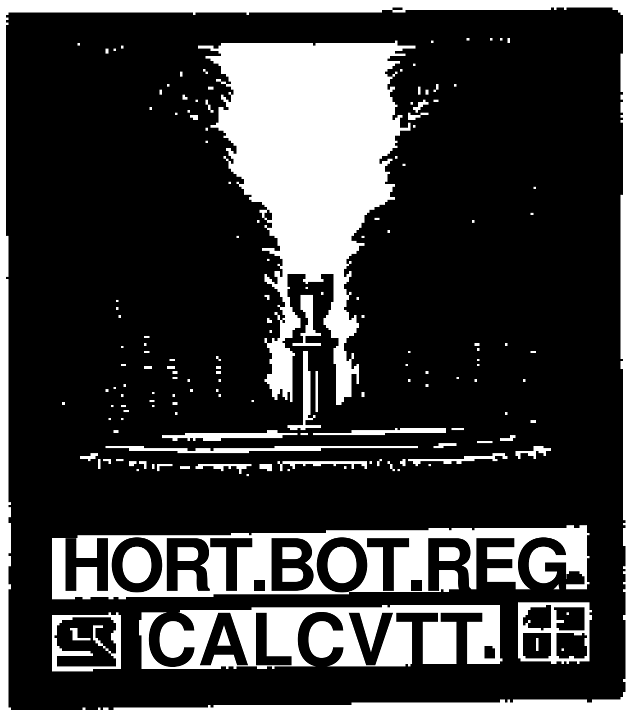
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CAWNPORE EXPERIMENTAL FARM.

OFFICIAL MANAGEMENT OF THE FARM.

THE farm work is now divided under two heads : —

I.— Agricultural experiments, which consist mainly in the measurement of results of various methods of cultivation.

II.—Mechanical experiments, which relate to the development of agricultural machinery,

2. Progress under the first of these classes has been much impaired by the neglect of the managing superintendent which led, under circumstances already reported to Government, to his enforced resignation. Progress under the second class may be accepted as considerable.

3. Since the removal of the late superintendent in October last, Mr. Fuller has been placed in responsible charge of operations, and has been provided with accommodation in the house belonging to the department near the farm lands, iu which, pending other arrangements, he will continue to reside during the greater part of the year.

4. Previous reports have noticed the initial attempts which had been made at the farm for the development of agricultural workshops. Mr. Fuller since joining the department had personally superintended work in this direction, and by last May had made no little progress in the modification of English ploughs for native requirements.

5. I had also during 1878 and 1879 prepared on the farm premises, for the scientific trial of various kinds of waterlifts, a series of wells and measuring tanks, the construction of which occupied a considerable time, but which during last rains were brought to completion. They were so constructed that any kind of waterlift could be tested in them, and meanwhile I had procured from Roorkee or had had constructed on the farm such models of waterlifts as I could obtain.

6. While these operations were ia progress, I lost no opportunity of representing to Government the importance of attaching to the department the services of a skilled engineer, on the ground that the development of machinery suited to the country must be kept under the control of skilled supervision, for very obvious reasons, some of which Avill be presently recorded,

7. The result was that Mr. Jones of the Irrigation Department, in charge of workshops at the Narora head works of the Lower Ganges Canal, was in May, 1879, temporarily transferred to the department, but in consequence of his services being required for railway purposes, was very shortly afterwards transferred to the Kajputana State Railway,

8. I then made an urgent request for the services of another engineer, and as it so happened that the committee appointed in 1878 for investigating questions connected with the deteiioration of land under the influence of *Reh* (saline efflorescence) had at about the same time strongly

Note by Director, Dept. Agriculture and Commerce.

recommended Government to place the scientific investigation of *Reh* phenomena under a special officer, it was determined by Government to depute permanently to this department an engineer from the Public Works Department. Mr. Wilson of the Irrigation Department was specially selected by Colonel Brownlow, the Chief Engineer, Public Works Department, for the appointment, and this officer joined at Cawnpore in the month of August. His report on the comparative results of the different classes of waterlifts tried on the farm, to which I will refer again, is appended. Mr. Wilson has since been transferred to another district, to lake charge of operations connected with *Reh,* but will continue to give his assistance to Mr. Fuller at Cawnpore when required to do so.

9. At tlae beginning of the year I took on the farm a European apprentice (Mr. Crawley) who had had some years' experience in farming and flax-growing in Ireland. He is now in immediate superintendence of operations under Mr. Fuller's orders, and occupies the late Superintendent's house on the grounds. So far he has proved trustworthy and careful.

10. I had sometime ago determined that experimental work should as far as possible be transferred from the farm area to a neighbouring Court of Wards' estate known as the "Rawatpur" estate, which is likely to remain under Government management for several years. An opportunity was given to me to do so by the orders I received from Government to take any advantage of Court of Wards' estates for agricultural experiments, so far as they did not iuvolve unremunevative outlay to the treasury of the estates.

11. The following quotation from one of my letters will explain my reasons for wishing to carry out agricultural operations on the Court of Wards' villages rather than on the farm :—

"The farms which Government maintains cannot be termed model farms, " partly because for one thing in which we can beat the native, he can beat us in a " hundred, and partly because if the farm was cultivated on Government account, " peculation and dishonest labor would destroy the value of every result. As it is, " native dishonesty goes far to impair the value of experimental cultivation, but it " would absolutely ruin any attempt at model farming. Every man employed to cut " the crops, to thresh, winnow or store the grain, or to sow the seed, takes something " of what passes through his hands, and thus prevents accuracy of measurement, while " by shirking their work, the cultivating laborers prevent accuracy of the record of " cost. The only hope of ensuring true experiments is *to* adopt a system under which " cultivators will carry them out on their lands for their own benefit."

12. The situation of the Rawatpur estate offered a convenient opportunity for establishing a system of agricultural experiment by the best agency, that of cultivators themselves, under our own directions.

FARM OPERATIONS.

Before noticing the operations desciibed by Mr. Fuller and Mr. Wilson, I will repeat the remarks which I placed nearly a year ago before Government in exi^lanation of the principles which have been adopted in developing experimental operations for the adaptation of foreign machinery to native requirements.

Note by Director, Dept. Agriculture and Commerce.

« In the first phce, we have to deal with a climate and with conditions of soil " completely at variance with those of England. The most skilled English agricul- " turist ought, therefore, to have the greatest diffidence in proposing any change, " founded on any English experience; in a system of cultivation which has been " evolved by centuries of' natural selection.'

" Every English machine or implement may, in the first place, be condemned as ?*prim& face* unsuitable for India, notwithstanding even that the principle on which " it is contructed may be equally sound for Indiau as for English conditions. The "onus of proof will always lie on the side of establishing that an English machine is " useful to this country, smd not on that of proving that it is not useful. Hence " our farms must {*quoad* machinery; be experimental, not inodol.

" The chief objections to English machinery (the word is intended to include "' implements') are, first the price, utterly and completely out of the reach of tho " mass of Indian cultivators; the second is the cheapness of labor with which machi- " nery has to compete, and the third is their unsuitability to Indian conditions.

" We have therefore to begin firstly, by reducing the cost of construction of "machines; secondly, by limiting our machines to those which will increase the " effect of available labor rather than economise or provide a substitute for labor : " thirdly, by modifying the machines until they are suitable for Indian conditions. " It follows that, until these objects ^re effected, we cannot, so far as machines are " concerned, come forward *to* advise natives *to* adopt any class of machines, or to " attempt to instruct them in their use.

"JThe second point noticed requires illustration by a practical example. A well " bucket (A) has been invented which is drawn by *one* bullock and *one* man, the ordi- "nary bucket in use (B) is drawn by *two* bullocks and *two* men; B raises less than ."double the water raised by A. But A, though it economizes labor, does not " increase,Ahe effect of existing labor. B gets more out of existing labor than A ; " *the* number *of* wells remaining the *sime.* *For* this reason cultivators prefer B " to A.

" If, then, the position assumed is accepted, that we must ascertain *how* machi- " nery can be adapted to meet native conditions before attempting to introduce them "*or instruct others in their use, then the first step is to choose the class of machines " to be adopted, the second to"adopt them, the third to introduce them."

13. During the past year, or*for a still longer period, we have adopted for experimental development three classes of machines, *viz.,* (1) Foreign ploughs, which I shall presently explain are implements new to India ; (2) waterlifts, in which improvement will (if practicable) be of great service to an irrigating country, (3) grain-cleaners or sifters.

14. The next step has been to attempt their modification or adaptation to native requirements. An account is given in the appended reports of progress made in this direction.

15. The third step has been to commence their introduction.—That this has been effected with some measure of success in the case of ploughs, and with some prospect of success, in the case of waterlifts, is also shown in the reports. The adaptation of grain-cleaners is not complete, but it is intended that some should be ready for trial by next rabi harvest.

16. *A. Ploughs.*—Mr. Fuller, the assistant in this department, deserves much credit for the energy and perseveranca which he has devoted to the development and construction of a cheap plough in which the

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mechanical principles of the English plough, altogether wanting in the natire implement, brought ^ ^ ^^^ rf & ^ . ^ cultivator, as I have represented elsewhere. The Indian plough ought not to be called a plough at all. It is a grubber or toothed implement, which (aa Mr. Fuller explains) stirs the soil without inverting it. It is an extremely good implement for the purpose it fuMls, and will probably never be superseded or ousted by any implement that we can introduce under the name of a plough. But it cannot be too often repeated, that the native implement, good as it is, is not, in English farm language, a plough at all, and that in introducing the implement which we are trying to establish, we are introducing a new implement into native agriculture and not trying to oust an old one. The same development has occurred in England. Diagrams from early English books prove the so-called Saxon plough to have been a very similar implement to that which has hitherto been known as the Indian plough, *I e.,* a soil stirrer, and not a soil invertor. The new principle of "inverting the soil" by an implement drawn by cattle is of comparatively modern application. In fact, the plough of the Saxons has received a double development in recent agriculture, one of which is the soil-inverting plough, and the other the soil-stirrer, known uuder the various names of grubber, subsoiler, bull-tongue, &c.

17. At the same time, while the new principle of inverting the soil has been thus introduced, an attempt has been made to combine the further advantage of opening the soil to a greater depth than can be effected by the native implement. How far this can be successfully effected without a corresponding increase in the power of the cattle used for agricultural purposes is yet doubtful, but if increased depth of soil-stirring, as well as inversion of soil can be attained, a double advantage will have been gained. It is now a matter of trial, which the farm experiments will shortly bring to a certain conclusion, to what depth we can allow the soil inverting plough to be used without placing too great a burJen on the cattle of minimum power, usually employed by cultivators^ As Mr. Fuller points out, much difficulty has been occasioned by an imperfect knowledge of the method of using the new implement, which has led to its rejection in some cases on theplea that cattle have not been equal to its draught. But the experiments now being conducted will succeed in determining the exact draught which ordinary cattle can sustain when the plough is properly used, and meanwhile the principle has been adopted of discontinuing the distribution of ploughs until competent ploughmen can in the first instance be sent out to teach their use.

18. Mr. Jones and Mr. Wilson instituted some careful experiments (which are still being continued) to establish the average draught which an ordinary pair of bullocks can sustain, and this once determined, it will be a matter of mechanical adjustment to construct implements to which the strength of bullocks is adapted.

19. I wish to draw attention to those remarks made by Mr. Fuller which indicate the great advantage which has been derived from Ameri! can models. For cheapness and adaptation to Indian requirements,

they appear certainly in advance of English patterns, and I believe that it may be even found possible to obtain the ironwork from America almost as economically as it can be constructed here, with the great advantage that it will be far more durable.

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There is no doubt that a light American plough constructed iu America is a more perfect instrument than we can (under any circumstances) make up in India, and that if we can import the metal portion from that country cheaply enough we shall be able to give to the cultivator a more useful instrument than any that we can make, and at the same time an implement which a native *mistri* can ordinarily put together and keep in repair without difficulty, since, if it occurs that any portion of the ironwork should break, a new piece of the same pattern would be supplied for a few annas.

20. I have not gone into the question whether soil inverting is or is not useful. I assume that it is. Of course, if the assumption is wrong, the advantage of a soil inverting implement disappears.

But so long as we have the experience of England, America and other civilized countries on our side, and so long as natives in India believe, as they do, in spade digging, so long are we entitled to presume that there will be an advantage in applying to this country the principle of the English plough, which may not be improperly termed a cattle drawn spade.

21. *B. Waterlifts.*—The object of the experiments in waterlifts is to ascertain whether any more effective machine than those now used can be placed in the hands of the agricultural population.

In order to solve this problem, it is necessary first to measure the cftective work of existing appliances, next, to make experimental trials with new models, and to select any which are more effective than those existing. Thirdly, to adapt models thus selected, so as to bring them within the reach-of native agriculturists.

For the purpose of measuring the work of different waterlifts the following arrangements have been made:—A masonry well about 50 feet deep has been constructed near a large tank, which latter is filled with water from the Ganges canal. The well is closed at the bottom with a brick floor, and a channel from the tank admits water to any depth required. This arrangement permits of the adjustment of any waterlift for depths not exceeding 50 feet. Near the well small masonry reservoirs are placed in which the water lifted in a given time can be accurately measured.

Of the general results obtained and recorded in Mr. Wilson's note the following is a brief abstract:—

22. Native appliances tested on the farm are three in number—

1. The swing-basket used by hand-power for depths not generally exceeding 5 feet.
2. The dhenkli, or earthen pot raised with lever by hand-power for depths of about 15 feet and under.

S£ lS^Sl and commerce.

3f Tlie ordinary father bucket worked by cattle on an inclined plane and generally used for depths exceeding 15 feet.

Persian wheels are little used in this province, and have not yet been tested on the farm, but statistics have been obtained from Bundelkhand, which are included in Mr. Wilson's note.

23. So far as observations have been recorded, baskets are most effective between 3 and 4 feet; and in terms of one Horse-Power the useful work done by 4 men is about 0·08—or 0·02 per man.

24. The work of one man at a dhenkli raising water from 13 to 15 feet is equal to about 0·03 of one Horse-Power. It must be however borne in mind that one man is in each case required on the field to regulate the distribution of water, and that with the dhenkli much less work is required from this man than in the case of the basketlift (by which much more water is raised in the same time). It is usual therefore for the two men at the dhenkli to take turns in raising water, whereas the fifth man at the basket does not assist. This circumstance makes the work done per man in the two cases nearly equal, and gives as a fair working unit 0·02 of a Horse-Power as the effective work of one man.

25. In the third case, that of the leather bucket, which may be said to be the ordinary waterlift of the province, the effective work of 2 bullocks increases considerably with the distance of water from the surface. The experiments, so far as they have gone, indicate the effective work per hour at 40 feet as about double that at 15 feet. In the former case it was 0·127 of a Horse-Power, in the latter 0·064.

26. The experiments are not considered final, and will be continued with different pairs of bullocks until a sufficient series has been recorded to justify more definite conclusions. Assuming however the results of the observations to afford a basis for calculation, the problem which has to be solved takes the following form :—

Can a waterlift, sufficiently cheap and easy of construction, be provided which up to 15 or 20 feet can be worked by manual labor, so that the effective work of each man employed will be greater than 0·02 of a Horse-Power, or which at a depth of from 15 to 40 feet can be worked by bullock labor, so that the work of a pair of bullocks is greater than 0·127 to 0·064 of a Horse-Power? The solution of this problem cannot, as I have indicated, be definitely undertaken until the data are more conclusively established, but the above statement will show clearly the method in which it has to be worked out.

27. Side by side with the above observations experiments have been tried to asceVtain the effective value of new appliances, in order to provide data for the solution of the problem stated in the last paragraph.

These have been three in number; (1) a chain pump worked by hand labor ; (2) a chain pump worked by bullock labour ; (3) a double bucket worked by bullocks.

[The latter is only so far new that it has not been yet adopted by native cultivators in the North-Western Provinces, though it has been often the subject of experiment on experimental farms, private gardens and elsewhere.] Note by Director, Dept. Agriculture and Commerce.

28. The general results are these—

(1.) The chain pump worked by four men is proved to be very effective for lifts under 15 feet ; the effective work of one man being about 0*034 of one Horse-Power.

(2.) That worked by bullock-power has only been tried at about 40 feet. It is much less effective than the ordinary leather bucket, the effective work of a pair of bullocks not exceeding 0·1 of a Horse-Power.

(3.) The term " double bucket" indicates that one bucket descends while another rises, both being worked by the same bullock or pair of bullocks. The effective work of one pair of bullocks, so far as experiments have been made, is about 0·18 of a Horse-Power. At depths up to 20 feet this exceeds the effective work of the ordinary bucket by about 50 per cent.

29. Another form of comparison is given by Mr. Wilson in tabulating the cost of the work performed by different appliances. The result is shown in the following table :—

Name of appliance.		Height of lift.	Cost of raising 1000 tons of water 1 foot high.
			Annas.
Manual labor,	Basket	3' to 4'-5	14·1
	Dhenkli	13'	8·7
	Chain pump	10·5 to 15'	8·2
Cattle labor,	Ordinary water-bucket ...	20' to 50'	14·0 to 9·6
	Double ditto ditto ...	20'	8·9
	Persian wheel	20'	11·7

30. The results indicated in the foregoing remarks have justified an attempt being made to adapt the chain pump to native requirements. The working models first employed were :—

(1) A pump brought myself from Australia at a cost of Rs. 300.

(2.) A pump manufactured at Roorkee for about Rs. 100.

These prices are too high forordinary cultivators, and can only be given in exceptional cases by rich zemindars. Experiments have been made by substituting, (a) sheet iron, *(b)* wood, (c) leather and bamboo, for the ordinary iron tubing. 1 he result has been a reduction of cost to something like Rs. 20 to Rs. 30, though it is not yet determined which of the new models will be formed most permanently effective. There is every reason to believe that this waterlift (of which the principle has been adopted with success in Australia as well as on pumps used by cultivators on the Ghazipur tobacco farm) will in one form or another be made readily adaptable to native requirements with great effect in all areas in which water is not more than 20 feet from the surface, and especially in those tracts (which are far from uncommon) in which bullock labor is deficient.

31. The above remarks will give a definite idea of the principles on which experimental work is being conducted. I cannot speak too highly

Note by Director, Dept. Agricult. and Commerce.

of the energy and ability which Mr. Fuller and Mr. Wilson have devoted to it, and, as I have said, whatever improvement has been made in the plough is due to Mr. Fuller. I regret however the difficulty which has been experienced in finding a good farm superintendent. The choice lies between aa incompetent man who knows something of the country and its agriculture, and a competent man who knows nothing of them. The criticism is true, that competent mea in India have succeeded in providing for themselves elsewhere, and are not forthcoming, while the experiment of bringing out a farmer from England who may or may not succeed, is a dangerous one to adopt without much caution, and has been indeed viewed with disfavor by high authority, in one instance at least, in which it has been proposed. Moreover, as I have in previous reports explained, we were saddled at first starting with previously imported farmers of the wrong class, men more fitted to grow roses than wheat.

At the present time experimental work of one class, *viz*, that affecting agricultural machinery is, in my opinion, making sufficiently good progress. Experimental work of the second class, *viz.,* that affecting methods of cultivation has been hitherto unsatisfactory, and although it will be placed on a much securer basis for the current year than the past year, and the assistant now on the farm under Mr. Fuller is a farmer of some experience at home, it remains a question, which will be brought under discussion elsewhere, whether or not scientific supervision should be obtained, and if so, in what way it should be provided.

E. C. BUCK,

llth February, 1880. *Director, Dept. AgrL and Commerce.*

REPORT

ON THE

CAWNPORE BIPERIHENTAI FARM,

FOR THE TEAR ENDING DECEMBER 31st, 1879.

Report by Mr. J. B. Fuller

^M . , Official superintendence.

AT the commencement of the year a new Superintendent was engaged, who, judging from the excellent recommendations he brought with him, should have proved himself more successful than his predecessors. But events have shown him to have systematically neglected orders from the very commencement of his tenure, and he is proved to have exercised no real supervision over the various operations in progress in the farm, and have trusted entirely to his native subordinates for the accurate recording of the results. An enquiry instituted in October last ended in his resignation from November 1st—the date from which I was put in immediate charge of the farm.

2. Under these circumstances I hesitate to put forward the various results which are represented to have been obtained. Unless they are guaranteed to be accurate, the publication of such results will be worse than useless, and the circumstances under which they were collected, and to some extent, the suspicious regularity and correspondence exhibited by the results themselves throw the very gravest suspicions on their accuracy. I therefore put aside all agricultural operations for the conduct and record of which the Superintendent was solely 'responsible, and confine the present report to the following three heads :—

(i.) Experiments in the reclamation *ofreh-infected* land on the Rāwatpur Court of Ward's estate.

(ii.) The adaptation and construction of improved agricultural implements for Indian use, which were conducted under my immediate direction.

(iii.) Experiments on the comparative efficiency of various methods of lifting water, conducted for the most part on the farm premises by W. J, Wilson, Esq., Assistant Engineer, on special duty with this Department.

(i.)-E*perimeatB in the reclamation of reA-infected land on the Rawatpur Court of Ward's estate.

3. (i.)—*Experiments in the reclamation of reh-infected land on the Rāwatpur CoUrt *f Ward's* ****

A number of the villages which constitute the Biwatpur estate are situated at only 2 or 3 miles distance from the farm premises, and the programme which was laid down for the guidance of the late Superintendent included the introduction into these villages of improved methods of cultivation under the orders of the Collector of the district. This remained a dead letter, and the only agricultural operations, worthy of the name, which were conducted on this estate, were some attempts to reclaim ^A-infected land in the village of Sh^hpur on the banks of the Ganges canal. These experiments were not under the immediate charge of the Farm Superintendent, but of his Assistant, and I believe that they were conducted with fidelity and the results accurately recorded.

4. The ground operated on lies close under the canal bank, and is a fair specimen of *tear* land, covered with efflorescent salt in some places, and in others bearing scanty

Report by
Mr. J. B. Fuller.

tufts of grass and, here and there, small *babtil* trees. The following is a summary of experiments which were tried :—

No.	Area of plot.	Ploughing.	Manure.	Seed.	Watering.	Results.
1	¼ acre,	Watered and ploughed with the English plough in May and again (8" deep) in July,	*Ashes of the Madar (*Calatropis gigantea.*)	Babul sown broadcast.	None ...	Seed germinated fairly well, the young trees now (December) 3" to 6" high, not looking healthy.
2	Do. ...	Ditto ...	Ditto ...	Juár, as a fodder crop	Ditto ...	Germinated unevenly, and in some places grew to a good height. The yield was only 13 mauads 14 seers of green fodder.
3	Do. ...	Ditto ...	Ditto ...	Madár (*Calatropis gigantea.*)	Ditto ...	Germinated well, but the young plants are now (December) withering.
4	Do. ...	Ditto ...	None ...	Babul, sown broad-cast.	Ditto ...	Germinated well and the plants are in rather better condition than on plot No. 1.
5	Do. ...	Ditto ...	Ditto ...	Madár ...	Ditto ...	Condition of crop similar to that of No. 3.
6	Do. ...	Ditto ...	Ditto ...	Rice ...	Was to have been kept flooded, but from failure of canal water this was impossible.	Only the plants situated on the high parts of the field grew to any height, the whole crop withered away when the ground was allowed to dry and only yielded 4½ seers of grain.

In addition to the above experiments the effect was tried on smaller plots of—

(a). Removing the upper crust of soil to the depth of three inches, and replacing it by earth dug from a pit in the corner of the field.

(b). Paring and burning the upper crust of soil, and re-spreading it.

(c). Surface draining by shallow trenches 5' apart sloping into a pit at one corner of the field.

Although twice sown not a single seed germinated on plots *(a)* and *(b)*; plot *(c)* was not to be sown till November, but appeared to give better results than any other of the plots experimented on, judging from the crop of grass it bore in the rains.

5. The processes experimented with, of the success of which some hope may be entertained, were therefore in the main three, (i.) deep cultivation two months before the rainfall, and again at the commencement of the rains ; (ii) manuring with madir ashes; and (iii) surface drainage,—but it is too early as yet to form a definite conclusion as to their results, which in some cases *(i. e.,* babul cultivation) will not be complete under a full year. A portion of the ground has also been sown with rabi crops.

(ii.)—The adaptation and construction of improved agricultural implements for Indian use.

6. (ii.)—*The adaptation and construction of improved agricultural implements for Indian use.*

The implements which have engaged attention during the year are ploughs and waterlifts.

Ploughs.— The main difference between the European or American and Indian plough is that the one inverts the soil while the other merely stirs it. The popular idea which associates English ploughs with deep and the native implements with shallow cultivation must be accepted with much reserve. Enquiries have shown that in the case of good cultivators at all events, the depth to which the ground is stirred in preparation for a *rabi* crop, is often equal to the average depth of English cultivation. This depth is generally attained by a laborious and costly system of ploughing and reploughing, and occasionally by the use of a more powerful implement than that ordinarily employed. Under the orders of the Director, Department of

*Madár ashes were tried as a manure in consequence of the r[illegible] of several [illegible] zemindars, but its efficiency was not apparent in these experiments [illegible] object of determining whether the land could be made at small cost to produce a plant the ashes of which would be serviceable when returned to the soil.

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Agriculture and Commerce, a collection of the ploughs used in each district of these provinces has been commenced, and the differences thus brought out are very striking. In the majority of districts the plough which is used, though of varying shape, consists essentially of a tongue of wood fitted with a small iron tooth. But, to notice one or two of the most striking divergences from this type, the ploughs contributed to the collection by the SaMranpur, Muzaffarnagar, and Meerut districts are of nearly double the ordinary size and weight, are shod with a horse-shoe shaped piece of iron round the edge of the " tongue," and instead of a small iron tooth are fitted with a long pointed bar of iron which projects out behind the heel of the plough and can be forced forward as its point wears down. Another plough used in one portion of Bundelkhand (the *ndgar)* weighs 3 mds., 14 seers, that is to say, considerably more than an ordinary English or American plough, and stirs up the earth to a depth of 9 inches or a foot. It is dragged by three pair of oxen and worked by nine men, yet so well appreciated are the advantages which result from its use, that cultivators club their oxen together for the purpose and plough each other's fields in turn.* It must be remembered that both the iron shed plough of the Meerut Division and the *ndgar* of Bundelkhand, aie only used by the most careful and painstaking classes of cultivators, but the fact of their being used disposes of many of the objections which are urged against the possibility of introducing European implements into the cultivation of this country, and proves not only that good cultivators recognize the advantages of deep cultivation, but that they are prepared to go to some trouble and expense to attain it.

7. The inversion of the soil which is effected by an English plough could however only be effected by the Indian cultivator through the expensive process of hand digging and the extent to which this is resorted to in the cultivation of some of the more valuable crops *(e. g.,* potatoes and sugar-cane) shows that the beneficial results (on some soils at any rate) are well known and appreciated. To dig an acre of ground by hand labor to a depth of six inches employs four men for five days, even in the comparatively soft soil of Bohilkhand; a plough on the European model worked by good bullocks can easily do this in two days. It is quite possible, or even probable, that inversion of the soil may cause at the outset some loss *of* produce. The earth which lies below the upper veneer of cultivated soil, has from non-exposure to the sun and air, never been properly disintegrated, and, if brought to the surface at the wrong season, will probably at first give less return than the upper layer. But cultivators readily admit, and experiments have proved, that the subsoil (if of the same character as the upper layer) will exhibit its natural fertility after a year's exposure, and the increased depth of the tilth will then largely add to the outturn. This is frequently to be observed in the case of land which has been disturbed to a greater depth than ordinary, and the sites of old embankments or watercourses, which have been levelled off into fields, are often marked for miles by the greater height and richness of the crops on them. If it is impossible to give land a fallow after inverting its soil, it should be ploughed at the commencement of the rains, and sown with an autumn crop, which is influenced far less than a spring crop by the rawness of the soil it is sown in. But the most favourable time for the use of an English plough would appear to be the end of the rains, followed by a fallow during the cold and hot weathfer months, or if possible, land should be watered and ploughed in April after the spring crops have been cut and carried. In no case is the English plough meant to supplant the native implement, which in its best forms is probably as effectual an instrument as could be devised for pulverizing the soil and for covering the seed.

8. The two chief objections to imported ploughs of either European or American manufacture were on the score of—

(i.) Their expense.

(ii.) Their draught, which was beyond the capacity of a pair of ordinarily good bullocks.

*The process is so expensive a one, that it is, as a rule, only followed in preparing land for sugar-cane.

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As regards the second objection, the case of the *ndgar* of Bundelkhand may be [illegible] showing that it is by no means indispensable that the drawing power of a plough in this country should be limited to the usual one pair of bullocks. But such a system as that on which the *ndgar* is worked presupposes powers of combination which are rarely possessed and would be only workable when the area to be deep ploughed each year was a very small one. The majority of cultivators cannot afford more than one pair of bullocks, and a plough which is to find favour with them must be of light enough *draught* to be drawn by one pair. It must also be of a light enough *weight* to be carried on the shoulder, cheap, and, if possible, should be easily repairable.

9. None of the English or American ploughs which had been imported fulfilled these requisites. Indeed, the ploughs which were imported previously to 1876-77 and which now for the most part lie useless in the farm store rooms, appear to have been ordered from England without any reference whatever to the *desiderata* of cheapness, lightness, and simplicity of construction. During the past two years several of the lightest description of English and American ploughs have been imported and thoroughly tried by me one against the other. But although the lightest of the American "Eagle" ploughs comes in its draught very nearly down to the required standard, the cost was always prohibitive, being in no case under Rs. 16 per plough. Experiments with a dynanometer gave good ground for the belief that for fairly good cattle, working eight hours a day, the average plough draught should not exceed 126lbs. This belief is not only based on measurements of the average draught overcome by different pairs of the Farm bullocks, when ploughing all day with English or American ploughs, but also on the fact that a very second rate pair of bullocks, getting no gram, worked regularly for 10 hours a day on a gin which turned a fan in the farm workshops, the average draught of which was 100lbs. The limit of price was fixed at Rs. 8, the utmost which could be expected from an average well-to-do cultivator. How far the ploughs experimented on fell short of these requirements may be judged of from the following table, which shows the weight, draught, and cost* (landed at the farm) of some typical ones.

	Weight	Average draught at 5 inches.	Cost, Rs.
ENGLISH.			
Ransome and Sims' B.F.O., ...	64lbs.	196lbs.	24
Ditto Eagle, ...	38lbs.	178lbs.	17
Howard's D. Cotton plough, ...	77lbs.	220lbs.	34
AMERICAN.			
Collin's cast steel	5[illegible]	180lbs.	25
Watts	42lbs.	150lbs.	12

The factors which contributed to these wide differences in draught were—

(a.)—The width of furrow slice, which in some cases was rather broader than in others.

(6.)—The weight of the plough itself, which has been proved by experiment to constitute from 33 to 50 per cent, of the draught.

(c.)—Differences in the style of work done, *i.e.*, the furrow slice may be broken and thrown lightly aside as in the case of a short breasted plough of the "Eagle" pattern, or may be turned over in a regular "glazed" line as with a long breasted plough like the B. F. O.

10. It was determined to attempt to adopt from these patterns a plough which, while turning over the soil to the depth of 5 inches, should suffer as little increase of draught as possible from the three causes abovenamed,—breadth of furrow-slice, weight (which aids the ploughman by giving steadiness) and style being sacrificed as far as possible, in order to reduce the draught down to the limit which was fixed on. One of the questions to be decided at the outset was, whether it would not be better to

* The cost is calculated on the published catalogues of the manufacturers, taking Re 1 as equal to two shillings, and adding 35 per cent, on account of freight.

† See a paper [illegible] published [illegible]

copy the native plough so far as to use a rigid beam for attaching the body of the plough to the yoke. This was found to be impracticable without adding considerably to the draught. From the nature of this attachment it was found impossible so to regulate the line of draught as to make it pass through the centre of the body of the plough (culled the *zero point)* which is necessary for easy and steady ploughing. In English and American ploughs this is attained by the combination of a horizontal plough beam with slanting traces. If a rigid beam is used as the sole attachment, the line of draught terminates behind the zero point, and (unless considerable force is exerted, which adds largely to the draught; the heel of the plough has a tepdency to be pulled up off the ground, and the plough travels on its point in much the same manner as an ordinary native plough. With the rejection of a rigid beam as the attachment, arose the question as to whether a wheel plough or a " swing" plough was best suited to the country. This was decided in favor of the "swing" pattern, since the extra weight and expense of a wheel were avoided, while the advantages which result from a wheel in this country are not so unequivocal as in England. The ridges which form the borders of the irrigation plots in all irrigated fields prevent steady ploughing altogether where a wheel is used, while the advantage of a wheel in transporting the plough to and from the homestead is very doubtful in a country intersected by the numerous watercourses of an Indian village, especially if the plough itself be light enough to be carried on the shoulder.

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11. The plough which was finally adopted is a modification of the Watts' plough already mentioned in para. 9. Its weight is only 30flbs., its average draught turning a furrow 5"x3J" on the farm land (which is a rather light soil) is 1261b*., and its price has been brought down to Rs. 6 if fitted with wrought ironwork, while it can be turned out at the Roorkee Foundry with cast ironwork for R3. 5. Natives will probably prefer wrought ironwork to cast as being more easily repairable. It is fitted with a small cast iron share on a principle which is believed to be a new one, by which the share can be slipped off or on to the frame with great ease. The depth of the furrow can be easily regulated by the length of the rope by which the beam is attached to the yoke. The plough being of so light a weight depends entirely on the correctness of its adjustment for working smoothly and easily, but to regulate the adjustment is a simple matter easily learnt with a few hours practice, and the principle is no new one to native cultivators, who adjust their own ploughs to bullocks of different heights by the use of wooden wedges. Although, before the cattle have become properly trained, an extra man will be needed to drive them, yet as soon as they have become accustomed to the plough the ploughman can easily drive them himself, as is always done now on the farm lands, and in any case the amount of work done by the plough far more than compensates for the wages of a second man.

12. At first ploughs of this description were made up for distribution by a contractor at Cawnpore, and were sold at Rs. 8 a piece. This was not found tu work well, and it was determined to start workshops on a small scale in connection with the farm at which ploughs should be made up, and the shares cast under the supervision of the Superintendent. One advantage of this system was the constant opportunity afforded for making fresh improvements which often suggested themselves in the process of construction. Between April 1st and December 31st, 1879, 322 ploughs of the approved pattern, varying a little in details of construction, were mado up at the workshops, and, including the ploughs which were previously made up by contract, the total number of ploughs sold during the year is 429, besides 8 more which wore given away as samples.

The price of these ploughs has been reduced from Rs. 8 to Rs. 6, since it has been proved that they can be made up at the latter price at a small profit. Messrs. Watts and Co., of Virginia Co., D. S., make a plough still lighter than the one experimented with on the farm, and enquiries have been made from them as to whether they could consent to supply the ironwork alone at wholesale prices. Ware this effected and the woodwork fitted to the ploughs at Cawnpore, an implement of far

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better workmanship than can be turned out in India could be supplied to purchasers at a price which would but little exceed the limit of Rs. 8.

13. The opinions which have as yet been received on the ploughs which have been distributed are of the greatest variety. It is satisfactory, however, to note that the opinion of persons who understand the use of English ploughs, is uniformly in favor of the one adopted. Mr. D. N. Reid of Sarun, Tirhoot, who has given an order for 100 of the ploughs to the Roorkee Foundry, writes—"that it is the only plough of a foreign pattern which he has yet seen cultivators inclined to adopt." Mr. 0. R. Webb of Dhooly, Tirhoot, states, that " he finds the plough -exceedingly useful, and that a number of planters are trying them, and are as well pleased with them as he is." In these provinces, Mr. McConaghey, Collector of Bánda, has used them with great effect in the reclamation of land infected with *kdns* grass in villages under direct management. He writes;—" The ploughs are much lighter in draught, more simple in construction, less likely to get out of order, and more easily repaired, and finally plough as deep and as strong as the English* ploughs. Ordinary bullocks can be worked in them, and can plough nearly au acre a day. Deep ploughing, especially in dry years, would greatly increase «the produce of the land in Bundelkhand, where we have to depend entirely on the rains. * * I have not encouraged men to buy them. They simply bought them because they thought they suited their purpose." Altogether 51 ploughs have been sent to the Bánda district and have been used there: a large number of these have been bought by cultivators, .twelve having been taken in one village.

On the other hand from some districts reports of a discouraging nature have been received, notably from Aligarh and Bulandshahr, each of which rivalled Bánda in the number of ploughs which it purchased. The draught is said to be far heyond the power of the cattle (which in both these districts are exceptionally good), and the efficiency of the plough is to some extent denied. Both of these impressions originate from ignorance of the method of using the plough, of attaching it to the yoke, and of regulating its adjustment. It has been determined in future to distribute no ploughs to native applicants, unless a trained instructor is sent with the ploughs, to explain the mode of using them, and the advantages which result from their use. To supply these instructors, a number of intelligent youths are being trained on the farm under my supervision.

14. It is however on the verdict of the cultivator that the plough depends for its adoption on a large scale, and unfortunately this verdict depends only partially on the real merits or demerits of the implement. In any case, only the most industrious castes of cultivators must bo looked to. The gap which divides the good cultivator of this country from the bad, is at least as wide as that which divides the good cultivator from the scientific agriculturalist, and it is impossible to hope that castes which fail to profit by the example of the Kurmis, Lodhis, and Játs in their midst will pay any attention to the teachings of agricultural science. Unfortunately too the persons whom the ploughs generally reach through the district officers, are the very people who must fail most completely to appreciate them, being the prominent zemindars of a district, who are as a rule notoriously indifferent concerning the agricultural condition of their villages.

2. *Waterlifts.*—The experiments which have been conducted during the past half year by Mr. W. J. Wilson, Assistant Engineer, attached to this department, have shown that the efficiency of the ordinary well bucket decreases very rapidly for depths less than 20 feet below the surface, since the repeated emptyings and fillings of the bucket occasion a greater loss of time than is necessary to rest the bullocks. It has therefore been an object to construct a cheap pump, light in weight so as to be easily carried to and from the well, which could lift water from a depth of from 15 to 18 feet more efficiently than this can now be done with bullock labor. The pattern of pump which seemed most suited for this purpose was that kind of chain pump in

* The English ploughs referred to are Messrs. Ransome and Sim3', B. F. O.

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which the plugs or suckers fit closely in only the lower portion of the pipe, the upper portion being wider so as to save all unnecessary friction, Pumps constructed on this principle (the *Bastiat* pump) were found serviceable in the Abyssinian war, and the greatly advertised *Me Comas' waterli/t* is merely an adaptation of the same principle. Iron pumps of this description had before this been constructed at Koorkee Canal Foundry for this department and gave admirable results. But the price was prohibitive, so far as cultivators were concerned, being from Rs. 103 to Rs. 120.

A wooden pump has now been constructed which when worked eight hours a day by three men will raise more water from a depth of 14 or 15 feet than can be effected by a pair of bullocks and two men. Its cost is only Rs. 18, but 15 feet is the maximum depth at which it can work, while the iron pump constructed at Roorkee worked effectively up to 20 feet. The subjoined table, summarized from the results of Mr. Wilson's experiments, contrast the actual amount of water raised and the efficiency (in H-P.) of the well bucket at 15',* and of the wooden water-lift at 14'.

	Height of lift,	*Labour employed.*	*Cubic feet of water raised per hour.*	*Useful work done,* In foot lbs. * per minute.	In H-P.
Well backet ...	1[illegible]'	2 bullocks. 2 men.	269*5	2,102	0-069
Pump	H'	3 men.	304*7	4,436	0134

In the wooden waterlift experimented with, rope takes the place of chain and hempen knots the place of wood and leather suckers. The wheel and frame are of wood, and a triangular grove running round the circumference of the wheel ensures the " biting " of the rope. The pipe is a split and hollowed bamboo covered with leather for the upper 12 feet; the lower 3 feet, in which the suckers fit closely, being carefully constructed of wood bound with iron. But it is intended to substitute light iron piping for the bamboo, as soon as this can be obtained of the requisite description, and the slight increase in the cost and weight of the pump will be more than counterbalanced by the gain in efficiency.

(iii.)—[illegible] ments on the comparative efficiency of different methods of lifting water.

(Hi)—Experiments on the comparative efficiency of different methods of lifting water.

During the first half of the year measurement tanks and wells were completed. The principal one is 10 feet in diameter and 45 feet deep with a floored bottom. It is situated close to the large tank on the garden from which it can be supplied with water to almost any height by a connecting pipe fitted with a sluice gate, Mr. Wilson was therefore enabled to make a series of careful experiments with most of the different methods of lifting water used in this country, as well as with some new methods, the general adoption of which has been advocated. A full account of their experiments and their results, prepared by Mr. Wilson, is appended to this report.

I have, &c,

J. B. FULLER,

Asst. Director, in charge, Oovt. Experimental Farm.

"Unfortunately the two experiments were not at exactly the same depth, and the results must be therefore accepted as giving only an approximate idea of the relative efficiency of the well bucket and pump.

APPENDIX.

Report on experiments with different waterlift s by MR. W. J. WILSON, C.E.

N.teby
Mr. W. J. Wilson,
Asat. Engineer.

1. THE object of the experiments now in progress is to determine the cheapest and best method of raising water under any given circumstances. With this view the discharges of some of the water-lifts ordinarily used in this country and of some pumps lately introduced have been tested when working at different depths. The results of these experiments are given in the accompanying tables.

2. Some of the terms used in the tables may require explanation. The action of a machine is expressed by multiplying the resistance overcome by the distance moved through; the product being called *work.* Thu3, the work clone in raising a weight of one ft>. through a height of one foot is one *foot-pound;* the work clone in raising a wsight of one ton through a height of one foot is one *foot-ton* ; the work done in raising the weight of a cubic foot of water (= 62^{f}4ft>s.) through a height of ten feet is 624 foot-pounds. The rate of work of a machine may be expressed in units of work (such as foot-pounds) per second, per minute, or per hour. But there is a peculiar unit appropriated to its expression called a *horse-poicer* (H-P) which is equivalent to 33,000 of power foot-pounds per minute or 1,980,000 foot-pounds per hour.

3. The work done by a machine is divided into *useful work* ami *lost work.* The HMMZ work of a machine is that which is performed in effecting the object for which the machine was designed ; the *lost* work is that which is performed in overcoming prejudicial resistances, such as friction. The useful work and the lost work of a machine together make up its total or gross work. For example, in a chain pump worked by men turning a crank, the total work done by the men upon the pump in a given time is the mean effort exerted by the men upon the crank multiplied by the distance described by the crank in that time; the useful work is the weight of water raised in that time multiplied by the height to which it is raised ; the lost work, or difference between the total work and useful work; is expended in overcoming the friction between the plugs and the pipe, the friction between the water and the pipe, and the friction between the axle of the wheel and its bearings, and in raising water which leaks down again between the pings and pipe. In the annexed tables only the *useful work* is shown. The *efficiency* of a machine is a fraction expressing the ratio of the useful work to the total work performed.

4. The best units of work for expressing the action of waterlifts are the cubic foot of water raised one foot high and the foot-ton. The former is easily calculated, the discharge of a waterlift boing usually given in cubic feet per second or per minute. The quantity of water required to flood an acre of land to a depth of one inch is nearly 100 tons (accurately 101*27.) If the average depth of a watering is 2| inches, 250 tons of water will be required at each watering; mutiplying this by the height to which the water is lifted we obtain the number of foot-tons of useful work that must be performed by the waterlift to irrigate one acre of land. If the number of foot-tons performed per hour and the cost per foot-ton are known, the time required to irrigate an acre and the cost of the irrigation can be obtained.

5. The following results of the work done by horses, men, and oxen working eight hours daily in England, are taken from Rankine's Treatise on the Steam Engine.

Kind of exertion.	Foot pounds per minute.	Horse-Power.	Foot-tons daily.
Horse, drawing a cart or boat, walking ...	25,950	0-785	5,554
Horse, drawing a gin or mill, walking ...	18,000	0 545	3,857
Man, turning a crank or winch	2,700	0*082	579
Ox, drawing a cart or boat walking (\ of power of ahorse)	17,2W>	0524	3,703
Ox, drawing a gin or mill, walking	12,000	0-363	2,571

M, ftj. KiUon, At. B.Iglnec, £ r » P '"V be ^ by men turning a crank or by oxen workin* a *in: if ^ , ^ o f the machine is 0-6, the useful work performed in the two causes Jill be

Kind of exertion.	Foot-pounds per minute.	Horse-power.	Foot-tons daily.
Man, working a pump by turning a crank (-3,700 x	1,020	0·019	3·17
Ox, working a pump by turning a giu (12,000 x 6)	7,200	0·218	1,043

6. At the Cawnpore Experimental Farm the discharges of the following water-lifts have been tested :—

(i.) lifts worked by manual labour—

a—the basket or fo.j (heights of lift 1'5 to 6'i •

b.-dltenkli (height of lift 15 feet) ;

«.—fhain pumps (height of lift 10-5 to 13 feet),

(ii) lifts worked by bullock labour—

ag single *moth* and inclined bullock run (height of lift 15 to 50 feet) •

b.—c on a vertical axis,

c—chain pump (height of lift 39 feet).

The quantity of water raised was measured in masonry tanks.

7. The results of experiments with the basket arc shown in table I Three men were employed to work the basket; one man resting while two worked; bu 1 e laborers said tlliU:cf m be

daily. I wo series of experiments were made, the same men being employed through out each series (except in i. *a,* when one of the men was changed). As the hoiVhtVf l.f decreases, the quantity of water lifted at each throw and the number of throws per minute increase, the former more rapidly than the latter In the fiJJr-« J experiments the basket was most effective (as'a machine) fo!• , i ^ of £ U ^ . » the second series for lifts between 3_h and 5 feet. Between the* lifts the rate of work performed was near ly 70 foot-tons per hour.

8' In a note on wells (Famine replies) Mr. Buck states that will, two 3 feet baskets lifts, s,x men can irrigate one acre a day. Hence four men can irrigate two third

SSarcu^cfcotofwaterraisedbyathrcefeetbasket lift per hour. In a day of fj* hours four men would raise 839-7x8-6,717-6 cubic feet. If this were used to irrigate two-th,rds of an acre, the depth of the watering would be -0-23 feet. This is very ... 2½ inches as the

9. With the *dheukli* only one experiment (table III, No. 8) has been made at the Cawnpore Farm. This apparatus is very commonly used for irrigation in the Moradabad district, and 1 tested one at Bachhraon on the 24th November. The results obtained were as follows:-

Height of lift . . . . 13·25

Capacity of earthen vessel (karwala,-Q'25 cubic feet =, V5Q <,lm
Number of times the kanvala was raised per hour =311
Quantity of water raised per hour -77-8 cubic feet -4 854-7 lbs.
Useful work performed per minute = 1,076-1 foot-pounds.

Ditto ditto per bour - 28-8 foot-tons.

Ditto ditto per day of 8 hours „ 230·4 foot-tons.

Kate of useful work performed » 0·033 H-P.

One mnn was employed to work the *dhenkli,* and he worked for four hours without stopping. Two men arc usually employed during the day, one raising the water and the other looking after its distribution, but the people at Bachhraon told me that one man could work the apparatus for eight hours a day. Mr. J. W. [illegible], Asst. Engineer.

10. Table II. gives the results of 9 trials with a 2£ inch iron chain pump for 15 feet lift made at Rooi kce.

The trials lasted only a short time, and do not give the rate of work that can be kept up daily. I think, however, that four men working eight hours a day can lift 300 or 320 cubic feet on hour to a height of 14'5 feet. The power of the four men usefully applied would then be represented by—

$$\frac{300 \times 62.4 \times 14.5}{60 \times 33000} = 0.137 \text{ H-P.}$$

I have used these figures in Table VII. to find the cost of work performed by the pump. Experiments 6 to 9 (Table II.) were made to determine the leakage between the plugs and the pipe at different speeds; this varied from 150 to 167 cubic feet per hour, and is fairly uniform for all the speeds tried. The efficiency of the pump therefore increases with the speed of the chain.

11. Table III. gives the results of trials with other pumps. Trials 1 to 3 were with a 2J inch McComa's chain pump for 12 feet lift from Melbourne. The rate of useful work performed varied from 0*149 to 0*157 H-P, the trials lasting only a short time. These results could not be maintained throughout the day, but the average power of four men working eight hours daily would probably be about the same as is obtained in the last paragraph for the same sized pump with a higher lift, or 0*137 H-P.

12. Trials 4 to 7 were with cheaply constructed pumps made up at the Experimental Farm on the principle of the chain pump, rope being substituted for chain, and wooden pipe or hollowed-out bamboo for the iron pipe. The power of three men varied from 0-106 to 0·134 H-P usefully applied, and I think that 0·100 to 0 105 H-Pcould be maintained throughout the day. In experiments 4 and 5 the plugs were considerably worn and worked loose in the pipe; in experiments 6 and 7 they fitted more tightly. Owing to the difficulty of getting large bamboos the bore of the pipe was made only 2£ inches, and the pump can be worked by three men. If the bamboo is replaced by galvanised sheet iron piping a larger bore can bo used and the weight will be very little if at all increased.

13. Tablo IV. gives the results of experiments made with the single *moth* and / inclined run on one of the wells ia the Experimental Farm: the experiments wci^ arranged by Mr. W. R. S.Jones, ExecutivcEngineer, in order to find the average amount of work done by one bullock or buffalo. Ten trials were made with bullocks, using a fresh pair every day; four trials were also made with four pairs of buffaloes. The *moth* used in these experiments contained 13*95, or nearly 14 gallons, and was smaller than is generally used. Mr. Wright, C.S., states that in the Cawnpore district the *moth* contains from 14 to 18 gallons. The buffaloes could probably have worked with a *moth* containing 28 or 30 gallons. The means of the 10 experiments with, bullocks and of the 4 with buffaloes give very similar results; the power, usefully applied, of one bullock being 0*065 fl-F, and that of one buffalo 0*086 H-P. With a larger *moth* the rate of work would have been higher.

14. To compare the quantities of water raised by a pair of bullocks from different depths, eight experiments, the results of which are given in Table V., were made on the blind well at the experimental farm. This well is connected by a sluice with an earthen tank containing water, so that the water in the well can be kept at any required depth from 13 feet to 45 feet below the top of the steining. During the first six experiments a *moth* was used containing about 17 gallons; it burst after the 6th experiment, and vras replaced by another containing nearly 21 gallons. The same bullocks were used throughout the experiments.

Notebr Mr. J. Wilson, Ast. Engineer.

15. The quantity of water lifttd per hour decreases as the height o lift increases, but not in the same proportion. With a 15 feet lift the discharge was 269'5 cubic feet per hour, and with a 40 feet lift 195*5 cubic feet per hour. The rate of useful work done increases as the height of lift increases: with a 15 feet lift it was 0'064 H-P., while with a 40 feet lift it was 0-130 H-P. These experiments are incomplete, as they do not give the number of hours that the bullocks can work daily at the rates observed. If with a 15 feet lift the bullocks can work eight or nine hours daily, with a 40 feet lift they may be unable to work more than six hours a day. Complete statistics can be best obtained by recording the quantities of water raised from wells working constantly during the irrigating season. But I think there is no doubt that this method of raising water with single *molh* and inclined bullock-run becomes more effective as the depth of water below the ground increases.

16. An experiment with the double *moth* worked by ropes passing round a drum on a vertical axis gave the following results :—

One buffalo was employed—

Height of lift averaged	45*5 feet
Contents of *,notk*	{ 2·34 cubic feet. (= 157 6 lbs.)

Duration of experiment *= 3 hours.

No. *of moths* lifted per hour=34J.

Discharge per hour=87-2 cubic feet (= 5*441 fts.)

Useful work per hour = 247,579 foot-tt>s.=101-6 foot-tons.

Useful work per minute=4,126 foot-tbs.

Rate of useful work =s 0-126 H-P.

Four trials with buffaloes working the single *moth* gave the rate of useful work performed by one buffalo when height of lift was 49-'3«0'066 H-P (Table IV.) but as mentioned above, the *moth* used was much too small. An experiment on the blind well (Table V.) gave the rate of useful work when height of lift was 45'=0130 H-P,

17. On the 24th November, 1 tested a double *moth* apparatus erected by Mr. D. 11. Smeaton, C.S., at Bacbhraon in the Moradabad district. Three trials were made, and tho results are recorded in Table VII. During the first two trials the apparatus was worked by a single bullock, larger and more powerful than those generally kept by cultivators : the pair of bullocks used in the third trial were similar to those commonly used for ploughing and irrigation. The useful work performed in the three trials was nearly equal. The owner of the well stated that the bullocks could work six hours daily, but required to be relieved every three hours.

18. A 3 inch McComa's chain pump from Melbourne has been erected on tho blind well and tried with the following result:—

Height of lift—39 feet.

Animals employed—two pairs of bullooks.

Duration of trial = 87 minutes.

Discharge per hour=150 3 cubic feet.

Useful work perbour=380,372 foot-lbs = 169'8 foot-tona.

Useful work per minute « 6,340 foot-tbs.

Rate of useful work=0'192 H-P.

Rate of useful work per bullock=0-048 H-P.

Speed of chain = 2'21 per feet per second.

Quantity of water that leaked back again between plugs and pipe per hour • 218*9 cubic feet.

Experiments 6 to 9 of Table II. gave the loss by leakage in a 2\ inch chain pump worked by hand equal to about 160 cubic feet per hour, when tho height of lift was 14'80 feet. Allowing for the increase in the diameter of the pipe and in height of lift the loss by leakage in the large pump was less than in the small one. The four experiments with the latter show that it is not effective when the speed of chain is less than four feet per second, and the same may be said of the larger pump. It will never supersede the *moth* for bullock power for lifts greater than 20 or 30 feet; but would give good results for high lifts if worked by steam-power, as the chain coufd then be driven at a greater speed.

Asst. Engineer.

19. Table VI. gives the results recorded on some wells working daily during the irrigating season. Commissariat bullocks were used in No. 1, and gave much higher results than have been obtained with ordinary bullocks. No. 2 was recorded by Mr. Beresford, Executive Engineer. No. 3 is the result of numerous experiments by Mr. F. N. Wright, C. S., in the Cawnpore district. The capacity of the *moth* is said to vary from 14 to 18 gallons, so I have used a mean value of 16 gallons or 160 fbs. No. 4 is from data furnished by the Collector of Agra; a large *moth* containing 34 gallons being used, bullocks of corresponding strength are required to raise it; the rate for hiring these bullocks is 14 annas a pair per diem. Nos. 5, 6 and 7 were recorded at the Government Horticultural Gardens, Lucknow; here also large bullocks are used, and tho tate for hiring them would be about 12 annas a pair. No. 8 was recorded at tho Shikohabad Railway Station with an exceptionally high lift, and is the mean of three days working.

20. In all the experiments at the experimental farm only one pair of bullocks at one time were employed to raise the *moth,* the system adopted in the Meerut and Aligarh districts of using two pairs of bullocks and a side run being apparently unknown in the neighbourhood of Cawnpore. Of the trials recorded in Table VI., Nog. 1, 3, 5, 6, 7 and 8 were made with single pairs of animals, while in Nos. 2 and 4 two pairs of animals were used to one *moth.*

21. The following results obtained by the Persian wheel have been furnished by Mr. Sturt, Assistant Commissioner of Jhánsi..

Height of lift, 20 feefc.
Discharge for one revolution, 160 HJ3-
Number of revolutions per minute, 1J.
Discharge per hour=205 cubic feet.
Useful work done per minute=4,267 foot-fts.
Bate of useful work*0128 H-P.
Useful work per hour«114'2 foot-tons.
One pair of bullocks can work this for six hours a day.

22. In Table VIII. the cost of the useful work performed by different water-lifts is obtained. To make the comparison complete, allowances should be made for the interest on the original cost of the lift, and for repairs and depreciation, but I have not sufficient *data* to do this. The chain pump for manual labour when lift is from 10 to 15 feet is decidedly more effective than the basket or *ben*. The *dhenkli* is also an effective apparatus for low-lifts, but, as generally worked, the cost is greater than that shown in the tables; one man being required for the distribution of the water and another to work the *dhenkli.* The two men take each work in turns for about 10 hours a day, so that each man actually lifts the water for only five hours a day. As regards the single and double *moth* for bullock-powor the records obtained from wells in atstual work are too few to pronounce definitely, but the trials made show that when the height of lift is about 20 feet the double *moth* is considerably cheaper to work than the single *moth.* Arrangements are in progress to work the two systems side by side, and with similar bullocks at places where irrigation is almost constantly going on. With the single *moth*, as the height of lift increases the cost of tho useful work performed decreases, a result that was anticipated in para. 15. The capacity of the leather bucket or *moth* varies from 14 to 36 gallons, and is regulated by tho strength of the animals employed,.

Note by Mr. w. J. Wilson, Asst. tngine .

23. The city of Jaipur is supplied with water from a stream 2* miles distant, ^ water being pumped up by steam-power to a height of 120 feet. The total cost ^ ^ waterworks was 4| lakhs, but omitting the cost of pipes, &c, for taking the water from the pumping station to the city, the expenditure was nearly as follows:

	Rs.
Weir in river ..»	[illegible]
Pumps	[illegible]
Engine house, &c	[illegible]
Boilers ...	[illegible]
Boilei house ...	[illegible]
Service reservoirs	[illegible]
Workshop and godown	[illegible]
Miscellaneous, gay	[illegible]
Establishment, say	[illegible]
Total	...8,02,177
Interest on original expenditure at Rs. 5 per cent. ...	10»,09
Maintenance lor one year ... ... »•	S8>25S
Depreciation at Bs.3 per cent, on engine, pumps, boilers and workshops (B». 1,29,529).	3,886
Total cost for one ye»r ...	4°>2*8

Average quantity of water raised daily *tat* one year-310,514 gallons.

Useful work done daily =»,105,120X ISO

e= 372,614,400 foot-fts.

as 166,846 7 foot-tons.

Cost of 1,000 foot-tons of useful work is «0,2Mxl6xl,000 / i«,345 7xS65

Major Jacob states that the cost of maintenance is high owing to the high price of coal, which delivered at Jaipur costs Rs. 40 a ton. At Cawnporo coal can be obtained for Rs. 20 a ton, and the yearly charge for maintenance would be reduced by Rs. 9,465. The cost of 1,000 foot-tons of useful work, including maintenance and interest charges, would then be reduced to 81 annas. *{The above detail* have been taken from a paper by Major Jacobin the Professional Papers on Indian Engineering.)*

24. Comparing the results given in para. 5 for English oxen and men with those obtained in the tables, it will be noticed that the former are much greater^ than the latter. A native working a chain pump eight hours daily can perform ('l* =) 242 foot-tons of useful work (Table VIL), while an Englishman would do almost 347 foot-tons or nearly half as much again. The difference between the cattle is still greater, the useful work performed by a pair of the large bullocks employed to irrigate the Taj garden being no greater than should be perfomed by a.single ox in England.

25. A fan in the agricultural workshops is worked by a pair of bullocks turning a gin. Average draught measured by indicating dynanometer about 100 fts. speed of bullocks = 113*2 feet per minute.

Working hours per day, 10.

Gross work done by a pair of bullocks turning a gin-113-25x100x60x10

«= 6,795,000 foot-fts.

=3,033 foot-tons.

From para. 5 the total work done daily by one English ox turning a gin is seen to be 2,571 foot-tons.

W. J. WILSON,

Assistant Engineer.

Table I.-Storcing'remlt of trial, with the lathetlift at Cawnpore Experimental Farm.*

	2			5	6		8	9				13	14					19
Number of experiment.	Date.	Height of lift.	Duration of experiment.	Number of baskets lifted.	Quantity of water lifted.	*Quantity of water lifted by one basket.* In cubic feet.	In pounds.	Number of times the basket was lifted per minute.	QUANTITY OF WATEB LIFTED. *Per minute.* Cubic feet.	Pounds.	*Per hour.* Cubic feet.	Pounds.	USEFUL WORK DOSE BT THREU MEN WOKKIWO ONE BASKET. Foot-pounds per minute.	Horse-power.	*In one hour.* Foot-pounds.	Foot-tons.	Cubic feet of water raised one foot high.	Remarks.
			Minutes.		Cubic feet.													
1	12th September ...	6'	70	1,412	510-5	0*36	22-6	20-2	7-29	455*1	4374	27,306	2,275-4	0069	1,36,524	60-95	2,187	
2	14th ditto	4*	45	949	487-3	0-51	32-8	2 M	10-82	675 7	649-2	40,542	2,702*9	0082	1,62,174	72-40	2,597	
3	15th ditto	3'	35	801	520-0	0-65	40*5	22-9	14-86	927*1	891-6	55,626	2,781*3	0 084	1,66,878	74 50	2,675	All these experiments were made by the same three men.
4	Ditto	2'	30	726	491-5	0-68	42*2	24-2	16 39	1,022·3	9*834	61,338	2,044-0	0062	1,22,676	54-77	1,967	
5	Ditto	1*5'	27	682	627-4	077	48-3	25*3	19*53	1,218-9	1,171 8	73,134	1,838*3	0-055	1,09,698	48-97	1,758	
1a	4th October	6 0'	90	1710	436 6	025	15-9	190	4 85	302*7	2911	18,162	1,816-2	0*055	1,08,973	48-65	1,747	
2a	Ditto	5-5'	30	600	177*2	0*30	19'7	200	6*91	368*8	354*6	22,128	2,028*3	0-061	1,21,698	54-33	1,950	
1a	27th September ...	5'	60	1.237	491-9	0*40	24*8	20 6	8 20	511-6	492 0	30,696	2,557*9	0-0775	1,53,474	68-52	2,460	
4a	Ditto	4-'5	50	1,082	467-2	0*43	26'9	216	9-34	583·1	560*4	34,986	2,623-8	00795	1,57,328	70-24	2,522	
5a	28th ditto	4'	45	972	4651	0 43	29-9	21*6	1034	6449	620*4	38,694	2,679*8	0078	1,54,788	69 10	2,482	One set of men employed in all these experiments except No. la., in ^hich one of the men was changed.
6a	Ditto	3' 5	40	874	469-4	0*54	33-5	21-9	11-74	732*3	704*4	43,938	2,562-9	0078	1,53,774	68-65	2,465	
7a	29th ditto	3'	40	921	525-2	0-57	35*6	230	1313	819·3	787*8	49,158	2,457-9	0-074	1,47,474	65 84	2,363	
8a	Ditto	2'-5	35	828	477-8	0*58	36-0	23»7	13-65	851*8	819 0	51,108	2,129-6	0065	1,27,776	5704	2,048	
9a	30th ditto	2' 0	35	867	529-5	0*61	38 1	24-8	15*13	944*0	907-8	56,640	1,888*0	0057	1,13,280	50*06	1,816	
10a	1st October	1'-75	30	776	472-5	061	380	25*9	1575	982*8	945*0	58,968	1,7199	0 052	1,03,194	46-03	1,654	

Note by Mr. W. J. Wilson, Asst. Engineer.

Table II.—Showing results of trials with a two and a half incJi iron chain pump for 15 *feet lift.*

Number of experiment.	Bate.	Height of lift.	•Deration of experiment.	Quantity of water discharged.	DISCHARGE PER HOUR. la cubic feet.	DISCHARGE PER HOUR. In lbs.	Number of men employed.	USErUL WORK DONE. Foot-ltis. per minute.	USErUL WORK DONE. Foot-lbs. per hour.	USErUL WORK DONE. Horse-power	Speed of chain in feet per minute.	Quantity of water lost by leakage in cubic feet per hour.	Sum of actual discharge and water loBtby leakage per hour.	Percentage lost by leakage.
			Minutes.											
1	August 5th, 1879 ...	14'«5O	30	221*6	443	27,643	3	*6,680*	400,826	0-20	Not noted...	...	...	...
2	Ditto 6tb, „ ...	14'50	60	401*0	401	*25,022*	3	6,047	362,824	0'18	Do. ...	...	...	...
3	October 1st, „ ...	14'60	20	130*9	39S-7	24,504	3	5,922	365,315	0*18	Do. ...	...	...	...
4	Ditto *'2nd,* „ ...	14"80	80	499-9	«75'O	23,400	4	6,772	346,320	017	Do. ...	...	...	...
5	Ditto, ,? ...	U'*80	80	514-7	386-0	24,086	4	5,941	356,479	0 16	Bo. M.	...	...	...
6	*Ditto* 3rd, *9?* ...	*U'* 80	80	428-2	321-2	2VU3	4	4,944	296,619	015	416	158*1	479-3	33
7	Bitto, „ ...	*14'SO*	*CO*	527	527	3,288	2	811	48,670	0*025	1-84	160*1	212·8	75
8	Ditto, „ ...	14'*80	5	*Nil.*	*Nil.*	*NIL*	2	*JVUl*	*Nil.*	*Nil.*	1*24	150-4	150-4	100
9	Ditto, „ ...	14'"8O	30	215-4	430-8	26,882	4	6,631	397,852	0*21	517	167 4	598-2	28

Table III.—Showing results of icaterlifts worked by manual labour at the Cawnpore Experimental Farm.

1	2	3	4	5	6	7	8	9	10	11	12	13
							Discharge per hour.		*Useful work done.*			
No. of experiment.	Date.	Description of pumps.	Number of men employed.	Height of lift.	Duration of experiments.	Discharge during experiment in cubic feec.	In cubic feet.	In lbs.	In foot-pounds per minute.	In foot-pounds per hour.	Horse-power.	REMARKS.
	1879.				Minutes.							
1	August 1st...	McComa's chain-pump 2½" diameter ...	3	10·90	40	303·8	455·7	28,436	5,166	309,949	0·157	
2	„ 2nd...	Ditto ditto ...	3	10·10	30	236·25	472·5	29,481	5,455	327,272	0·165	
3	„ 6th...	Ditto ditto ...	4	11·50	60	410·0	410·0	25,584	4,904	294,216	0·149	
4	„ 4th...	Wooden chain-pump 2½" diameter ...	3	14·	65	270·0	249·2	15,650	3,628	217,701	0·110	
5	„ 5th...	Ditto ditto ...	3	14·	90	360·0	240·0	14,976	3,493	209,664	0·106	
6	„ 12th...	2½" chain-pump with bamboo pipe ...	3	14·	54	274·2	304·7	19,013	4,436	266,186	0·134	
7	Octr. 2nd...	Ditto ditto ...	3	14·40	90	375·0	350·0	15,600	3,744	224,640	0·113	
8	„ 5th...	[illegible]	1	15	180	186·0	62·0	3,869	956	57,332	0·029	Iron bucket contained 0·[illegible]4 cubic feet. Number of lifts per hour=161½.

[illegible]

Table 1 V.-Showi^ results of trials with single «moth " and inclined bullock-, run on a well at Cawnpore Experimental Farm.

1.	2.		3.	4.	5.	6.	7.	8.	9.	10.		12.	13.	14.	15.	16.	
			Animals employed.				Quantity of water lifted by one mot.			Quantity of water lifted per hour.		USBFUL WORK DONE BT ONE BOLLOCK OR BUFFALO.					
														In one hour.			
No. of experiment.	Date.		Kind.	No.	Height of lift.	Duration of experiment.	In cubic feet.	In pounds.	Number of mots lifted per hour.	Cubic feet.	Pounds.	Foot-pounds per minute.	t§	Foot-pounds.	Foot-tons.,	Cubic feet of water raised one toot high„	Bemarks.
	1878.					Hours.											
1	April	1	Bullocks	2	48' 8"	4	2·338	148·6	38	64·9	4,046	1,«*8	0 050	99,451			
2	"	2	Do.	2	49' 3"	5	"	"	37	47·3	3,767	1543	0-i 47	92,591			
3	"	2	Do.	2	49' 1"	4½	"	"	40	101·4	6,278	2,599	0 079	155,8'>8			
4	"	3	Do.	2	49' 9"	3	"	"	43	73·7	4,604	1,8^6	0-057	1.°3,167			
5	"	4	Do.	2	49' 9"	3	"	"	38	71·5	4,464	1,829	0 055	109J39			
6	"	7	Do.	2	49' 8"	3	"	"	42	[illegible]	5,859	M17	0-073	145 011			
7	"	8	Do.	2	48' 8"	3	"	"	38	44·9	6,30]	2,194	0-066	131,647			
8	"	10	Do.	2	49' 8"	3	"	"	40	48·4	5,580	2 310	0070	138,577			
9	"	11	Do.	2	49' 8"	3	"	"	44	102·8	6,417	2,656	0 080	169,364			
10	"	15	Do.	2	49' 8"	3	"	"	43	96·1	6,999	2,483	0075	148,971			
Average of ten experiments				2	49' 3"¼	...	2,585	150·5	37·6	68·9	5,235	2,158	0-C65	129,432	57-8	2,074	
11	April	14	Buffaloes	2	48' 8"	3	2·335	149·5	43	96·1	6,000	2,483	0 075	148,971			
12	"	15	Do.	2	49' 3"	2½	"	"	40	96·1	5,999	2,4*3	0-075	148,971			
13	May	9	Do.	2	49' 8"	3	"	"	30	67·0	4,181	1,732	0 05*2	103,932			
14	"	11	Do.	2	49' 9"	2	"	"	34	75·0	4,748	1,965	0060	117,791			
Average of four experiments				2	49' 3"	...	2·235	139·5	37·5	83·9	5,331	2,166	0*066	129,916	680	2,082	

Table F.—Showing results of trials with single moth and inclined bullock-run on the blind well at Caxonpore Experimental Farm.

1	2	3	4	5	6	7	8	9	10	u	12	13	14	'5	16	17
	Date.	*Animals employed.*		Height of lift.	Duration of experiment.	*Quantity of water lifted by one moth.*		Number of mutha lifted per hoar.	*Quantity of water lifted per hour.*		USEFUL WORK DONB BY ONB BULLOCK*					Remarks.
											Foot-pounds per minute.	Horse-power.	*lv one hour.*			
		Rind.	Number.			Cubic feet.	Pounds.		Cubic feet.	Pounds.			Foot-pounds.	lfoot-tons.	Cubic feet of wter raitc d one foot h gh.	
				Feet.	Hours.											
1	4th September, 1879,	Bullocks..,	s	15	3	2*66	165-9	101 ^	269*5	16,815	2,102	0 064	1,26,114	56-3	2,022	
2	6th ditto	Ditto ...	s	20	3	a-73	170-4	79	215-7	13,460	2,244	0-068	1,34,602	60*1	2,157	
3	7th ditto	Ditto ...	2	25	3	2-76	172-2	79|	219*9	13,722	2,857	0 087	1,71,529	76-6	2,749	
4	8th ditto	Ditto ...	8	30	3	2*76	172-2	69f	192*3	11,998	3,000	0 091	1,79,974	80*3	2,885	
5	Oth ditto	Ditto ...	2	35	3	2-76	172-2	71	196*0	12,228	3,567	0*108	2,13,989	95-5	3,430	
6	11th ditto	Ditto ...	2	40	3	2-70	1687	72$	195*5	12/201	4,067	0*123	2,44,019	10S-9	3,910	
7	12th ditto	Ditto ...	2	40	3	3·34	208'2	61*	204-7	12,772	4,258	0·129	2,55,446	114-0	4,094	
8	13th ditto	Ditto ...	2	45	3	3 34	208-2	55	183*6	11,453	4,295	0·130	2,57,703	1150	4,131	

Table F/.—Records of results obtained with the single moth and inclined bullock-run wiien irrigation was in progress.

Number.	Height of lift.	Labor employed.		Number of working hours in a day.	Quantity of water lifted 6y one moth.		Number of moths lifted per hour.	Quantiiyof water hfted per hour.		Number of moths lifted during the day.	Quantity of water hfted during the day.		USEFUL WORK PKBFOBMKD.				Remarks.
		Animals.*	Men at 2 aunas.		Cubic feet.	Pounds.		Cubic feet.	Pounds.		Cubic feet.	Tons.	In foot-pounds per minute.	Horse-power.	In foot-tons. Ver hour.	In foot-tons. Per day.	
1	35'	k bullocks (Commissariat) ...	1	6	4-73	295*2	66-7	315-4	19,681	400	1,892	527	11,481	0·35	307	1,845	Commissariat mills, Cawnporc.
2	30'	4 buffaloes at 4 annas ...	1	10	5-34	333·2	41*7	2227	13,896	417	2,227	62 0	6,948	0 21	186·0	1,860	Recorded by Mr J. S. Bcresford, Executive Engineer at Atrauli.
3	40'	2 bullocks at 4 „ ...	1	875	2·56	160*0	40·0	102-4	6,400	350	896	25·0	4,266	013	114*2	1,000	Becorded by Mr* F. N. Wright, C.S., in Cawnporc district.
4	60'	4 ditto at 7 „ ...	1	10	5·45	340·0	40*0	218-0	13,600	40O	2,180	60·7	11,336	0-34	303·6	3,035-7	Tāj gardens, Agra.
5	ir'5	2 ditto at 6 „ ...	1	9	3'00	187-2	68*3	204-9	12,787	615	1,645	51-4	3,730	O·il	99 9	899*5	Lucknow Horticultural gardens.
6	22·0	2 ditto at 6 „ ...	1	9	3'00	187*2	63·0	1890	11,794	667	1,701	47-4	4,521	0-14	121·1	1,090-0	Ditto ditto.
7	25·0	2 ditto at 6 „ ...	1	9	3-00	187·2	55*8	167-4	10,446	502	1,506	42 0	4,353	0 13	116-6	1,049*0	Ditto ditto.
8	68·0	2 buffaloes at 4 „ ...	1	6	5·76	365*7	28*75	163 9	10,226	173	996	27 8	11,589	035	314'8	1,8887	Recorded at Shikohabad.

* pay of bullock driver included in the rate allowed for the animals.

Table S—*Showing the results* [illegible] *three trials with* [illegible] *double-moth apparatus, erected by Mr. Smeaton,* [illegible] *in the* [illegible] *district.*

Number.	Date.	Height of lift.	Animals employed.	Duration of experiments.	Quantity of water lifted by one bullock. Cubic feet.	Quantity of water lifted by one bullock. Ponnds.	Number of moths lifted in one hour.	Quantity of water lifted in one hour. Cubic feet.	Quantity of water lifted in one hour. Founds.	Number of working hours in a day.	Number of moths lifted daring day.	Quantity of water lifted in the day. Cubic feet.	Quantity of water lifted in the day. Tons.	Work performed. In foot pounds per minute.	Work performed. Ilorse-power.	Work performed. Per hour.	Work performed. Per day.	Remarks.
				Hours.														
1	24th N[illegible]r ...	30'71	1 bullock ...	3	2·96	184·7	97½	288·1	17,978	6	584	1,7[illegible]	48·8	5,306	0·188	144·9	987·8	
2	[illegible] ...	31'10	1 ditto ...	3	2·95	184·7	90½	287·4	18,838	6	560	1,404	44·7	6,200	0·184	148·2	878·8	
3	Ditto ...	30'60	1 ditto ...	3	2·94	184·7	95½	270·9	17,056	6	501	1,640	40·7	5,097	0·177	156·1	995·6	

In the first two trials the apparatus was worked by single bullocks larger and more powerful than those generally kept by [illegible] ; the bullocks [illegible] in the third [illegible] similar to those commonly used for ploughing and irrigation.

Note by Mr. W. A. Wilson, Asst. Engineer.

Table VUL—Showing cost of work done by different waterlifts.

Number.	Kind of waterlift.	Height of lift.	Labor employed.		Number of working hours in a day.	Cost of labor.		Useful work performed.		Cost of useful work performed.		Bemarks.
			-g JO QO cu M	[illegible]		Per day.	Per hour.	Pounds.	Foot-tons daily.	1 horse-power per hour.	K	
						Annas.	Annas.					
1	Basket or *beri* ... .«	3' to 4'·5	...	4	8	8	*1-0*	0-oso	565*4	12·5	14·1	See table I.
2	*Dhenkli,* or lever-lift	13'	...	1	8	2	0-25	0033	230-1	7'6	8-7	„ „ III., No. 8.
3	Chain pump	lO'-5tol5'	...	4	8	8	1-0	0 137	968*8	7·3	8'2	„ para. 10.
4	Single moth and inclined bullock-run ...	69'	2	1	6	10	1-67	0*35	1,888-7	4*8	5·3	„ table VI., No. 8.
5	Ditto ditto ditto ...	50'	t*-	1	10	SO	3-0	0-344	3,035-7	8-7	9·9	» „ „ M 4.
6	Ditto ditto ditto ...	40'	2	1	8*75	10	1-14	0·130	1,0000	8*8	10 0	M ft 9> » 3.
7	Ditto ditto ditto ...	30'	4	1	10	18	1-8	0*210	1,860	8-6	9·6	9» it f» » 2.
8	Ditto ditto ditto ...	20'	ti	1	9	14	1-6	o-iio	1,000*0	12*3	14·0	„ >, Nos. 5, 6 and 7.
9	Double moth	20'to 22'	2	...	6	8	H	0·179	950	7-4	8 4	„ table VH.
10	Persian wheel	20'	2	...	6	8	H	0-123	6858	10*4	1.T	„ para. 21.

* The pay of the driver of the bullocks is included in the rate given,
t These bullocks cannot be hired for less than 14 annas a day.
X Ditto ditto 12 annas a day.

ORD'E'B OF GOVERNMENT,

No. 1252 OF 1880.

FROM

THE SECRETARY TO GOVERNMENT,

N.-W. PROVINCES AND OUDII,

To

THE DIRECTOR, DEPT. OF AGRI. AND COMMERCE,

N.-W. PROVINCES AND OUD£.

Bated Naini Tul, the 19th July, 1880.

^NUE DrAUIMENx

SIR,—I am directed to acknowledge-your'letter No. 341 A., dated the 5th June, with which was submitted the annual report on the Government "Experimental Farrn^ Cawnpore, for 1878-79, drawn up by Mr. Fuller, together with Mr. Buck's review thereon.

2. The report, while it gives an interesting account of the experiments with ploughs and water-lifts, 'contains no allusion to the state of the farm and farm operations proper, arid sketches out no programme for the future.

3. The reason given- is that the late Superintendent, though doming with 'a high character, was found to have systematically neglected orders from the very commencement. ,An inquiry made in October ended in his resignation on the 1st November, from which date Mr. Fuller assumed charge. "Agricultural operations are therefore entirely put aside, tis the results professed to have been obtained were obviously not to be depended on. But Mr. Fuller might have given an account, however brief, of the crops actually grown, the objects aimed at, ami their general successor failure,, irrespective of an accurate record of results. The condition of the farm and its appurtenanoes when he took -over charge should also have been placed on record, and the nature of the late Superintendent's shortcomings might have be'en explained, *i.e.,* whether he merely neglected to record results as directed, or misconducted operations. It should also have been stated what is to be dojie in "future, and a-balance-sheet, showing the receipts and expenditure of the' year, and hotv the accounts stand, should certainly have been submitted. The Lieutenant-Governor trusts, however, that now* that Mr. Fuller is in charge, the next report will give a full and satisfactory account of the operations of the year.

4. The subjects- treated of are— '

(1) Experiments in the reclamation of reA-infcctcd land on the Rtiwatpur Court of Wards' estate ;

(2) The adaptation and construction of improved agricultural implements for Indian use, which were conducted under Mr. Fuller's iaitnsdiite direction ; and

(3) Experiments with water-lifts conducted mostly 'by Mr. Wilson.

5. Mr. Buck has prefaced the 'report with a review in which lie describes the history and pivgrses of the inechmical experiments g>in& on with ploughs, water-lifts, and grain-cleaners. A really improved

plough would no doubt be an immense boon to the agricultural community, and jt would seem has been all but secured. The native plough scratches and moves, but does not invert the soil. The object is to get a plough which will invert the soil in the English way, and at the same time be sufficiently light of draught for an ordinary pair of bullocks to draw, and sufficiently cheap to be within the means of an ordinary cultivator. An acjnptatiou from an American plough is the one that has been adopted. Its weight is only 30lbs.; its average draught, turniug a furrow 5" x 3\"9 is 126lbs.; and its price with wrought-iron work Rs 6, and with cast-iron work Rs. 5- Four hundred and thirty-nine have been sold during the year, and negotiations are in progress for the supply of the iron-work • from America, wlien an article of better workmanship can be turned out than it is possible to produce in India; and at a^ price little in excess *of* T?s. 8, the limit within which it is considered the cost must be kept. But the accounts received of the new ploughs are not satisfactory from all • districts, the difficulty being said to be their heavy draught. This is believed to be due to improper handling, and it has been determined in future not to send them out without "a competent instructor to teach their use, and youths are being trained on the farm to meet this want. There is much truth, however, in what Mr. Fuller says in para. 14, that it is hopeless to expect the classes, who will not profit by the example of good agriculture already set them by several castes, to appreciate an improved plough, and it has yet to be seen whether one can be made up which will supplant the time-honored instrument in use to any large extent.

6. T&e experiments with water-lifts are fully detailed in an appendix by Mr. Wilson, and possess much scientific interest, besides showing the way in which problems connected with Indian agriculture have to be grappled with. The results, so far, are summed up by Mr, Buck in his review. Final conclusions have not yet been -arrived at; but it is believed a chain-pump c-in be successfully used where water is not more than 20 feet from the surface.

7. The experiments in *reh* reclamation were carried on in Q Ualf-acre .plots, and the "processes which, it is hoped, miy be successful to some extent, are:—

^1) Deep cultivation two months before the rains, and again at the commencement of the rains;

(2) Manuring with *maddr* ashes; and

(3) Surface drainage.

It is too early as yet to form any definite conclusion; and, if they are to be of any real value, the cost of the experiments should be compared with the results.

I have the honor to be,

SIR,

Your most obedient servant,

C. ROBERTSON,

Secretary to Government,

JV.- *W. Provinces and Oudh.*

REPORT

ON THE

CAWNPORE EXPERIMENTAL FARM OPERATIONS

DURING THE RABI SEASON, 1880-81.

ALLAHABAD:

HORTH-W ESTERN PBOVINCES AND OUCH GOVERNMENT PBES8.

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ON THE

CAWNPOKE EXPERIMENTAL FARM OPERATIONS

During the Eabi Season 1880-81.

No. 1864A/LXXXIII OF 1881.

FROM

THE OFFG. DIRECTOR, DEPT. OF AGRI. AND COMMERCE,

NORTH-WESTERN PROVINCES AND OUDH,

To

THE SECRETARY TO GOVERNMENT,

NORTH-WESTERN PROVINCES AND OUDH.

DATED CAWNPORE, THE 21ST JULY, 1881.

SIR,

I HAVE the honor to submit the usual report on the Cawnpore Experimental Farm operations during the rabi season of 1880-81. As in previous reports, these operations are subdivided into (A) field experiments of a purely agricultural nature, and (B) the development and construction of improved agricultural implements.

(A.)—FIELD EXPERIMENTS.

2. During five months of the period under report I was absent on leave *to* Europe, but my departure and arrival were so timed that I was able to supervise the sowing of the rabi crops before I left, as well as their harvesting after my return. Unfortunately it was impossible for Mr. Harrison, who acted for me during my absence, to pay anything but occasional flying visits to the farm, since he was compelled to remain in camp throughout the cold season, and I think that some of the crops suffered in the way of imperfect irrigation from the want of strict supervision.

3. The season was in many respects a very peculiar one. As shown in my report for the preoeding half-year, the rainfall of 1880 was abnormally light, amounting to 4-5 inches between June 1st and August 31st. A fall of 1/4 inches in September showed that Cawnpore caught the skirt of the cyclone which caused such deluges of rain in and near the hills ; but from September 18th to the end of the year the rainfall did not amount to three-tenths of an inch. The rabi crops are sown, as a rule, between October 15th and November 7th, during which period the ground was too dry to allow of germination if the seed was left to natural moisture. It was therefore necessary in every case to irrigate before spwing, and the crops were accordingly sown as well as raised by the help of canal-water. The following table shows the rainfall of the rabi under report: —

	Month.	*Rainfall in inches.*
1830	September	1*45
	October	005
	November	0-03
	December	0*2
1881	January	0-02
	February	0*21
	March	0*25
	April	000
	Total	2-21

There were therefore practically no winter rains, and this is the third year in which they have failed at Cawnpore.

4. Under these circumstances a really good harvest could scarcely have been* expected. Seed sown in soil moistened by irrigation never germinates so regularly or so strongly as if sown in soil naturally moist, since it is extremely difficult to ensure that all portions of the field shall be irrigated alike, and surface irrigation in the deficiency of subsoil moisture cannot be expected to promote strong or healthy root growth. Hence the crops on the fields of good cultivators round the farm compared very badly with those of the rabi preceding, while the average production of wheat on the farm lands (calculated on 11 acres) only amounted to 15 maunds (=20 bushels) per acre, although the whole of the land was three times irrigated in addition to the irrigation necessary for ploughing and sowing. In certain cases^ however, excellent outturns were obtained, amongst which I may mention 22^ maunds and 23 maunds per acre on fields manured respectively with a green crop and with poudrette.

5. The field experiments conducted during the season under report comprise experiments on—

(1) Different manures..
(2) Selection of seed.
(3) Irrigation.
(4) Deep cultivation.
(5) New staples—Cape oats from Australia and American maizes.
(6) Flax.

(1) Experiments on manures.

These may be thrown into two classes according as they were made—(a) with wheat or barley, (&> with sugarcane.

(a> *Experiments with wheat and barley.*

Mention was made in my two previous reports of a series of plots, each containing 400 square yards, which had been carefully marked oat and set aside for the systematic trial of different manures. These plots are 50 in number and comprise two sets, one for the kharif and one for the rabi, each in, duplicate, so as to give two parallel trials of each, manure in each season. To prevent as far as possible all chance of mistakes, a label is attached to each plot with a description of its treatment, and the experiments, if carefully carried out, will furnish in. time a valuable indication of the merits of the different manures which are available in the country, used singly and in combination. Reliable results cannot however be expected for the first two or three seasons until by similar cropping the plots have been reduced to a level and any differences in their previous treatment counteracted. This has as yet been done with only nine plots, which had been marked out and cultivated a year before the others. Their previous treatment, and details of their cultivation during the season under report, irrespective of the manures applied, are given below : —

Treatment on account of crop experimented with.				*Previous treatment.*		
Ploughing.	Seed and rate per acre.	Irrigation.	Weeding.	Year.	Manure.	Crop.
Twice (soil inverted) in October, 18S0.	White wheat, 1J maunds.	Three times from canal in addition to the watering for ploughing and sowing *(paled).*	Once ...	1878-79... 1879-80... 1880 (kharif).	*Nil* ... *Nil* ... Same as now applied.	Barley. Cotton. JVlaize.

The following table shows the manures which were applied during the season tinder report, together with the results obtained :—

Manure and rate per acre.	Cost of manure per acre.	Outturn in lb. per acre. Grain.	Outturn in lb. per acre. Straw.	*Cost of cultivation.	Value of produce.
	Rs. a. p.			Rs. a. p.	Rs. a. p.
3. Crop of indigo ploughed in during October	7 6 0	1,781-7	2,474*8	28 13 0	58 4 3
2. Cattle dung, 240 maunds	12 0 0	1,346 1	1,926*9	33 7 0	44 5 7
3. Cattle dung, 240 maunds (duplicate experiment to the above).	12 0 0	1,2553	1,775 6	33 7 0	41 3 9
4. Cattle dune, 240 maunds, and gypsum, 2401b.	17 4 0	1,240 3	1.805-8	38 11 0	41 0 5
5. Ashes of 240 maunds dung	12 0 0	1,113 2	1,597 2	33 7 0	36 11 1
6. Poudrette, 240 maunds	12 0 0	1,884 6	2,704-3	33 7 0	62 1 11
7. Bone superphosphate, 2251b.	11 4 0	986-1	1,397*5	32 11 0	32 6 2
8. Bone-dust, 3201b.	4 0 0	795-5	1,228*1	25 7 0	26 11 7
9. *JVil*	...	707-8	1,291-7	21 7 0	24 13 6

Throwing these results into the form <>f a percentage on the outturn and the profit yielded by the un manured plot, we obtain the following figures :—

	INCREASE PER ACRE. Per cent, in gross outturn. Grain.	Straw.	Actual in net profit.
Manures yielding nitrogen-			Rs. a. p.
Green soiling	151	91	26 0 9
Poudrette	166	109	25 4 5
Cattle dung (average of two experiments)[1]	83	47	6 0 2
Cattle dung plus gypsum	75	39	Decrease of Rs. 1-1-1.
Manures not yielding nitrogen—			
Ashes of cattle dung	56	23	Ditto „ 0-2-5,
Bone superphosphate	39	8	A net loss per acre.
Bone dust	12	Decrease 5	Decrease of Rs. 2 2-4.

The most prominent fact brought out by these figures is the great effect of manures containing nitrogen as compared with those which do not contain it. This appears to prove that it is in nitrogenous substances that the soil is most deficient; and since it is a well-known fact that manures only produce their full effect when in proper combination, it follows that, unless nitrogenous manure be added, the application of manures supplying phosphoric acid, potash, or lime can give but little profit. Hence superphosphate of lime in the experiments under notice only increased the outturn per acre bj^ about 2801b. of grain and 1001b. of straw, which was not nearly sufficient to pay for its cost. The excellent results yielded by superphosphate in the *rafoi* preceding the one now under report must have been due to the fields having previously had a good dressing of manure, which supplied the nitrogen requisite to draw out the full value of the superphosphate. No nitrogenous manure had, on the other hand, been supplied to the plot now under discussion for the past three years. I may note here that superphosphate unaccompanied by nitrogenous manure has been found to yield equally poor results by Mr. Lawes of Rothamsted, on whose farm the application of superphosphate alone *(though at the rate of* 14 *maunds to the acre)* continuously for 24 years was found only to have increased the outturn by an average of 2£ maunds per acre.

* The head "cost of cultivation" includes the following items :—

	Rs. a. p.
Two ploughings	3 0 0
Clod-crushing	0 10 0
Seed	3 0 0
Sowing	1 11 0
Weeding	2 0 0
Total	10 5 0

	Rs. a. p.
Brought over	10 5 0
Irrigation—	
Canal dues	1 8 0
Lifting (for 3 waterings)	3 6 0
	4 14 0
Rent	6 4 0
Manure	Variable.
Total	21 7 0

6. Other points brought out by the foregoing table is the poverty of cattle dung, as used by the natives of this country, compared with either green soiling or poudrette; while the still smaller return given by the ashes of cattle dung effectual ly disproves the assertion which is sometimes made that the consumption of cattle dung as fuel occasions no real loss to the country so long as the ashes are utilized us manure. This may be true with freshly-cultivated soils which abound in nitrogen, but in the case of the long-cultivated fields of the Doab is absolutely incorrect.

7. The following explanations are necessary concerning the different manures, the effect of which has been discussed in the preceding paragraph.

Green soiling consisted in ploughing in a crop of indigo which had been grown on the plot during the preceding rains. The cost of such a crop is not estimated to exceed Rs. 7-6-0, since no rent can be charged to it, and there would be no need of irrigation in years of ordinary rainfall. The effect of a crop of the leguminous order in fixing nitrogen in the surface soil is well known, though opinions differ as to origin of this nitrogen: some authorities (of whom Ville is the chief) considering that it is actually fixed from the air, and hence is *added* to the soil; while others follow Lawes and Gilbert in asserting that it is merely derived from the subsoil, from which it is drawn up by the long roots of plants of this order. It may be mentioned that *san* hemp (*Crotalaria juncea)* is equally efficacious with indigo for the purpose of green soiling. A parallel experiment was made with hemp on a field belonging to a native cultivator, on one portion of which hemp was grown during the rains and ploughed in during September, while the other portion was left fallow. Wheat was sown in October on both portions, with the following results :—

	Area of plots In square yards.	OUTTURN.			
		Actual.		*Per acre.*	
		Grain.	Straw.	Grain.	Straw.
		lb.	lb.	lb.	lb.
Portion green soiled ...	200	45-5	80	1,1011	1,936-0
„ left fallow ...	200	2625	64-5	635 2	1,560 9

Here green soiling increased the outturn of grain by 73 per cent, and of straw by 24 per cent.

Cattle dung was of the same description as that ordinarily used by native cultivators, and is estimated to cost about Rs. 5 per 100 maunds.

Cattle dung and gypsum.—The addition of gypsum positively decreased the outturn. As to the use of gypsum as manure reference may be made to para. 8 following.

Bone superphosphate was estimated to cost Rs. 5 per 100lb. as shown below :—

	Rs.	a.	p.
66lb. bone-dust at 11 annas per maund	1	14	0
33lb. sulphuiic acid at 2 annas per pound ... — ...	0	2	0
Total ...	5	0	0

8. Other experiments in addition to those detailed above were made to test the manurial value of gypsum and hujnan excreta.

Gypsum (sulphate of lime) has been found to be a valuable manure in some parts of England and America, not only as supplying lime to the soil, but also in virtue of the property which it possesses of fixing the volatile compounds of nitrogen, and so retaining them in the soil instead of allowing them to dissipate themselves in the air. At the suggestion of Mr. Buck I obtained a consignment of gypsum from the salt range in the Paiijab through the courtesy of Mr. Halsey, as well as from quarries in the neighbourhood of Naini Tål by the assistance of Mr. Lawder, c.E. Gypsum is at present rated absurdly high in the railway tariffs, being included amongst chemicals instead of amongst minerals. If however its use as manure was to become general, I have no dpubt but that it would be reclassified, and in estimating its cost I have therefore assumed that it could be carried by rail at mineral rates. Under this assumption Naini Tål gypsum oould be landed at Cawnpore for Re. 1-12-0 per maund-

		ies, a. p	
Collection charges ... .•• •••	•••	0 S 0	per maund.
Carriage from Naini Tål to Bareilly ...	•..	1 0 0	„
„ Bareilly to Cawnpore •••	...	0 4 0	»
Total	r••	1 12 0	

A large number of experiments were tried with gypsum during the season under report, but with the most discordant results. In one experiment (already noticed), in which it was associated with cattle dung, it actually decreased the outturn. The results of other experiments in 'which ifc was used by itself or with cattle dung in different proportions are given below :—

Number of experiment.	Area of plot in square yards.	Amount of gypsum per acre.	OUTTURN.			
			Actual.		Per acre.	
			Grain.	Straw.	Grain.	Straw.
		R>.	fb.	n>.	ft.	It.
»•{	400	360 ...	85-0	116-5	1,028-5	1,409-6
	400	*Nil* •••	*58-5*	106-75	707-8	1,291-6
M	600	100 ...	217-78	325-5	1,756-5	2.625-7
	600	200 ...	1850	305-5	1,492-3	2,464-3
	106-7	*Nil* •••	40-25	72-25	1.825-7	3,2773
m. {•	605	Gypsum 80 ...	j 105-0	1490	840	1,192
	605	Dung, 216 mds. •••				
		No gypsum •••	^ 1550	2270	1,240	1,816
		Dung, 216 mds. •••				

In experiment No. I. the use of 3601b. of gypsum increased the outturn of grain by 45 per cent. ; in experiment No. II. gypsum largely decreased the outturn, the decrease being larger with the larger amount of gypsum used ; the result of experiment No. III., in which gypsum was associated with cattle dung, agrees with that of the experiment noted in para. 7, the outturn being considerably decreased.

The experiments will be continued, but it is possible that the large amount of lime which the soil of the farm land contains, and'which shows itself in the formation of numerous kankar-beds, may make the application of a further supply of lime in the shape of gypsum positively injurious.

Human excreta.—A. trial was made of the system of movable latrines on trenches, which has been so often advocated for Indian villages. A piece of poor sandy land *was trenched with the English plough, and a movable grass screen erected, which could be shifted along down the trench as occasion required. A boy was "kept to shift the screen and to draw earth over the *excreta* morning and evening. The experiment could unfortunately ba only continued for 80 days, during which time the screens were used by 11 persons daily. The plot of ground which was thus manured measured 311*6 square yards ; at this rate an acre would be manured in a year by the daily attendance of 37 persons. The plot of ground immediately-adjoining the manured plot was taken, as standard of comparison, being treated in exactly the same manner as regards ploughing, sowing, and irrigation. Both plots were sown with barley and irrigated three times. The result is shown below:—

Area, of plot in square yards.	Manured or unmanured.	OUTTURN. Actual. Grain.	Straw.	Per acre. Grain.	Straw.	Value of produce per acre*
		ft.	lb.	n>.	It).	Rs. a. p.
311-6 146*5	Manured ... Unmanured ...	182-25 55-75	232 57-75	2,830-3 1,S41-8	3,603 5 1,907 9	66 7 1 40 12 9

The excellent outturn given by the unmanured plot was doubtless owin«r to its having been ploughed up at the same time as the manured plot was trenched, and thus lay in open fallow from May until sowing time. But the produce of the manured plot was by far the best and amounted to 35 maunds to the acre, an astonishing crop from such poor land as that experimented with.

(o) *Manure experiments on sugarcane.*

&. The effect of cattle dung, guano, and bone superphosphate, each in two different proportions, was tried on about four acres of sugarcane. For the purpose of measuring the outturn rectangular plota, representing an average portion of the crop, were marked out in each field, and coarse undrained sugar *(gurh)* was manufactured from the cane produced by them. The method of cultivation, irrespective of manure, is shown in the following tabular form :—

Treatment on account of the crop experimented with. Ploughing.	Irrigation.	Grubbing and weeding.	*Previous treatment.* Year.	Manure.	Crop.
Twice in February, 1880, before crop was sown.	Dung plots six times ; guano and superphosphate plots five times.	Dung and guano plots grubbed and weeded four times ; superphosphate plots three time*. All plots covered with leaves in April, 1880.	1879-80 ...	Guano ...	Maize.

There was therefore a slight difference in irrigation and grubbing, the dung plots getting rather more water than the others and the superphosphate plots being only grubbed three times instead of four.

The variety of cane used on all the plots was that known as *matna.*

The results are shown below :—

MANURE. Kind.	Bate per acre.	Area of plot iu square jarus.	OUTTURN. Actual. Canes.	Sugar.	Per acre. Sugar.	Cost of cultivation per acre.	Value of outturn per acre.
	Mds. s		lb.	ft.	lb.	Rs. a. p.	Rs. a. p.
Cattle dung	260 0 260 0	388-4 135	2,940 3845	217-5 34	2 710-3 1,218-9	53 11 4 53 11 4	159 7 0 65 5 2
	130 0	[Average'of ttietwo above plots. 315 3	1,194	1,005	1,964-6 1,542-7	53 11 4 47 3 4	110 7T 86 11 9
Guano	12 35 12 35	244-4 410	1,986-25 1,450 5	105-5 131	2,089-2 3,019 2	166 11 4 166 11 4	117 8 1 169 13 1
	3 18	Average of the two above plots. 191-4	691	74 25	2,554 2 1,848-6	166 11 4 93 2 4	143 10 7 103 15 2
Bone superphosphate	6 24 6 24	150 144	610-25 267-50	80-75 76 25	2,605·5 2,562-8	51 0 10 51 0 10	146 8 6 144 1 9
	3 32	Average of the two above plots. 113-3	3885	37*25	2,584·1 1,591-3	51 0 10 44 10 10	145 5 1 88 7 10

The profits per acre yielded by each manure were therefore—

		Mds.	s.	Us.	a.	P.	
Dung	...	260	0	56	10	3	In calculating these profits cost of sugar manufacture has not been allowed for : this amounted to He. 1-5-4 per maund of sugar.
Do.	...	130	0	39	8	5	
Guano	...	12	35	(loss of 23	0	9)	
Do.	...	3	18	10	12	10	
Bone superphosphate	...	6	25	94	4	3	
Ditto	...	3	32	44	11	0	

The heavy yield which resulted from superphosphate is explained by the nitrogenous manure which was applied in the form of guano, 12 months previously, and which allowed the phosphoric acid to exert its full power.

(2) Selection of seed.

10. The effect of this'in the case of wheat was tried in two parallel experiments. The wheat-seed used was procured in the Cawnpore bazaar and was of very inferior quality. Selection was effected by the us© of a grain-separator, which eliminated 25 per cent, of the smaller and more shrivelled grains. Two quarter-acre plots were marked off and each divided into two portions, on one of which seed selected as above was sown, and on the other unselected seed. The same amount of seed was sown in both oases. Each plot w.is irrigated three times. The results are given in the following table :—

Number of experiment.	Seed.	Outturn per acre.	
		Grain.	Straw.
		tb.	tb.
I. ...	Selected	1,0460	1,486-0
	Unselected	814-0	3,492-0
II. ...	Selected	1,060-0	1,4340
	Unselected	1,020*0	1,574-0

Selection of seed therefore increased the outturn of grain by 29 per cent, in one case and 4 per cent, in the other. The outturn on all four plots was very poor, and had it been larger, the advantage resulting from ^election of seed would doubtless have been more conspicuous.

(3) Irrigation.

11. The effect of different numbers of waterings withoanal water was tried on a series of five plots which were irrigated respectively 4, 3, 2, 1, and 0 times. Each plot measured 400 square yards and was ploughed twice before sowing, in August and October. The crop was cut on April 7th; the results were as follows :—

Number of waterings with dates.	*Outturn per acre.*		*Increase in outturn resulting from irrigation.*				Money value of the increase in produce due to irrigation, which cost at most Rs. 4-14-0 per acre, including canal dues.
			Grain.		*Straw.*		
	Grain.	Straw.	Per acre in It).	Per cent.	Per acre in Ib.	Per cent.	
Four times.	lb.	lb.					Rs. a. p.
Novr. 26th, Jany. 2nd, Feby 4th, March 11th ...	1,603-2	2,910-0	1,352-2	538	2/268-7	353	40 4 6
Three times.							
Novr 29th, Jany. 8th, Feby., 21B t ...	1,0164	1,911-8	765·4	304	1,270-5	198	26 2 9
Twice.							
Deer 26th, Feby. 6th ...	1,200 9	1,6606	949-9	378	1,079-3	158	29 6 3
Once.							
January 4th	1,055 7	1,488-3	801-7	821	8470	132	24 13 0
Not irrigated ...	251-0	641-3	...	...	...	...	...

The money value of the increase due to irrigation is even more disproportionate to the cost of the irrigation than in the case of similar experiments conducted on tho farm during the rabi season of the preceding year: and with regard to the present experiments, it must be remembered that the first watering *(paleo)* on which the plots were ploughed and sown has not been taken into consideration, and that had not canal irrigation been available for this, no crop whatever could have been gathered.

It is noticeable how vastly a watering in March increased the outturn; when this was not given, the difference resulting from the plots having been watered once, twice, or three times is comparatively small.

12. In connection with the subject of irrigation I may mention the extraordinary difference which exhibited itself between the outturn of wheat-fields (a) ploughed up in July, so as to catch in open fallow what little rain fell, and (6) not ploughed up till September. This was especially noticeable in the case of one field which had been originally intended for cotton, and a portion of which had been ploughed up at the commencement of the rains, while the remainder was left unploughed till September, when the whole field was ploughed up and sown with wheat. The strip which had been first ploughed was accurately marked by a broad band of wheat running down the field, almost twice as tall and as thick as on the later-ploughed portions. Two typical plots were marked out in both portions and the crop carefully weighed. The result was:—

	Outturn per acre.		Value of crop per acre.
	Grain.	Straw.	
	lb.	ft.	Bs. a. p.
Portion ploughed in July ,,,	1,630*7	2,676·4	55 9 10
,, not ploughed till September ...	983·4	1,493-8	32 13 10

Hence the difference in value of outturn made by early ploughing amounted to over Us. 22 **per** acre. *

(4) Deep cultivation.

13. All the fields on the farm were cultivated with the soil-turning plough as in previous years, but only one experiment was made to test the results of this cultivation as compared with the native system, and this unfortunately was a complete failure. The plots on which the experiment was made were the same as those on which sorgho had been grown experimentally during the rains preceding, and their soil appears to have been exhausted, since the outturn of wheat was extremely small. Only six weeks intervened between the final cutting of sorgho and the sowing of tho wheat, and this was too short a period to allow of the soil recovering itself. The outturns were so small as to be valueless.

Mention may be made, however, of a crop of castor which had been sown in the July preceding on some sandy land sloping down towards the Ganges ravines. Owing to the deep cultivation which the land had received the crop survived the failure of rains, and was the only crop of any kind gathered from land of this description for miles round. The crop was gathered in April, having received no irrigation whatever since it was sown. The result is shown below:—

Area of field in square yards.	*Outturn in castor seed.*		Value of crop per acre.
	Actual.	Ter acre.	
	ft		Bs. a. p.
3,936-1	116*5	1457	5 0 0

This outturn is of course extremely small, but suffices to show the utility of deep cultivation, without which there would bare been no crop whatever.

(5) New staples.

14. The cultivation of two new staples was attempted—of Cape oats and of American maizes.

Cape oats.—Some seed had been obtained from Australia through the courtesy of Mr. O. G. Palmer, C.B., who wrote of it as being the most " profitable hay crop grown in South Australia on the better classes of soils, very free from disease and standing even the Australian droughts." The crop was a complete success : it was watered three times, and treated in every way like an ordinary *rabi* crop, but grew far higher and thicker than the oats ordinarily cultivated in this country. If grown for cattle fodder, it should yield two or three cuttings of green fodder during the cold season, when cattle food is scarcest, the stalks being cut down each time as soon as the ears show signs of appearing. This could not be tried with the crop experimented with, as it was necessary to grow it for seed. The yield in grain and straw was very heavy, the grain amounting to 2,299H>. per acre and the straw to 3,9931b.

American maizes.—In the report for the preceding *hliarif* it was noted that there appeared to be more chance of success in cultivating American large-grained maizes as a cold-weather than as a rain crop. During the *rabi* under report a trial was made of the following maizes :—

American large white corn.
Ditto white flint corn.
American Canada corn.
Country maize from Jaunpur.

The seed of all these American maizes was acclimatized*; not imported, having been produced in India from imported seed. Seed of the first-named variety had been raised in the Kbatmandu valley, whence a small quantity was kindly sent for trial by Mr. C. E. Girdlestone, the .Resident. The seed of the second and third American varieties had been raised on the Awa estate during the rains preceding, and hence had probably rather deteriorated in quality. But the results prove sufficiently well that some varieties of American maizes can be introduced into India as a cold-weather crop with great advantage, since if sown in September they will yield a large stock of food in February, at the time when the poorer classes are hardest pressed. The results are shown below, the first table giving details of cultivation and the second details of outturn :—

Treatment on account of crop experimented with.				*Previous treatment.*		
Ploughing.	Manure and rate per acre.	Irrigation.	Weeding.	Year.	Manure.	Crop.
Once in October.	*NU* ...	7 times from canal. American maize from Nepal 8 times.	Twice weeded.	1879-80 ... 1880-81 ... Kharif ...	Dung ... *Nil* ...	Potatos. *Nil* ...

Area of plots in square yards.	Variety of maize.	OUTTURN. Actual. Hulled corn.	OUTTURN. Per acre. Hulled corn.	Cost of cultivation.	Value of produce.
		lb.		Rs. a. p.	Rs. a. p.
222·2 ...	Large white corn from Nepal.	62*5	1,361-4	18 4 0	20 3 2
272-3 ...	American white flint	140-0	2,488-4	17 2 0	36 14 10
264-3 ...	American Canada corn.	237-0	4,348-2	17 2 0	64 8 7
318*75 ...	Country maize from Jaunpur.	146-5	2,224*5	17 2 0	33 0 2

The American variety known as Canada corn gave therefore a most enormous outturn and can be confidently recommended for cultivation.

15- (6) Plax cultivation.

A large consignment of Dutch flax seed was imported from England, but altogether failed to germinate. Recourse was therefore necessary to what acclimatized seed was in stock, and since the crop from which this had been produced in the year preceding was not a very healthy one, it is probable that its quality was far from being first rate.

Details of the method of cultivation are given below r—

Treatment on account of crop experimented with.						*Previous treatment.*			Cost of cultivation*
Area of plot in square yards.	Ploughing.	Man ure and rate per acre.	Seed.	Irrigation.	Weeding.	Year.	Manure.	Crop.	
									Rs. a. p.
3,122 4	Twice—once during rains and ones in October; also country ploughed before sowing.	Dung, 135 maunds.	Acclimatized flax.	4 times from canal.	Once	1878-79,	*Nil* ...	Wheat,	29 13 0
						1879-80	Dung, 50 maunds	Wheat,	
						1880-81, (Kharif),	*Nil* ...	*Nil.*	

The crop was an unequal one ; in some portions of the field it was excellent, but in other portions much dwarfed, apparently from lack of moisture. The seed was sown after an irrigation from the canal and not on natural moisture, and the irregular germination was, I think, due to unequal distribution of water. The field being on a slight slope, it was very difficult to distribute irrigation water evenly over the surface. In every way the season was against flax cultivation, which requires a damper air than Cawnpore affords, even in a cold weather season when the winter rains do not fail.

The flax was pulled, rippled (t.«., the seed heads stripped off), and retted in exactly the same manner as was done in the preceding rabi. The stalks were broken in a machine invented by Dr. Collyer, which when worked by four coolies can break 200tt>3. of flax daily. Soutching was performed by the farm apprentices and by coolie women, the amount scutched per head per day being about l'6tb. of flax and 8Ibs. of fine tow, which required no further scutching.

The return per acre was—

		lb.			£	*s*.	*d*.
Flax, first quality	...	76	worth in England about	...	1	14	0
„ second „	...	43	ditto	—	0	9	0
Tow, fine	...	604	ditto	...	0	[illegible]	0
„ coarse	...	41	ditto	...	0	1	0
		220*	Total	...	2	13	0

A sample of the flax was submitted to the opinion of experts through the Secretary, Agri. Horticultural Society of Calcutta, and was pronounced to be of good quality and easily saleable in the European markets at good prices.

Little progress has been made, however, towards finally deciding the question whether the production of flax in districts like Cawupore offers any hope of substantial profits. The cost of scutching was extremely high, reaching Rs. 70 per ton, and it will be necessary to adopt some other system for the purpose than that of single hand labour, unless its efficiency is very greatly increased by practice.

(B)— THE DEVELOPMENT AND CONSTRUCTION OF IMPROVED AGRICULTURAL IMPLEMENTS.

16. Ploughs.—The pattern of the Kaisar plough has been somewhat altered, a long beam, after the fashion of the native plough, haying been substituted for the short

beam with which if was previously fitted. This change was not made till after much consideration, since it renders the plough more weighty and cumbrous, but experience has shown that it popularizes the plough and makes its form appear less strange to native eyes. The price remains the same, Rs. 6 apiece. During the half-year under report 86 ploughs were distributed, 8 of which were given away and the rest sold. Out of the 86, 44 were of the newly-adopted pattern.

17. Pumps.—The form of the chain waterlift has been finally decided upon, and 11 were sold during the half-year, 7 of which were for depths less than 15, and the remaining 4 for depths less than 20 feet. As has been stated in previous reports, it is only for depths less than 20 feet that the waterlift is conspicuously more effective than any one now in use in the country.

18. **Winnowers.**— Ad wantage was taken of the last *rdhi* harvest to test by continuous use the pattern of winnower now made in ths Farm workshops. On the whole it did well, though some important modifications suggested themselves in course of work, and when carried out were found to have added considerably to the effectiveness of the implement. Careful comparison was made of the work of *(a)* the winnower imported from England (one of Dell's) at a cost of Rs. *200, (b)* one of the winnowers made up in the workshops at a cost of Rs. 35, and (c) the native method of winnowing. Trials were made on two days—once when a strong gale was blowing from the west, and again when there was only a very light breeze. In the former case the native method of winnowing consisted in merely pouring out the mixed grain and chaff *{bhusa) out* of a basket held up in the air, when the wind blew the chaff on one side, allowing the grain to fall straight down. In the latter case the wind was not strong enough to effect the separation, and the method followed was to make an artificial breeze by waving a sheet backwards and forwards in front of the basket from which the grain and chaff is poured out. The results are given below in tabular form :—

Method of winnowing.	*Labour required.*		*Result* actually obtained.*		*Time and cost of winnowing 100 maunds, as deduced from the results.*	
	Number.	Cost.	Amount of wheat winnowed.	Time token in winnowing.	Time taken to winnow 100 maunds.	Cost of winnowing 100 maunds.
		Annas.	lb.	M.	H. M.	Annas.
			First experiment in a gale of wind.			
English winnower	4	e\	561|	80	18 58	15-4
Farm „	3		376	91	32 I*	21-1
Native method	3		537*	113	28 33	18 7
			Second experiment in a calm.			
English winnower	4	eh	448	70	20 50	16-9
Farm „	3	H	410	125	40 39	26-6
Native method	3	10*	503	195	51 41	*67 8*

So long, therefore, as a high wind is blowing cultivators are able to winnow grain after their own fashion at a rate actually cheaper than if they used the farm winnower ; but in a calm matters are very different, and the native method is shown in this case to be extremely tedious and expensive. West winds are undoubtedly prevalent during the season when winnowing is in progress, but long periods of light east winds or no wind at all are far from uncommon, and indeed there was such a period during this last harvest. In cases like this the winnower now being distributed will be of great service.

During the half-year under report 22 winnowers were sold at a price of Rs. 30 apieee.

19. **Windmill.**—Mention may here be made of a windmill, of a pattern known as the "Kewanee," which was imported from America during last cold weather mainly at the suggestion of the Government of India. The price as given by an agent of the manufacturers who was then travelling in India was 54 dollars, but this was incorrect,

and it was necessary to pay the manufacturers 84 dollars, which was the real price of the machine, less customary discount. The whole cost of the windmill landed at Cawnpore was close upon Us. 300.

After numerous trials with different kinds of pumps the machine was fixed on the edge of a tank and attached to a plunger pump with a cylinder 7 inches in diameter and a 4-inch stroke. It was employed to lift water from a depth of 12 feet and to irrigate an adjoining field. The following figures show the results of various experiments made to test its discharge :—

Character of wind, with approximate velocity per hour.	Number of experiment.	Depth to water.	Quantity of water lifted per hour.		Useful work performed.	
			Cubic feet.	lbs.	In foot lbs. per minute.	Horse power.
		Feet.				
Strong breeze: between 8 and 9 miles	I.	14	125-1	7,806-24	1,821-4	•055
Fair breeze: 6 miles ...	II.	11	74	4,617-6	846-5	•025
Ditto ...	[illegible]	11	76	4,742-4	869-4	•026
Ditto ...	[illegible]	14	64 36	4,016-06	937 08	•028
Ditto ...	V.	14	60-4	3,768 96	979-42	•026
Light breeze: 5 miles ...	VI.	11-6	62·6	3,906-2	748-6	•022
Gentle breeze: 3 miles ...	VII.	11-5	14·6	911-0	174-6	•005

The experiments are not so satisfactory as could be wished, since it was only possible to make a rough guess as to the most important factor—the velocity of the wind.

It may be noted that the discharges obtained in experiments II. to V. are slightly less than those of a lever lift *(dhenkoli)* worked by two men.

The minimum velocity of wind necessary to work a windmill with any degree of effectiveness may be taken as 4 miles an hour. It has been shown in a note by Colonel Brownlow, published in one of the Professional Papers on Indian Engineering (No. 33, July, 1879) that the number of months in which the *average* velocity of wind exceeds 4 niiles an hour in these provinces is comparatively small. Observations at the five principal stations in the North-Western Provinces taken for seven months (November, 1871, to November, 1874) show that the average wind velocity of each month exceeded 4 miles an hour—

At Roorkee	for	2	months.
„ Bareilly	„	7	„
„ Agra	„	16	„
„ Lucknow	„	7	„
„ Benares	„	13	„

But this low average velocity is in great part due to the almost invariable dropping of the wind at night. Taken hour by hour there are many periods in each month during which the velocity reaches a comparatively high figure. The following figures are abstracted from a table appended by Mr. Blandford to the note above quoted, showing the mean velocity of the wind at Agra for eight months, November to June, *i.e.*, the months during which irrigation is chiefly needed :—

Month.	*Average number of houra per diem in which velocity per hour exceeded*				
	4 miles.	5 miles.	6 miles.	7 miles.	8 miles.
November ...	7	3	2	...	...
December ...	5	1	...	...	...
January ...	9	6	4	2	...
February ...	9	7	3	1	...
March ...	9	7	5	4	...
April ...	13	10	9	3	2
May ...	24	19	9	4	1
June ...	23	16	13	10	5
	99	71	45	24	8

Taking the total number of hours as 192, the number during which the wind was blowing with a certain velocity was—

Velocity per hour.	Number of hours for which this velocity was maintained.
4 miles ... ... — ...	99—71 = 28
5 „	.71-45=26
6 „ ... ... — •••	45—24=21
7 „	.24— 8 = 16
8 „	.8= 8

Experiments with the Kewaneo windmill have shown that with the wind velocity at 6 milds per hour its efficiency (in HP.) was about "026. Taking -C as the measure of the efficiency of the pump which was worked by the windmill, we obtain -04 HP, as the amount of power actually exerted by the mill, which exactly agrees with the figure arrived at by Smeaton on theoretical grounds. Applying this figure ('026 HP.) to the above table, and modifying it for each case according to the square of the velocity, we obtain the following result:—(28 x -Oil + 26 x '018 + 21 x -026 + 16 x •035 + 8X-046) -*-192«-0117 HP.

The efficiency of a *dhenkoli* worked by two men turn and turn about for 8 hours a day is about *028 HP., and the average efficiency spread over the whole 24 hours will be *009, or only slightly less than that of the windmill.

The cost of the windmill together with the pump was Rs. 360, so that its daily cost (on account of interest and wear and tear at 15 per cent.) distributed over the eight irrigating months of the year will be 3˙5 annas. To this must be added 1'5 annas as the wages of a boy to look after it, and so the total daily cost will be 5 annas. This is more than the daily cost of a *dhenkoli.*

A small windmill, such as the one experimented with, appears therefore to offer no advantages over the modes of lifting water now known to the country, while it is constantly liable to damage from sudden storms of wind. The windmill experimented with was totally disabled by a dust-storm which swept across the country in May, and repairing it entailed a great deal of expense and trouble.

I have the honor to be,

SIR,

Your most obedient servant,

J. B. FULLER,

Offg Director, Dept. of Agriculture and Commerce*

OEDEES OF GOVEENMENT.

No. 1323 OF 1881.

FROM

THE SECRETARY TO GOVERNMENT,

N,-W. PROVINCES AND OUDH,

To

THE DIRECTOR OF AGRICULTURE AND COMMERCE,

N.-W. PROVINCES AND OUDH.

DATED NAINI TAL, THE 22ND AUGUST, 1881.

Revenue Department.

SIR,

I AM directed to acknowledge your letter No. 1665A., dated the 21st July last, in which you reported on the Cawnpore Experimental Farm Operations during the rabi season of 1880-81.

2. The report gives a very clear statement of the work and results of the half-year. The problems connected with the improvement of agricultural methods and appliances are being patiently and judiciously studied, and will, it is hoped, before long be satisfactorily solved.

3. A full account is given of the trial of the " Kewanee " windmill imported from America, and the conclusion seems to be that the machine is hardly adapted for general use in this part of India. In G. 0. No. 1119, dated 1st July, 1880, you were asked to report to the Government of the Panjdb the results of the trials of this windmill; and I am to request that if you have not already done so, you will now send the report required.

I have the honor to be,

SIR,

Your most obedient servant,

C. ROBERTSON,

Secretary to Government,
JV.-JV. Provinces and Oudh.

EEPORT

ON THE

CAWNPORE EXPERIMENTAL FARM OPERATIONS

DURING THE KHAR IF SEASON, 1881.

ALLAHABAD:

KOBTH-WKSTEBN FB0VINCBS AKD OUDH GOVERNMENT TRESS.

1882.

REPORT

ON THB

CAWNPOEE EXPERIMENTAL FAEI OPERATIONS

During the Kharif Season of 1881.

No. 41GA OF 1882.

FROM

W. 0. BBNETT, ESQ.,

Offg, Director, Dept. of Agri. and Commerce, 8.-W. P. and Ouih,

To

THK SECRETARY TO GOVERNMENT,

JSorth- Western Provinces and Oudh.

DATKD CAWNPOM, TBB 28TH MARCH, 1883.

I HAVB theTionor to submit Mr. Fuller's report on the kharif harvest on the Experimental Farm at Cawnpore. The delay in its submission has been due entirely to the lateness of the cotton pickings. The greater part of that crop not having been sown till a month after the usual time, the pods continued to be thrown out till after Christmas. After that it was necessary to gin a rather large crop, and to obtain the opinion of experts on the prices which the produce would command in the market, in order to strike the value per acre of the crop.

2. It was a singularly unfortunate year for experiments. The effects of the various kinds of manure were neutralised by the excessively heavy rain in August and September, which, by flooding the lower lands, gave higher-lying fields an advantage quite independent of their manner of cultivation. Moreover, the manure itself was washed from one field and deposited in another tying below it, and injured by excessive wet. The experiments in manures have therefore proved complete failures, and cannot be said to teach anything.

3. The deep and shallow ploughings were in the same way equalised by the very heavy rain, which loosened the soil to the utmost depth required by the cotton with which it was sown. These experiments did however show, what has indeed been repeatedly proved before, the immense advantage of ploughing the land a considerable time before the crop is sown. In the case of cotton it nearly doubled the outturn, raising the value of the produce from Us. 33-5-0 to I*s. 55-3-0 per acre. I think that Mr. Fuller is mistaken in considering that the knowledge of the benefits of early ploughing is confined to the Meerut Division. They are certainly fully appreciated all over Oudh. No doubt the land is far better exposed by the farm plough than by the native implement, and that gives the former a great advantage for this operation. This year's results in no way vitiate the conclusions drawn from last year's experiments as to the immense advantage of deep ploughing in a year of drought.

Th" '*' The outturn of tWs year's cottoa was nearly I62fts. of cleaned cotton to the acre. This is not so good a result as was obtained last year; but, considering that the land was neither manured or irrigated, cannot be considered as otherwise than satisfactory. The provincial average outurn per acre was last year less than 661bs. of clean cotton; and, with one exception, the highest rate of produce (252fts. per acre) was obtained on the Cawnpore farm from country seed. This year's experiments with native and imported cotton point to one interesting fact, though the experience of a single year can hardly be taken as final proof. On light loamy soils the native cotton easily beat the American. Its produce being 195 and 252lbs. of cleaned cotton to the acre, against 106 and 91'5fts.; and this result is confirmed by the fact that the produce of duplicate plots sown with the same seed closely agreed. On a heavy loam, however, the superiority of Mew Orleans over the Kulpahar variety was equally striking : the former yielding 263fts. of cleaned cotton against 126fts. of the latter.

5. The experiments in sorgho sugar were vitiated by a want of proper acquaintance with the means by which it should be manufactured from the juice. The experiments, which have considerable intents, will it is hoped be repeated next year with a fuller knowledge, and consequently more satisfactory results.

6. I think that the Kaiser plough has probably a future in the cultivation of the country. It agam gained the first prize atthe Lucknow exhibition, and very favourable reports are received of Us workmg from such competent judges as the indigo-planters of Tirhoot. Mr. Cabaniss of ff the WI'/A . T th8 my beSfc plOUgh for In*an agriculture, with the exception resnectS h t T 7?T ^^ * mUch moro eXpenaive TM& TM* I «* ** in ^ reap cts ,t ,, better su,ted to India than even that. A large number hare been sent to the Panjib, and so of then Tw It 7 Z * 2 o f lndU, In PiUbbit * oaSnall y fouQd a -mindar who had twelye of them working on hi.i*, the majority of whioh he had made up in his own village in imitation of plou as t him from mnd^who"w - *; r' U * «* « " ^ accidentally came^cross another s ^ r ^ r i f A t ^ I t s benefit [illegible] harvest, and perhaps for two, till they are fully apparent. Its progress therefore must be slow.

7. Another point to be noted is that it is not fitted for every class of soil. Nor indeed could any plough be devised that would be. Where the race of plough-bullocks is exceedingly poor and feeble, its draught is too great for them. But this is not the case with the majority of districts in these provinces. Where again the soil is very hea [illegible] it suffers from the opposite defect [illegible] reports that 111. oKta, ,, fte soil a,,,, ,,,,,;«, pioag]M whioh i<rh f m [illegible] The [illegible] ... [illegible] made that should at the same time be effective, bu. the attention of the department will in the ensuing year be turned to the development of a plough which, without being materially dearer, will answer better for heavy cultivation.

8. Many inquiries are made after the departmental pump, and a [illegible] been sold. Considering its cheapness and effectiveness, I cannot doubt that it will be [illegible] come into very general use. I may pe haps t [illegible] d t0 reCord * CaS6 which [illegible] A common cultivator who h,! [illegible] pump at work during the exhibitioD [illegible] village blaCk8mith for how much [illegible] one. The man undertook to do it for Rs. 120, the real price of the pump being Rs. 40 only, and constructed an implement with the tube made of tin, with edges at the joints turned inwards. Of course after a few days' use the pump altogether broke up, and the cultivator sued the maker in the Small Cause Court to recover the price.

9. The success of the Bihia mill has been due to a large extent *» the intelligent *ay in which its sale has been pushed. Our implemenfe bave boen A~w» ^ck by the difficulty we have experienced in getting trust[illegible] agen*. As 8oon aS tbis di^ty_whioh is not an insuperable one—is overcome, there is I [illegible] every prospect of a krge 8ale for tbe pump3 owtain^» and pro* bably for the ploughs.

I have the honor to be.

SIR,

Your most obedient servant,

TV. C. BENETT,

Ofg. Director, Dept. of Agriculture and Commerce,

North. Western Provinces and Oudh.

REPORT ON THE OAWNPORE EXPERIMENTAL FARM FOR THE KHAfiflT SEASON OF 1881.

I.__field experiments.

THE season under report was by no means a favourable one for experimental « > *.*.* « -. The raim commenced early, tbere being a fall of over five inches during the first fortnight o June. Advantage was largely taken of the opportunity thus afforded of getting the cotton-seed into the ground L l y ; but a break of nearly three weeks, during which the hot winds again commenced blowing, parched up the young plants as they germinated, and the cotton sown on the first burst of rain did not ou the whole do as well as that sown during July, after the rains had set in thoroughly. The rainfall of July and August was abnormally heavy, flooding a great portion of the country, and doing seriom damage in this way to the young cotton and maize ; but the whole season's rain was concentrated in these two months, and by the end of August the rams had practically ceased. Details of the rainfall are given below :—

Month.	Rainfall in inches.	Number of days on which rain fell.
June	5-5	4
July	12-4	15
August	17·3	22
September	0-4	3
October	0 2	1
November	0·0	0
Total	35-8	45
Normal rainfall during this period ...	26-56	...

The raiufall of September anJ October was actually one inch less than it was in the year preceding, when the total rainfall only amounted to between six and seven inches. The shallow-rooted millets and maize suffered severely in consequence, and yielded an outturn much under the average. Unirrigated rice totally failed. Cotton, pulses, and til did not feel the drought so much, and rather benefited than otherwise by the absence of Ojtober rain, which is often very prejudicial to them. But the ground rapidly lost the moisture which it had acquired during the two preceding months, and the rabi sowings germinated very poorly, except where the ground had been previously watered. The average outturn of clean cotton on the farm was 161/8tt>3. on 67 acres; and considering that only one-tenth of this area was manured and none of it irrigated, this return must be considered satisfactory.

2. The excessive rainfall of July and August was especially prejudicial to the experiments, tthich were conducted with different manures, and to test the value of deep cultivation. The experimental delds were covered with water for over a week, and since ihey are situated on a slope, «ie manures must have been in great part washed out of the soil, and carried in solution from one plot to another. Moreover, the plots being on a slope did not all suffer equally from flooding, and this by introducing a second variant into the experiunnt tended of course to obscure the relative effect of the manures. The swamping of the ground also reduced deep and shallow cultivation to a par, since it converted the soil into a quagmire, and made it equally easy of penetration by plant roots, whether the ploughing was deep or shallow.

3. The operations of the season uuder report comprised experiments o n -

(i) Manures.
(ii) Deep and shallow tillage.
(iii) Cottons.
(iv) Sugar manufacture from the Impee or Sorgho *(Sorghum saccharatum).*

4. (i) Experiments on manures.—These were continued on the experimental plots (each of 400 yards square) which have been mentioned in preceding reports as having been marked out for the purpose; and which, having been similarly cropped during the two preceding seasons, must have been tolerably well reduced to a level as regards natural fertility. The results exhibit some

startling discrepancies, due, as has already been explained, to the submergence of a number of the plots for over a week at the end of July, but they are given as they stand below, together with details of cultivation :—

Treatment on account of crop experimented with.				*Previous treatment.*		
Ploughing.	Seed and rate per acre.	Irrigation.	Weeding	Tear.	Manure.	Crop.
Twice with earth-taming plough...	Maize, 6 seers...	*NJ.*	Twice ...	1878-79 ...	*Nil.*	Barley.
				1879-80 ...	*Nil.*	Cotton*
				1880-81— Khaiff...	Same as now applied.	Maize.
				Rabi ...	Ditto.	Wheat.

The land had therefore been cropped continuously for three years, and during the preceding year had borne two very exhausting crops.

The following table shows the manures experimented with and the results they yielded. To indicate the effect of the flooding on these results a column is added, showing the outturn of wheat, which was obtained *from the same plots with the same manures,* though in slightly different proportions, during the preceding rabi season?—.

Manure and rate per acre.	Cost of manure per acre.	Outturn of maize (grain) in ll)s. per acre.	Outturn of wheat (grain) from same plots in the preceding rabi.	Total cost of cultivation, including harvesting and cleaning.	Value of grain produced per acre.
	Rs.	lbs.	lbs.	Rs.	Rs.
Manures yielding nifcropren—					
Poudrette, 180 matinds	90	1,458	1,884 6	22·1	19-5
Cattle-dung, 180 maunds	90	633	1,346-1	21-4	8*5
Cattle-dung, 180 ruaunds, and bone-dust, 360lbs.,	13 5	630	...	25 75	8-4
Cattle-dung, 180 maundy and gypsum, 240Jbs.,	14-25	1,218	1,2403	27·0	16*3
Manures not yielding nitrogen-					
Ashes of 180 maunds cattle-dung ...	90	723	1,113-2	21-5	9-7
Bone superphosphate, 240fl>a.	115	213	986-1	23-3	28
Bone-dust, 3601ba.	45	963	795 5	17-1	130
Gypsum, 2401fcs.	5 25	1,038	...	17-9	14·0
No manure	GO	1,239	707 8	12·8	166

While therefore the outturns of the preceding season showed that the efficiency of a manure depended in chief measure on the supply of nitrogen which it yielded, the present outturns, although keeping poudrette as before at the head of the list, indicate that no manure at all is considerably more efficacious than any of the other manures experimented with, whether they are nitrogen-yielding or not. This result is due to the more favourable situation of the non-manured plot which lay at the head of a slope, and was therefore less swamped than the others. Any attempt at criticising results which exhibit such discrepancy would of course be futile.

I may mention that arrangements Lave been completed for continuing these experiments in duplicate in future, which will do much to prevent the re-occurrence of such a failure as this. Under any circumstances, the average of two plots in different situations will be a much mor« reliable guide than the outturn of a single one.

Two double sets of plots—one double set for the *tali* season and another for the *kharl]-~* were marked out a year ago ; but before commencing experiments it was necessary to take a* least a couple of crops off the ground in order to reduce the plots to an equality.

5- (ii) Experiments on deep tillage.—These were continued on the plots (each of 400 square yards) which had been made (he subjects of a similar experiment in the preceding year. The crop experimented with was cotton, that in the preceding year having been sorgho. The plots had not been manured for three years, received no irrigation, but were twice weeded.

No. I. was ploughed with the earth-turning plough two months before sowing, and again at sowing time.

Nos. II. and III. were ploughed once with the earth-turning plough at sowing time.

No. 'II' WaS plouShed twice with fche nafciTM Phagh at sowing time (this plot had never been touched with any plough but the native).

The outturns are shown below :—

Number of plot and description of tillage.	Comparative cost of tillage per acre.	Outturn of clean cotton per acre.	Cost of cultivation, including picking and ginning.*	Value of produce per acre.
		lbs.	Rs.	Rs.
I.—Deep plou... months before sowing and again at sowi...	3·0	252	22·4	65·6
II. and III.—Deep ploughed at sowing time ...	1·5	141 / 166	18·0	40·3
IV.—Country ploughed at sowing time	1·0	177	18·5	43·3

Th En.lUh DZT7i!)I!l!?h therefore Under 8imilar circumstance8 gave rather better results than the gro^d, fhZn £... MH b T 6Xplained before (para 2 is d ... swamping of the roots therefore finding soft earth ... saturated with moisture to a considerable depth in either case, and the plant ments of the previous to whatever depth they penetrated. The results of the experi- when it is a matter ... kharif prove beyond doubt that had the season been one of deficient rainfall, results of the ... every drop of rain should be drunk in as deeply as possible, the suits of the trial would have been widely different.

T ... the outturn ... Very ... ploughing ... hot months increases outturn. There was no comparison between this field and the others in strength of plants and colour of foliage ... although ... which suffered most from ... Coding. This result is is ... and this corroboration ... all the more ... the outturn ... of these ... ploughed, and not plot No. I. striking, since it was plot No. II. which was then early not due to any ... as the present case. The important outturn is the more plainly to any natural superiority of soil, I compare the results of the two seasons below :-

Season.	Crop.	Tillage.	Outturn per acre.	Increase per centum due to early ploughing.
			Green fodder, maunds.	
Kharif, 1880 ...	Sorgho ...	Early ploughed (No. II.) ...	124	106
		Ploughed at sowing time (No. I.) ...	60	
			Clean cotton, lbs.	
Kharif, 1881 ...	Cotton ...	Early ploughed (No. I.) ...	252	78
		Ploughed at sowing time (No. II.) ...	141	

... the benefits of early ploughing are well known, and advantage is taken of any rain which falls between December and May to plough up fields which are to bear in the ensuing kharif. This practice appears to be seldom if ever followed in the Agra and ... bad Divisions, possibly because the occurrence of winter rains is so uncertain as to give the custom no opportunity of taking root. For such a ploughing the earth-turning plough is ... advantageous, since by its use the object of the ploughing, i.e., to loosen the earth and expose it to atmospheric influence, is accomplished far more thoroughly and expeditiously than is possible with the native implement.

6. (III) Experiments with indigenous and imported varieties of cotton.—The total area under cotton during the ... outturn of 161-8 ... 6·21 acres which yielded an average ... that no irrigation ... that none of the ... had been freshly manured, and irrigation was used, this result is a satisfactory one, representing as it does an average return of over Rs. 34 peracre, on an outlay of about Rs. 18.

Trials of Central India cotton from Hinganghat, and of the varieties of American cotton known as New Orleans and Upland Georgian, were made on two classes of soils,-on a light loam,

*Cost of picking estimated at value of one-twelfth of produce: cost of ginning at 2 annas per ...

which had been lightly manured in the previous year, but had since borne a crop of wheat; and on a heavier loam, which had not been recently manured, but which had lain fallow fora year and a half, and was therefore the stronger soil of the two.

In the first series the imported cottons were tried against two varieties of country cotton,—that grown in Bundelkhand, known as *Kulpahar,* and that commonly grown round Oawnpotifc In the second series they were tried against the *Kulpahar* variety of country cotton only' The method of cultivation followed in each case is shown in tabular form below;—

Number of experiment.	Treatment on account of crop experimented with.					Previous treatment.		
	Ploughing	Seed and rate per acre.	Manure and rate per acre.	Irrigation.	Weeding.	Year.	Manure.	Crop.
I.	Once ...	Sown broad-cast at 6 seers.	*Nil.*	*Nil.*	Twice ...	1879-80 ...	Guano, 1*2 maunds.	Wheat.
						1880-81 ...	Duog, 270 maund9.	Wheat.
II.	Once ...	Ditto ...	*mi.*	*Nil.*	Once ...	1879-80 ...	Poudrette...	Maize.
						1880-81 ...	*Nil.*	*Jid.*

The outturns which were obtained are shown below;

Kumber of experiment and class of soil.	Name of variety.	Area of plot.	Outturn in clean cotton per acre.	Cost of cultivation per acre, including picking and ginning.	Value of produce per acre.
		Acre.		Bs.	Bs.
I.—Light loam ...	American New Orleans ...	•12	104*0 } average 108*8	16·8	26 0
	Ditto duplicate plot ...	•11	109-75 }		
	American Upland Georgian ...	•11	9075 } average	16-3	22 3
	Ditto, duplicate plot ...	•10	92-25 }		
	Hingangh&t ...	'09	1235	17"4	29 3
	Kulpahar ...	•10	194-75 } average 1953	19-3	45 2
	Ditto, duplicate plot ...	•10	196-0 }		
	Gawnpore ...	•10	252-0	217	55-3
II.—Heavy loam ...	American New Oileans ...	•11	263-0	21-8	60-9
	Ditto Upland Georgian ...	•22	137-75	17·6	31-&
	Hinganghât ...	•18	91-5	16-0	2M
	•Kulpahar ...	•21	126-75	17·2	20-3

The results of the duplicate plots in the first series exhibit a most satisfactory correspondence.

The experiments would therefore appear to prove—(1) that for light poor soils the indigenous cotton is by far the most profitable ; but (2) that on better class soils and with careful cultivation American New Orleans cotton can be grown with very great success and profit. That the local variety should be the one best suited for unfavourable conditions was of course to be espected, but it is very satisfactory to have proved that the cultivation of a high class American cotton m these provinces only necessitates a moderately good soil and moderately careful cultivation. About 20 per cent, of the area under cotton in these provinces is land under very high cultivation and there is therefore a wide field for the introduction of American varieties.

The rates on which the outturns of the several plots have been valued are much to the disadvantage of the American varieties, siuce American cotton not being regularly on the Cawnpore market, only commands there a price equal to that of the best Bengal.

Fresh seed of the New Orleans variety was obtained from America and sown during the reason under report, but it germinated very poorly, and only yielded sufficient produce to serve as*seed for next kharif season. It is satisfactory to note however that the quality of American cotton does not appear to deteriorate on acclimatization in this country, since some of the farm produce, grown from seed which had been acclimatized for at least four years, was pronounced by experts fully equal to good American-grown cotton.*

H.*v*7·^kPerTMents on the manufacture of sugar from sorgho (Sorghum saccharatum).—Hitherto sorgho has only been grown on the farm as a fodder crop, but an attempt was made during the season under report to follow experiments recently made in America with a view to test its value as a sugar-producer. Sorgho requires less than one-third of the time and expense which are necessary for a crop of sugarcane, and hence its cultivation would appear to promise well, if it can be made to produce a sufficient quantity of the coarse sugar used in the country.

The points to be settled at the outset were—(1) the variety of sorgho which contained most saccharine matter ; and (2) the period of growth at which the saccharine matter was most fully developed, and at which therefore the plant should be cut.

The extent to which sorgho is cultivated in America has led to the development of a large number of varieties ; but in India there appear to be only two,-the black-seeded, an introduction trom China, and the red-seeded ^or Impee), which has it *habitat* on the east coast of Africa. Unfortunately, only a very small amount of seed of the latter variety could be obtained, and 'experiments were therefore confined to the black-seeded variety.

Eight successive experiments were made at intervals of about a week, in order to discover the age at which the plants should be cut. The juice was expressed by one of Messrs. Thomson and Mylne's small vertical roller-mills, and boiled dowa in a single evaporating pan. The results are shown below:—

Date of sowing.	Date of cutting.	Number of days between sowing and cutting.	Weight of stems.	Weight of sugar.	Percentage of sugar to stems.
			lbs.	lbs.	
June 16th ...	August 29th ...	74	193	3-75	1-9
Ditto (duplicate experiment)...	Ditto ...	74	171	3-25	1-9
May 4th ...	August 30th ...	118	166	100	6-0
[illegible]	September 5th ...	124	113	4-25	37
	Ditto 13th ...	132	66	6*5	99
	Ditto 20th ...	139	122	7-25	60
Ditto ...	Ditto 27th ...	146	*86*	35	40
June 16th ...	October 4th ...	153	90	25	27

The stems should therefore be cut after from 4 to 4£ months' growth, when the seeds have almost ripened.

The sugar obtained was of the consistency of treacle, and conld not be made to crystallize. It would only command a sale for tobacco sweetening at about Re. 1-12-0 per mannd, and at this rate would yield no profit. This was no doubt in great part due to defects in the boiling process and inexperience of the sugar-maker; but I may mention that the difficulty of effecting proper crystallization has been found the main obstacle to the use of sorgho as a sugar-producer in America, although the recent experiments of Professor Collier, Chemist to the Agricultural Department at Washington, have shown that with certain treatment a fair proportion of sugar crystals can be obtained.

The experiments will bo continued during the following kharif, trials being made with red-seeded as wdl as black-seeded sorgho, and also with a variety which has been proved to be the best in America (Minnesota amber corn), some seed of which has been received from the Government of India. Greater care will be taken in the process of boiling and concentration, and the services of an experienced sugar-boiler will be engaged.

* The A*Sin.cetUi8 Para, was written, the sale of the farm cotton has been completed with exceedingly satisfactory results. ihu£ fal'!?"1 Td n WttS Purchased by the Muir Mills at Rs. 23 per rnaund, which is 56 per cent, higher than the price of }uf;?r Ka)dBe n8al,»--tbMj standard quality of the Oawnpore mirket. The produce of ordinary country seed and oil ,,at ""Ported from Bundelkhand was pronounced by three European cotton merchants as "equal to the finest Ben-tfff "~'a ^uality not ^ the market this year,—and purchase i at Rs. 19-2-0 per maund, which is 18 per cent, higher than, Brt^u Omraaudedb y"Sood Bengal." This difference can only be ascribed to the effect of deep cultivation, since iu< »o otto* respect did the method of cultivation differ from that followed by native cultivators.

•**•—2fo *development and manufacture of improved agricultural implement*'

8. During the half-year an attempt was made to transfer to a private firm the manufacture of the Kaisar plough and the chain water-lift. The object in opening workshops at the farm was merely to provide the requisite facilities for experiments in adapting European or American imple'' ments to Indian requirements, and not to attempt to manufacture''on a large scale for sale to the public. So soon as an implement appeared *primd facie* suited to the country, it was always intended to transfer if possible its manufacture to private hands, and trust to private enterprise rather than to Government agency for pushing its sale. The Kaisar plough and the water-lift have both met with sufficient success to justify a belief that they would fill a want in Indian agriculture, and consequently their manufacture in the Government workshops was stopped, and arrangements made for transferring it to a European firm. The attempt, however, only met with failure; since, although the prices which were fixed allowed of a profit of at least 25 per cent., the workmanship was exceedingly bad, and it is feared that the reputation of the implements may have suffered considerably u» consequence. The attempt is not, however, to be abandoned, but it has been necessary to re-commence manufacture at the farm, whilst opening negotiations with another firm.

The number of ploughs sent out between June 1st and November 30th, 1881, was 216, of which 205 were sold and 11 given away. Out of the 216, 123 were of Government and 93 of private manufacture.

Nineteen of the improved 20ft. water-lifts, all of farm manufacture, were distributed during the half-year, two of which were given away as samples, and the rest sold.

No winnowers were sent out during the half-year, since there was no use for them during the season which it includes,

J. B. FULLER,

Assistant Director, in charge Caumpore Experimental Farm.

REPORT

ON TIIE

OAWNPORE EXPERIMENTAL FARM OPERATIONS

DURING THE RABI SEASON, 1881-8 2.

ALLAHABAD:
KOBTS-WBSXEBH PROVINCES AND OUDQ GOVERNMENT PBESS.
1882.

No. ^ OP 1882.

FROM

THE DIRECTOR, DEPT. OF AGRICULTURE AND COMMERCE,

K.-W. PROVINCES AND OUDH,

To

THE OFFG. SECRETARY TO GOVERNMENT.

N.-W. PROVINCES AND OUDH.

Dated Cawnpore, the 28th July, 1882.

SIB,

I HAVE the honor to submit Mr. Fuller's report on the rabi operations at the Cawnpore Experimental Farm. He was throughout in managing charge, holding the same position towards me with respect to the Farm as Messrs. Duthie and Ridley hold with respect to the Botanical and Horticultural Gardens. The post of Overseer was filled by Mr. Spitteler, acting under Mr. Fuller's orders.

2. The main experiments during the season were in wheat cultivation. The results go far to discredit the extremely low estimate which has been accepted of the productiveness of Indian agriculture. The land of the Farm is generally poor and nowhere *of* exceptional fertility. Only one-fourth of the area sown had been specially manured for this crop, and a very moderate amount of irrigation—two waterings to a fourth and three to the remainder of the area—was given. Yet the crop on 16*8 acres averaged more than 23 bushels to the acre, and on one unmanured plot, which had only been watered twice, reached the very high outturn of over 44 bushels.

The only advantage it enjoyed over ordinary native cultivation was the use of a soil-inverting plough, against which should be set the disadvantages in some cases of exceptionally poor soil, unsucoesful experiments, and double-cropping.

3. The danger of error in generalizing from single instances was to a certain extent guarded against by conducting the more important experiments in duplicate on plots situated at some distance from each other in different parts of the Farm. The generally close correspondence of the results adds considerably to their value. The conclusion arrived at from experiments with natural manures, and confirmed by separate experiments with artificial manures on the Ville system and by a scientific analysis of the soil, is, if warranted, one of extreme practical importance. Of the four elements which manure adds to the life of plants it appears that the soil of the Farm is seriously wanting in one only—nitrogen. Omitting nitrogen from the artificial manures, no increase was given by a combination of phosphorus, potash, and lime. When nitrogen to the extent of three-fourths of the requirements of the crop was added, the weight of outturn in grain was two and a half times as great as that of the unmanured plot, and of straw nearly three times. Mr. Fuller classes bone-dust as one of the manures yielding phosphoric acid ; but the superior yield it gave when compared with calcic superphosphate, in which the phosphorus is in a far more available form, points strongly to the conclusion that its fertilizing qualities were due principally to the nitrogen it contains. Allowing 4 per cent, of nitrogen to the constitution of bone-dust, the amount contributed to the reserves of that element already present in the soil by 3601b. of bone-dust would be more than 14lb., or about a third of the whole requirements of the crop. The low outturn secured by 160 maunds of whole dung when compared with the outturn produced by the ashes of the same quantity is explained by the fact that in the dung-manured plots a large proportion of the wheat was consumed by white-ants, for the extirpation of which an earlier watering than could be given is required. A scientific analysis by Mr. Hill, the Meteorological Reporter for these Provinces, showed that while the farm soil has sufficient lime and a larger quantity of potash and phosphorus than typically fertile soils in Europe, it fails in nitrogen only, having 1,4831b. to the top nine inches of an acre, while an average quantity of the same element in Europe is 5,7571b. in the same area.

4. Other facts pointing in the same direction will be found in the report; and if the conclusion is to be accepted as established, it follows that the main problem of practical agriculture in this country is now to supply nitrogen in the form of a cheap manure. Mr. Fuller recommends the use of saltpetre and green soiling by ploughing in a young crop of hemp. There seems to be little doubt that the latter is a very cheap and effective means of fertilization. If saltpetre is of so great a value as these experiments appear to show, it is probable that any artificial restraints on its manufacture act injuriously on the agricultural interests of the country.

5. The great increase in produce which results from early ploughing is almost certainly due to the amount of nitrogen in the form of ammonia which it enables the loosened soil to absorb from the rain, and probably from the air as well. Another conclusion of practical importance is that drainage may do much harm by washing the nitrogen out of the soil. It is not impossible that this may be the cause of the barrenness of ravine tracts, off which the rain drains rapidly instead of being absorbed by the soil,

6. The experiments with different numbers of waterings gave in both series the unexpected result that one watering followed by a weeding gives a higher produce than two waterings, after the second of which the land is allowed to cake. I should however hesitate to- accept the result of these experiments as conclusive. Further waterings up to five give a steadily increasing rate of produce.

That well water produced more than canal is probably correctly ascribed to the greater opportuneness with which the farmer can be supplied. The difficulty of obtaining canal water at the time when it was most required completely ruined the sowings of American maize and English carrots and wurzels, and was the cause of the destruction of much of the dung-manured crop by white-ants.

7. It was found that much saving could be effected by thin sowing, provided that it were possible to guarantee the even germination of all the seeds over the whole plot sown. Where this was secured there was not much difference in the outturn of plots sown behind the plough, or by dibbling in a twelfth part of the same amount of seed, or in plots in which every furrow, or only every second or third furrow, had been sown.

8. Of the foreign crops Cape oats were again very successful. Black and white gram and English wheats and barleys proved to be far inferior to native varieties; but as the results from this year's sowings were better than any in preceding years, it is possible that these crops may improve with further acclimatization. The experiment would be of greater interest if the best kinds of Indian wheat were not already as good as any known. Naked barley seems to be an impostor and *Alfalfa* to be only another name of lucerne.

9. The workshops, which for the greater part of the time were in charge of Captain Clibborn, but which it has since been found necessary to combine again with the Farm, turned out a fair number of ploughs, winnowers, and pumps. Negotiations for the manufacture of the Kaisar plough were undertaken with Messrs. Coen and Co. of Agra and Crowley of Allahabad, but without much practical results. Experiments are being made towards adopting a plough better suited to heavy soil than the Kaisar is, and for the improvement of the Farm pump. The Little Giant (a combined thresher and winnower) imported from America, was very successful, though its expense forbids the hope that it will ever be used, unless, which is not at present likely, a number of cultivators will co-operate. Even then it is doubtful whether, unless its construction be materially cheapened, it can be made to do nearly enough work to pay interest on the capital outlay,

I have the honor to be,

SIR,

Your most obedient servant,

W. C. BENETT,

Dr., Dept. of Agri. and Com., N.-W. P. & Oudh.

REPORT

ON THIS

OPEBATMS AT THE CAWNPOKE EXPERIMENTAL FAR!

During the Rabi Season, 1881-82.

THB operations of the half year may be subdivided into (A) Field experiments of a purely agricultural nature, and (B) Experiments with agricultural implements and machinery.

(A.) FIELD EXPERIMENTS.

2. As has been too commonly the case in late years, the season was marked hy a deficiency in the rainfall. Ample rain fell in Jaly and August and the tillage of fields intended for Tabi crops progressed satisfactorily s but the rain virtually ceased before the commencement of September, and the rainfall of that and of the succeeding month {October) only amounted to -4 and -2 of an inch respectively, against a normal quantity of 5*4 and 1*0 inches* Under the circumstances it was* surprising that the ground retained sufficient moisture to bring about the proper germination of the seed when -sowing time came with the middle of October, and in some cases it was considered advisable to irrigate previously to sowing. This was done however with only a small portion of the farm area, aad the crops on high-lying fields, which had lost a portion of the rainfall by surface drainage, suffered considerably from uneven germination. That the natural moisture was sufficient on level land which had been well ploughed as proved by the fact that two adjacent fields, each of about half an acre in extent, yielded crops of wheat at such closely corresponding rates as 1,5811b. and 1,5881b. per acre, although one was sown after irrigation and the other without it, their treatment in **other respects being exactly similar.**

From November 1st till If ay 31st the rainfall did not amount te one inch, and of this only -6 inch fell while the crops were on the ground. This small quantity was of but little practical benefit, being evaporated almost as soon as it fell. The rainfall of the season is shown below :—

Month.	Rainfall in inches.	
	Actual.	Normal.
September	04	5 41
October	02	108
Total	0·6	6'49
November	00	0-08
December	0-0	0-18
January	0-0	0 74
February	02	0 53
March	00	0 25
April	04	0 15
	03	0 41
Total	0·9	2-34

When there are however facilities for cheap irrigation, such as are eqjoyed by the Farm, the occurrence of winter rains is not a matter of importance. Indeed, it is probable that the total absence of fungoid disease (rust, smut, &c.) which characterizes a dry cold weather more than compensates for the expense of having to give (say) 4hree waterings instead of one or two.

3. Measured by the Farm crops the season was an extremely good one, and **the** outturn obtained from unmanured and not heavily irrigated land would have

been surprising to any one who was not convinced of the natural fertility of Indian soil. The total area under wheat was 16-8. acres, not more than one-fourth of whicb had received manure during the preceding year. No field received more than three waterings after sowing and a portion (about 4 1 acres) was only watered twice. Yet the average produce of wheat grain per acre was over 1,3901bs. (=17 mds.j, th& maximum outturn amounting to so high a figure as- 2,820rbor 34 mds (=47 bushels). One of the unmanured fields, which had also only received two waterings, yielded at the rate of 2,6621b. or 32 mds. per acre. The crop was not only large in quantity but of excellent quality, and over 50 per cent, of it stood the test of being twice passed through an English separator and may bfr considered first-class grain. The seed was originally obtained from Muzaffarnagar three years ago and was of the same kind as that which has been largely distributed by this Department during the past two years.

4. The cultivation ef the half year comprised experiments on—

(1) the effect of different manures ;
(2) irrigation ;
(3) thin sowing;
(4) new varieties of seed[1].

The cultivation of American maize as a cold-weather crop, and of English carrots and mangels, formed part of the programme, and these crops were sown in September. Unfortunately however canal water ran short (the canal distributary being closed for repairs), and with the failure of rain all three crops withered and died. The Farm lost in this manner the produce of 3 acres of land, only a portion of which could be resown with wheat. The loss ta an ordinary cultivator would of course have been crushing, and may famish a clue to the reluctance with which many cultivators rely on canal irrigation for crops for which *timely* watering is essential. The cultivation **of flax** must also bo added to the list of experiments. Over an acre of it was grown from Riga seed, and the produce was by no means unsatisfactory. It has not however been broken and scutched as yet, and until these operations have been completed it is impossible to speak with confidence of the quality of the outturn.

4- (i) **Experiments on manures.**—These may be subdivided into (a) .Experiments forming part of a continuous series on plots set aside for the comparative trial of certain manures over a number of years ; (6) Experiments with certain combinations of chemical manures on the lines suggested by M. Georges Ville, the French chemist;. *(c)* Special experiments to test the value of phosphoric acid on the farm soil ; *(d)* Special experiments on green soiling.

(a) ***Experiments forming part of a continuous series.*****—It has been already stated** in previous reports that two series of plots, each in duplicate, had been marked out for the continuous trial of different manures in the kharif and rabi seasons. By continuous heavy cropping the plots had been reduced to a par as regards natural fertility by the commencement of the season under report, and were therefore fit subjects for experiment. Wheat was the crop grown, and the treatment of the plots, irrespective of manure, is shown in tabular form below :—*

Treatment on acsount of crops experimented with.				*Previous treatment*		
Ploughing.	Seed and rate peracre	Irrigation.	Weeding.	Year.	Manure.	Cropa,
Twice, with soil-inverting plough.	White wheat at 1) md.	Once before sowing *ipaleo)* and three times *fterwaids.	Once.	1879kharff ...	Nil	**Cotton.**
				1880 » ...	Nil	**Maize.**
				1881 „	Same as now applied.	**Do.**

It was unecessary to crop both sets of plots with maize in the kharif preceding the rabi under report, and they bore therefore two crops within the year. The effect of this in lessening the rabi produce must not be lost sight of.

The area of each plot was one-twelfth acre. The manures experimented with and the result per acre is shown below :—

No. of plot.	Manure and rate per acre.	Cost of manure per acre.	OUTTURN IN POUNDS PER ACRE. Grain. First series (B.)		Straw. First series (K.)	Second series (Al.)	Cost of cultivation.*	Value of produce per plot.†
				Second series (Al.)				
		Rs. a. p.	lb.	lb.	lb.	lb.	R.	Rs.
1	Saltpetre 240 lb. ...	9 0 0	1,242	1,605	1,635	2,160	28·0	42·1
2	Saltpetre 240 lb., bone-dust 360 lb.,	13 8 0	1,395	1,575	1,785	2,124	32·5	43·8
3	Dung 160 mds. ...	9 0 0	918	738	1,080	915	28·0	24·1
4	Dung 160 mds., bone-dust 360 lb.,	13 8 0	846	678	1,155	843	22·5	22·5
5	Dung 160 mds., gypsum 240 lb.,	14 4 0	882	594	1,152	774	23·2	21·7
6	Ashes of 160 mds. dung ...	9 0 0	1,281	978	1,491	1,326	28·0	36·1
7	Bone-dust 360 lb. ...	4 8 0	1,287	1,422	1,509	1,869	23·5	39·6
8	Bone superphosphate 240 lb. ...	14 8 0	1,065	1,170	1,278	1,524	33·5	32·6
9	Gypsum 240 lb. ...	5 4 0	798	912	1,017	1,233	21·2	26·4
10	No manure ...	Nil	777	771	1,221	1,113	19·0	23·2

The first point to be checked in this table is the correspondence between the two sets of plots. With this end I compare below (1) the per cent increase in outturn, (2) the difference in outturn per cent, of each pair of plots and the pair preceding it on the list.

Manure.	Per cent. increase in grain on outturn of unmanured plot. First series (B)	Second series (Al.)	Difference between the outturn per cent* of each plot and that of the plot preceding it. First series (K.)	Second series (Al.)
Gypsum	2	18	...	...
Bone superphosphate	37	51	+35	+33
Bone-dust	65	84	+28	+33
Ashes of dung	66	26	+1	−56
Dung and gypsum	13	23	−53	−3
Dung and bone-dust	8	13	−5	−10
Dung	18	5	+10	−8
Saltpetre and bone-dust	79	104	+61	+99
Saltpetre	60	108	−19	+4

* The head "cost of cultivation" includes the following items. :—

	Rs. a. p.
Two ploughings	3 0 0
Clod-crushing	0 8 0
Seed	3 0 0
Sowing	1 2 0
Weeding	2 0 0
Irrigation—	
Canal dues	1 8 0
Lifting (for four waterings) ...	4 8 0
Making water beds ...	0 2 0
Rent	3 4 0
Manure	Variable.
Total ...	10 0 0

† Calculated at the rate of Rs. 2 per maund for grain and 5 annas per maund for straw.

It will be noticed that the increase per cent, on the unmanured outturn is as a rule larger in the second than in the first series, but the proportionate increase between one plot and another corresponds in both series with tolerable regularity. Considering that this is only the third season in which the two sets of plots have been similarly manured and cropped and that they are situated at a considerable distance apart, the general correspondence between their outturn speaks strongly for the general accuracy of the results.

Taking now the average of the duplicate plots, the results of each manure which was experimented with may be compared as follows, the manures being classified according to the principal ingredient in plant food which they supply:—

	RESULT PER ACRE.					
	PER GENT, IN GROSS OUTTURN.				ACTUAL ON PROFITS.	
	Increase.		*Decrease.*		Increase.	Decrease.
	Grain.	Straw.	Grain.	Straw.		
					its.	Ita.
Manures yielding nitrogen.						
Saltpetre	83	62	...		9-9	...
Dung	7	...	...	15	...	8*1
Manures yielding phosphoric acid.						
Bone superphosphate	44	20	...	...	...	5X
Bone-dust	75	44	—	...	11-9	...
Manures yielding nitrogen and phosphoric acid.						
Saltpetre and bone-dust ...	91	67			6'6	
l)un^ and bone-dust	...	...	2	15	...	4-2
Manures yielding lime and potash.						
Gypsum	10		...	4		20
Ashes of dung	46	20	...	...	b-9	...
Manures yielding nitrogen, lime and potash.						
Dung and gypsum	...	...	5	18	...	5-7

The value of the table is very greatly impaired by the lowness of the outturn yielded by all plots to which dung was applied, v/hich is quite abnormal and due to a special cause. The plots having been cropped in the kharif preceding, it was only possible to apply the manure six weeks before the wheat was sown. It is well known that dung, unless it has lain mixed with the soil through a rainy season, attracts white-ants, and it is for this reason that native cultivators scatter manure on their rabi as well as on their kharif fields before the commencement of the rains. If dung is applied after the rains have ceased, early irrigation is an absolute necessity as a check to the insects, and in the present case, owing to a failure of canal water, this could not be effected. The plots should have been watered by the end of November at latest; but it was not possible to give the first irrigation until December 20th, by which time a large portion of the crops had been destroyed. The outturns of the plots to which dung was applied must therefore be wholly disregarded.

5. Bone-dust and saltpetre stand at the head of the mineral manures, increasing the profits of cultivation by Bs. 12 and Rs. 10 per ncre respectively when used singly, but by less than Rs. 7 when used together. Grounds have been given in previous reports for believing that nitrogen is the element most needed by Indian soils, and saltpetre is specially well qualified to supply nitrogen, which constitutes 12 per cent, of

its weight. The 360ft. of saltpetre applied per acre represent therefore nearly 44ft. of nitrogen, which is about the quantity contained in the grain and straw of a good crop of wheat.

The increase given by bone-dust is not so easily accounted for. The element for which bone-dust is generally valued is its phosphoric acid ; but bone superphosphate also contains this, and in a much more soluble form, without however adding so much to the outturn or even reimbursing its cost. The explanation probably lies in the fact that bone-dust contains, in addition to its phosphoric aoid, a certain amount of nitrogen (about 4 per cent.) valuable to Indian soils for its own sake as well as for enabling the phosphoric acid to exert its full effect, which in the absence of nitrogen it cannot do. If this is the case, the phosphoric acid in ground bones is, so far as Indian soils are concerned, of subordinate importance to the nitrogen which they contain ; and this view is strengthened by the fact that when saltpetre and bone-dust were used together and the value of the latter was confined to its phosphoric acid, the outturn showed but little increase over that yielded by saltpetre alone.

6. Light is thrown on the subject from another side by an analysis of the soil of one of the unmanured plots which was kindly made for me by Mr. S. A. Hill, B.Sc, Meteorological Reporter to Government. The sample was collected after the rabi crop had been cut and cleared, equal quantities of soil being taken from the first, second, aud third three inches of depth and carefully mixed. The sample therefore represents the soil of the upper nine inches of ground. I subjoin Mr. Hill's report, adding columns to show the actual amount in pounds of the mare important ingredients which the analysis indicates as present in the upper nine inches of an acre, and also the quantity which is consumed by a wheat crop of 20 mds. grain and 25 mds. straw :—

The soil when received was moist.* brown in color, and contained a few roots of wheat or some other cereal. When dried in the air its color was light brownish grey. Roughly washed in a very slow stream of water it left about 80 per cent, reddish sand with a very few small nodules of kankar. By ... washing a minuf quantity of the dense dark-brown mineral *wolf ran* Ctungatate of iron ... be extracted. The spesific granity of a carefully powdered and selected sample was 3 54, or nearly tue same «« that of pure quartz. A chemical analysis of the soil gave the following results :—

		Per cent.	lb. in the upper 9 inches of an acre.	Amount consumed by a crop of wheat.
			ft.	lb.
Volatile, 3 06	Moisture expelled at 250°F. ...	0 60		
	Combined water expelled at a red heat.	2 03		
	Organic matter ...	0 16		
	Carbon dioxide ...	0 16		
	Ammonia ...	None.		
	Nitrogen pentoxide ...	0-11	5,717-25 (= 1.483 nitrogen.)	173-5 (= 45 nitrogen.)
Soluble in Hydrochloric acid, 12*59.	Chlorine ...	Trace.		
	Sulphur trioxide ...	Do.		
	Silica and tungstic oxide ...	0-13		
	Phosphorus pentoxide ...	0 51	26,136-0 (=11.411-5 phobphorus.)	18-5 (=8-1 phosphorus.)
	Alumina ...	4-18		
	Oxides of iron and manganese ...	5*56		
	Lime ...	0-90	46,391-4	12-3
	Magnesia ...	0*91		
	Potash ...	0 32	16,335-0	27
	Soda ...	0 08		
Clay decomposed by sulphuric acid 6*29.	Alumnia and oxide of iron ...	2-92		
	Silica ...	3*37		
	Insoluble sand ...	78-10		
	Total ...	100·01		

• The soil appears to have plenty of phosphate, but to be weak in potash and very deficient in organic matter.

It is generally accepted that the only ingredients in plant food with which practical agriculture need concern itselfara, in the order of increasing importance, lime,

• There had been a slight shower of rain two days before the sample -was taken.

potash, phosphoric pentoxide (or acid), and nitrogen. *A* tolerable safe conclusion as to the richness of the Farm soil in the three first named may be drawn from a comparison of the quantities contained by other soils known to bo fertile :—

	* A very fertile alluvial soil in East JTriesland.	f A fertile soil near Gottingen.	•f A loam producing remarkably fine crops of wheat.	The Farm boil.
Percentage contained of lime ...	6-3	2·1	•83	•9
Ditto potash ...	•21	trace	2-8	-32
Ditto phosphoric pentoxide ...	-47	•2	•24	•57

These figures show very clearly that the Farm soil is in no way deficient either in potash or lime and contains considerably above the ordinary amount of phosphoric acid. Phosphatic manures cannot therefore be expected to produce much effect, and this is certainly borne out by the experienoo of the two last years. In the season under report dung ashes produced a larger increase in the outturn than even the costly superphosphate, owing probably to the salts of potash which they contain.

But the analysis shows the Farm soil to be very deficient in nitrogen, perhaps the most essential of all the ingredients in plant food. The nitrogen contained in organic matter is not assimilable in that form, and as the soil contains no ammonia, the only source of nitrogen available is nitric pentoxide. It will be seen that the amount of this substance present in the soil is vastly in excess of the requirements of a single crop, but only a small proportion of the whole assumes a sufficiently soluble form each year to be of practical benefit, and the be3t' indication of the condition of the Farm soil us regards its nitrogen supply will be furnished by comparison with other soils. The presence of nitric pentoxide in Indian soils results from the rapid reduction of ammonia, which is characteristic of a tropical climates ; and in European soils nitrogen is found in most part in the form of ammonia, only a portion of which is reduced each year.

The percentage of ammonia found in nine samples of arable soil quoted in Johnstones and Cameron's Agricultural Geology varies from ·116 to "170, tho average being •144. This is equal to 575761b. of nitrogen per acre, or to over four times as much as is contained *in* the Farm soil. It may also be mentioned that the nitrogen contained in the upper nine inches of soil on a field at the Bothamsted Experimental Farm which had been continuously cropped with wheat for 22 years—unmanured—amounted to 2,5071b , or nearly double the Farm supply. Theory therefore amply bears out the experience that the manures which are most productive are those supplying nitrogen.

7. (&) *Experiments with certain combinations of mineral manures on the Ville system*.— These experiments were suggested by the work of M. Georges Ville entitled "Artificial Manures," which has been recently translated by Mr. W. Orookes, F.B.S. Their object was to discover by actual experiment the direction in which the deficiency of the Farm soil lay, this being effected by using certain manurial substances in varying combinations, so as to be able to judge of the effect of excluding each one of them from the mixture. Tho crop experimented with was wheat, and the general treatment of the plots was exactly similar to that of the plots dealt with in the preceding sectlons. Details of the manures applied and of the results per acre are appended. The size of each plot was one-twenty-fourth of an acre :—

* From Johns tone and Cameron's Agricultural Geology,
t From Sibsou's Agricultural Chemistry.

Number of plot.	Manures applied, with rate per acre.	Plant food substance which the manure rcprcsen ted.		Outturn per acre in pounds.		Increase per cent, on unmanured plot.	
		Amount supplied by the manure per acre.	Amount consumed by a crop of 20 mds. wheat.	Grain.	Straw.	Grain.	Straw.
	lbs.	tt>s.	lbs.				
J	Calcic superphosphate 180 Ammonic chloride 138, Potahsic sulphate 90. Calcic sulphate 96,	Phosphorus 9 6 Nitrogen 86 0 Potassium 25 8 (= potash 31-1) Calcium 28 2 (-=lime 39-4)	8 1 45-0 22 4 (=potash 27-0) 8 7 (=lime 12M)	2,142	3,066	150	185
II.	Ditto less calcic superphosphate.	Less phosphorus.	...	1,896	2,652	121	146
III.	Ditto less aoimonic chloride.	Less nitrogen ...	...	840	1,152	*Nil*	7
IV.	Ditto less potassic sulphate.	„ potassium...	...	1,908	2,778	122	158
V.	Ditto less calcic sulphate,	„ calcium ...	...	1,812	2,412	111	124
VI.	No manure ...	*Nil* ...	—	858	1,074	...	...

It iB very seldom that an agricultural experiment yields such clear and decisive results as are obtained here. It has been noticed before that the four substances conveyed to the soil in these manures are the only ones with which agriculture *need* concern itself. By supplying the crop with nitrogen to the amount of three-fourths of its requirements, the outturn is more than doubled; omit nitrogen and no increase is obtained, although all the other manures may be given. The omission of phosphoric acid from tiie combination causes a decrease of only 12 per cent., of potash 11 per cent., and of lime 16 per cent, in the outturn of grain rand allowing for the disturbing causes which can never be entirely eliminated from field experiments, these figures so nearly agree as to render it probable that the effect of omitting any one of those three substances is much the same.

I may note that this is the second season of the application of these manures, they Laving been used for a crop of maize in the preceding kharif.

8. *(c) Special experiments on the effect of phosphoric acid as a manure on the Farm* aoiZ.—Three experiments were made with the object of testing the value of phosphoric acid when used in combination with nitrogenous manure—that is to say, under the most favourable circumstances. The area under experiment was of considerable size, amounting to nearly two acres. The treatment of the fields, irrespective of manure, is summarized below :—

No. of experiment.	Treatment on account of crop experimented with.				Previous treatment.		
	Ploughing.	Seed and rate per acre	Irrigation.	Weeding.	Year.	Manure.	Crop.
I.	Twice; in July and September.	White wheat 1} maund.	Sown dry ; watered three times alter germination.	Once	1878-79 ... 1879 80 .. 1880-81 ..	*Nil* ... Guano in<is. *NiL*	Juar. Wheat, Sorgho.
II.	Three times ...	Ditto ...	Sown after irrigation, and watered three times after germination.	Once	1878-79 ... 1879-80 . 1880-81 ...	*Nil* ... Indigo ploughed in. *Nil* ...	Indigo. Wheat. Sorgho.
III.	Four times ...	Ditto ...	Ditto ...	Once	1878-79 ... 1879-80 ... 1880-81 ...	Dung ... *Nil* ... Guano ...	Maize. *Nil.* Sugarcane.

The manures which were applied and the results obtained were as follows :—

No. of experiment.	Area of plot.	Manure applied and rate per acre.	Outturn per acre in pounds. Grain.	Straw.	Percentage increase on plot which received no phosphoric acid. Grain.	Straw.
	Acre.					
I.	·41	Dung 140 mds. * Bone superphosphate 288lb.	1,568	2,491	A slight decrease.	A slight decrease.
	·41	Dung 140 mds. No superphosphate	1,588	2,322	...	...
II.	·22	Dung 155 mds. † Mineral superphosphate 388lb.	1,978	3,008	24	36
	·47	Dung 140 mds. No superphosphate	1,584	2,220	...	...
III.	·22	Bone superphosphate 290 lb.	2,820	Not weighed.	13	...
	·22	Mineral superphosphate 290 lb.	2,555		3	...
	·50	Nil	2,486		...	...

K • LT<Z?f ... outtura is remarkable ... average of the seven fields being 2,082lb. of wheat grain to the acre (=25 mds. or 36 bushels) worth, with the straw, about *Rs. 62.*

The results of the experiments are somewhat conflicting, the application of phosphoric acid giving in one case no increase whatever, and an increase in the other case 24, 1 and 3 ... A certain amount of discrepancy must however be expected ... experiments on so large a scale, and from the outturn of the ... experiments ... conclusion follows that the application of phosphotic ... produces very little if any ... The excess in the produce of the manured plot in experiment No. II. is probably due to other causes. Superphosphate cannot be prepared at Cawnpore at a lower cost than Rs 4-12 per maund, and the application of 4 mds. of it requires therefore an increased at yields of grain and a corresponding quantity of straw per acre merely to reimburse its cost. ... the produce of manured plot ... the whole of the increase ascribed to ... ion of the superphosphate, there would still be a considerable loss on its use.

9. *(d) Special experiments in green soiling.*—If the conclusion be accepted that the most prominent deficiency in the Farm soil is in its nitrogen supply, The practical question arises as to how this supply can be increased. A certain amount of nitrogen is derived by the soil from the rainfall in the form of ammonia, the number of pounds of nitrogen which an acre annually receives in this way being estimated at 7 in England† but as high as 20 in some parts of Southern Europe. It is probable that in India the amount ... since the ... at some seasons of the year is known to ... highly charged with ammonia. Under these circumstances it is more than ever ... facility ... afforded for the rapid absorption of the rainfall by the soil, and this accounts for the benefit which results from ploughing up land at the very ... later, ... four months ... the heat of India oxidized into nitric acid almost ... it reaches the earth, and since in this form it can be readily abstracted from the soil by water, it is probable that India owes much of its fertility to the absence of subsoil drainage, which is so marked a feature in this country. The annual loss ... in drainage water is estimated in England to amount to 15 or 16lb. per acre, more than double the quantity which is annually received from the rain‡.

* Both the bone and the mineral superphosphate ... this ... were procured from Dr. Wal... die of Calcutta! having been manufactured respectively by the action of sulphuric acid on burnt bones and on mineral substances (coprolites) containing phosphoric acid; neither therefore contained any nitrogen.

† The amount of ammonia in the rainfall of England is ordinarily about 1·07 parts per million in country districts and from 3·5 to 9·0 in crowded cities, such as Glasgow and London. Angus Smith notices the exceptionally large proportion of 32·35 parts per million in a h... of rain water collected from the impure atmosphere of the City of London. ... a sample ... fell at Lucknow in June, 1882, was ascertained by Major Pitcher to contain ... parts per million.

‡ See a paper on the Rain and Drainage waters at Rothamsted printed in the Journal of the Royal Agricultural Society [Vol. XVIII, Pt. I, p. 63].

Looking at the increase in produce which results from ploughing up land in April and allowing it to lie in open fnrrow throngh the hot-weather months, the conjecture may be hazarded that possibly the soil may be able to absorb ammonia directly from the air when in loose and porous condition, and this wonld still fnrther tend to maintain the continuous fertility of the Indian soil.

Comin* now to the means of artificially increasing the nitrogen supply, the most obvious of existing resources is cattle dnng, the value of which however principally depends on the food which the cattle receive, and is therefore not very great to tne Indian cultivator. In that portion of it which is used as fuel the nitrogen is of course entirely lost, and there is a considerable waste in that portion kept as manure trom exposure to the influence of the sun and rain. A much more effective source of nitrogen is, as has been already shown, saltpetre, which even at its present price will yield a considerable profit. It is very doubtful however whether a cultivator will eyer be indu<fd to purchase his manure, and the manufacture of saltpetre in villages is checked by Customs regulations.

It is possible that a third and much simpler method of increasing the stock of nitrogen may be found in "green soiling"—that is to say, in growing a crop of the leguminous order, cutting it down while green and ploughing it in. According to some authorities plants of this order are able to absorb nitrogen directly from the air, and their tissues become therefore store-houses of atmospheric nitrogen which yield their contents to the soil when allowed to rot in it. Experiments made m the rabi leason of last year appeared to give excellent ground for believing that ploughing in a leguminous crop after this fashion does as a matter of fact greatly add to the outturn, and the experiments were repeated with still more marked results in the season under report. Two parallel plots each one-twelfth of an aore were sown with hemp on August 17th ; the hemp was cut down on September 22nd when about 2 feet high and ploughed in with the English plough, the stalks being laid in the farrows exactly as is done with long strawed dung in England. Since rain failed, the plots were watered on September 27th to hasten the decomposition of the hemp, and again on October 20th, when they were ploughed up and sown with wheat. The total cost per acre was not therefore more than Rs. 4-2-0 :—

		Rs.	a.	p.	
Cost of seed (say)	...	0	8	0	At thirty seers to the acre.
sowing	...	1	2	0	
cutting	...	1	8	0	
?? ploughing iu	...	1	0	0	
Total	...	4	2	0	

One of the plots was manured with gypsum at the rate of 120ft>. per acre when the hemp was cut, in order to discover whether any benefit would result from the property possessed by this mineral of arresting th9 volatile compounds of ammonia givea off in decomposition.

A third plot, situated next to one of these under hemp, had been under lucerne (also a leguminous crop) for the year preceding, and it is interesting to note how excellent was the crop of wheat yielded by it. The lucerne had been sown in September, 1880, and up to September, 1881, when it was ploughed up to make room for a crop of wheat, it had been cut six times, yielding a total outturn of 280 mds. of green fodder to the acre.

Details of the outturn obtained from all three plots are given in tabular form below. The wheat was in each case watered three times after germination and weeded once :

No. of plot	Specific treatment.	*Outturn per acre in pounds.* Grain.	Straw.	Cost of cultivation.	Value of outturn.
				Its	Its.
I.	Green Boiled with hemp ...	1,718	2.328	26 1	50*9
II.	Green soiled with hemp and manured with gypsum at 1201b. to the acre	2,244	3,237	28-9	67*2
III.	Cropped with lucerne for a year previous	1,395	2,127	22-0	42 3

Unfortunately there was no unmanured plot in the same series the outturn of which could be taken as a standard of comparison, since the soil of all the other experimental plots had been somewhat exhausted by a crop of maize in the kharif preceding. There were however two fields at a short distance from the series of experimental plots on which wheat was grown without manure, but otherwise with exactly similar treatment, and the outturn of which may fairly be taken as representing what the hemp plots would have produced had no hemp been grown on them. One of these fields with an area of ·12 acre yielded 1,280lb. of wheat to the acre and the other, with an area of ·62 acres yielded 1,298lb. The agreement between these outturns is all the more striking since the fields were situated at a distance of at least 200 yards from one another. Taking the average of these two outturns, *viz.*, 1,289lb., as the outturn of unmanured laud, the increase resulting from the use of hemp as manure and from the effects of a crop of lucerne may be represented as follows :—

Treatment.	Result per acre. Increase per cent in gross outturn of grain.	Increase in actual net profit per acre, making rateable* allowance for straw.
		Rs.
Green soiled with hemp	33	9·4
Ditto and manured with gypsum	74	22·9
Cropped with lucerne	8	4·9

The results therefore appear to leave little doubt of the fact that green soiling with hemp does increase the outturn, especially when gypsum is added. It appears certain that the increase is due to a larger supply of nitrogen, although opinions differ as to whether this is actually drawn from the air or merely concentrated in the upper layer of soil, being drawn up from below by the long tap roots of the hemp plant. The result appears of the highest practical importance, and the trials will be continued on a large scale during the current year. The increase which resulted from previous cropping with lucerne must be due to the same cause and is borne out by the practice in English agriculture of growing a drop of clover before wheat, which is said to often add as much as a quarter (480lb.) to the outturn per acre.

10. (ii) Experiments on Irrigation.—Trials were made *(a)* to ascertain the effect of irrigation in increasing the outturn, and (£) to obtain fresh information on the vexed question of the relative merits of canal and of well water.

(a) ***Effect of irrigation in increasing the outturn.*****—Experiments were made with** wheat on two series of plots, both of which were sown without previous irrigation. The soil of series A was at the time of sowing the dampest on the farm ; on the other hand the soil of series B was considerably drier than the average. By an41 pfortunate mistake a watering was given to the plot in series B which should have been left unirrigated; so that the outturn of this series of plots merely indicates the result of giving different *numbers* of waterings, and not the result of watering as compared with that of not watering at all. Both series of plots were ploughed three times before sowing and weeded once after the first watering. Series B had borne a crop of wheat unmanured in the preceding year, while series A had enjoyed a year's fallow. The size of the plots in both series was one-twelfth of an acre. The results are shown in the two following tables :—

* The produce of straw on the fields taken as standards of comparison was not weighed.

Series A.

Number of times irrigated, with dates.	Cost of irrigation per acre.	Date when weeded.	Outturn per acre in pounds.		INCREASE DUE TO IRRIGATION.		
					Per cent, on produce of irrigated plot.		Actual in value of produce per acre.
			Grain.	Straw.	Grain.	Straw.	
	Bs. a. p.						Bs.
Not watered	*Nil.*	Dec. 19	513	838	..	...	...
Once: Dec. 4th ...	2 12 0		1,671	2,355	*225	181	33-4
Twice: Nov. »5th, Feb. 23rd ...	3 14 0	• 127	1,515	2,165	195	158	258
Three times: Nov. 25th, Feb. 3rd, March 4 th	5 0 0	*; 7	1,670	2,578	225	207	30-0

A single watering therefore more than trebled the produce and, in addition to paying for itself, increased the profits of cnltivation by over Rs. 33. It is remarkable that one watering should have had so great an effect, but the result is corroborated by the outturn of a neighbouring field which reached the high figure of 32 mds. (=40 bushels) to the acre with only two waterings. That one watering should have given a larger outturn than two is also *primd facie* surprising, but must be explained by the weeding which was given after the first watering and which left the soil of the once-watered plot in open condition right through till harvest, while that of the twice-watered plot was caked by the second irrigation in February. A similar result will be seen in the outturns of the second (B) series :—

Series B.

So. pi plot in farm register.	Number of times irrigated, with dates.	C/OHt Of irrigation per acre.	Date of weeding.	Outturn per acre in pounds.		INCBEASB DUE TO IRRIGATING MOBE THAN ONCE.		
						Per cent, on produce of once wattred plot.		Actual in net profit per acre.
				Grain.	Straw.	Grain.	Straw.	
		Us. a. p.						Rs.
B.b.4	*Once :* Nov. 12th ...	2 12 0	Nov. 25	696	1,158	...	...	...
B.b.5	*Twice :* Nov, 12th, Feb. 20th,	3 14 0	» 25	513	948	Decrease 32	Decrease 41	Decrease 2-3
B.b3	3 *times:* Nov. 12th, Dec. 20th, Feb 28th,	5 0 0	I! 25	921	1,635			
B.b.2	4 *times: Nov.* 12th, Dec. 20th, Feb. 1st, Feb. 28th.	6 2 0	„ 25	1,104	1,821	58	57	64
B.b.l	5 *times:* Nov. 12th, Dec. 20th, Jan. 19th, Feb. 15th, March 4th.	7 4 0	„ 25	1,209	1,788	73	54	76

This was the third year in which these plots had been cropped with wheat unmanured, and the outturns are in consequence small. Two waterings again gave a poorer return than one, and this fact may be considered finally proved by the coincidence of the results of two independent experiments. It is not usual amongst native cultivators to give a weeding to rabi crops, although the experience of the last three years has taught nothing so clearly as the immense benefit which results from it in saving of water. It will be noticed that each watering over two in number not only paid for itself, but produced a very considerable profit.

11- (6) *Relative merits of canal and well water.*—An excellent opportunity was afforded for contrasting the results of using canal and well water for irrigation by a cultivator's field situated a short distance outside the Farm enclosure, and about 200 yards from the canal distributary, in which there was a *kucha* well regularly used for irrigation. So soon as the field had been sown, an arrangement was made with the cultivator by which he was to v/ater one half of the field from his well when irrigation was required and leave it to the Farm to water the remaining portion from the canal as nearly on the same date as possible. In order to prevent neglect on his part a liberal rate was fixed according to which the produce was to be valued when cut, cleaned and weighed by the Farm. The crop which had been sown was the mixture of barley and gram known as *bejhra* with rape *(sarsori)* in lines. The area of the well-irrigated portion was ·24, and of the canal-irrigated portion ·28 of an acre. The result is given in the following table: —

Plot.	Number of waterings.	Date of watering.	Date of weeding.	OUTTURN PER ACRE IN POUNDS.			Value of outturn per acre.
				Bejhra.		Rapeseed.	
				Grain.	Straw.		
Canal-irrigated ...	3	November 14th... December 24th... February 16th ...	November 20	1,109	1,412	101	31-6
Well-irrigated ...	3	November 11th... December 10th... February 16th ...	November 22	1,312	2,031	137	39-6

The result is certainly surprising, and it is unfortunate that it was not possible to arrange for the conduct of a duplicate experiment. If there was any apparent advantage in situation, it was on the side of the canal-irrigated plot. It may be added that the experiment had not even been thought of at the time when the field was being sown.

I attribute the difference without hesitation to the delay of 14 days in giving the December watering, which arose from the canal supply having failed at that time. The damage which resulted from this failure to the experimental manure plots has been already noticed. A great factor in the influence of water on a growing crop is the *timeliness of its supply,* and it is in this respect that canals are least satisfactory. Hence perhaps the lowness of the rate which cultivators are prepared to pay for canal water compared with either its real value or with the cost of drawing it from a well and hence too the not uncommon occurrence of well irrigation close under the bank of a canal distributary.

12. (iii) Experiments on thin sowing.—The effect was tried *(a)* of dibbling in wheat seed by hand instead of sowing it in the ordinary way, and (b) of sowing the seed in every second and every third furrow, instead of in every furrow, as is usually done.

The plot which was sown by dibbling measured one-twelfth of an acre and formed a portion of a field, the remaining part of which (·22 acre) was sown in the ordinary way. In dibbling, the grains were dropped into little holes made with the finger, two grains to each hole, the holes being six inches apart in the same line, and the lines at a distance of one foot apart. In sowing as ordinarily effected the seed was dropped behind a country plough and covered by the earth thrown up from the next furrow; there was therefore a line of plants to each farrow or at a distance of *6* inches apart. In dibbling 5 seers would sow an acre, while for sowing in the ordinary fashion 60 seers are required. Both plots had been manured with 155 maunds dung and 388lb superphosphate to the acre,—were sown after the ground had been moistened by irrigation,—were three times watered subsequently and once weeded. The results were as follows:—

Method of sowing.	*Seed used per acre.*		*Outturn per acre in pounds.*		Value of outturn per acre.
	Amount.	Cost.	Grain.	Straw.	
	Seers.	Rs. a. p.			Rs.
Behind the plough in ordinary fashion,	60	3 0 0	1,978	3,008	60-8
Dibbled by hand ...	5	0 4 0	1,986	2,412	57-8

The close correspondence of the outturns of grain is very extraordinary and indicates that the produce represents the real capacity of the field, not to be increased by adding to the number of plants per acre. Dibbling however occasioned a considerable loss in straw (20 per cent.), as indeed was to be expected. Adding the value of the saving in seed (Rs. 2-75) to that of the outturn of the dibbled plot, we obtain Rs. 60'5 as against Rs. 60 0 (the value of the gross produce of the plot sown in the usual fashion), and the net result of dibbling was therefore a gain of eight annas.

The results of sowing in every second and in every third furrow closely agree with the foregoing. In this case it was necessary to sow the seed without previous irrigation, andjrince the soil was not sufficiently moist germination was very uneven. In the portion of the field sown in every furrow as usual the large amount of seed used compensated for the failure of a large portion-of it to germinate, and the result was a crop of 15f mds. of grain to the acre on afield measuring '43 of an acre. On the other two plots the crop was a failure owing to frequent bare patches. Selecting however a small portion of each plot in which germination had been fairly regular, the following results were obtained :—

Method of sowing.	Seed used per acre.		Outturn per acre in pounds.		Value of outturn per acre.
	Amount.	Cost.	Grain.	Straw.	
	Seers.	Rs. a. p.			Rs.
Every third furrow ..., ...	15	0 12 0	1,265	1,943	38-4
Every second farrow	30	1 8 0	1,340	2,027	40-6
Every furrow (as usually done) ...	60	3 0 0	1,295	1,862	39-0

Making allowances for errors of experiment, which were intensified by the small size of the thinly-sown plots, the results are practically identical. There can be little doubt therefore that the amount of wheat seed usually sown per acre is at least ten times in excess of the quantity which would be sufficient if all the grains germinated. The extra expenditure of some Rs. 2-8 per acre in seed may be considered as an insurance against loss from uneven germination either by reason of badness of seed or the unequal distribution of moisture in the soil. It is a question however whether the saving of grain which would be effected would not compensate for the trouble of hand-picking seed and obviating in this way all possibility of loss from the first of these causes, and experiments in this direction will be continued.

The individual wheat plants on the thinly-sown plots were of course much finer than where sprung from thickly-sown seed. Some plants bore as many as 49 stalks with an average of 36 fully formed grains to each ear, or at the rate of over 1,700 fold. I did not notice however that there was any difference in the quality of the *cleaned* grain, though the *average* quality was undoubtedly better.

13. (iv) Experiments with new varieties of seed.—Cape *oats.*—These again succeeded well. The seed was obtained in 1880 from Australia, only as much being received as would fill a small envelope, and a small plot cultivated during the rabi season of 1880-81 gave a return at the rate of 2,219 ft. (=27 mds.) grain and 3,993ft. (=49 mds.) straw to the acre. During the season under report it was grown on a larger scale, sufficient seed being in stock to sow, although thinly, -26 of an acre. The land had been manured with dung at the rate of 100 mds. to the acre, was irrigated before sowing and three times subsequently. One weeding waa given. The yield por acre was 1,706 ft. (=*20| mds.) grain and 2,198 ft. (=261 mds.) straw, which is a very satisfactory outturn, although considerably less than that obtained in the preceding year. The cultivation then was however on so very small a scale (the plot only measuring a few square yards) that its results cannot be upheld as a reliable indication of the outturn per acre, and on the other hand the produce in the season under report would have been larger had the seed been aown somewhat thicker. The purpose for which oats seem to promise best is that of producing green fodder in the cold-weather months rather than as a grain crop. A large quantity of oats is grown with this object in the Meerut Division. There is now sufficient seed of the Cape variety in hand to enable sd*me experiments being made next rabi season and test its capabilities as a fodder plant.

Black and white pram.—The large white-grained variety of gram (known as the "kabuli") and the black-grained gram were tried against the ordinary brown-orained kind with the following results:**

Variety of gram*	Area of plot.	Outturn per acre in pounds.		Difference per cent, from outturn of common variety.	
		Grain.	Straw.	Grain.	Straw.
	Acres.				
White	•01	603	1,204	—68	—4Q
Black	•02	1,249	1,249	—33	—33
Common	•2	1,862	1,93^	...	...

The plots received two waterings after sowing and one weeding. No manure was used. The outturn of the common variety was extremely good compared with that of the other two kinds, the better quality of which would not compensate for the deficiency in their produce.

English wheats, barleys and oats.—Trial was made of two varieties of wheat, three varieties of barley, and three varieties of oats, specially selected by Messrs. Sutton and Sons of Reading. Plots of wheat from Farm seed and of barley from country seed purchased in the bazar were also grown for comparison. The field had been manured with 100 mds. dung and was irrigated before sowing. The number of waterings given after sowing in each case are shown in the table which follows. One weeding was given. The area of the plots varied from • 1 to '03 of an acre :—

Name of crop.	Name of variety.	Number of waterings given after germination.	Outturn per acre in pounds^	
			Grain.	Straw.
Wheat ...	English, Bough chaff	5	114	1,230
	English, Eed bearded	4	283	1,385
	farm	3	1,757	2,562
Barley ...	English, Peerless	3	741	2,198
	English, Beardless	3	803	1,843
	English, Golden melon	3	1,000	1,828
	Farm	3	1,591	1,319
Oats ...	English, Black Tartary	4	87	1,866
	English, Lincolnshire Poland ...	4	208	3,889
	English, Early blossom	4	102	3,026

In face of the excellence of indigenous wheats and barleys the attempt to introduce English varieties possesses little practical interest. It is worth noting however that this is the first season in which any produce whatever has been gained from English wheat seed, the trials of the two years preceding having resulted in complete failure. It will be interesting to see whether the acclimatized produce will give a better return next year.

Naked barley (Bordeum gymnodistiehon) from Kotgarh.—A rather imaginative account of tho excellence of this barley was lately sent to the Calcutta Agri.-Hortt. Society by Captain b[1]. Pog&on and printed in the Society's Proceedings for August 25th, ltfbl. The difference between it and ordinary barley lies in the fact that it* flower scales do not adhere to the grain so as to form a continuous husk, but drop off in threshing, leaving the grain naked like that of wheat. There is therefore a less difference between its gross and its net weight. It is known by the vernacular name of « Rasuli" or " Paighambari," indicating apparently its introduction from Arabia. Its ears may bear either two rows *(var.* distichon) or six rows *(var.* hexastichon) of grains. A field of the former sub-variety was grown on the farm in the rabi of 1880-81 and gave an outturn of 21 mds. grain to the acre, which was 50 per cent, less than the outturn of good ordinary barley under similar circumstances. At the suggestion of the Government of India, a fresh trial was made during the rabi under report with seed procured from Kotgarb through Captain Pogson. This turned out to be of tho six-rowed sub-variety, but yielded an outturn of only 10 maunds to the acre, a little more than half of the yield from very indifferent seed of the ordinary kind grown side by side with it under similar treatment.

South American lucerne (Alfalfa).—A. quantity of seed of this well-known fodder plant was obtained through the kindness of H. B. M.'s Consul at Venezuela, bnt turned out to be almost exactly similar to the lucerne, which has become acclimatized in this country. Like many other fodder crops it bears in its own country an extraordinary reputation for resisting drought, but when brought to the test of an Indian hot weather it proved itself much inferior to lucerne from Indian seed, yielding 50 per cent, less green fodder.

(B) EXPERIMENTS WITH AGRICULTURAL IMPLEMENTS AND MACHINERY.

14. During the half-year under report the Agricultural Workshops wero dissociated from the Farm and placed under the orders of Captain J. Clibborn, B.S.C., Executive Engineer then attached to the Department. They have since been retransferred to the Farm. The number of implements sent out between November 1st, 1881 and May 31st, 1882 is shown below:—

Ploughs.			*Winnowers.*	*Pumps.*
Sold.	Given away.	Total.	Sold.	Sold.
168	9	177	9	10

34 of tho ploughs were manufactured by Messrs. Coen and Co. of Agra for the Dep.itment, the balance having been up in the Farm workshops. I understand Oat Messrs Coen and Co. have also sold a considerable number independently of this Department. The sale is however very small at present compared with the proveldutility of a plough by which the surface soil is inverted as well as stirred, and the undoubted suitably *oi* the departmental implement for light soils, such as obtain throughout a grea portion of the Provinces. For heavier soils it is probable that ploughs of Enghsh or American manufacture will be superior to anything that can be made up in this country, and during the half year experiments were conducted wh.ch ended in the modification of two Roughs, one English (Ransomo's B. F. O.) and another American (Watt's steel plough), so as to render them more suitable for native requ.rements, and they are now both admirably fitted for ploughing heavy loam or clay lands, provided good bullocks are available, such as are in general use in the districts of the Meerut division. A limited number of ploughs of both these patterns is now in stock for sale.

15. Amongst trials of machinery conducted during the half year, those of threshing and winnowing machines deserve especial notice.

ZWl»n<7.-Repeated experiments have proved that a pair of bullocks driven by a coolie will tread out on an average 2 mds. of wheat grain in a day of eight hours. Allowing 2 annas as the wage of the coolie and 3 annas for the bullocks, which w,ll cover the cost of the extra food they receive when in active work, the cost of threshing out a maund of wheat cornea to 25 annaa. TWa is by no means high, and the drawbacks produce in the season under report would have been larger had the seed been sown somewhat thicker. The purpose for which oats seem to promise best is that of producing green fodder in the cold-weather months rather than as a grain crop. A large quantity of oats is grown with this object in the Meerut Division. There is now sufficient seed of the Cape variety in hand to enable sdme experiments being made next rabi season and test its capabilities as a fodder plant.

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15. Amongst trials of machinery conducted during the half year, those of threshing and winnowing machines deserve especial notice.

Threshing.—Repeated experiments have proved that a pair of bullocks driven by a coolie will tread out on an average 2 mds, of wheat grain in a day of eight hours. Allowing 2 annas as the wage of the coolie and 3 annas for the bullocks, which will cover tho cost of tho extra food they receive when in active work, the cost of threshing **out** a maund of wheat comes to 2·5 annas. This is by no means high, and the drawbacks to the process are (1) its slowness, which leaves the wheat lying for a long time in tho threshing-floor exposed to tho chances of rain or hail ; and (2) the peculiar'earthy smell and flavour which the grain acquires and which is a serious check to its sale in the English market. In order to test the advantages offered by machinery for threshing, an American combined thresher 'and cleaner was purchased, that manufactured by Messrs. Heebner and Sons of the United States and known as the Little Giant No. 3. Its price in America was only 124 dollars, but when landed in Cawnpore its cosfcumounted to Rs. 557. Rs. 180 must be added to this as the price of a four-bullock gin which is required to drive it, but which was already available on the Farm ; so that the total cost of tho machine was close upon Rs. 740. To work it for eight hours a day the following labour was required :—

		Rs. a. p.	Rs. a. p.
6 pairs bullocks, two for relief	...	© 0 3 0	= 1 2 0
4 drivers	... ...	@ 0 2 0	=0 8 0
2 feeders	... ...	0 0 2-0	=0 4 0
2 women	... ...	@ 0 1 6	=0 3 0
			2 1 O

Four careful experiments extending over 23 hours proved that the machine will £hresh and clean at least 20 maunds in a day ; so that, allowing nothing for interest oa outlay and wear and tear, the cost per maund only comes to 1-9 for threshing *and win* nowmg.* The cost of winnowing by machine as a separate process amounts to 4-7 pie per maund, and the total cost of threshing by bullock-treading and of winnowing will be 2-9 annas per maund. The threshing machine effected therefore a savin* of 1 anna per maund, and it would therefore require to work off nearly 1,800 mauids in order to repay the 15 per cent, on its cost for interest on outlay and wear and tear. The machine was undoubtedly cheap, but was of anything but good materials and workmanship and required constant repairs. On the other hand I believe that its outturn might be increased to at least 30 maunds a day with a little practice. For short periods of a quarter of an hour I have worked it at the rate of 90 maunds a day, but with groat strain on the bullocks and risk to the machinery.

16. *Winnowing,*—Experiments were made to contrast the work of the English machines manufactured by Dell of Mark Lane and Ransome of Ipswrch, costing from Us. 200 to Rs. 250 apiece, with that of the one manufactured in tho Farm workshops and sold at Rs. 35. I should mention however that the Ransome's winnower was of an old pattern and is greatly inferior to the machines now turned out by this firm. The cost of working each winnower was found to be—

		Rs. a. p.	Rs. a. p.
3 coolies	... ...	@ 0 2 0«	0 0 0
3 women	... ...	<® 0 1 Gss	0 4 6
			0 10 G

The result of the trials is shown below:—

	Maunds of grain cleaned per day of eight hours.	Cost of cleaning per maund.
	Mds.	Pies.
Dell's winnower	36	47
It&nsome's »	16	10 5
Farm ia	19	*8-8*

The Farm implement came out therefore very creditably, and as soon as certain alterations now under trial have been made in its driving gear it will be still more efficient.

J. B. FULLER,

*A**L Dir.,y Dept. of Agri. and Commerce, N.~ W. P. and Oudh,*
In Charge Government Experimental Farm, Caivnpore.

ORDERS OF GOVERNMENT.

No. 1558 OF 1882.

FROM

THE OFFG. SECRETARY TO GOVERNMENT,

N.-W. PROVINCES AND OUDH,

To

THE DIRECTOR OF AGRICULTURE AND COMMERCE,

N.-W. PROVINCES AND OUDH.

Dated Naini Tal, the 2nd September, 1882.

SIR,

DBPARTMBMT.

I AM directed to acknowledge the receipt of your No. 1115A., dated 9th August, 1882, with which you submit Mr. Fuller's report ou the rabi operations of the Cawnpore Experimental Farm during the season 1881-82.

2. Mr. Fuller has as usual given a full, .clear, and interesting account of the nature of the experiments conducted and of the results obtained. The operations of the half-year are sub-divided into—(A.) Field experiments of a purely agricultural nature : and (B.) Experiments with agricultural implements and machinery.

3. I'nder (A.), experiments were tried on the effect of—(1) different manures, (2) irrigation, (3) thing sowing, (4) new varieties of seed. The main experiments were made in the cultivation of wheat, and the results go to discredit the low estimate that has generally been accepted of the productiveness of Indian agriculture. The experiments also go to show that the chief requisite for fertility wanting in Indian soil is nitrogen; and if this conclusion prove to be correct, one main problem of practical agriculture in this country would be to supply nitrogen in the form of a cheap manure. The result of further inquiry and experiment will be awaited with interest.

4. Trials were made with irrigation *(a)* to ascertain the effect of irrigation in increasing the outturn, (6) to obtain fresh information on the vexed question of the relative merits of canal and of well-water. Under (a) it was found that a single watering more than trebled the produce. One watering followed by a weeding gave a higher produce than two waterings, after the second of which the land is allowed to cake. You hesitate, however, to accept the result of these experiments as conclusive. Well-irrigated laud gave an outturn per acre of the value of Rs. 39'6, while the value of the outturn of canal-irrigated land under the same conditions was Rs. 31·6 only. The difference is ascribed to canal water not being obtainable at the proper time. Mr. Fuller remarks—" A great factor in the influence of water on a growing crop is the timeliness of its supply, and it is in this respect that canals are leas satisfacttory

Hence perhaps the lowness of the rate which cultivators are prepared to pay for canal water, compared with either its real value or the cost of drawing it from a well; and hence too the not uncommon occurrence of well-irrigation close under the bank of a canal distributary." It must not, however, be forgotten that the remark as. to timeliness of supply may not unfrequently be applicable to some of the land which is irrigated from a well, and for which the cultivator has to wait his turn in using the well.

5. The experiments on thin sowing consisted of (a) dibbling- in wheat seed by hand, instead of sowing it in the ordinary way; and *(b)* sowing the seed in every second and every third furrow, instead of in every furrow as is usually done. In dibbling, five seers of seed are required to sow an acre, if every third furrow is sown 15 seers, if every second furrow is sown 30 seers, and under the ordinary method 60 seers are required per acre. In all the cases the outturn was nearly the same. There seems to be little doubt that the amount of wheat seed usually sown per acre is at least ten times in excess of the quantity which would be sufficient if all the grains germinated. The extra expenditure of seed may be reckoned as insurance against uneven germination, and Mr. Fuller thinks it is questionable whether the saving of grain which would be effected by thin sowing would not compensate for the trouble of hand picking seed, all possibility of loss from badness of seed being obviated. But it may be doubted whether ordinary cultivators will readily be induced to pick their seed, or trust those who profess to sell picked seed, and then to adopt the minute process of dibbling.

6 Of the experiments with new varieties of seed, that with Cape oats seems to have been successful, and those with gram, English wheats and barleys, naked barley, and Alfalfa seems to have been of little practical utility.

7. *Experiments with agricultural implements and machinery.*— One hundred and sixty-eight ploughs were sold and nine given away, while nine winnowers and sixteen pumps were sold during the half-year. Efforts are being made to introduce a plough suited to heavy soils, and trials with an American threshing and winnowing machine gave interesting results. You seem to be doubtful, however, whether the machine is likely to come into common use and to pay expenses, in which case experiment with it is to a certain extent futile.

8. In conclusion, I am to acknowledge the services of Mr. Fuller as manager of the Farm during the half-year. The report will, as usual, be published in the *Gazette.*

I have the honor to be,

SIB,

Your most obedient servant,

J. R. REID,

Offg. Secretary to Government,

N.- W. Provinces and Oudh.

No. 1559.

COPY, with copy of the report, forwarded to the Superintendent, Government Press, for publication in the *Aorth-Western Provinces and Oudh Gazette.*

F. BAKER,

Under-Seey. to Qovt., N.-W. P. and Oudh.

REPORT

ON THE

CAWNPORE EXPERIMENTAL FARM,

FOR THE KHABIF SEASON, 1882.

ALLAHABAD:

KORTH-WBSTEBN PROVINCES AND OUDH GOVERNMENT FRX8S.

188 8.

No. 397 A. oi 1883.

FBOM

THE DIRECTOR, DEPT. OF AGRI. AND COMMERCE,

NORTH-WESTERN PROVINCES AND ODDH,

To

THE SECRETARY TO GOVERNMENT,

NORTH-WESTERN PROVINCES AND OUDH.

Dated Cawnpore, the 17th March, 1883.

SIB,

I HAVE the honor to submit Major Pitcher's report on the Cawnpore Farm for the late kharif harvest. Its submission is unavoidably delayed until the results of the cotton crops have been ascertained.

2. Last year's experiments were spoilt by excessive floods, which obliterated the differences between the various experimental plots, and, in the case of the most important of the new products, by an unavoidable want of experience. No such drawbacks have to be reported this year.

3. Some progress has been made towards eliminating disturbing causes in the plots set apart for the comparison of the effects of various kinds of manure. The original standard plots, having been left entirely unmanured for four harvests in succession, have now been treated with exactly the same manures for five further consecutive harvests. The duplicate plots have nearly attained the same degree of experimental accuracy. But there are so many disturbing causes independent of the mere treatment of the soil, and over which the farmer has little or no control, that experiments of this kind, however carefully conducted, must be extended over a long series of years before their results can venture to claim any conclusive scientific authority.

4. As far as they go, the trials of various kinds of manure confirm the main results of previous years and point to nitrogen as the element in which the soil of the farm is deficient. On four standard plots the average produce given by nitrogenous manures was 2,1381b. per acre, while that given by phosphates and manures not rich in nitrogen only averaged l,337fc. On the duplicate plots the averages were 1,6951b. and1,014ft. respectively. The increase in outturn was 60 per cent, in the first case and nearly 70 per cent, in the second.

5. The experiments with deep and shallow ploughing for cotton show a decided advantage on the side of moderately deep ploughing even in a year when a copious suppFy of rain diminished the necessity for it. The continued use of the inverting plough on the Farm lends no countenance to the fear, which is not unfre-<iuently expressed, that it may eventually lead to the deterioration of the productive powers of the soil.

6. The advantages of early ploughing are so very generally understood that I agree with Major Pitcher in thinking that this series of experiments may be discontinued.

7. The sowing of cotton in drills was tried for the first time on the farm this year. The result showed an increase of 39 per cent, in cotton and 30 per cent, in seed over a crop raised on the plan which is generally used in these provinces. The experiments will be repeated next year.

8. Another system, which, as far as I know, is never practised by the native agriculturist, yielded most satisfactory results. New Orleans and Upland Georgian cottons rattooned, and in the second year of their growth gave double and half as much again as the produce of plants sown this year. The American cottons maintained their very high price in the Cawnpore market at a time when native cottons were suffering a most serious decline, and realized Us. 23-12-0 per maund while good Bengal only commanded Rs. 13-12*0.

9. The result of sowings in different qualities of soil showed, as they did last year, that while the native Kulpahar pays best on a light loam, it is far distanced by American cotton where the soil is heavier.

10. The ravages of a little-known species of caterpillar, which attacked only the American cottons on the neighbouring estate of Rawatpur, &nd was not found on the Farm at all, were the cause of some anxiety, and the reappearance of the insect will be looked for next year. At first it was feared that the crop might have been almost entirely destroyed; but when I last saw the Manager, he informed me that, though the leaves had been eaten, a very large proportion of the cotton had escaped.

11. The trial of Nankin cotton will be repeated next year. A fibre with a good natural colour, which does not fade, would be of considerable commercial value.

12. Perhaps the most important of the experiments with products were those with different kinds of sorgo. Even in America the exact value of this plant as a sugar-producer has not been finally determined, but its great agricultural importance is widely recognized. It has three great advantages over the cane—in yielding a grain fit for human consumption; excellent fodder for cattle ; and in taking up the land for four months only instead of a whole year. In addition to this, it requires hardly any manure and no irrigation. Of three varieties tried, the amber and the red, while they yielded a rather less proportion of juice and gur to the whole plant than sugarcane, were not inferior to it in the proportion to the cleaned canes. The gur, though not yielding so large a proportion of crystal as ordinary sugar and possessing a peculiar acidity, was well-flavored and commanded a higher price in the market. For eating and various manufacturing purposes it appears to have a good future.

13. The great difficulty is in its manufacture, and this is where failure was encountered last spar. This year Major Pitcher gave every stage of the process his personal attention; and I was much impressed when I was staying at the Farm by the incessant care he devoted to it, and the scrupulous cleanness of the gur turned out. It is possible that his practical knowledge of chemistry may suggest before next harvest some method for reducing the objectionable quantity of glucose; but the present product has a market value which would make the cultivation of the plant very remunerative. Before, however, it can be hoped to spread, it will be necessary to instruct the natives who are to grow it in the proper method of preparing the gur, and this is a subject which will receive attention next year.

14. The experiments in *Ensilage* proved, at any rate, that fodder can be kept in good condition for a long time, and probably from one rainy season to another. In these provinces this is a question the importance of which cannot be over-estimated, and experiments will be continued with the view of ascertaining the cheapest way in which effective silo pits can be made. They may become of the very greatest value in connexion with the scheme of fodder reserves which is under the consideration of Government.

15. The Kaisar plough has gained prizes at a number of agricultural shows, and its merits are beginning to be more generally appreciated than hitherto. More than double the number were sold during this half-year than in the corresponding period last year. Where the soil is heavy and better bullocks and a larger price can be afforded, there can be little doubt of the superiority of the Watts' plough to all Indian adaptations from European or American models; and a considerable number have been ordered in the hope that they may suit the requirements of the Upper Doab.

16. Considerable improvements have been made in the Farm water-lift, and it is possible that a still better Form of plug may be discovered. As it stands, it is a very useful and effective implement; but the new form of exercise it imposes on the native who uses it seems to be an obstacle to its general introduction. It is possible that this may disappear as its advantages are better understood. In the meantime the demand remains about what it was.

17. Major Pitcher has been in charge since the transfer of Mr. Fuller to the Central Provinces in July, and the post of Overseer has been held by Lachman Prashad TCflxmo

I have the honor to be,

SIB,

Your most obedient servant,

W. C. BENETT,

Director.

REPORT

ON THB

CAWNPORE EXPERIMENTAL FARM

For the Kharif Season of 1882.

1.-FIELD EXPERIMENTS.

As compared with the seasons experienced at the Farm for several years past, the kharif season of 1882 may be taken to have been fairly good. The rains commenced early, and with the exception' of a continuous fall in July and long break in August the showers were fairly distributed. The total rainfall closely approximated the normal rainfall as shown below :—

Month.	Rainfall in inches.	Number of days in •which rain fell.
June	11-2	9
July	6-8	15
August	69	11
September	15	4
October	•6	1
November	•0	0
Total	26 9	40
Normal rainfall during the period	26 5	

In July, weeding was somewhat interfered with by the continuous fain. In August, maize 'wffered during the long break from 6th to 21st August, and the village crops around the Farm gave a very poor outturn. The variety grown at the Farm and known as Jaunpur maize flowers later than the ordinary country variety ; it had suffered therefore less by the time that the canal (which happened during the break to be closed for repairs) was again thrown open.

2. The operations of the season comprised experiments on—

(1) Manures.
(2) Deep and shallow ploughing.
(3) Early and late ploughing.
(4) Drill and broadcast sowing.
(5) Cotton.
(«) Sorghum BUgar.
(7) Ensilage.

3. (i) Manures.—The plots on which manures are tested are now arranged in duplicate. Each plot measures one-twelfth of an acre, and the duplicate series provides some check on the re8ults of the standard series.

For the past four years the treatment of both standard and duplicate series has been as under: —

Year.	Season.	Standard plots.		Duplicate plots.	
		Manure.	Crop.	Manure.	Crop.
1878 to 1879	Khaiif	*Nil*	*NU*	No record	No record.
	Rabi	*Nil*	Barley	Ditto	Ditto.
1879 to 1880	Eharif	*Nil*	Cotton	*Nil* *	A3
	Rabi	*Nil*	Fallow	Bone Baperphosphate	Wheat.
1S80 to 1881	Kharif	"Same as now applied	Maize	*Nil*	Fallow.
	Rabi	Ditto	Wheat	*NU*	Ditto.
1881 to 1882	Eharif	Ditto	Maize	Same as now applied ...	Maize.
	Rabi	*NU*	[illegible]	*Nil*	*NU*
1882	Kharif	See return	Maize	See return	Maize.

* An exception is the plot which was this year treated with saltpetre ; in 1880-81 it was treated with poudrttie.

For the season under report each plot was treated as under-

Ploughed ... ...,	... Three times with Watt*' plough*
Weeded	... Twice.
Irrigated ... ... Mf	... Once.
Seed sown ... ,,, ...	... Maize at 6 seers per acre.

The following table shows the manures experimented with and the results :__.

Manure and rate per acre*	OUTTURN PEE ACRE.			
	Grain.		Stalk and leal.	
	Standard.	Duplicate.	Standard.	Duplicate.
Manures yielding nitrogen.	lb.	ft.	Maunds.	Maunds.
Cattle-dung, 180 maunds ...	2,169-0	2,020 5	95-4	89 7
Cattle-dung, 180 maunds, and bone-dust, 360 55.	2,434-5	1,845-0	102-9	87-6
Cattle-dung, 180 maunds, and gypsum, 240 ft.	1,758*0	1,704 0	87-6	82-5
Saltpetre, 240 lB. ...	2,190*0	1,278-0	111-9	93*3
Ditto and bone dust, 360 ft. ...	...	1,626*0	•*•	87 6
Manures yielding little or no nitrogen.				
Bone superphosphate, 240 lb. ...	1,422 0	1,378-5	84-3	81-0
Bone-dust, 36&lb. ...	1,417-5	844-5	79-8	56*7
Gypsum, 210ft. ...	1,056*0	912-0	58 5	75-0
Ashes of 180 maunds cattle-dung...	1.452-0	922-5	87-3	71-4
No manure ... ... ,,, ...	1,002-0	924*0	74*7	69*0

4. Nitrogenous manures, as may be seen, maintain a very marked superiority in yield as against manures yielding little nitrogen ; and the duplicate plots corroborated fairly the results of the standard plots save in the case of the saltpetre standard plot, which shows a variation due probably to unexhausted poudrette *(vide* note to table of previous treatment).

There is little to be learnt, however, from experiments which have as yet so little continuity; and patience must be exercised until a sufficient number of annual experiments have been carried out to enable us to assert positively that by a certain expenditure on any particular manure corresponding increase in produce can be obtained, returning a fair profit on such expenditure*

5. (ii) Deep and shallow ploughing.—A new field was selected for these trials to which for several years past no manure tad been applied, and which had hitherto been cultivated with the native plough alone. It had further been reduced in fertility by crops of maize and wheat in succession. The field *yr&s* divided into four plots, each measuring exactly one-sixteenth of an acre and separated from its neighbour by a pathway four feet wide. The plots were thus treated—

I. and IV;—Ploughed twice at sowing time with a native plough.

II.—Ploughed once at sowing time with a Kaisar plough to a depth of 5 inches.

HI.—Ploughed once to 9 inches at sowing time with a Collins' plough-

Cotton was sown broadcast, harrowed in and *zpatela* run over the fields.

The crops were weeded twice and were not irrigated.

The yield was as under.

Number of plot.	Detail of ploughing.	Actual outturn,				Outturn per acre.	
		Cotton.		Seed.		Cotton.	Seed.
		lb.	oz.	lb.	oz.	lb.	ft.
I....	Native plough ...	5	15	12	10	95	202
II. ...	Kaisar ,, ...	7	0	14	5	112	229-
III....	Collins[1] ,, ...	6	9	13	6	105	214
IV. ...	Native ,, ...	6	4	13	0	100	208

It is to be regretted that space was not available for larger plots, and an endeavour will be made next year to secure more ground. The present figures are evidence in favour of moderately deep ploughing rather than ploughing to great depth. Here, however, again we must wait for continuous series of trials before drawing conclusions that can be generally accepted.

8\. ^ ^ar^y and late ploughing.—Two series of plots were prepared for experiments with the maize and cotton respectively. The plots intended for maize came to an untimely end through bursting of a rajbaha in May, which levelled all distinctions.

The cotton plots were four in number. Two fields were selected at some distance from each other and were each divided into two plots.

In each field one plot was ploughad in May and again at sowing time, while the other plots were only ploughed at sowing time. A crop of wheat had been taken off each field in the previous season; no manure was applied nor were the crops irrigated, but each plot was weeded[1] twice.

The following table gives results :—

Number of plots.	Area in square yards.	Actual outturn.		Outturn per acre.	
		Cotton.	Seed.	Cotton.	Seed.
		ft.	Th.	m.	tt>.
J.-Rarly ploughed	2,472	83	193 75	162 5	379-3
II.-I.ate ploughed	2,217	65-5	156-0	142-9	340-&
	1,691	53-5	117 3	167 4	356-7
iv-ute pioughed	2,122	66*75	130-5	152-7	297 6

^7. The advantage of early ploughing is demonstrated from the above, as has been done in previous experiments, but I am not aware that its advantages were ever contested. In Oudh every native is aware of the advantage derivable from the ploughing of unoccupied fields after every good fall of rain between November and the monsoon, and considers each of such ploughings as equivalent in benefit to manuring the land. Even standing green arhur is ploughed between the ^Pws. It seem to be purely a question on the part of the cultivator of leisure, or of bullock power, being available, and I would propose to discontinue this series.

8# (iv)—Drill and broadcast sowing;—In these provinces it is usual to sow cotton broadcast, but in the Central Provinces cotton is sown in drills. The merits of the two systems were put to test side by side in a field divided into two plots, the treatment of which in previous years had been as under:—

Year.	Manure.	Crop.
1879-80-	*Nil*	Mandoa.
1880-81	*Nil.*	*Ail.*
1881-82	*Nil.*	Wheat.

The drills were two feet apart, and the seed was sown atintervals of two feet. The two plots were sown with Kulpahar seed and treated as under :—

Manure.	Ploughed.	Weediogs.	Irrigation.
Nil	Once in May and again at time of sowing.	Two	*Nil*

The area and outturn of each plot were as follows :—

Mode of sowing.	Area in square yards.	*Actual outturn*		*Outturn per acre.*		*Increase per aere.*	
		Cotton*	Seed.	Cotton.	Seed.	Cotton.	Seed.
		lb.	ft.	ft.	ffi.	ft.	ft.
Drill	3,320	130-12	311-5	189 7	454-1	51-8	106-4
Broadcast	3,654	104-12	262-5	1379	3477	...	...

As the price realised for the Kulpahar cotton grown bj the Farm was **Bs. 15-8-0** per bazar maund, and the price of the cotton seed is about Be. 1 per maund, the above experiment shows a profit of about Rs. 9-4-0 per acre in sowing in drills over sowing broadcast.

The experiments will be repeated in future years.

9. (T) Exotic cottons.—The following kinds were experimented with :—

1.—New Orleans.
2.—Upland Georgian.
3.—Nankin cotton.

Two plots sown in July, 1881, were ratooned for a second crop, and six plots where **sown** this year.

The.treatment of these in past years and the present is shown in the following table, toge* gether with the results : —

Number of field.	Area [illegible] yards.	Nature of soil.	Previous treatment. Year.	Manure.	Crop.	Treatment during present year. [illegible]	Ploughing.	Watering.	Weeding.	[illegible]	[illegible]
I.	8,541	Light loam	1879-80 1880-81 1881-82	Guano ... *Nil.* *Nil*	Wheat ... Sorgho. Wheat.	Dung, 100 maunds to the acre.	[illegible]	*Nil.*	[illegible]	New Orleans,	[illegible]
IL	4227	Do.	1879-80 1880-81 1881-82	*Nil.* Dung, *Ml*	Wheat ... *Nil.* Wheat.	*Nil.*	Do.	Do.	Do.	Do.	[illegible]
III.	336	Heavy loam.	1879-80 1880-81 1881-82	Poudrette, *Nil.* *Nil.*	Maize ... *Nil.* Cotton.	*Nil.*	*Nil.*	Do.	[illegible]	New Orleans ratooned.	190-7
IV.	5,622	Light loam.	1879-80 1880-81 1881-82	*Nil* *Nil.* *Nil.*	*Nil.* *Nil.* Wheat.	*Nil.*	[illegible]	Do.	Do.	Upland Georgian.	**110-4**
V.	5,201	Do.	Same as of No.	IV. ...		*Nil.*	Do,	Do.	Do.	Do.	72-7
VI.	1,155	Heavy loam.	1879-80 1880-81 1881-82	Poudrette, *Nil.* *Nil.*	Maize ... *Nil.* Cotton.	*Nil.*	*Nil.*	Do.	Do.	TTpland Georgian ratooned.	144'6
VII.	1,937	Do.	1879-80 1880-81 1881-82	*Nil.* Guano, Boiie superphosphate.	*NU.* Sugarcane Wheat.	*Nil.*	[illegible]	Do.	Do.	Nankin*	91*8
VIII.	1,625	Do.	Same as No.	VII. ...		*NH.*	*Nil.*	Do.	Do.	Do.	**113***

10. Continuous showers in July interferred with the weeding of the crops raised from seed, and the plants were checked somewhat in growth. The ratooned crops, besides being on rich soil, were from their more vigorous growth less affected by the vicissitudes of season. The produce of the New Orleans and Upland Georgian was valued by the Elgin Mills at Hs. 22-tf-0 per maund of 82 1b, equivalent to Bs. 27-7-0 per bazar maund, while last year the valuation was Rs. 25 ; and as the bazar prices of country cotton are lower this year than last, it seems clear that the acclimatised seed has not degenerated.

11. Samples of American and of country cotton cleaned with the Emery saw gin and with the ordinary country charkha were submitted to the Manager, Elgin Mills, for opinion, froi* whom the following report was received : —

«With reference to your letter, dated 11th instant, forwarding samples of cotton, I have the honor t* xeport as follows:—

2. The samples received were—

1. Upland Georgian—saw ginned.
Ditto— charkha ditto.
2. New Orleans— ditto ditto,
Ditto- saw ditto.
3. Kulpahar— charkha ginned,
Ditto— saw ditto,
4. Country cotton—ditto ditto,
Ditto— charkha ditto.

3. After carefully examining the above samples and comparing the cotton ginned with the native charkha MI the ordinary manner -with that ginned with the Burgess 'JSmery) saw gin I have arrived at the conclusion that the staple has not been injuriously affected by the latter process, t.' <?, cut, broken, or otherwise appreciably damaged, while the superiority of the saw gin over the old primitive method is very marked, so far as opening out and cleaning the cotton is concerned; as applying to the first two varieties, &»., Upland Georgian and New Orleans.

The effect of the saw gin on the short-stapled country cotton, however, is that the seed is partially broken ja the process, and small particles adhering to the fibre are passed through the machine, which materially reduces its value for spinning purposes.

I am of opinion, therefore, that the Burgess saw gin, while doing its work admirably on the long-Btapled varieties, is not so well suited for cotton grown in the North-Western Provinces usually known as Bengals.

4. The following are, approximately, valuations of the samples according to the ruling prices of the day :—

Georgian and New Orleans	Bs. 22-8-0	per maund of 82 lb.
Kulpahar and country cotton	„ 16-0-0 and 16-4-0	ditto.

Following the above opinion, the whole of the American cotton was saw ginned, while the country cotton was cleaned by charkha; and the prices eventually realised were Es. 23-12-0 for American, Rs. 15-8-0 for Kulpahar, and Es. 15-4-0 for country cotton per bazar maund respectively.

I may note that a sample of the country cotton cleaned by the saw gin and sent to the Cawnpore market was rejected by the dealers not on account of any supposed injury *to* the staple, but on account of its clean appearance, the dealers suspecting that it was old cotton cleaned with a Behna's bow.

12. Comparing the value of the exotic cottons with the produce of oountry cotton grown •* the Farm, we find as follows :—

Kind of cottoD.	Class of land.	Produce per acre of cleaned cotton.	Value per acre of cleaned cotton.
		lb	RB. a.
Country cotton...	Light loam	178·6	35 2
Exotic New Orleans and Upland Georgian ...	Ditto ...	92·0	25 *4*
Ditto ditto ditto ...	Heavy loam	167*6	45 15

showing, as was done last year, that in heavy loam the exotic cotton is a more paying crop than country cotton, even though the latter were to yield up to 200 ft. per acre; while in light loam *t is country cotton which is most profitable.

The cotton hand-books of Bombay, Madras, and Bengal, together with that for all India, °°nipiled by Dr. Royle, have left little to discover in the way of experiments with exotic cottons, *° far as the English home market is concerned ; and it was established clearly that India could *tever hope to compete * successfully at Manchester with America in American cottons : but since then times have changed, and the question now is whether the exotic cotton cannot be grown for local mills with success and with great profit to the ryot and to the spinning companies.

The Farm experience is so far favourable to an affirmative. At the Rawatpur estate, which ?8 Ut a short distance from the Farm, the success of American cotton has been very marked : the cultivators are, I understand, beginning to appreciate the high price obtainable, and the cultivation is likely to extend.

13. Last year and again this year the American cotton plants at Rawatpur were stripped of ''teir leaves by swarms of caterpillars, which left the adjoining fields of country cotton absolutely Untouched, nor did they visit the fields on the Experimental Farm.

It seemed at first as if the crops would be damaged, but 1 understand the yield has been fa% good.

As the caterpillar was a stranger to the cultivators of the district, I kept some of the chrysalIkes until a moth emerged and then tried to get the latter identified. The Agri-Horticultural Society of Bengal returned a caterpillar first Bent without being able to recognize it, their only authority having left for England. Then the moth travelled to the Fanj&b and to Simla, and at last found a resting place at Poona, where it was kindly identified by Lieutenant-Colonel Swiuhoe, Assistant Commissary-General, Bombay Army, who writes as follows to confirm a first opinion:—

Dated 21st February.—" I have to-day received from Mr. Arthur Butler, of the British Museum, the specific name of the little moth you sent me: it is *Glyphodes Multilinealis of Ghienee.* Mr. Butler says it is common and it appears widely distributed.

" The cotton you sent me with your letter, 18th December last, I put carefully though a process of drying and heating, and have succeeded in hatching out three moths, all of one species, and each of them came out of the heart of a separate injured cotton pod; and I can't help thinking that this, is the real insect that has been damaging the cotton. I took it myself out of a cotton-field near Karachi four years ago, and sent specimens of it to the British Museum. It was pronounced to be a new species of the tribe *Tortrices,* family *Nycteolidcn,* and was named by Mr. Butler *JErias tristrigosa.*

I don't mean to say that *Glyphodes Multilinealis* has not been injuring your cotton. Probably both insects have been at your cotton, one in its leaves and the other in the pod."

It may be interesting to others who may come across rare specimens to know that Lieutenant-Colonel Swinhoe has a collection of over eleven hundred species of moths.

14. *Nankin cotton.—OS* this variety it is necessary, in view of the interest lately taken in it, to make a separate note.

To all appearance, in the field before the bolls burst, the plant is the same as that of New Orleans or Upland Georgian, and quite different therefore in growth and leaf to country cotton. It was grown at the If arm some few years ago, but discontinued owing to the unfavourable reports on its staple received from Calcutta. This year some seed was received from the Saharanpur Botanical Gardens and from the Rawatpur estates, where it had been grown, as well as on other estates in the Cawnpore district, for several years past. On the plant the cotton is of a dirty fawn colour mixed with white ; bolls of fawn-coloured lint and of pure white lint being sometimes found on the same plant. After ginning, spinning, and weaving the result is a dark khaki-coloured cloth of uniform tint, admirably adapted for army clothing. The colour can, apparently, be bleached, judging from a coat shown to me at the JDlgiu Mills, but does not appear to fade with ordinary washing and wear. The Mills object to its staple as being difficult to work with machinery, and the English operatives at the Elgin Mills say that on account of this difficulty it is known to the trade in England as " rotten cotton ;" a difficulty, however, which does not seem to be recognised by native weavers.

This cotton is cultivated in Central India and woven into cloth for the regiments of Central India Horse. Lieutenant-Colonel Martin, O.B., in reply to inquiries, has kindly sent two samples of cloth of first and second quality. The Officer Commanding the 23rd Pioneers has sent samples of cloth and cotton from crops raised near Mian Mir by Subadar-Major Natha Singh, A.D.C. ; and from the Government of Madras have been received specimens of the cotton, and of cloth manufactured from it at the Coimbatore jail. From the Cotton Hand-book of Madras it appears that samples of Nankin cotton took prizes at the Madras Exhibition in 1859. The Secretary to the Muir Mills, Cawnpore, writes : —

" This Company has grown for some years crops of this cotton and have manufactured drill from the same. I enclose a pattern of the drill for your examination. We have endeavoured to introduce the cotton among th$ cultivators, but have not succeeded to any extent. We purchase any quantities of the cotton we may have offered to US, but at present very small quantities have been, secured, and we are therefore unable to manufacture cloth for sale of the pattern sent you."

All the samples of Nankin cotton received appear to be of fairly uniform colour save that from the Muir Mills, which is brighter and lighter than the rest, though but a slight shade different *to* the first quality of cloth used by the Central India Horse.

In the report of the Mission to Yarkand, page 479, reference is made to a reddish-coloured cotton sold in the Yarkand bazar and known as *kdrd kiwdz,* which maintains the colour after washin c. Lieutenant-Colonel Gordon, C.B., to whom I sent specimens of the Farm-grown cotton, speaking from recollection, seems to think Nankin identical with *kdrd kiwdz,* and has kindly promised to try to procure seed from Yarkand.

To sum up : Nankin cotton has long passed the experimental stage. It has been grown successfully, has been woven successfully, and is approved of by those who have had good opportunities of observing it in use ; but of value there are not at present sufficient data, as, owing to absence of demand, the market rate has been purely nominal.

The figures for the small quantity grown on the Farm, as shown in the table in para. 9, give an average of 102*8 lb. of clean cotton per acre on good soil, a poorer yield certainly than that of country cotton or New Orleans ; but the crop will probably give another picking in April, and may, on the whole year's outturn, compare more favourably.

15. *Sorghum sugar.*—The attempts of last year to manufacture sugar from sorghum were renewed this year and with better success. Two fields were sown.

(1) was divided into three sections, which were respectively planted with Minnesota early amber, acclimatised red sorghum, and acclimatised black sorghum. The field was manured with farmyard manure at 100 maunds to the acre.

(2) An unmanured plot in which sorgham was planted for cattle-food.

Contrary to expectation, the unmanured plot gave a better crop than the manured plot, This may have arisen from the fact that No. (1) lies lower than No. (2), and was waterlogged for some time in July. In America the general opinion is in favour of a sandy upland soil well drained, but not freshly manured. A professional sugar-boiler (kindly procured for the Farm by Messrs. Thomson and Mylne) could make nothing out of the juice at first, and pronounced it impracticable. One of the Farm apprentices, accustomed to sugar-boiling, then tried his hand on it, and by the use of lime succeeded at last in making gur of fairly good quality from the early amber and the red varieties, but for a long time failed with the black variety: eventually succeeding with that also by adding a very small quantity of carbonate of soda, as well'as lime, to the boiling juice.

16. Samples were sent to Carew and Co., Limited, to Messrs. Thomson and Mylne, and to the Agri-Horticultural Society, Bengal. A sample was also submitted through a native gentleman to a committee of sugar-brokers in Lucknow, the manner and place of its production being carefully concealed. The following opinions were received :—

MESSRS. CAREW AND CO.

" I have now the pleasure to send analysis of your sample of sorghum and to remark—

" 1st.—It is very acid. Having no experience of sorghum juice, I do not know how far this is due to delay or accident in manufacture.

" 2nd.—The amount of glucose is large and is probably due to the acid, which has the effect of converting crystallizable sugar into glucose, if present in a heated solution.

" 3rd.—Each part of glucose present is held iu refining to convert another part of crystallizable sugar, and this with the allowance for ash reduces the available sugar from your sample to 24 per cent,

" As a rule we would decline sugar with so small a result.

" My valuation is of course for refining purposes.

" It is pronounced here less *sweet* to the taste than cane gur; but it seems to me that, in small quantities, reaching the market early, it should bring top prices, *viz.,* Ks. 3-8 to Rs. 4 per maund.

Sugar analysis.

Sample received—November, 13th.
Marked Amber Sorgho Gur, 2oz.
Description,—Gur.
Colour, &c—light yellow—*Very acid.*

Composition.

Cane sugar	61*00
Glucose	23*85
Ash	3-15
Insl. matter—sundibre	0*23
Colouring matter extractive	3*78
Water	7*99
Total	100*00

Available sugar 24-5%."

MESSRS. THOMSON AND MYLNE.

" The sample of gur you sent us is of tho kind made for eating, and is not used for making sugar ; the present highest rates for eatable gur and gur for making sugar are 13 i and 15 seers per rupee respectively, and the value Put upon your sample is 13i to 12J seers per rupee."

Lucknow and Cawnpore native brokers valued it at 9 to 10 seers per rupee, expressly placing a higher value on it than on what fresh sugarcane gur would fetch a month later, on account of its early appearance in the market, and as a fact sugarcane gur is now selling in Oawnpore (in March) at 14 seers per rupee.

The Agri-Horticultural Society wrote as follows :—

•« The samples above referred to are worthy of consideration, both being products of some value, if properly and carefully prepared.

« The plant is well known—sorgho or sorghum, the seed of which yields a hard food-grain, capable of being ground into good white flour. It is also used for cattle-feeding purposes, the green fodder of the plant being highly nutritious and sweet.

"The sample of gur said to have been prepared from the expressed juice of this plant is very soft, pasty, sticky and devoid of all granulation.

"In its present hard, dry condition it would be saleable in the bazar at about Es. 2-8 or Rs. 3 a bazar maund; but if subjected to a damp atmosphere, or kept during the rainy season, it would quite change its character and become dissolved in the form of molasses, in which state it would Be suitable for distilling into spirit only, and worth about Re. 1 to Rs. 1-8-0 a bazar maund.

" I am however of opinion that with care and cleanliness in boiling the expressed juice, and better manipulation generally, this plant is capable of yielding a good marketable gur; that further efforts should be made to improve upon the sample *now* under consideration, and in doing so that details should be given of the cost of producing it and that a large sample be furnished."

It will be observed that the Society's differs considerably from the professional opinions on this product and from the verdict of the market.

To revert to the professional opinions. Another given later on by Messrs/James Saunders and Co., of Melbourne, of samples from the Farm forwarded to them by the Government of India, runs thus:—

"Memorandum by Messr. James Saunders and *Co.,* of Melbourne, on Sorghum sugars :—

"Sample.—Three samples have been received as folloirs ;-Red sorgho, black sorgho, amber sorgho, and are herewith returned.

« *Mode ofvaluation.-These* were shown to a sugar-broker of 10 years' London experience, and his separate opinion quite agrees with the writer's.

« *London value.-The* amber quality has been taken as a test, and the broker gives *it* a value of £15-10-0 in London.

"Net price to cultivator.-AUowing £1-10.0 a ton for freight, bagging, shipping and commissions, which would fully cover all in case of large shipments direct from port to London, a net balance of £14 per ton remains. From this, London brokerage, 1 £- per cent., and carriage to port of shipment hnve to be taken; the latter omitted, the available money for distribution would be say £ 13-15-0 (about Rs. 6 a maund).

" *Uses.*—These depend on—

(a) quantity of saccharine per cent.

(b) qunntity of crystallising matter per cent.

As it now stands it is most likely to be of use to brewers, as the demand by refiners for low class "Mauritius" and even down to Madras 'jaggeries' compels them to often use crystals.

" *Use in Australia.*—*The* above remarks apply with even greater force, crystals of low count beincr almost invariably used. There would therefore be strong hope of better price in Victoria, which is the chief brewing centre ; but this would be counterbalanced in part fat least for a time) by higher freight, which with charges would by sail be 55s. to 60s.

" *Proposed trial.*—Regular supply should it be desired to try it in Victoria; one quality should be selected, say 'amber ;' all available information condensed and forwarded with (say) a ton to our firm, on which a report on the market value and experimental use can be made; but it should be borne in mind that, for trading purposes, it is useless to go to trouble and expense, unless a regular and constant supply can be kept up."

17. These points are so far plain that at the present stage of these experiments, the gur" produced is better adapted for eating purposes in India and for export for brewing purposes than for refineries. The best samples have a strong taste of honey, and coming early into the market, it should have a ready sale. As a fact, I may note that a native gentleman of Cawnpore, with whose name and appearance I am quite unacquainted, bought at th6 Farm as much as the Superintendent would sell him at four aunas a seer, and soon after returned to ask for more at the same price. The high price was put on simply because we did not then wish to sell, and at the same time did not wish to disoblige anxious enquirers.

18. The acidity of sorghum juice is far greater than that of cane and constitutes a difficulty. In using lime-water as a preliminary test, as recommended by Dr. Shier, I found the proportion of lime requisite to produce complete neutrality to be about 2oz. to 100 gallons of juice, where Farm sugarcane required about l^oz. ; but in the actual boilings the tempering must be done very carefully, so as to avoid alkalinity, which blackens the juice; and we deemed it advisable to err for this season, considering the small quantity of juice available, on the side of acidity. Next season I propose to try lime sucrate as being more manageable and of more constant quality than rough milk of lime. This is recommended in " Sugar Growing and Refining," a book full of the latest information on the subject, which was received by the Farm rather late for this year's operations.

The greatest care was taken to avoid fermentation. The canes were stripped on the fields before being cut and were pressed as quickly as possible after cutting. An attempt to save labour by pressing the canes with the leaves on (as sometimes practised in America) proved a great failure. The vessels for holding and boiling the juice were carefully cleansed and fumigated daily ^ith sulphur, and the juice filtered, before boiling, through fine flannel. All the operations of pressing and boiling were conducted as with sugarcane. A Bihia mill was used for pressing, a few drops of castor-oil to aid clarification, and lime was used for tempering, as already stated.

19. It remains to note the yield, which is shown in the following table. The cane was throughout much the same in quality, but day's workings were varied by experiments, of which ** is sufficient if what succeeded fairly is noted :—

Variety.	Percentage of clean canes per maund of plants.	*Percentage of juice.*		*Percentage of gur to weight of*		
		Plant.	Gleaned canes.	Plant.	Cleaned canes.	Juice.
Amber	43-45	21-45	49*36	3*61	8*32	*16-86*
B *. ...	44-20	23*14	52*35	404	9*14	17*46
	40*22	2164	53*81	3*05	7-58	14 09
ugarcane, variety chin ...	58*38	27-78	47*52	4 76	816	17*18

The average produce per acre of the three varieties was as follows:—

	Maunds.
Weight of plant	125-00
Ditto cleaned canes	53*27
Ditto gur	4*44
Ditto grain	3*00

Value of produce per acre—

	Rs.	a.	p.
Gur at Rs. 4 per maund	17	12	0
Grain at Re. 0-12-0 maund	2	4	0
Tops and leaves for fodder at 10 maunds per rupee...	9	8	0
Vinegar	1	0	0
	30	8	0

Cost of production per acre-

	Rs.	a.	p.
Manure, 100 mds.	3	0	0
Ploughing twice	1	8	0
Clod-crushing	0	4	0
Sowing	0	12	0
Deed	0	4	0
Weeding	2	0	0
Cutting	3	8	0
Bent for kharif	4	0	0
Sugar-boiling at Be. 1-12-0 per maund of gur	7	14	0
Total ...	21	2	0

It may be repeated that the crops were exceedingly poor.

No one would claim from the above that any great success had been achieved; but criticism *y be deprecated, either for or against, for several seasons to come. A congress of sorghum-growers and sugar-manufacturers was held in America only so late as January, 1880, at which statements were made showing considerable diversity of treatment of the plant, where all were anxious to promote its cultivation.

Meantime, if in the place of mere criticism others would take up the subject and make known any advance effected, sorghum may yet find a good place amongst Indian crops.

20. Its advantages are that it can apparently be grown as an ordinary kharif crop on poor land year after year without irrigation, and does not require the great labour, expense, and capital requisite for sugarcane. It only occupies the ground four months, and can be grown iu places where sugarcane cannot be grown at all. If too poor a crop for sugar, it is still a most nutritious fodder for cattle, the seed being also good food. If fine enough for sugar, it keeps. the mills going for a month earlier. Cattle eat the *megass* greedily, while they will not eat that of sugarcane. The leaves and tops also go to the cattle. From fermented juice alcohol can be distilled, and from the skimmings of the boiling-pan vinegar can be manufactured. Sorghum may therefore be said to have potentialities.

21. (vi) Ensilage.—Some experiments were made in ensilage about two years ago, when the conclusion was arrived at that the system would never succeed in India, the fodder in the silo on the latter being opened having been found in a high state of putrefaction. It did not however appear from the record that the fodder had in these experiments been packed so as to exclude the air, and in view of the increasing attention which the subject is receiving in Europe and America it seemed advisable to try again.

To avoid all possible elements of failure, one silo was simply a large tin-case let into the ground in which 8£ maunds of fresh-cut green juar stalks were packed ; the juar was cut small with a chaff-cutter and packed by layers, eaoh layer being well trodden down, covered with tarred paper and three inches of earth above to keep out the air. It was left for 48 hours, after which the covering was removed, the fodder retrodden to assist consolidation, and a fresh quantity put in.

Some salt being sprinkled on each layer, a final covering of six inches of earth was given. In this miniature silo there would be no question of failure to carry out instructions.

A larger silo was a disused masonry reservoir, into which 51 £ maunds of green juar were packed in as above described.

The silos were packed between 3rd and 25th September, 1882.

It must be borne in mind that the object sought was, not to show how a silo could be most economically constructed, but to establish whether green fodder could be stored at all.

The intention was to keep the silos closed until the hot weather, and tarpaulin was placed in readiness in case of rain ; but in my absence occurred the heavy rainfalls of January 23rd and 26th, and rain was allowed to soak right through the covering of earth and some six inches of the top layer of fodder.

On the 28th January I had both silos opened. Where rain had penetrated the fodder was rotten and mouldy and white-ants were busy. Below however the fodder was perfectly good, looking green and succulent and with a sweetish vinous odour. The Farm cattle not only eat it greedily, but when placed before them in a basket alongside a basket of ordinary cut chari showed a distinct preference for the silo fodder. Five seers at morning and five seers at evening were given to each of several lean kine until the silo was exhausted. A question was whether cattle could be fed on the fodder entirely with safety. For this an undesirable animal was selected which never kept condition \ no one would take him at a gift, and two attempts to lose him across the Ganges had proved ineffectual, a day or two always finding him back, grazing on experimental crops Silo fodder alone was given to him, as much as he chose to eat. Next morning he was reported as looking "rather sulky," but nothing worse came of it, and he continued to eat as much as he could get while the silo lasted.

In the case of the large silo the damaged layer was removed and a fresh covering of dry earth laid on. It will be opened in April. Every week in England sees more information added to the ensilage question, and by next season the knowledge now possessed of the subject will be far more complete. Originally it was insisted that the fodder must be free from rain or dew, and cut small, which latter operation constitutes a great expense. Now it is said that .wet fodder uncut ^ay be harvested this way. The oovering with an air-tight material of each layer is dispensed with by some save in the ease of the last layer. For consolidation planks are used, kept down by heavy weights, such as boxes filled with puddled clay. There are roadless tracts of country in these provinces, where more juar stalk is grown than the cattle can consume or the people dispose of, though the cattle are generally numerous in such parts Long before the end of the cold leather the chopped karbi has to be soaked in water to be at all eatable, and by the end of Phagun it is past chopping for. In such situations a cheap mode of preserving fodder green till April, May, and June might be a boon. In other places when all surplus fodder can be sold it is a question whether a cultivator might not employ his money better in maintaining for hot weather fodder a field of mangold-wurzel, lucerne, or Guinea-grass.

It may be noted that the large silo was first tried with ordinary *dhub* grass, butthe first layer in three days resembled in appearance a mass of farmyard manure, and grass was not persevered With.

B.—AGRICULTURAL IMPLEMENTS AND MACHINERY.

22. The following ploughs were received for trial during the season under report:—

A native plough from the Panjab.

Two ploughs made at the Saidapet Farm.

Three Swedish ploughs also from Saidapet.

Two English ploughs frem Messrs. Ransomes and Jeffries.

Two ploughs from Colonel Woodcock, District Superintendent of Police, Sultanpnr.

Of the two English ploughs, one oatalogued as marked P.L.K. is a *very* small one, giving a depth of furrow of 3 inches only ; the other marked W.K.S. is an exact copy of the now discarded form of Kaiser, which was sent to England two years ago. Jt carries with it such faults as the original Kaiser possessed.

The Swedish ploughs are quite unsuitable for cattle of these provinces, being very heavy, both in weight and draught: their price is also excessive, being Rs> 18 per plough, exclusive of freight from Madras; while the Watts' American plough can, under recent arrangements with the Manufacturers, be delivered at Cawnpore at Bs. 10, and possibly for less. The ploughs made at the Saidapet Farm are equally in weight and draught unsuitable for these provinces.

Of the ploughs received from Sultanpur, the main difference between them and the Kaiser is in the substitution of nuts and bolts for rivets and of a wooden for an iron standard, which necessitates reduction of the breadth of the beam at a point where strength is required, and in tho breast being more curved, resulting in a cleaner furrow, but at the expense of greater draught.

The Panjab plough is similar to that in use in the Muzaffarnagar district, with a moveable breast. It is heavier than either the Watts or Kaiser, and does not invert the soil.

23. Besides frequent trials at the Farm, all the above ploughs, with the exception of the Panjab plough, were sent for exhibition to Saháranpur, Bijnor, Khairabad, and Bulandshahr. In each case either the Watts' or the Kaiser caught the judge's approval. Sales have somewhat increased this season, as shown in the following statement:—

Name of plough.	Sold.		Given for trial.	
	1881.	1882	1881.	1882.
Kaiser ...	205	430	11	24
Watts' beam ...	...	13	...	5
B. F.O. beam ...	...	23	...	5
Total	205	466	11	34

One gentleman, an indigo-planter of Tirhoot, purchased 105 Kaisers. I sent him a Watts' for trial and opinion and received the following reply :—

"I can't say that I approve of it half as much as the Kaiser for indigo land preparations. For not only is the price double and the draught much hea?ier on the bullocks, but it is much too heavy for the ploughman to carry about from place to place, to and from his work, which is most essential for us. I have used some of the Kaiser ploughs now for about two years, and they are as good as new, except the continual wearing out of the shares, which is of course to be expected."

The Collector of Hydrabad, Sinde, in writing for a fresh supply lately of six Watts' ploughs, reported that the plough "has been pronounced by Mr. W, Strachan, Superintendent of the Model Farm,.Hydrabad, to be a complete success. The stilt handle is, however, fully six inches too short for the average Sindhi, who to use it has to walk with his body bent, which soon tirels him. The iron fittings also are of inferior quality."

In the garden of a native gentleman, Munshi Shiu Persh&d, at Bareli, may be seen an example of sugarcane grown under cultivation with the native plough and with Kaiser plough respectively growing side by side, and the difference in favour of the Kaiser is, 1 have been told by the late Collector, very marked.

I have seen a like difference also this year in contiguous fields of barley grown in the Rae Bareli district. The true place for the soil-inverting ploughs is in the early preparation of the soil, particularly in indigo and sugarcane lands. The finishing ploughings and the sowings are best done with the native plough. Its introduction should be confined in the first instance to sugarcane, cotton, and indigo growers. Success with these crops will lead to its extension to other and less valuable crops. Unfortunately much of the so-called absence of enterprise in the people arises from a suspicion that increased production means to the landlord increased assessment and to the cultivator increased rent.

24. Waterlifts.—Some modifications have been introduced. The stand has been strengthened, the diameter of the wheel increased, and for wooden plugs, grooved iron plugs with a leather fitting to the groove and projecting from its edge, so as to fill the tube of the lift, have been substituted.

The result is increased efficiency; but this efficiency, easy to maintain and to demonstrate at the Farm, is not so easily maintained elsewhere, unless those who indent for lifts take care to renew the leathers when worn, and can appreciate the fact that the lift is as efficient, as it undoubtedly is, only when worked at high speed, a method of proceeding which is foreign to native ideas.

Lifts are now constructed for 5', 10', 15', 20', and 30\

The sales of the lifts since May last up to date and for the same period in the previous year were as under :—

Height of lift.	Sold.		Given for trial.	
	1881-82.	1882-83.	1881-82.	1882-83.
5'	4	4	...	1
10'	...	2	...	1
16'	6	2	...	2
20'	20	21	2	1
30'	...	3	...	...
Total	30	.	2	5

As encouraging facts, it may be stated that a zamindar from a distant village of Bundelkhand commissioned a bania of Cawnpore to purchase eight pumps, sending oarts for them and clamouring because they were not ready immediately. It seems that he purchased one two years ago and acted on experience. In another case a talukdar of Oudh returned one for repairs which be had managed to break, and also said that it would not work. A mistri was sent back with (ha lift to put it up and explain the working, and then came a letter asking for another lift to be sent as quickly as possible in addition to the first.

25. Winnowers.—For the driving band in the old machines a press-wheel has been substituted with advantage. Six were disposed of between June 1st and November 30th, 1862.

26. Maize-shelling machine—A. very simple and efficient machine was received from Messrs. Heebner and Sons, U.S., at a cost to Cawnpore of Rs. 78. It is worked by one coolie and requires two boys to feed it. As shown in the following table, it is far cheaper than hand labour, and would suit for Tarai cultivation, where maize is plentiful and labour scarce: —

Mode of hulling.	Number of labourers.	Total amount of wages per day.	Quantity of hulled grain per day.	Cost of hailing per maund of grain in annas.
		Rs. a. p.	m.	
Corn-sheller	Two meu and 1 wo boys.	0 7 6	789(	·77
By stick	Six boys ...	0 7 6	388	158
„ charpai	Six women ...	0 7 6	109	5-64
„ khurpi	Ditto ...	0 7 6	132	4-65
„ hand	Ditto ...	0 7 6	142	4 30

It was exhibited at Bijnor, Khairabad, and Saharanpur, and seemed to take the fancy of the people exceedingly.

27. Emery saw-gin with Dr. Forbes **Watson's Improvements**—One was procured daring tlie year in consequence of a recommendation in its favour received through the Government of Iudia. For cleaning American cotton it is most efficient, giving cleaner cotton at 10 annas per miund than the native churka produces at Rs. 2-8-0 per maund. It is not however adapted for cleaning short-stapled native cotton, as was shown years ago by Sir Walter Cassel in his Cotton Handbook for Bombay,

In conclusion it may be noted that I have merely reported on the Farm operations, and that their initiation was due to Mr. Fuller, while the work of carrying out Mr. Fuller's plans waa most efficiently conducted by the Superintendent, Laohman Farshad Banna.

J). G. PITCHER, MAJOR,

Asst. Director for Oudh,

REPORT

ON THE

CAWNPOjRE EXPERIMENTAL FARM,

FOR THE EABI SEASON, 1882-83.

ALLAHABAD:

NORTH-WESTERN PROVINCES AND.OUDH QOTIRKHSNT PRI3S.

1883.

No. $\frac{1007A.}{CXCIV.}$ OF 1883.

FROM

THE DIRECTOR, DEPT. OF AGRI. AND COMMERCE,
NORTH-WESTERN PROVINCES AND OUDH,

To

TEE SECRETARY TO GOVERNMENT,
NORTH-WESTERN PROVINCES AND OUDH.

Dated Caumpore, the 17th Juty, 1883.

SIR,

I HAVE the honor to submit Major Pitcher's report on the rabi harvest at the Cawnpore experimental farm.

% The average outturn of wheat over the whole farm was this year 21*8 bushels per acre, which is 1*36 bushels less than the average outturn in the year before. The crop as a rule was aot finer than that grown by neighboring cultivators, and may be accepted as representing with some fairness an ordinary outturn from cultivation of a normal character on land which is rather below than above the average.

3. The results from the experimental plots agreed very closely with those of last year. In both years saltpetre alone and saltpetre mixed with bone-dust gave by far the largest outturn. The difference obtained by adding bone-dust was very slight on both occasions, and on the last the Plot without it did better than the plot with it. The produce in grain for both years is as follows: —

	Produce in grain.		Per cent, of increase on unman ured.	
	1882.	1883.	1882.	1883.
	lb.	lb.		
Saltpetre alone	1424	2,080	84	102
Saltpetre with bone-dust	1,485	2,000	92	94
Wholly unmanured	774	1,032	...	...

It is doubtful, with these figures, whether bone-dust contributed at all to the superior productiveness. If it did it was certainly not in any proportion to the additional expense of Rs, 4-8-0 per acre which its application involves. It may further be remarked that saltpetre does not as yet show any sign of exhausting the soil, and a farther confirmation is given to the view that, at least for the production of cereals, nitrogen is the one great want of soils like that of the farm.

4. Last year bone-dust gave a much larger return than bone superphosphate. This might probably be explained by some disturbing cause such as no single experiments can be sure of escaping. This year bone-dust and superphosphate were almost exactly equal. Similar results ^ere obtained last year when both bone and mineral superphosphates were tried. There is nothing in the experiments as yet to show any great need of phosphoric acid ; that lime should ^e wanted in the greater part of tjiese provinces is nearly incredible. In neither year has gypsum made any appreciable effect on the yield, and it seems very doubtful whether there is any use in continuing this part of the experiment. It may be of some advantage in the case of leguminous crops, but it seems to be of little direct use to cereals.

5. Another form of applying nitrates is by ploughing in some leguminous crop, an Operation which has probably a further advantage in the mechanical opening up of the soil. The result this year was that the outturn of grain of six plots so treated averaged 1,653 ft, while that on six plots similarly situated but unmanured was 1,271 ft. The additional 382 ft per

acrfr were obtained at a cost of at the outside Rs. 2-8-0, and, being worth nearly Rs. 10, gave a very handsome profit on the outlay.

6." The advantages of deep ploughing were very strikingly shown. By inverting the soil to a depth of nine inches the produce wa's nearly doubled, a depth of five inches increased it by 32 per cent, and in both cases only two ploughings were given, to four by the ordinary native plough. In fact, the superiority of moderately deep ploughing on all ordinary soils has long been placed beyond question.

7. The experiments with well and canal water were continued ; the results, omitting straw, in the two years being as follows :—

	Canal. ft*	Well. ft.	Per cent, increase of well over cunal.
1882	1,110	1,449	30
1883 ... ., ...	1,227	1,380	12

The experiments have not been carried on long enough to enable us to conclude with certainty that well water is in itself a better fertilizer than canal water. The advantage it has in the greater opportuneness with which it can be applied was alluded to ia last year's report; on the other side must be put its greater expense.

8. The English barleys gave rather a better yield this year than they did last, producing on an average 1,077 ft per acre against the former average crop of 848 ft, They are still far inferior in productiveness to the ordinary native variety, which again continues to yield about twice as heavy a crop as the Kotgarh barley. Cape oats show no sign of deterioration, and this year have yielded as much as 2,02(5 ft to the acre. English wheat does not promise to succeed. It is far too slow in arriving at maturity.

9. An attempt to supply unprepared linseed fibre for the purpose of paper manufacture disappointed any expectations that may have been formed of it. A white variety of linseed, not generally known in these proviuces, was imported from Jahiun and yielded an oil of exceptional- purity and brilliancy, which might become a valuable article of commerce.

10. The ensilage which had been partly damnged by the rain in January was closed up again and not re-opened till May. The fodder was considerably fermented, but not so injured as to make it unfit for cattle food ; and the possibility of keeping green fodder from the end of one rainy season to the beginning of the next was clearly demonstrated. The subject is a new one, not only here but in England and America, and there are many questions of detail which arc waiting for solution. Major Pitcher's suggession to scatter boosa between the layers of oipen stalk, and to use it instead of earth as a top covering, is one that appears to deserve trial.

11. Among the new implements experimented with, there are two which promise to be of use to Indian agriculture. A cheap and efficient hand-threshing machine, which only cost Rs. 128-9-0 when imported, and might probably be made up for less in thia country, was found to be much more expeditious and more cleanly in its action than the ordinary method of treading out by oxen. A new form of sugar evaporator, imported from America, promises to be a still more valuable addition to the existing stock of implements. It is cheaper than the apparatus of iron pans which is now in use, it is incomparably more rapid and simple in its operation, and it produces a finer quality of rāb. At the various agricultural shows where it was exhibited it attracted much attention, and copies are behig made for the sugar manufactory at Rosa, and for Pandit Ajodhya Pras&d of Indalpur, whose agricultural experiments have lately been in the main concentrated on the production of sugar.

I have the honor to be,

Bip,

Your most obedient servant,

W. C. BENETT,

Dir, Deft, of Agri. and Commerce, iV.- *W. P. and Oudh.*

REPORT

ON THE

CAWNPOKE EXPERIMENTAL FARM

FOR THE RABI SEASON OF 1882-83.

1- *Character of the season.*—The season was again abnormal in character. In September and October last only two inches of rain fell instead of 6'49 inches the normal quantity, and, as a consequence, the moisture in the soil so necessary for the rabi sowings was barely sufficient for Proper germination. Between the 1st October and the 25th January only -5 inches of rain fell, and matters began to look very threatening for all those cultivators who had no canal water at their service. On the farm lands, two waterings had been given to most of the crops, and to some had been given three waterings, when, on January 25th and following days, three inches of rain fell accompanied by very high wind. The most forward and most promising crops being then in flower, they necessarily suffered from the effects of the storm to a greater degree than crops less advanced, and but for this accident the yield in some of the manured experimental plots would have been higher than what is shown against them. A general result on the yield was a greater proportion of straw to grain than usual.

One advantage of experimental stations is the test they afford of the true character of the Reason's outturn, Last year the maximum outturn of wheat per acre on the farm amounted to 2>820 ft (47 bushels). This year it in no case exceeded 2,181 ft (36*3 bushels); while on 16-8 acres the average was 1,390 ft (23*16 bushels) last year against 1,309ft (21*8 bushels) this year, •this gauge of the season's yield is, I find, in accord with the estimate current amongst the zamindars.

Again, when I was out in camp, complaints were rife of the great damage done to mustard crops by blight. Returning to the farm I found that our loss from the same cause amounted to some 50 per cent.

In March a hailstorm of some severity passed over the city of Cawnpore leaving the farm comparatively untouched. Had the farm lain in its track, I should say, judging from the size of the hailstones, that the result would have necessitated the remission of a considerable portion of this *eport. Owing to the damage caused to vineyards in France by hailstorms, considerable attention kas been given to their occurrence by scientific men, and amongst others M. Arago held that by intercepting the electricity of the passing cloud and conducting it to the earth, the hail would fall J&nocuous as rain. Factory chimneys, as he showed in the case of Manchester, have an effect in ^ia way in increasing the rainfall. It will be interesting to observe, as time goes on, whether the increasing number of factory shafts in Cawnpore seem to attract rain to it. Already as I write the increased quantity that has fallen in the city, as compared with what has fallen on the farm three miles away, has been very marked.

It was noticed that after the hailstorm the grain of some of the barley lost its brightness, a&d eventually when threshed out it was classed in the bazaar as old grain, and priced lower in consequence.

2. *Operations of the season.—The* following experiments were planned :—

(1) Experiments with manure.
(2) Ditto in ploughing.
(3) Ditto in irrigation,
(4) Ditto in thin sowing.
(5) Ditto with varieties of seed.

The experiments with manures comprised—

(a) The standard series of wheat plots manured with nitrogenous and non-nitrogenous manures in duplicate.

(6) That known as the " Ville " series.

(c) Various.

The treatment of the plots of the standard series for the past four years and for the present year has been as under: —

Previous treatment.				*Treatment during the season.*			
Year.	Season.	Manure.	Crop.	Ploughing.	Seed per acre.	Irrigation.	Weeding.
1878	Kharif	Nil.	Nil				
1879	Rabi	Do.	Barley				
2879	Kharif	Do.	Cotton				
1880	Rabi	Do.	Nil				
1880	Kbarif	Do.	Maize				
1881	Rabi	Do.	Nil				
1881	Kharif	As now applied.	Maize				
1882	Rabi	Do.	Wheat				
1882	Kharif	Nil.	Nil				
1883 ...	Rabi	As now applied.	Wheat	Three ...	120 ft ...	Twice ...	Once.

The following table shows the results obtained with the various manures :—

Manure.	Amount in ft. per acre.	OUTTURN PEB ACHE.			
		Grain,		*Straw.*	
		Standard.	Duplicate.	Standard,	Duplicate,
		lb. oz.	lb. oz.	lb.	lb.
Potassic nitrate	240	1,978 8	2,181 0	3,636	3,906
Potassic nitrate ... and Bone-dust	240, 360	1,944 12	2,055 12	3,690	3,834
Farmyard manure ...	14,400	1,713 0	1,623 0	3,126	2,958
Farmyard manure and Calcic sulphate	14,400, 240	1,761 0	1,886 4	3,270	2,778
Farmyard manure and Bone-dust	14,400, 360	1,584 0	1,400 10	2,634	2,412
Farmyard manure (reduced to ashes) ...	14,400	1,383 0	1,417 8	2,412	2,436
Bone superphosphate	240	1,347 12	1,271 4	2,040	2,100
Bone-dust	360	1,032 12	1,433 4	1,704	2,424
Calcic sulphate	240	996 0	1,152 0	1,554	1,824
No manure	...	1,065 0	999 0	1,764	1,704

The high proportion of straw to grain, as compared with last year's results and to which allusion has already been made, may be traced in the first six plots.

It will be interesting to note as time goes on how far potassic nitrate alone unaided by cinereal (or mineral; manures will suffice to maintain fertility. The use of nitrous earth as a manure is freely resorted to by native cultivators in the shape of a top dressing to poppy tobacco, wheat, jetia sawan, and sometimes I believe to maize.

Mr. Warrington writes* : " As the whole object of artificial manuring is to supplement the deficiencies of the soil, it is highly desirable thfit a farmer should ascertain by trials in the field -what is the actual amount of increase which he obtains from the manure he purchases. A few carefully made experiments will teach him what his land and crops are really in need of. Should he add superphosphate with the nitrate of sodium for his wheat ? What dressing of the nitrate is most economical? Is superphosphate alone sufficient for his turnip crop, or should guano or nitrate be employed as well? What is the smallest quantity of superphosphate sufficient for the crop? Will it pay to use potassium salts for his seeds or pasture ? These and many other questions can only be answered by trials on his own fields, and on the farmer's knowledge of such facts will depend the economy with which he is able to use purchased manures."

* Chemistry of the Farm.

This extract explains in clear language what we are attempting to do at the farm, *viz.,* to arrive by degrees at some sort of estimate as to how far the wheat urops of these provinces may be benefited by the application of manures which will pay for their purchase, at the same time maintaining fertility and not simply exhausting it. Variations will be made as experience suggests. For instance, we are now able to see pretty clearly how useless the application of calcic sulphate ty itself is for a cereal crop, though the addition of it to farmyard manure appears to produce some increase in the effect of the latter, owing no doubt to its converting part of the insoluble nitrogenous humus into soluble ammonia compounds. But the plot is in no wise thrown away. Calcic sulphate has a marked and important effect in the growth of leguminous plants, and its proper place towards cereal crops is in aiding in the growth of a leguminous crop such crop to be ploughed in for wheat. Under this treatment the plot in question may take a higher place next year. So also with the superphosphate plot, it will for next year be used for a nitrous superphosphate manure experiment.

The following table shows the cost and profit of applying each manure during the season Under report. I may note that the calcic sulphate (or gypsum) was obtained very cheaply at four annas a maund, as the waste product of soda-water manufacture. Considering the unquestionable evidence from England and America as to its good effect on leguminous crops, it is worth more notice than it seems to have received hitherto from indigo growers. Large natural beds of gypsum exist in the hills both of the North-Western Provinces and of the Punjab.

Manure.	Cost per acre.	Value of produce per acre. Standard.	Value of produce per acre. Duplicate.	Average value of produce.	Profit on manured over unmanured plot.	
	Bi. a. P.	Rs. a. P.	Rs. a. P.	Rs. a. P.	Rs. a. P.	
Potassic nitrate	7 8 0	69 1 0	75 11 6	72 G 3	29 8 6	
Ditto and bone-dust... ...	12 0 0	68 5 9	71 15 10	70 2 9	22 13 0	*
farmyard manure	9 0 0	59 11 3	56 8 10	58 2 0	13 12 3	
Ditto aud calc. sulphate ...	10 0 0	61 9 9	63 0 9	62 5 3	16 15 6	
Ditto and bone-dust ...	13 8 0	54 2 7	48 3 8	51 3 1	2 5 4	
Ditto ashes only	9 0 0	47 11 7	48 12 8	48 4 1	3 14 2	
Bone superphosphate	14 8 0	45 4 4	43 6 8	44 5 6	5 8 3	Loss.
Bone-dust	4 8 0	35 4 1	49 2 10	42 3 5	2 5 8	
Calc. sulphate*	1 0 0	33 10 3	39 0 4	36 5 3	0 0 6	Loss.
Unmanured...	...	36 6 2	34 5 4	35 5 9	...	

B.—THE VILLE PLOTS.

(6) *Th* Ville plots.*—These were a repetition on the same plots of last year's work illustrates by growing crops on the land how a practical anafysis of the soil may be made. It must be admitted though that experiments of this sort run too great risk from the chances of weather to be Very largely adopted in practice and that they are more interesting than practical.

The treatment of these plots during the past four years and during the present year has been as follows :—

Year.	Previous treatment. Season.	Previous treatment. Manure.	Previous treatment. Crop.	Treatment during 1882-83. Ploughing.	Treatment during 1882-83. Seed per acre	Treatment during 1882-83. Irrigation.	Treatment during 1882-83. Weeding.
1878 to 1879 ...	Kharif ... Rabi ...	Nil.	*Nil.* Barley ...				
1879 to 1880 ...	Kharif ... Rabi ...	*Nil.* »	Cotton ... *Nil.*				
1880 to 1881 ...	Kharif ... Rabi ...	*Nil.* »	Sorgho ... *Nil.*				
1881 to 1882 ...	Kharif ... Rabi ...	Same as now applied.	Maize ... Wheat ...				
1882 to 1883 ...	Kharif ... Rabi ...	As in table...	*Nil* Wheat ...	Three ...	120 ft. ...	Twice ...	Once.

The following table gives this year's results, in considering which the qualifying effect of the January storm must be borne in mind. The effect, however, of withdrawing the nitrogen in the case of a cereal crop is still plainly enough marked :—

Number of plot.	Manures and rate per acre.	Outturn per acre.		Difference between the outturn of each plot and that of plot No. I.		Remarks.
		Grain.	Straw.	Grain.	Straw.	
		lb. oz.	lb.	lb. oz.	lb.	
I. ...	Calcic superphos, 180 lb. Ammo, cloride, 188 „ Potass sulphate 90 „ Talc, sulphate 96 „	1,726 8	2,772	...	...	The most advanced when the rain fell and therefore most injured.
II. ...	Do. less calc. superphosphate	1,771 8	3,252	45 0	480	Gain.
III. ...	Do. „ ammo, cloride ...	1,192 8	1,824	534 0	948	Loss.
IV. ...	Do. „ potass, sulphate ...	2 076 0	3,936	349 8	1,164	Gain.
V. ...	Do. „ calcic, sulphate ...	1,641 0	2,388	85 8	384	Loss.
VI. ...	No manure	1,045 8	1,428	681 0	1,344	Loss.

C—Various Manures.

Under this heading come chiefly experiments in green-soiling. Fairly large fields were taken up and divided into manured and unmanured portions, and changes were rung on hemp and on indigo refuse. Two plots will be found of cinereal manares very common and very commonly neglected, *viz.* brick kiln refuse and ashes of weeds. The following table shows the treatment of the fields during past seasons as well as in the present season :—

Number of plot.	Previous treatment.			Treatment during 1882-83.				
	Year.	Manure.	Crop.	Manure.	Ploughing with earth-turning plough.	Seed and rate per acre.	Irrigation.	Weeding.
1	1878-79 1879-80 1880-81 1881-82	Nil ... Dung ... Dung ... Nil ...	Wheat ... Ditto ... Wheat and flax Cotton ...	A portion with hemp, another left unmanured.	Four ...	Wheat 120 lb.	Twice ...	One.
2	1878-79 1879-80 1880-81 1881-82	Nil ... Guano ... Dung ... Nil ...	Maize ... Wheat ... Ditto ... Cotton ...	A portion with hemp, another with hemp and [illegible] and the remaining portion left unmanured.	Four ...	Ditto ...	Ditto ...	Ditto.
3	1878-79 1879-80 1880-81 1881-82	Same as No. 2...	Same as No. 2...	A portion with hemp, and another left unmanured..	Four ...	Ditto ...	Ditto ...	Ditto.
4	1878-79 1879-80 1880-81 1881-82	Nil ... Nil ... Nil ... Nil ...	Barley ... Linseed ... Wheat ... Wheat ...	Ditto ...	Four ...	Ditto ...	Ditto ...	Ditto.
5	1878-79 1879-80 1880-81 1881-82	Nil ... Nil ... Dung ... Nil ...	Juar ... Nil ... Wheat ... Mung and Til...	Ditto ...	Three ...	Ditto ...	Ditto ...	Ditto.
6	1878-79 1879-80 1880-81 1881-82	Nil ... Nil ... Dung and gypsum Nil ...	Juar ... Nil ... Wheat ... Wheat and gram	A portion with fresh indigo refuse and lime, another with last year's refuse and lime, a third with last year's refuse only, and the fourth unmanured.	Three ...	Ditto ...	Ditto ...	Ditto.
A.	1878-79 1879-80 1880-81 1881-82	Nil ... Nil ... Nil ... Hemp and gypsum	Barley ... Cotton ... Juar ... Wheat ...	Hemp and gypsum,	Three ...	Ditto ...	Ditto ...	Ditto.
B.	1878-79 1879-80 1880-81 1881-82	Nil ... Nil ... Indigo ploughed in Hemp ...	Barley ... Cotton ... Wheat ... Ditto ...	Hemp ...	Three ...	Ditto ...	Ditto ...	Ditto,
C.	1878-79 1879-80 1880-81 1881-82	Nil ... Nil ... Nil ... Nil ...	Barley ... Cotton ... Juar ... Wheat ...	Unmanured ...	Three ...	Ditto ...	Ditto ...	Ditto.
D.	...	Not known ...	...	Brick-kiln refuse...	Three ...	Ditto ...	Ditto ...	Ditto.
S.	...	Ditto ...	...	Ashes of weeds ...	Three ...	Ditto ...	Ditto ...	Ditto.

The following table shows the result obtained :—

Number of fields.	Particulars of manure applied during the year.	Area in square yards.	Actual outturn. Grain.		Actual outturn. Straw.		Outturn per acre. Grain.	Outturn per acre. Straw.
			It	oz.	It).	OZ.	ft.	m.
1	Hemp ploughed in ...	4,400	1,743	9	3,993	12	1,917*9	4,3931
1	•No manure	4,010	1,515	5	2,630	4	1,828 9	3,174-6
2	Hemp and gypsum	851	325	9	466	12	1,851*6	2.654*6
2	iJemp	1,759	640	14	1,064	12	1,763-4	2,929*7
2	No manure	2,387	630	1	1,116	15	1,277-4	2,264-7
3	Hemp	2,415	838	15	1.402	4	1.679-2	2,310-3
3	No manure	2,496	520	6	823	8	J,009*0	1,596-8
4	Hemp	3,654	915	1	1,957	0	1,212 0	2,592-1
4	No manure	3,375	565	6	1,204	0	810 7	1,726 6
5	Hemp	2,581	943	4	1,854	12	1,766-8	8,478-1
5	No manure ...	2,073	514	7	788	0	1,198*2	1,835*3
A.	Hemp and gypsum ...	400	153	10	310	5	1,858 8	3,754 8
B.	Hemp	400	113	8	183	7	1,373 3	2 219-6
C.	No manure ...	400	88	0	145	13	1,064 8	1,764-3
D.	Brick-kiln refuse	400	124	15	217	11	1,511-7	2,634-0
E.	Ashes of weeds	400	112	11	200	14	1,363-5	2,430 6
6	Fresh indigo refuse and lime	1,661	554	4	1,019	0	1,615 0	2,969*2
6	Last year's indigo refuse and lime	797	194	10	285	0	1,181 9	1,730-7
6	Last year's indigo refuse	785	182	11	301	5	1.126 3	1,857 7
6	No manure M· ...	1,532	240	5	308	8	759-2	974-6

Green-soiling with hemp* appears to be so cheap and so effective that there mast be some good reason for its not being more systematically adopted. It is very commonly practised in some Parts of Oudh, particularly near the city of Lucknow, but the cultivators tell me that they only P^otise it occasionally when the land is out of heart and when they cannot afford to purchase Poudrette. It is only used by them for cereal crops and the objection against perennial use of it is Q°t quite clear. Possibly the land after a time lapses into a condition analogous to that of clover ^ckness, and it is worth while putting this to the proof.

The cost is very trifling and is no more than the cost of seed, of sowing it broadcast and of Pulling the plants and laying them in furrow, the ploughiug would come in any case. The Oudh cultivator is still more economical in levelling the plants with a heavy log dragged across the fields by bullocks and then ploughing in the levelled plants. Per acre the cost is -

	Rs.	a.	p.
Seed 30 seers at Be. 1-4-0 per maund ...	0	15	0
Sowing ...	0	1	0
Cutting and laying in furrow ...	1	8	0
Total ...	2	8	0

In the case of indigo refuse the cost is necessarily regulated by the distance of the vats from the fields, and the material is bulky.

Natives have, I believe, a prejudice against using the refuse during the season immediately following indigo manufacture, on the score of its being too heating, and only use it in the following J©ar. Their idea of heating is quite correct, for left in heaps a strong fermentation is developed with great heat leading to great loss of ammonia, and the refuse (or *sit)* left contains nitrogen in Very insoluble form. In the indigo districts of Bengal I understand the prejudice against fresh has long disappeared from the European factories, and when carted out fresh and buried into arPows *sit* is considered a good dressing for three years or so. The addition of caustic lime with view to assisting decomposition forming soluble ammonia compounds, correcting the acidity of the organic acids and in freeing ammonia to be oxidised in the soil and to form nitrates for the *e of a cereal crop, seems advisable, and is supported by the figures in the table given. There °uld of course have been a plot manured with fresh refuse without lime for a fair comparison, * unfortunately it was overlooked. That lime should have had little effect on old refuse was no more than was expected.

• The "hemp" referred to is *sanai* (crotalaria juncea).

The following table shows pecuniary results :—

Number of fields.	Manure and rate per acre.	Cost of manure per acre.	Value of produce per acre. Grain.	Straw.	Total.	Net increase over the unman ured.
		Rs. a. p.	3s. a. p.	Rs. a. p.	Rs. a. p.	Rs. a p*
1	Hemp	2 8 0	52 10 0	17 13 8	70 7 8	4 14 5
1	No manure	...	50 2 11	12 14 4	63 1 3	...
2	Hemp and gypsum 160 lb	3 2 0	50 12 8	10 12 7	61 9 3	14 3 7
2	Hemp	2 8 0	48 6 1	11 14 6	60 4 7	13 8 7
2	No manure	...	35 0 9	9 3 3	44 4 0	...
3	Hemp ... ... M«	2 8 0	46 1 2	11 6 9	57 7 11	20 13 S
3	No manure	...	27 10 11	6 7 9	34 2 8	...
4	Hemp	2 8 0	33 4 1	10 8 10	43 12 11	12 0 3
4	No manure	...	22 4 5	7 0 3	29 4 8	...
5	Hemp	2 8 0	48 8 4	14 2 2	62 10 6	19 13 4
5	No manure ... — ...	...	32 13 10	7 7 4	40 5 2	...
A	Hemp and gypsum 240 lb	3 8 0	51 0 3	11 3 3	62 3 6	22 5 4
B	Hemp	2 8 0	37 10 9	9 0 4	46 11 1	7 12 11
C	No manure	...	29 3 6	7 2 8	36 6 2	...
6	Fresh indigo refuse* 120 maunds and lime 6 maunds.	6 0 0	44 5 4	12 1 1	56 6 5	25 9 10
6	Last year's refuse and lime 6 maunds ...	7 3 3	32 6 1	7 0 6	39 6 7	7 6 9
6	Last year's refuse	6 0 0	30 14 4	7 8 9	38 7 1	7 10 6
6	No manure	...	20 13 3	3 15 4	24 12 7	...

3. *Deep and shallow ploughing.*—A new field was selected this season and was divided into four sections by wide paths. The sections were treated as follows : —

First—Ploughed to a depth of nine inches, once in the rains and onoe at time of sowing.

Second—Ploughed to a depth of five inches, once in the rains and once at the time of sowing-

Third and fourth— Ploughed with the ordinary native plough, twice in the rains and twice at the time of sowing.

Last year plots I. and II. were ploughed to the depth of five inches, but plots III. and IV. were ploughed in the usual manner with the native plough.

Wheat was sown broadcast in all the plots.

The results are shown in the following table :—

No. of plot.	Area in square yards.	Actual outturn. Grain.	Straw.	Outturn per acre. Grain.	Straw.
I. ...	373	79 14	131	1,036-4	1,699
II. ...	293	46 15	73	775-3	1,206
III. ...	373	45 6	71	588*7	921
IV. ...	355	42 14	69	584*5	940

The plots were admittedly smaller than is desirable, but it is difficult to find space on the farm which has not been cultivated with an improved plough. In explanation of the generally low yield, it may be explained that the field had been heavily cropped for the past two years, and that no manure was used. Deep ploughing it may be remarked has never been advocated sA the farm as beneficial regardless of the nature of the sub-soil, but only when a depth of good soil warrants its application.

4. *Irrigation.*—Six plots each i-tji of an acre are set out along the canal bank and arranged with a view to the value of more waterings than one being tested. The storm in January interfered too much to render the results of great value; the outturn was in all cases necessarily very low as no manure was used, and the ground had been purposely exhausted for three years previously by double cropping without manure. The diminished outturn is indeed instructive as to what can be done in the way of robbing land of its fertility.

		Rs. a. p.
* Cost per 100 maunds of fresh refuse	... ...	4 0 0
Ditto old ditto	... ...	5 0 0

No. of Field.	No. of waterings.	Outturn per acre.			Increase per acre on each watering over the unwatered plot.			
		Grain.		Straw.	Grain.		Straw.	
		lb.	oz.	lb.	lb.	oz.	lb.	
I.	Nil	330	0	585	...			
II.	One	412	8	666	82	8	81	
III.	Two	481	8	801	151	8	216	
IV.	Three	651	8	1,050	321	8	465	
V. and VI.	Four	698	4	1,312	368	4	727	

The result, so far as it goes, is to show a much greater proportionate increase in the third Catering than in the rest, but still an increase on each. Whether the increase on waterings over tnree covers the cost, will always depend on the extent to which the crop has been manured. Whether manured or not, the cost of irrigation would be the same, and with fields so depleted of fertility as these, all that can be done is to demonstrate the ratio of increase. Cost cannot be fairly brought into comparison.

Another series tried was well *versus* canal irrigation.

Three plots of 1/12 of an acre eaoh and lying in a row were taken. The two outer plots are each close to tanks of equal capacity, one of which can be filled from the canal and the other from a well. The centre plot was unirrigated and the outer plots were irrigated with measured quantities from their respective reservoirs.

The yield from the unirrigated plot was practically nil. The results from the other plots may be gathered from the following table :—

System of irrigation.	Outturn per acre.			Value of produce per acre.								
	Grain.		Straw.	Grain.			Straw.			Total.		
	lb.	oz.	lb.	Rs.	a.	p.	Rs.	a.	p.	Rs.	a.	p.
Well	1,380	12	2,118	37	14	2	8	9	9	46	7	11
Canal	1,227	0	2,293	33	10	8	9	5	5	43	0	1

Here the well irrigation shows to small advantage over the canal as regards fertility, but when the question of cost is imported into the comparison, canal irrigation has the best of it. On the farm the calculation is—

For lift-irrigation from the canal (one lift) including labour, three waterings, canal dues, cost of baskets, &c, per acre=5-9-0.

For well-irrigation from a depth of 30 feet and giving three waterings, per acre= 9-3-0.

And to this latter calculation must be added some unknown quantity, as interest on capital sunk in well and on bullocks, a charge which is included in canal dues.

5. *Thin sowing.*—A field of fair size was divided into four parts—

(1) was sown in the ordinary way in every furrow,

(2) was sown in every second farrow,

(3) was sown in every third furrow,

(4) the seed was dibbled in by hand a foot apart each way.

The treatment of the field during the past four years and during the present year was as under—

Previous treatment.			Treatment during the season under report.					
Year.	Manure.	Crop.	No. of plot.	Manure.	Amount of seed per acre.	Ploughing.	Irrigation.	Weeding.
					lb			
...	*Nil.*	Sorghum ...	1	Green-Boiled with hemp.	103	Three ...	Two ...	One.
1879-80 ...	Guano.	Wheat ...	2	Ditto ...	41	Ditto ...	Ditto ...	Ditto.
...	*Nil.*	Ditto ...	3	Ditto ...	21	Ditto ...	Ditto ...	Ditto.
...	*Nil.*	Flax ...	4	Ditto ...	18	Ditto ...	Ditto ...	Ditto.

The following table shows the area and outturn of each plot—

Number of plot.	Area in square yards.	*Actual outturn.* Grain.	*Actual outturn.* Straw*	*Outturn per acre* Grain	*Outturn per acre* Straw.	*Decrease.* Grain.	*Decrease.* Straw.
		lb. oz.	lb	lb.	lb.	lb.	[illegible]
1 Every furrow ...	1,144	377 2	713 0	1,595-5	3,016-5	[illegible]	[illegible]
2 Every 2nd do. ...	1,122	293 15	58 JO	1267 9	2,506 2	327-6	[illegible]
3 Kvery 3rd do. ...	1,156	323 12	612 0	1,355-4	2,562 3	240 1	454-2
4 Dibbled in by hand	1,173	214 5	366 0	884-2	1,510 1	711-3	1,506-4

These experiments, conductedon a larger scale than the similar series of last year, give rather different results. From close personal observation of the plots the only- conclusion I can draw is, that for improving seed selected grain should be sown, dibbled in on well-manured plots of known even fertility throughout, and the crop reserved for sowing in the ordinary way in the following year, and that sowing in the ordinary way has an advantage in the suppression of weeds, which is very important, seeing that the introduction of the seeds of these weeds, some of which are no doubt bitter, might very materially damage the character of a consignment for milling purposes. I noticed in our thinly-sown crops this year an abundant growth of a diminutive bind-weed which only appeared when the stalks were high and strong enough to afford it support, and it was then impossible to weed it out.

6. *Neio varieties of seed—Oats.*— Cape oats and three varieties of English oats, all from acclimatised seed, were sown on parallel plots marked out on a field which had been green-soiled with hemp, and were irrigated three times. The English varieties were so late in ripening that it was hopeless to expect much of a crop. The greater part of the crop was accordingly cut while still green and ensilaged.

The Cape oats, of which we were able to make so favourable a report last year, did still better this year, and the whole of the seed of this and of other plots has been distributed without our being able to satisfy all the indents received. The produce on the experimental plot measuring 1,386 square yards was equivalent to 2,026 ft of grain and 3,303 ft of straw per acre.

Barley.—A field green-soiled with hemp was sown with parallel plots of country barley three English varieties (acclimatised seed) and Kotgarh naked or *rasuli* barley.

The area and outturn of the several plots is shown below :—

Variety.	Area in square yards.	Actual outturn. Grain.	Actual outturn. Straw.	Outturn per acre. Grain.	Outturn per acre. Straw.
	lb.	lb. oz.	lb. oz.	lb.	lb.
Golden (English)	377	97 4	209 0	1.248	2,683
Beardless (English)	406	74 1	237 0	883	2,825
Peerless (English)	394	90 9	227 0	1,112	2,788
Rasuli	286	66 4	145 8	],121	2,462
Country	829	345 10	417 8	2,018	2,437

The country barley outdid its competitors, but it may be that the acclimatised English varieties, which did much better this year than last, may improve as time goes on.

As regards the *tasuli* barley, which has long been grown in Oudh as a curiosity, it so plosely resembles wheat, that our farm sample passed inspection with skilled valuers in the Cawnporo market as true wheat. This supplies the strongest argument against promotion of its cultivation, as it might, if it could be grown so profitably as has been lately asserted, be used for adulteration to the detriment of the Indian wheat trade.

What.—In afield green-soiled with hemp the ordinary farm seed (Muzaffarnagar white wheat) was tried against two English varieties (acclimatised). One of these latter was so hopelessly backward, that it was deemed best to consign it to the silo and the other was a case of mucli straw and little grain.

The following table gives results—

Variety.	Area in square yards.	Actual outturn.		Outturn per acre.	
		Grain.	Straw.	Grain.	Straw.
		ft. oz.	'ft.	ft.	ft.
Jough ch iff (English)	173	16 14	86	472	2,405
* arm wheat	328	110 0	148	1,623	2,i 83

Gram.—The three varieties tried last year, white, black, and red or ordinary country gram, were again tried this year, with the results tabulated below. The field had received no manure for two seasons but had lain fallow during the past kharif. The plants were somewhat touched ty frost, and though gram is not ordinarily irrigated, it was found advisable to give the fields two "Waterings :—

Variety.	Area in square yards.	Actual outturn.		OxUturn t>er acre.	
		Grain.	Straw.	Grain.	Straw,
		Ib. oz.	ft oz.	ft.	Ib.
^hite	233	31 12	33 8	6595	695 S
B1*ck	813	82 12	86 8	492*6	514-9 '
	618	123 0	133 0	963 3	1080-7

The grain in all three varieties was very fine, but the red variety would appear to be that best suited to the Dn&b.

Linseed.—Two sets of experiments were carried out—(1) for fibre as a paper-making material, (2) to test the oil-yielding properties of two varieties.

Land was selected which had lain fallow daring the kharif and had been unmanured for two years. Contiguous plots were sown (for fibre) thickly with Riga (acclimatised) and country linseed Respectively. The Riga seed germinated very unevenly, and although on an average the Kiga crop stood 24 inches against 15 inches in the country variety, the stems of the former were less bulky *&d the yield in consequence much lighter.

As soon as the crops commenced to flower, strips were cut from each plot and the produce was sent to the Lucknow paper mills for trial. Similar strips were cut at later stages and despatched, and finally from the last strips the stems were sent after the ripe seed had been extracted.

Of course had the stems been steeped and scutched at the farm and the flax alone been sent, it would have been easy enough to make paper from it; but the object in view was to test a statement that has been widely published, to the effect that the paper maker will take the stems without previous preparation, and forthwith reduce them to his purposes.

So far this has failed in proof, the insolubility of the lignose or " boon" proving a not ^expected difficulty.

(2) The varieties tested for oil were the ordinary blue-flowered and brown-seeded linseed of the Du&b and a variety of white linseed from Jalaun, the flower of which is also white. The area and outturn of the plots sown is shown below:—

Variety.	Area in square yards.	Outturn of seed.	
		Actual.	Per acre.
		Ib. oz.	Ib.
5K*	1,211	79 14	319
*	1,858	129 0	336

Frost struck both plots when in flower, thus both lessening the yield considerably and rendering a comparison of yield as to seed impracticable.

Eight pounds were taken of each and were put into a native oil press with the usual proportion of water and with the following result :—

Number of trial.	Variety.	Weight of seed.	Weight of water added.	Weight of oil.	Weight of oil-cake.
		ft.	lb.	It).	lb.
1	White	8	1*	2-75	4-5
2	Ditto	8	1*	2-87	4-19
3	Farm red	8	1*	2-5	5 19
4	Red purchased in bazaar	8	H	2 37	5-37

It was not only in quantity that the oil from the white variety excelled, but in quality also, being much brighter and of finer colour. In the bazaar the "white" oil was valued as 15 per cent, better than the " red ;" a better test of course would be extraction with ether, but I have not yet had leisure for carrying it out.

7. *Nankin Cotton.—As* noted in the kharff report, a further picking of 41*2 ft. was obtained in April and May, giving a total of 144 lb. clean cotton to the acre. The plants have been ratooned and seem very vigorous. A larger extent of ground has been prepared against next year.

8. In the rabi report for last year it was noted how white ants had spoilt some of the experiments by attacking the farmyard manure. White ants on unoccupied ground seem to perform a service for agriculture similar to that performed by the earthworm in England. At the same time they are often a pest, especially to sugarcane growers, and have put a stop to sugarcane growing in some parganas. I may mention therefore a remedy which Mr. Ridley of the Lucknow gardens has put to test. Kerosine oil will not of itself mix with water, but if first shaken up with milk it will amalgamate with that, and can be then diluted with water to any desired extent, a little of it going a long way and proving a very effective insecticide. Mr. Ridley found a mixture of two parts of oil to one of sour milk " churned" together to mix completely. Diluted to *the* extent of one wineglass to four gallons of water, it was in no wise injurious to plants or grass.

9. *Ensilage*—Tn the report on the kharif harvest, I gave details of the attempt that had been made to gain some experience on the subject applicable to India. The farm silos were packed in September, following some rather ancient directions taken from the " American Agriculturist," which were all that I dould, on taking charge, find available. On the 18th October a letter appeared in the *Times* newspaper from Professor Thorold Rogers on the advantages, of ensilage, and from that period may be said to date the great interest taken in the subject in England. The first hand-book published in England was one by Mr. Rogers in December last, which was followed in February and March by pamphlets issued by Mr. T. Christy, and by the *H\eld* office respectively. These pamphlets have added a good deal to what was previously known on the subject, but still leave points for settlement as regards India, which can only be set at rest by practical experiments. It may be again mentioned that the farm silos were damaged by very heavy rain in January, under circumstances which it was impossible to foresee or to guard against, save by an expenditure which would, with all previous experience of the force of our Duab winter rains, have been unwarrantable. After removing that portion which the rain had damaged, the remainder of the fodder in one of the silos was again covered over until the 2nd May. On reopening the pit, it was found that the fodder was not so good as when seen in January, having somewhat advanced in fermentation. Still it was readily and almost greedily eaten by the farm cattle. Noticeable differences were that the odour had changed from that of vinous fermentation to that of spenttan ; the fodder had darkened in colour, and in the place of being quite dry was, towards the bottom, reeking with sap liquor. The liquor was absorbed by a quantity of *bhusa* being thrown on it, and the cattle ate the latter just as readily as they had eaten the fodder. In March a quantity of green oats and corn was cut and ensilaged, but instead of being reduced by the chaff cutter to small pieces, an inch or so in length, the plan was tried (said to have been proved successful by some American experimentalists) of putting in the grass whole, and of heavily weighting the mass by baskets of stone and earth on a platform of planks and using *no* airtight covering. This silo was also opened in May, after lying for two months ; but although the cattle ate the fodder, it was not, in appearance and odour, suggestive of success. True, I have subsequently seen it asserted that no silo should be opened until three months have elapsed, but

I doubt whether fodder can be ensilaged whole with success unless very green and soft, and think that it should be cut small whenever practicable.

A small quantity of lucerne (6£ maunds) was chopped, mide airtight with a covering of earth, and weighted as well, for two moaths. On uncovering it the olour of ammonia was quite overpowering, but soon passed off. In Mr. Christy's pamphlet is mentioued the fact that a sample of ensilaged clover from France was pronounced at an English Custom House to be fine American tobacco, which exactly describes the appearance of this lucerne. Only one animal could be educed to eat it, and he a Cabul donkey.

For the benefit of any who may purpose experimenting this season, ani who may not have seen the pamphlets already alluded to, I may note a few points.

Salt is not now considered necessary.

Cut straw has been mixed with the fodder to absorb moisture, but whether this is an advantage or not is still undetermined.

In opening a large silo the air near the opening should be tested in the usual way, with a light, for carbonic acid.

Packing about two feet in depth daily is considered better than a rapid filling. The importance of compacting the fodder is strongly enforced.

One experimenter mentions " rubber blankets, tarpanliaes, canvas or coarse cloth painted with boiled oil" as excellent for excluding air, while another uses a covering of six inches of straw before laying on weights on a plank platform.

Opinions as to the weight sufficient vary from 100 ft to 300 ft per square foot.

At the farm where *bhusa* is plentiful, it is proposed this year to sprinkle it plentifully as packing proceeds, and to cover the whole with bhusa a foot deep or so after weighing the fodder well until all air has been pressed out. Bhusa forms a good airtight covering and will at the same time all come in with the ensilage as fodder.

A chaffcutter appears to be a necessity, and hitherto such implements have been rather expensive; but a cheap form has recently been introduced in England, of which a trial will be made.

10. *Agricultural Implements.*—Further experience with the winnowers has determined me in removing the riddle frame and its belongings from the machine, and in concentrating the whole power on the blast. But without cogs 1 feel some doubt as to being able to multiply power in a way that shall rival in lasting effect that of an English winnower. When the wind fails in April and May it is singular how strong the desire for a winnower is; but with the rising gale the cultivator thinks ruefully of his money and votes the winnower an expensive toy.

The new plugs adopted for the pumps having in practice revealed defects, have been further modified and the following results have after continuous trials been obtained :—

Height of lift.	Description of lift.	Labour required.	Average quantity of water lifted per hour.	Useful work performed per minute in foot lbs.	Efficiency of the implement assuming the standard work of a man=2,700* ft. lbs. and of a bullock a 12,000 ft. lbs.
Feet.			Cubic feet.		
[illegible]	Chain pump* ...	4 men	1,600	8,320	•77
10	Swing basket	4 men	464 7	2,416	·22
15	Chain pump	4 men ...	535	5,564	•51
	Ditto ...	4 men —	315	4,914	·45
20	Dhenkli	1 man ...	62	967	•36
	Chain pump	4 men	272	5,657	•52
25	Single mote and inclined bullock-run	2 bullocks and 2 men ...	2157	4,486	•15
	Chain pump ...	4 men	197	5,122	•47
50	Single mote and inclined bullock-run*	2 bullocks and 2 men ...	219 9	5,717	•19
	Chain pump ...	4 men	125	3,900	•36
	Single mote and inclined bullock-run	2 bullocks and 2 men ...	192 3	6,000	•20

* Taken from Raukine's treatise on steam engine. The labour on this lift was not so continuous as that on the other lifts owing to the rapidity with which the tank was filled. The figures given therefore are probably too high, and further trials will be made on a different system of measuring.

Ploughs.—A valid objection to the improved ploughs which have up to date been introduced in these provinces has been their inability to supersede the ordinary native plough for sowing purposes. Ordinary cultivators cannot afford at present, prices to purchase an improved plough and maintain it in addition to the native one necessary for sowing purposes.

Following up a suggestion from the Commissioner of Agriçulture for the Panjab, a new form of plough has lately been devised in the farm workshop which promises well.

Taking the form of plough most commonly used all over the provinces in which the sole is moveabie, and is for use fixed in by a wedge a second sole is supplied which can be attached at will, and can be made up for two rupees. On this extra sole is a fixed iron breast, and by its use a clean furrough of five to six inches in depth is obtained, and the soil completely inverted. Several of the new pattern have been made up, and will be distributed for trial during the coming kharif season.

Hand threshing machine.—One was forwarded during the half-year from Messrs. Mayfarth and Company, Frankfort. In principle of action it resembles our large American thresher, and has like it the disadvantage in the eyes of the native of rejecting about 60 per cent, of the straw whole instead of reducing it to " bhusa."

'The cost of the thresher in Germany was £ 6 and by the time it was set up at Cawnpore it had cost Rs. 128-9-0.

The following table gives the results of machine-threshing by hand and in the native fashion by treading out under cattle. In the case of the thresher the straw was reduced to bhusa by » hand-worked chaffontter, the cost of which was originally Rs. 71.

Manner of threshing.	Labour required.	*Average amount threshed ptr day in maunds of* 82115. Grain.	Straw	Cost of threshing per mauud of wheat.	Cost of cutting *W* chaff per maund of grain.
				Rs. a. p.	Ks. a. p.
Hand thresher	5 Men	19*1	30	0 0 6*3	0 0 72
By bullocks ... ,.. ...	3 Bullocks 1 Man 1 Woman	225	375	0 2 9-3	

With an area, then, of (say) 15 acres yielding 240 maunds, the work of threshing and of reducing the straw to chaff would take 12*5 days at a cost of Us. 16"89. To this must be added Es. 24 as interest on the capital sunk in the two machines, giving a total of Rs. 40*89. Using cattle, the work would take 107 days at a cost of Rs. 41*5. It is true that some of the bullocks must always be kept for ploughing or for work at the well, but it may be questioned whether in the place of treading out corn the bullocks might not be more economically employed in raising water for the irrigation of a crop of green forage against the hot weather.

Another advantage in favor of the hand-thresher is the saving effected in the winnowing. The grain requires very little winnowing after leaving the machine, and is free from the earthy and manurial contaminations which are now laid to the charge of Indian wheat. The thresher *is* very strongly made and is well adapted to rough work. It was shown at the Khairabad and Bahraich agricultural shows, exciting everywhere most lively interest. The chaffcutter is always useful on the farm for cutting up winter fodder, and is likely to be more in demand if ensilage comes more into vogue. As already mentioned a new and cheaper form of chaffcutter has beeo ordered for trial.

Possibly with the development of the wheat trade, the advantage of getting clean wheat quickly into the market will dawn on the bucolic mind.

Sugar evaporator.—This machine, the credit of ordering which from America is due *t°* Mr. Fuller, arrived too lato for trial with either sorgho or sugarcane at the farm, nor as a matter of fact could I have seen to it properly at tho time, being away on other duties*

At my request Mr. E. Macalister of Messrs. Carew and Co., Ld., very kindly undertook trials, the results of which are shown below:

Description of apparatus.	Juice boiled in 12 hours. Gallons.	Juice boiled in 12 hours. Maunds and seers.	Amount of rab.	Labour required.	Fuel.	Cost. Labour.	Cost. Fuel.	Cost. Total.	Cost per maund of rab.
			M. a. c.		M. c.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Evaporator	177*	23 11	4 1 0	2 men and 1 boy.	11 4	0 7 0	2 12 6	3 3 6	0 11 [illegible]
Karahi (one flat shallow pan)...	55	7 9	1 11 4	1 man and 1 boy.	5 19	0 4 0	1 6 0	1 10 0	1 [illegible] [illegible]
Bel C5 pairs	83	10 36	1 39 0	1 man and 1 boy.	7 32	0 4 0	1 15 3	2 3 3	1 1 [illegible]

Mr. Macalister adds the following notes :—

" The rab produced from Cook's evaporator was all of best quality, light in colour, grainy, and with a minimum of molasses. The ease with which the natives worked, unassisted, and the uniform good quality of the outturn, are much in its favor."

From Rosa the machine was sent to the Qola Gokur Nath fair held in the Kheri district, on the 9th April and following days, in the heart of a good sugar-producing tract. Most of the country cane had been cut, and what was left was so acid and dry as to be no longer workable for sugar with the ordinary native apparatus.

In the evaporator, however, which was worked continuously through the fair as fast as six tola mills working simultaneously could supply it with juice, *r&h* of first quality was turned out to the manifest astonishment of the zamindars and cultivators, who constantly crowded round to watch, and who now and again roundly accused our men of using masalah. Pandit Ajudhia Pershad offered to take four for his own estate alone, if they could be produced at Rs. 100 each.

From Gola it wai sent to the Fyzabad agricultural show on April 17th, which I was unable to attend. Major Barrow, Officiating Deputy Commissioner*, writes as follows :—

" It worked very well indeed, and was highly approved. The rab that was made was eagerly bought up at ten seers per rupee, whereas other rab was selling at twelve and fourteen seers. The cleanness of the rab attracted most attention; some critics said the rib was *"pkika "* less sweet than ordinary rab (possibly owing to the inferior cane left at so late a period of the season). I heard no other adverse criticism. The machine itself was much admired, aud I could have sold four had they been available."

The evaporator is made of sheet metal, galvanized iron or copper, ours being of galvanized iron. At intervals of about 6 inches ledges run across the bottom of tha pan (which is oblong and ...v and the alternate ends of the ledges being open, there is a continuous channel from one end of the Pan to the other. These ledges are in the case of Cook's pan (the one imported) hollow and open at the bottom, which gives much more heating surface. The sides of the pan extend beyond the ^re tiao of the furnace, so as to give a cooling surface for the collection of scum.

For portability it is constructed with a light iron furnace on rockers to admit of the pan being placed at any desired slope.

The cane juice is allowed to trickle in at the upper pan, and winding down round the ledges is clarified, defecated and evaporated in its course, arriving at the outlet in the state of consistency required. ^ Wilfully managed the operation is almost continuous. The method of working it is soon learnt, and where economy is an object, a clay fQrnace, which answers well, can be rigged out to take the place of the iron portable furnace.

The cost of this evaporator amounted to Rs. 330-15-0, a similar apparatus made up in this country should not cost more than ^ ioo; or of the pau aloue Rs. 60 or so. Measures aio being takea for manufacture.

11. During the past year samples of farm produce and of improved implements were sent to the agricultural shows at Bijnor, Sah&ranpur, Aligarh, JBulandshahr, Meerut, Gola Gokurn, Khairabad, Fyzabad and Bahraich, and in each case medals, certificates, or prizes, were obtained in fair competition.

12. The correspondence of the year has been somewhat varied, extending to stations in every province of India as well as to some in native States.

13. Luchman Parshad Barmah has held the post of Superintendent and has zealously carried out the work with great intelligence and conscientiousness.

D. G. PITCHER, MAJOR,

*Asst. Director for Oudh, in charge Exp. Farm, Cawnpore**

OEDERS OF GOVERNMENT.

No. 2209 OP 1883.

FROM

THE OFFG. SECRETARY TO GOVERNMENT,

N.-W. PROVINCES AND OODH,

To

THE OFFG. DIR. OF AGRICULTURE AND COMMERCE,

N.-W. PROVINCES AND OUDH.

Bated Camp Lucknow, 19th October, 1883.

SIR,

I AM directed to acknowledge the receipt of your letter No. 1274A., dated the 14th September, 1883, with which you submit your report on the operations of the Cawnpore Experimental Farm during the rabi season of 1882-83.

2. The management of the farm appears to have been satisfactory, and the results of the operations of the half-year are clearly set forth in the report. I am to suggest that special attention be given to the best methods of cultivating wheat, and the best varieties to be sown, as the development of the Indian wheat trade with Europe has become a matter of the greatest importance to the country.

I have the honor to be,

SIR,

Your most obedient servant,

J. R. REID,

Offg. Secretary to Government,
N.-W. Provinces and Oudh.

EEPOET

ON THE

CAWNPORE EXPERIMENTAL FARM;

FOR THE KHARIP SEASON, 1883.

ALLAHABAD:
NORTH-WESTERN PROVIDES AKD OUDH GOVKBMMENT PRESS.
* 18 8 4.

No. 540 OF 1884.

FROM

THE DIRECTOR, DEPT. OF AGRI. AND COMMERCE,
NOKIH-WUSTERN PIIOVINCES AND OUDH,

To

THB SECRETARY TO GOVERNMENT,
NOUTH-WBSTBRN PHOVINCBS AND OUDH,
GBNBRAL AND REVENUE DEPARTMENT,
NAINI TAL.

Dated Cawnporc, the 844 April, 1884.

SIR,

I have *. honor to »taii M.iorrUcl,.r', report ,,,, the H-* hr-» - *e Cawnpore Farm for 1883. It has been delayed owing to the unusual amount of work which was pnt upon that officer by the Calcutta Exhibition.

1 Th, ™» ... both «* -* BJ***4. •* «-•— » °» ttara " " " consequence fess than that of last year.

3. Being convinced of the futility of applying non-nitrogenoas enures by themselves to the soil of the farm, Major Pitcher has mad, a change m the ^ ^ ^ the experi-cental plots, adding saltpetre to the plot that was formerly manured phate only, *»d. b J H « B to those which used to be manured with bone-dust and gypsum. The comparison * now be with nitrogenous . « _ ™ * ^ the same manures reinforced with gypsum, bone-dust, or superphosphate. Tnongh it is muoli too «riyto torn a definite opinion, the follow-ing table would seem to indicate lhat as yet there » no reason to b.li^e th at the addition ^Kenous manures makes any addition to the we** of the gnun, or a any rate any a ddition comparable wilh the increased cost. For each year the mean yveld in gram of bo* the dap. * w given:-

	1883.	1883.
Nitrogenous.		
Cow-dung alone	2,095	1,316
Saltpetre alone	1p734	940
Nitrogenous m combination.		
Saltpetre and bone-dust	1,626	1,519
Saltpetre and bone tuper phosphate		1,216
Cow-dung and calcic sulphate	1,731	1,312
Cow-dung aud bone dust	2,140	1,549
Sheep-dung and bone-dust	...	1,353
Shcep-duog and calcic sulphate	...	1,413

. 4. The very low yield obtained this year from saltpetre alone is not explained, and as a ^ein8tanceiti8notofmuchvalae• ^ - . - ^ ^ ^ ^ave a la per outturn alone than , 4 combined with S ^ Combined Witb bone dU9t> a la rha^en obtained from any manure whatever in ^cic sulphate, and a much larger outturn than has been ooiaiue the harvest now reported.

5. ; ,. ploughing for cotton conHrm those for last year, and show The results from deep and shaUow^ might have been ejected, that the advantage , though not perhaps to the extej^ that ^ ^ ^ ^ & ^ rf ^ of a moderately deep ploughing is even greate»j« a ,, H dr oar like proportions of the yield —»7 ramfall. Taking 100 as the yield from two snaiiow p oun m ,, , i to that obtained by one ploughing at different depths have been as follows:-

	Year.	Shallow.	6 inch.	9 inch.
Farm	1882	100	114·8	107·6
	1883	100	116·1	116·9
Common cultivator	1884	100	110·3	112·6

*6. It was found last year that sowing cotton in drills gave an increase of 39 per cent, in cotton and 30 per cent in seed over the ordinary method of sowing broadcast. This year the further experiment has been tried of sowing on ridges 3 feet apart. The following are the results, the produce being given in pounds :—

Cotton.		Ridges.	Line.	Broadcast*
Nankin	Cotton ...	120	100	56
	Seed ...	347	301	157
New Orleans	Cotton ...	94	87	86
	Seed „	213	209	207
Country	Cotton ...	66	54	81
	Seed ...	167	145	227

It must be admitted that no safe conclusion can be drawn from these figures, and that the teachings of the plots on which ratooned and new-sown crops have been compared are almost equally indecisive. The largest yield, which was at the rate of 188·3ft. of cleaned cotton to the acre, was obtained from selected acclimatized New Orleans seed sown on ridges.

7. The manufacture of sorghum sugar was attempted for the first time and without success in 1881. In 1882 a small quantity of *gur* was made, and at the last harvest very considerable quantities both of *gur* and *rab* were produced without difficulty. It has now, in fact, been established beyond a doubt that this crop can be grown for sugar with the prospect of a fair profit. It remains to be seen whether it is likely to compete with sugarcane proper in ordinary cultivation. Its advantages are very great, and though the net profit, as calculated in the farm books, does not equal that of sugar cultivation, it is probably as great as that of many other crops which like it do not require the labour, skill, and long use of the soil demanded by sugarcane. As it comes into the market at least a month earlier than sugarcane *gur,* it for that time commands a fancy price like what is paid for winter strawberries, and the first lOQft. sold by the farm realized at the rate of Rs. 6-10-8 per maund in the Oawnpore market. Altogether nearly 20 maunds of *gur* or *rab* were manufactured.

8. In the ensilage experiments the most important result, which agrees with some obtained by Major-General Sir Herbert Maopherson at Allahabad, was the success of pits without any interior coating whatever to protect the fodder from damp or white ants. The question of cost will be taken up in the report on the present *rabi;* but there appears to be no reason why, if plain earthen pits without any masonry lining will serve the purpose, this method of storing fodder should not come into universal use.

9. Some slight improvements have been made in the Kaisar plough, which has, as usual, been very successful at all the local agricultural shows, and further attention has been paid to the pumps, winnowers, and cotton-gins; but the most important introduction in the line of agricultural implements is a sugar evaporator imported from America. This appears to promise a very great saving, both in the original cost and in the expense of manufacturing *rab,* on the existing systepi of iron pans, and it is not unlikely to have as good a future as the Behea mills. Pandit Ajudhya Prasad of Indulpur speaks of it in the highest terms; and Mr. Nicholls, O.8., who worked one on the Awa estate, reports that it found much favour among his cultivators. It can be made up for less than Rs. ftO, and is therefore free from the objection of costliness which is fatal to most improved implements.

I have the honor to be,

SIR,

Your most obedient servant,

W. 0. BENETT,

director.

REPORT

ON THE

CAWNPORE EXPERIMENTAL FARM

FOB TEE KHARIF SEASON OF 1883.

THE monsoon commenced late, and the first shower of importance was that of July 6th, when 2'4* fell. From that date up to the 26th July the season seemed propitious. From the 26th July to the 17th August an unlucky break brought injury to the late-sown maize; the showers were still light up to the 20th, and had it not been that the canal distributaries were opened on the 15th August, the loss would have been serious.

The return given below shows the amount of rain and the number of days on which rain fell both at the farm and at the city. Comparison with the normal amount shows how singularly deficient the season proved :—

Month.	Rainfall in inches.		dumber of days on which rain felL	
	At the farm.	At the city	At the farm.	Aft the citj.
June	35	•60	2	2
July	812	9-80	12	11
August	2*82	4-10	6	4
September	2-12	2-70	7	*
October	...	•«	...	...
November	...	...	...	...
Total ...	1341	1,7 20	27	25
formal rainfall for the period ... «•• *•	26-50		IH	

The operations of the season comprised experiments on-

(1) Manures.

(2) Cotton—

(a) Deep and shallow ploughing.
(J) Broadcast *versus* sowing in drills and on ridges.
(c) Cropping the plants a second year.
(d) Exotic cottons.

(3) Sorghum and sorghum sugar. %

(4) Ensilage.

(1) Manures.—This year the duplicated series of plots was completed up to 10 in each Series, and the plots which last year were mspeotively manured with bone-dust, bone superphosphate, and calcic sulphate alone, this year received in addition nitrogenous manures.

The manures applied and crops obtained on these plots for the previous 5 years are shown in the accompanying table :—

Number of plot.		1879-80. Manure.	1879-80. Crop.	1880-81. Manure.	1880-81. Crop.	1881-82. Manure.	1881-82. Crop.	1882-83. Manure.	1882-83. Crop.	1883-84. Manure.	1883-84. Crop.
I.	Standard ...	*Nil.*	Cotton	Dung ...	Maize & wheat.	Dung ...	Maize	Dung ...	Maize	Dung ...	Maize,
	Duplicate ...	Ditto	Ditto	Ditto ...	Ditto ...	Ditto ...	Ditto	Ditto ...	Wheat	Ditto ...	Ditto.
II.	Standard ...	Ditto	Ditto	Dung and bone dust.	Ditto ...	Dung and bone dust.	Ditto	Dung and bone-dust.	Maize	*Dung* and bone-dust.	Ditto.
	Duplicate ...	Ditto	Ditto	Ditto ...	Ditto ...	Ditto ...	Ditto	Ditto ...	Wheat	Ditto ...	Ditto.
III.	Standard ...	Ditto	Ditto	Dung and calcic sulphate.	Ditto ...	Dung and calcic sulphate.	Ditto	Dung and calcic sulphate.	Maize	Dung and calcic sulphate.	Ditto.
	Duplicate ...	Ditto	Ditto	Ditto ...	Ditto ...	Ditto ...	Ditto	Ditto ...	Wheat	Ditto ...	Ditto.
IV.	Standard ...	Ditto	Ditto	Ashes of dung.	Ditto ...	Ashes of dung	Ditto	Ashes of dung.	Maize	Ashes of dung.	Ditto,
	Duplicate ...	Ditto	Ditto	Ditto ...	Ditto ...	Ditto ...	Ditto	Ditto ...	Wheat	Ditto ...	Ditto.
V.	Standard ...	Ditto	Ditto	Poudrette ...	Ditto .	Poudrette ...	Ditto	Potassic nitrate.	Maize	Potassic nitrate.	Ditto.
	Duplicate ...	Ditto	Ditto	Ditto ...	Ditto ...	Ditto ...	Ditto	Ditto ...	Wheat	Ditto ...	Ditto.
VI.	Standard ...	Unknown	Unknown	No manure ...	Fallow...	No manure ...	Fallow	No manure,	Fallow	Potassic nitrate and bone-dust.	Ditto.
	Duplicate...	No manure	Cotton	Potassic nitrate and bone-dust	Maize & wheat.	Potassic nitrate and bone-dust.	Maize	Potassic nitrate and bone-dust.	Wheat	Ditto ...	Ditto.
VII.	Standard ...	Ditto	Ditto	Bone superphosphate.	Ditto .	Bone superphosphate.	Ditto	Bone superphosphate.	Maize	Potassic nitrate and bone superphosphate	Ditto.
	Duplicate...	Ditto	Ditto	Ditto ...	Ditto...	Ditto ...	Ditto	Ditto ...	Wheat	Ditto ...	Ditto.
VIII.	Standard ...	Ditto	Ditto	Bone-dust ...	Ditto ...	Bone-dust ...	Ditto	Bone-dust,	Maize	Sheepdung and bone-dust	Ditto.
	Duplicate ...	Ditto	Ditto	Ditto ...	Ditto ...	Ditto ...	Ditto	Ditto ...	Wheat	Ditto .	Ditto.
IX.	Standard ...	Ditto	Ditto	Calcic sulphate	Ditto...	Calcic sulphate	Ditto	Calcic sulphate.	Maize	Sheepdung and calcic sulphate.	Ditto.
	Duplicate ..	Ditto	Ditto	Ditto ...	Ditto...	Ditto ...	Ditto	Ditto ...	Wheat	Ditto	Ditto.
X.	Standard ...	Ditto	Ditto	No manure ...	Ditto ...	No manure ...	Ditto	No manure,	Maize	No manure	Ditto
	Duplicate ...	Ditto	Ditto	Ditto ...	Ditto ...	Ditto ...	Ditto	Ditto ...	Wheat	Ditto . .	Ditto.

During the season under report the treatment has been as follows:—

Ploughing—twice.

Weeding—twice.

Irrigation—twice.

Seed per acre—maize 15lb.

Manure—as in table.

The outturn is shown below, the figures for last year being also given :—

Manure and rate per acre.	Year.	Outturn per acre. Grain. Standard.	Grain. Duplicate.	Stalk and leaf. Standard.	Stalk and leaf. Duplicate.
		lb.	lb.	Mds.	Mds.
Cow dung, 180 mds.	1883 ...	1,462·5	1,170·0	42·9	31·3
	3882 ...	2,169·0	2,020·5	95·4	89·7
Ditto, 180 mds., bone-dust, 360 lb ...	1883 ...	1,720·5	1,377·0	47·3	37·9
	1882 ...	2,434·5	1,845·0	102·9	87·6
Ditto, 180 mds., calcic sulphate, 240 lb. ...	1883 ...	1,644·0	979·0	45·5	32·2
	1882 ...	1,758·0	1,704·0	87·6	82·5
Ashes of 180 mds., cowdung	1883 ...	1,073·25	712·5	38·6	28·4
	1882 ...	1,452·0	922·5	87·3	71·4
Potassic nitrate, 240 lb.	1883 ...	1,068·0	829·5	45·3	28·3
	1882 ...	2,190·0	1,278·0	111·9	93·3
Ditto, 240 lb, bone-dust, 360 lb. ...	1883 ...	1,793·25	1,244·25	47·6	32·3
	1882 ...	[illegible]	1,626·0	**	87·6
Ditto, 240 lb., bone superphosphate, 240 lb.	1883 ...	1,385·25	1,047·75	45·4	C4 6
Superphosphate, 240 lb. only	1882 ...	1,422·0	1,378·5	84·3	81·0
Sheepdung, 120 mds. bone-dust, 360 lb.	1883 ...	1,797·75	909·0	42·5	27·1
Bone-dust, 360 lb. only...	1882 ...	1,417·5	844·5	79·8	56·7
Sheepdung, 120 mds., calcic sulphate, 240 lb....	1883 ...	1,485·0	1,341·0	35·3	34·4
Calcic sulphate, 240 lb. only	1882	1,056·0	912·0	58·5	75·0
No manure	1883 ...	990·0	801·75	34·7	32·5
	1882 ...	1,002·0	924·0	74·7	69·0

Attention may be directed to the increase given by bone-dust where combined With a nitrogenous manure.

Some naturally poor and artificially exhausted soil was divided off into a fresh series of plots, in two of which some refuse from the Oawnpore Woollen Mills was tried, with so far negative result, the material not having had time to decompose. The past and present treatment of the other plots is shown below, following which is given the outturn :—

Previous treatment.			*Treatment during* 1883.					
Year.	Manure.	Crop.	Number of plot.	Manure and rate per acre.	Ploughing.	Weeding.	Watering.	Seed and rate per acre.
1879-80 ...	Guano ...	Wheat ...	1	Brick-kiln refuse, 120 mds.				
1880-81 ...	Sheepdung ...	Ditto ...	2	Poudrette, 120 mds,		2	2	Maize 15 ft
1881-82 ...	No manure ...	Cotton ...	3	No manure ...	! •			
1882-83 ...	Ditto ...	Wheat.						

Number of plot.	Manure.	*Outturn per acre.*	
		Grain.	Stalk.
		tt>.	Mds.
3	Brick-kiln refuse, 120 mds.	748*5	22-3
2	Poudrette, 120 mda.	874·5	31*9
3	No manure	546*0	20-1

(2) Cotton-—*(a) Deep and shallow ploughing*—The experiments of last year were repeats' this year on the same four plots.

In addition a new field giving a much larger area, and which had been tilled by the ordinary method for the past five years, was leased from a neighbouring cultivator and was divided into three parts. They were treated as under—

(1) Ploughed twice with a country plough.
(2) Ploughed onoe to five inches.
(3) Ditto to nine inches.

No manure was applied and country cotton seed was sown broadcast.

The outturn from all these plots is shown below, and the outturn of last year for comparison. Though the results of the five inches ploughing and nine inches *ploughing vary* somewhat, the net result is in favour of ploughing deeper than what the ordinary cultivator practises.

Number of Plot.	Detail of ploughing.	Area in square yards.	OUTTURN PER ACRE.				INCREASE PER ACRE OVER COUNTRY PLOUGHING.			
			In 1883.		*In* 1882.		*In* 1883.		*In* 1882.	
			Cotton.	Seed.	Cotton.	Seed.	Cotton.	Seed.	Cotton.	Seed.
»• 4.			lb.	lb.	lb.	ft.	lb.	ft.	lb.	lb.
**ot i.	Twice with country plough ...	300	110·9	249-0	95	202	...	...	...	
» II.	Once with Kaisar plough 5" deep ...	300	141-1	308 5	112	229	21·6*	49·4*	14-5*	24·0*
» III.	„ Watta* plough 9" deep ...	300	136*1	304-5	105	214	16*6*	45-4*	7-5»	9-a*
.. IV.	Twice with country plough ...	300	128·0	269·2	100	208	...	...	...	...
^•ic« *B.*										
*lot I.	Twice with country plough ...	1.820	93-4	198 7	...	...	...	...	...	...
» II.	Once with Kaisar plough 5" deep ...	1,775	104*9	232 4	...	...	11-5	33 7	...	...
» III.	„ Watte' plough 9" deep ...	1,790	114*7	238·4	...	...	21-3	39 7	...	

' Over the AYerage of the two plots ploughed with country plough.

(6) *Drill versus broadcast.*—Seven fields were divided off into plots which were sown with cotton—

(1) broadcast,
(2) in drills,
(3) on the top of ridges,
(4) on the slopes of ridges.

Observation in the previous year had shown that cotton plants were far stronger and healthier when growing on the interior slopes of the field boundaries, and this without reference to light or aspect: hence the establishment of the 4th method of sowing.

Nankin, New Orleans, and country cottons were sown, and the following table gives details:—

Number of field.	Manner of sowing.	Manure and rate per acre.	Ploughing.	Weeding.	Watering between July and November.	Seed and rate per acre.
1	On top of ridges 3' apart ... In lines %' apart ... Broadcast ...	Foudrette 200 mds.	2	2	2	Nankin cotton 3 Ib. Ditto 3 Ib. Ditto 12 Ib.
2	In lines 3' apart; the plants ridged when 6" high. In lines 3' apart; plants not ridged ...	Ditto ...	2	2	2	Ditto 3 ft. Ditto 3 Ib.
3	In lines 3' apart ... Broadcast	Ditto...	2	2	2	Ditto 3 Ib. Ditto 26 Ib.
4	In lines 3' apart ... Broadcast	Ditto ...	2	2	2	Ditto 3 Ib. Ditto 26 Ib.
5	On tops of ridges 3' apart On slopes of ridges 3' apart ... In lines 3' apart Broadcast	Ditto ...	2	2	2	New Orleans 3 ft. Ditto 3 Ib. Ditto 3 Ib. Ditto 12 Ib.
6	On tops of ridges 3' apart On slopes of ridges 3' apart In lines 3 feet apart Broadcast	Ditto...	2	2	2	Ditto 3 ft. Ditto 3 ft. Ditto 3 ft. Ditto 12 ft.
7	In lines 3' apart; subsequently ridged up ... In lines	Ditto ...	2	2	2	Ditto 3 ft. Ditto 3 ft.
8	On tops of ridges 3' apart ... On slopes of ridges 3' apart ... In lines 3' apart Broadcast	Ditto ...	2	2	2	Ditto 3 ft. Ditto 3 ft. Ditto 3 ft. Ditto 12 ft.
9	On tops of ridges 2' apart On slopes of ridges 2' apart In lines 2' apart Broadcast	No manure		2	2	Country cotton 5 ft. Ditto 5 m. Ditto 5 ft. Ditto 12 ft.

The cost of making ridges 3' apart =»Rs. 2-10* per acre, and of dibbling in seed 3' apart on the ridges 9f annas per acre.

	Rs.	a.	p.
* One pair of bullocks with ploughman @ 10 annas a day for 2 days	1	4	0
Three men @ 2 annas a day for 2 days ...	0	13	0
Four women @ 1 anna 3 pies per day for 2 days ...	0	10	0
Total	3	10	0
† Two men @ 2 annas per day	0	4	0
Four women @ 1 anna 3 pies per day	0	5	0
Total	0	9	0

In drills the cost »• Re, 1-1-0 per acre for lining and sowing.

In sowing broadcast the cost « 10 annas per acre.

Taking the market value of each class of cotton as under—

	Per maund.
New Orleans	Rs. 20
Nankin	« 16
Country	„ 12

The following table shows outturn and value of each method :—

No. of field.	Manner of sowing.	Area in square yards.	Actual outturn. Cotton. lb. oz.	Actual outturn. Seed. lb. oz.	Outturn per acre. Cotton. lb.	Outturn per acre. Seed. lb.	Value of produce per acre. Cotton. Rs. a. p.	Value of produce per acre. Seed. Rs. a. p.	Value of produce per acre. Total. Rs. a. p.	Increase in value by sowing in lines over broadcast. Rs. a. p.	Increase in value of produce by ridging. Over lines. Rs. a. p.	Increase in value of produce by ridging. Over broadcast. Rs. a. p.
	A.—Nankin cotton fields.											
1	On top of ridges 3' apart	791	15 8	45 0	94-8	275·3	18 7 [illegible]	4 3 1	22 10 10	...	4 1 11	9 11 3
	In lines 3' apart ...	882	14 2	41 2	77*5	225-7	15 1 11	3 7 0	18 8 11	[illegible]	...	...
	Broadcast ...	2,023	22 12	65 14	54 [illegible]	157 6	10 9 2	2 6 5	12 15 [illegible]	...	...	...
2	In lines 3' apart; subsequently ridged up ...	2,197	65 10	190 [illegible]	144*5	419*5	28 3 1	6 6 2	34 9 3	...	4 0 9	...
	In lines 3' apart ...	2,000	52 3	160 [illegible]	126*2	388*2	24 9 11	5 14 7	30 8 6	...	...	...
3	In lines 3' apart ...	1,737	49 10	147 14	1382	412 0	26 15 5	6 4 5	33 3 10	17 2 7	...	...
	Broadcast ...	1,302	18 5	49 13	680	185 1	13 4 3	2 13 0	16 1 3	...	...	...
4	In lines 3' apart ...	1,362	16 14	50 5	59-9	178-8	11 10 11	2 11 3	14 6 2	[illegible] 8 5	...	...
	Broadcast ...	1,582	14 15	41 15	457	128-3	8 14 [illegible]	1 15 2	10 13 9	...	...	...
	B.—New Orleans cotton.											
5	On top of ridges 3' apart	457	12 2	30 14	128*4	326-9	31 5 0	[illegible] 15 7	30 4 7	...	Decrease 0 11 10	4 1 7
	On slopes of ridges 3' apart	54€	15 12	38 14	139 6	344 6	34 0 9	[illegible] 4 0	39 4 9			
	In lines 3' apart ...	369	10 [illegible]	26 14	136 0	352 5	33 2 8	[illegible] 5 10	33 8 6	4 13 5	...	...
	Broadcast ...	571	14 [illegible]	37 [illegible]	118 5	314·6	28 14 5	[illegible] 12 8	88 11 1	...	...	...
6	On tops of ridges 3' apart	851	16 14	37 10	95-9	213-&	23 [illegible]	[illegible] 4 1	26 10 3	...	Increase. 2 13 8	< 1 1
	On slopes of ridges 3' apart	376	6 12	15 0	86 8	193 0	21 [illegible]	[illegible] 15 0	24 1 8			
	In lines 3' apart ...	861	14 6	32 13	80 8	184 4	19 11 [illegible]	[illegible] 13 0	22 8 3	3 3 5	...	...
	Broadcast ...	480	6 14	15 10	69*3	157'5	16 14 [illegible]	[illegible] 6 5	19 4 10	...	...	...
7	In lines 3' apart; subsequently ridged up.	400	6 10	14 2	801	170-9	[illegible] 8 7	2 9 6	22 2 1	...	3 11 7	...
	In lines 3' apart ...	426	6 13	13 6	66 0	151*9	[illegible] 1 [illegible]	2 5 0	i8 6 6	...	...	...
8	On tops of ridges 3' apart	592	[illegible]	1G 15	63 8	138-4	15 8 11	2 1 9	17 10 8	...	Decrease 0 13 1	Decrease 1 6 5
	On slopes of ridges 3' apart	543	7 4	15 14	64*6	141*5	15 12 1	2 2 6	17 14 7			
	In lines 3' apart ...	537	7 7	16 9	67 0	149-2	16 5 5	2 4 3	18 9 8	Decrease 0 9 4	...	...
	broadcast ...	562	8 1	17 6	69-4	149-6	16 14 9	2 4 3	19 3 0	...	...	...
	C.—Country cotton.											
9	On tops of ridges 2' apart	750	10 13	27 4	69-7	175 8	10 3 1	2 10 4	12 13 5	...	Increase. 2 0 9	3 2 3
	On slopes of ridges 2' apart	750	9 10	24 10	621	1589	9 1 4	2 6 7	11 7 11			
	In lines 3' apart ...	750	8 6	22 9	54-0	145'C	7 14 5	2 3 6	10 1 11	5 3 0	...	...
	Broadcast ...	750	12 9	35 3	81*0	227-0	11 13 7	3 7 4	15 4 11	...	...	...

Allowing in each case for the cost of preparation, it was found that where other conditions were equal the ridge system gave a decided gain over the simple drill, and both again gave better results than broadcast sowing. Where this was not the case the experiments were marred by difficulties in applying irrigation with impartiality— difficulties which would not have occurred had the rainfall been sufficient.

(<0 *Cropping the plants for a second year.—One* field of New Orleans and two of Nankin cotton were loft standing over from last year and a portion of each was ratooned.

The following table shows the results in juxtaposition with those for 1882. In quality the cotton was inferior to the produce of the same plots last year. The value of woollen refuse in toe case of these plots seems very marked, but it is too early yet to say what" iti value is and what quantity should be used. It is different to the refuse of English Mills in not having been subjected to the ammoniacal bath which makes the latter so valuable :—

No. of field.	Particulars of sowing and ratooning.	Manure and rate per acre. 1882.	Manure and rate per acre. 1883.	Grubbing.	Weeding.	Watering.	Area in square yards.	Outturn from October to February, 1884. Actual. Cotton.	Actual. Seed.	Per acre. Cotton.	Per acre. Seed.	[illegible]
								lbs. oz.	lbs oz.	lbs.	lbs.	IDS.
1	A.—Sown broadcast in June, 1882, with New Orleans cotton and ratooned in July, 1883.	Dung. 100 lb.	...	[illegible]	[illegible]	[illegible]	1,680	24 7	57 12	' 70-4	166-3	[illegible]
	B.—Sown broadcast in June, 1882, and not ratooned.	Ditto,	...	[illegible]	[illegible]	[illegible]	1,728	47 2	118 15	131*9	333-1	
[illegible]	A.-Sown broadcast with Nankin cotton in June, 1882, and ratooned in June, 1883.	No manure.	(a) Woollen refuse and lime, 10 mds. to the acre.	1	[illegible]	[illegible]	272	6 9	13 10	116-7	242*4	11[illegible]
			(6) No manure ...	[illegible]	[illegible]	[illegible]	507	9 10	18 4	91-8	174 2	
	B.—Sown broadcast with Nankin cotton in June, 1882, and not ratooned.	Ditto	(a) Woollen refuse and lime, 10 mds, to the acre.	[illegible]	[illegible]	[illegible]	[illegible]	7 3	15 1	124*2	260*3	
			(6) No manure ...	[illegible]	[illegible]	[illegible]	462	10 15	21 2	114-5	221-3	
[illegible]	A.— Sown broadcast with Nankin cotton in June, 1882, and ratooned in June, 1883.	Ditto,	(a) Woollen refuse and lime, 10 mds. to the acre.	[illegible]	[illegible]	[illegible]	283	6 1	11 10	103-6	198-8	91*
			(b) No manure ...	[illegible]	[illegible]	[illegible]	585	5 9	10 3	46·0	84-2	
	B.-Sown broadcast with Nankin cotton in June, 1882, and not ratooncd.	Ditto,	(a) Woollen refuse, and lime, 10 mds, to the acre.	[illegible]	[illegible]	[illegible]	283	6 11	15 6	114-3	262·[illegible]	
			(6) No manure ...	[illegible]	[illegible]	[illegible]	644	7 4	14 12	54*4	110-8	

(d) Exotic cottons—Fresh New Orleans seed was imported from America and was sown in the fields which have already been noticed under the headings of drill and broadcast.

Two other fields were sown with acclimatised New Orleans seed which has been cultivated continuously on the farm for the past six years. One of these fields has already been noticed under drill and broadcast. The other was ridged and sown with carefully-selected seed.

The results appear in the following table :—

Number of field.	Manner of sowing.	Area in square yards.	Actual outturn. Cotton.	Actual outturn. Seed.	Outturn per acre. Cotton.	Outturn per acre. Seed.
			lb. oz.	lb. oz.	lb.	lb.
1	Sown on tops of ridges 3' apart with selected acclimatised New Orleans cotton seed.	1,216	47 6	124 14	188-5	497·0
2	Sown on tops of ridges 3' apart with acclimatised seed.	457	12 2	30 14	128-4	326 9
	Sown on slopes of ridges 3' apart ...	546	15 12	38 14	139-6	344 6
	Sown in lines 3' apart ...	369	10 6	26 14	136·0	352-5
	Broadcast ...	574*	14 1	37 5	118·5	814*
3	Sown on tops of ridges 3' apart with fresh New Orleans seed.	851	16 14	37 10	95·9	213'9
	Sown on slopes of ridges 3' apart ...	376	6 12	15 0	86-8	193·0
	Sown in lines 3' apart ...	861	14 6	32 13	80*8	134-4
	Broadcast ...	480	6 14	15 10	69 3	157-5
4	Sown in lines 3' apart, subsequently ridged up, with fresh seed.	400	6.10	14 2	80-1	170*
	Sown in lines 3' apart, subsequently not ridged.	426	5 13	13 6	66·0	151*9
0	On tops of ridges 3' apart with fresh seed,	592	T 13	16 15	63-8	138j
	On slopes of ridges 3' apart ...	543	7 4	15 14	64 6	141 1
	In lines 3' apart ...	537	7 7	16 9	67·0	149 2
	Broadcast ...	5G2	* 1	17 ft	69 4	149 [illegible]

The high outturn of 18851b. of clean cotton on a field, the soil of which was distinctly inferior, indicates the commercial value of selected seed.

Nankin cotton. In addition to the fields already noticed 10 fields were sown with Nankin cotton. A large quantity of seed was received from Central India very late in the season and was sown wherever space could be found for it.

The yield varied from 144 5tb. of clean cotton on good soil accessible to irrigation to 5'lfo. on land when the conditions were most unfavourable.

(3) Sorghum.—A quantity of seed of the Minnesota amber cane was imported from America, with which four large fields were sown, while a fifth field was sown with farm acclimatised seed.

To portions of each of the last four fields cowdung manure was applied at the rate of 100 maunds per acre. Past and present treatment of these fields is shown below: —

Number of field.	*Previous treatment.*			*Treatment in* 1883.				
	Year.	Manure.	Crop,	Manure.	Ploughing.	Weeding.	Irrigation.	Seed and rate per acre.
1	1880-81	Dung	Sugarcane	Nil	3	3	1	Amber sorgho 12 lb.
	1881-82	*Ntl*	Lucerne					
	1882-83	*NU*	Tobacco					
2	1880-81	Guano	Sugarcane	Half manured with dung at the rate of 100 maunds to the acre.	2	3	1	Ditto.
	1881-82	Cowdung	Wheat and tobacco					
	1382-83	*Nil*	Juar in kharif and gram in rabl.					
3	1880-81	*Nil*	Fallow	Ditto	3	3	*Nil.*	Ditto.
	1881-82	*Nil*	Ditto					
	1882-83	*Nil*	Wheat					
4	1880-81	*Nil*	Fallow	Ditto	2	2	*Nil.*	Ditto.
	1881-82	*Nil*	Millets					
	1882.89	*Nil*	Barley					
5	1880 81	*Nil*	Pulses and til	Ditto	4	2	1	Red sorgho 10 it.
	1881.82	Dung	Cereals					
	1882-83	Hemp	Ditto					

Up to the break in the rains these crops were remarkably fiae; but the long brehk told heavily, specially in the crops grown on the manured sections-

Sugar manufacture commenced on the 15th October and lasted till the 10th November, The juice was carefully strained and fumigation with sulphur of vessels and mills was freely resorted to, to avoid *inversion* through fermentation.

GUT was made by the ordinary native method, and *tab* in an "evaporator."

The following table gives results and averages, the figures obtained at the farm in working up sugarcane juice being also given for the sake of comparison :—

	SORGHO.									
	Field 1.	*Field* 2.		*Field* 3.		*Field* 4.		*Field* 5.		Sugar-cane.
	Unmanured.	Unmanured.	Manured.	Unmanured.	Manured.	Unmanured.	Manured.	Unmanured.	Manured.	
Area in square yards	4,324	2,155	2,414	1,726	1,735	1,215	1,720	1,545	400	1,717
Actual weight of cleaned cane lb ...	5,550·5	2,914	2,438	1,905	1,755	934	1,337	1,992	433	11,158
Ditto dry and worm-affected canes, lb. ..	1,541·5	410·5	710·75	421	520	331·5	493	506	125	...
Ditto leaves and tops, excluding the weight of grain, lb.	2,605·5	1,255	1,160·25	762	615	585·5	610·5	1,094	278	4,440
Total outturn of canes and leaf, lb. ...	9,697·5	4,579·5	4,309	3,088	2,890	1,901	2,440·5	3,592	836	15,598
Actual weight of grain, lb.	198·5	180	124	74·5	76·75	53	68	106	37·25	...
Ditto of juice of which *gur* was made, lb.	1,153·5	519	846	183·5	208·75	453	639	925	193	684
Ditto of which *rab* was made, lb. „	1,516·25	927·5	226·25	727·25	649·25	...	...	...	...	5,069
Total juice ...	2,669·75	1,446·5	1,072·25	910·75	858	453	639	925	193	5,753
Weight of *gur* made, lb.	136·5	76·5	125·5	28·75	30·5	73·5	107	140·5	34·25	90·7
Ditto of *rab* made, lb.	376·0	184·75	42	133·75	123·0	...	...	...	...	783·0
Weight per acre of cleaned cane, lb. „	6,213	6,545	4,888	5,342	4,896	3,920	3,762	6,240	5,239	31,452
Ditto dry and worm-affected canes, lb. ...	1,725	922	1,425	1,180	1,450	1,321	1,387	1,585	1512	...
Ditto leaves and tops, lb.	2,917	2,818	2,326	2,137	1,716	2,332	1,718	3,427	3,364	12,516
Ditto total weight of cane and leaf, lb. ...	10,855	10,285	8,639	8,659	8,062	7,573	6,867	11,252	10,115	43,968
Ditto seed	222·1	404·2	248·6	208·9	214·1	211·1	191·3	332·0	750·71	...
Ditto juice	2,988·3	3,248·7	2,149·8	2553·8	2393·4	1,804·5	1,798·1	2,897·7	2,335·3	16,216·9
Ditto *gur* if all the juice were turned into *gur*, lb.	483·1	478·8	313·9	400·1	349·6	292·7	301·0	440·1	414·4	2,151·5
Ditto *rab* ditto *rab*, lb. ...	543·9	647·1	399·0	469·6	453·4	...	...	...	...	2,505
Percentage of juice over cleaned cane, lb. ...	48·1	49·6	43·9	47·8	48·8	46·	47·7	46·4	44·5	51·5
Ditto *gur* over cleaned cane, lb. ...	7·7	7·3	6·5	7·5	7·1	7·4	8·2	7·0	7·9	6·*
Ditto *gur* over juice, lb.	36·1	14·7	14·8	15·6	14·6	16·2	16·7	15·1	17·7	13·2
Ditto *rab* over cleaned cane, lb. ...	8·7	9·8	8·1	8·7	9·2	...	...	...	...	7·9
Ditto *rab* over juice, lb.	18·2	19·91	18·5	18·3	...	...	...	...	...	15·4

The total amount of gur made amounted to 803 lb., of which 373 lb. were sold in open market at Cawnpore at* Rs. 2-13-9 per maund of 82 lb.; of the rest 100 lb. were sold at Rs. **6-10-8 per** maund at the beginning of the season, before sugarcane gur had come to market. The remaining quantity was reserved for distribution and exhibiting at the various agricultural shows. 759·5 lb. of rab were made, which realised Rs. 2-8-0 per maund of 82 lb.

Annexed are analyses kindly undertaken by Carew and Co., Limited, Rosa :—

***Analysis of two samples of sorghum sugar received from the Government Farm, Cawnpore, March 12th,* 1884.**

	Rab.	Gur (last year's).
Crystallized sugar	62·50	63·08
Glucose	18·54	17·75
Ash	1·80	3·87
Insoluble ash...	1·65	1·75
Colouring matter and extractive	5·31	6·79
Water	10·20	6·76
	100·00	100·00
Available sugar ...	37·66	31·79

	Rs.	a.	p.
* Rate of sugarcane gur on the same day—			
1st quality	3	6	0
2nd do.	2	12	3
Average ...	3	1	1·5

The following tables give full particulars of average production, value, cost and profit as compared with sugarcane :—

I.—Table showing average outturn, of amber sorgho on the unmanured fields and of sugarcane per acre.

	Sorgho.	Sugarcane.
	lb	lb
Average outturn of cane and leaf	[illegible]	43,968
Weight of cleaned cane	[illegible]	31,452
Ditto of worm-affected canes and leaf	[illegible]	12,516
Ditto of gur	[illegible]	2,151-5
Ditto of grain	[illegible]	...

II.—Table showing value of produce per acre of sorgho and sugarcane.

	Sargho.	Sugarcane.
	Rs. a. p.	Rs. a. p.
* Value of gur per acre at Rs. 4-3-4 per maund of 82lb.	22 13 8	110 6 7
† Value of leaves and dry canes at Rs. 15 per 100 maunds	7 7 0	...
‡ Value of grain at Re. 1 per maund of 82lb.	3 2 6	...
Total	33 7 2	110 6 7

* Average of the last 4 years' prices prevailing at the Cawnpore market.
† Last year the value of leaves was calculated at Re. 1 per 10 mds. This year fodder has been very dear, and Re. 1-8 is the average of what was paid for the jowar purchased for ensilage.
‡ Last year the value of grain was taken at 12 annas per maund of 82lb., but this year the rate of Re. 1 per maund was obtained.

III.—Table showing cost of produce per acre of sorgho and sugarcane.

	Sorgho.		Sugarcane.¶	
	No.	Cost.	No.	Cost.
		Rs. a. p.		Rs. a. p.
Ploughing	2	1 8 0	8	6 0 0
Clod-crushing	2	0 4 0	6	0 12 0
Sowing		0 10 0		1 14 0
[illegible]		1 4 0	7	13 9 0
[illegible]	2	4 0 0	[illegible]	12 0 0
Weeding and hoeing		6 12 0		2 0 0
Watching ‖		4 0 0		...
Cutting and cleaning		[illegible]		[illegible] 0
Seed	...	[illegible] 4 0	...	6 0 0
Rent		6 0 0		12 0 0
Sugar boiling at Re. 1-6 per maund of *gur*	...	7 12 0		36 1 0
Total		24 6 0		96 4 0
Value of produce ...		33 7 2		110 6 7
Net profit		9 1 2		14 2 7

* Only two out of the four fields whose average is calculated were watered.
The cost of one watering, including canal dues, is Rs. 2-8-0 : hence Rs. $\frac{2-8-0}{2}$ = 1-4-0.
† Last year the cost of weeding was only Rs. 2 per acre as the fields were weeded only once.
‡ Last year the cost of cutting was given at Rs. 2 per acre, and the cost of cleaning included in the cost of sugar boiling, which was given at Re. 1-12.
§ No manure applied to fields of which average was taken.
‖ Was omitted last year.
¶ The following items of expenditure differ from those given in Part I., "Field and Garden Crops":—

	Farm	*"As given in Field and Garden Crops."*
	Rs. a. p.	Rs. a. p.
1. Ploughing ...	6 0 0	8 0 0
2. Watering ...	13 9 0	12 6 0
3. Weeding and hoeing ...	12 0 0	9 9 0
4. Cutting ...	...	2 8 0
5. Seed ...	6 0 0	8 0 0
6. Rent ...	12 0 0	10 0 0

The differences are thus explained—

1. Ploughing—The farm field was ploughed only 8 times ; in "Field and Garden Crops" the number of ploughings is 12.
2. Watering—Also due to a difference in number.
3. Weeding and hoeing—Ditto.
4. Cutting—Cutting and cleaning usually done by men who get the tops of cane and not paid in cash ; as the value of these is not taken into account in the produce of the field, the cost of cleaning and cutting should not be entered.
5. Seed—Due to difference in rates.
6. Rent—Calculated at Rs. 8 per acre for 19 months, the time occupied by cane.

(4) **Ensilage.**—Juar and sorglium were separately ensilage 1 in masonry vats and juar alone in three simple earthen pits dug in waste soil near the bank of a nullah. All were thatched over. It was thought very probable that in the earthen pits the fodder would be attacked by white ants, but this was not the case. The juar was cut small by two men, who with a chaff-cutter delivered 4 maunds per hour. The amount cut daily was trodden down in the evening by farm labourers as extra work at wages of 2 pice each. A layer of 2 inches of *bhusa* was spread over it and weighted with baskets of broken bricks (giving 66ft. of weight per square foot) and left to sink for 48 hours. This was continued till the pits were full.

The cost of cutting and filling came to Be. 1-2 per 100 maunds.

In the first pit opened 13,262ft. of green fodder were filled in by the 21st October. I* was opened on the 2nd February, 1884, and 10,658ft. of fodder taken out, of which 9,854ft. was in most excellent condition. The waste consisted of the somewhat mouldy surface layer. There were no traces of white ants.

The whole of the fodder was fed off to the farm cattle and evidently much relished. Cultivators from the neighbouring villages who came to see the pit opened seemed surprised at the results and stated that they should try a silo on their own account next season.

The question of cost will be gone into in the rabi report, by which time the whole quantity stored, or 44,586ft., will have been fed off.

IMPLEMENTS.

Ploughs.—The Duplex plough, mentioned in the last rabi report, was altered in such particulars as further experience suggested, the principal being the substitution of an iron sole and step in the place of wood. The alterations were made for the sake of strength, as well as to add weight to the plough, to steady it when ploughing deep. Two of these ploughs are kept constantly at work on the farm and six of the latest pattern have been sent out for trial to different persons interested in agricultural matters. Up to 30th November 57 Duplex ploughs of the original pattern were sold and 35 distributed for trial. It was exhibited at the Bulandshahr, Meerut, Sahâranpur, and Aligarh Exhibitions. At Bulandshahr it got the first and a special prize ; at Meerut it was awarded a certificate of merit; and at the last two exhibitions has been reported as deserving a first prize had exhibits from outside districts beep admitted to competition for prizes.

The Kaisar plough was also exhibited at these exhibitions. At Meerut it headed all the ploughs offered for trial and it was well reported on at the other exhibitions; 154 were sold daring the season.

Waterlift.—The 5' chain lift, trials of which were noticed in the last rabi report *to* be not so satisfactory as those for other depths, was subjected to a different mode of trial suggested bj Mr. W. J. Wilson, C.E.

The results of these experiments and the details of the labour employed are shown below :—

Labour employed.	Average quantity *ot* water lifted per hour.
	Cubic feet.
4 men—two working at a time and relieved after every 2 hours	1,451·6
2 men and 2 women—one man and one woman working at a time and relieved after every 2 hours	3,363·5
4 women—two working at a time and relieved after every 2 hours	1,250-0
2 men working for 4 hours continuously and then working again after a recess of 2 hours at noon	1,313*8

14 pumps were sold during the season.

*Winnowers**—To the friction wheel a spiral spring has been added, so as to maintain pressure This has so far proved satisfactory. Six of the improved pattern have been sold. During tb* coming rabi harvest one of the improved pattern will be given a continued trial at the farm.

Cotton $wi.—The saw gin reported in the last report having been found to affect injuriously the short staple of the indigenous cotton, efforts were made to make a cheap roller gin at'.the farm after the model of Dobson's knife gin. A difficulty yet to be overcome is the crushing of the seed, the admixture of fragments of which lowers the value of the lint.

Evaporators or mgar-boiling.—The evaporators having found so much favour at the agricultural shows last year, manufacture was taken up at the farm. An evaporator of galvanised iron sheet for setting up on a *kachha* brick or clay furnace, together with iron ladle, strainer, and iron grating for furnace, can be made up for Rs. 40. A clay furnace costs about Rs. 1-8 and answers admirably. Four evaporators have been sold and have all been reported on as giving satisfaction. Rai Ajudhya Prasad of lndulpur writes : —" The evaporator worked very nicely. I prepared about 60 maunds rab in it. The result I will enter in my annual report.

The Farm Superintendent, Lachhman Parshad Barma, has had much extra work to do during the past season in preparing collections of grains, fibres, and models of implements for the Calcutta Exhibition. His careful, intelligent management of the farm is therefore all the more to his credit. The collections referred to have won medals and certificates of merit at the Exhibition, of which details will be given in the next report. It is to this extra work that is due such delay as has occurred in preparing the figures for the report

D. G. PITCHER, MAJOK,
Assistant Director for Oudh,
In charge of Farm.

PRINTED AT THE N.-W. P. AND OUDH GOVERNMENT FBESS, ALLAHABAD.

EEPORT

ON THE

CAWNPORE EXPEEIMENTAL FARM

FOR THE BABI SEASON, 1883-84.

AHAHABAD:

NOBTH-VTI8TIBK PROVINCES AND OTIDH GOVERNMENT FRIBS.

18S4

No. 1058A OF 1884.

FROM

THE DIRECTOR, DEPT. OF AGRL AND COMMERCE,

NORTH-WESTERN PBOVINCES AND OUDH,

To

THES CHIEF SECRETARY TO GOVERNMENT,

NORTH-WESTERN PROVINCES AND OCDH.

Dated Cawnpore, the 4Ah October, 1884.

SIR,

I HAVE the honor to submit Major Pitcher's report on the Cawnpore Experimental Farm for the rabi season of 1883-84. The season has differed materially from that of 1882-83. No rain fell from the sowing up to the harvesting of the rabi* The crop was dependent entirely on artificial irrigation.

2. *Outturn of wheat.*—The maximum outturn of wheat of the farm was 3,06 libs or 51 bushels, as against a corresponding maximum of 2,181ibi or 33·3 bushels last year. It is the largest maximum outturn of wheat which has yet been obtained on the farm. The average outturn also is in excess of any previous average outturn obtained. The land was ploughed five time3 and irrigated (after sowing) four times. Last year the land was ploughed three times and irrigated twice. This goes to show that thorough ploughing and timely sufficient irrigation are after all the most important factors in production.

3. *Experimental manuringa.*—The experimental manurings in the serie3 of plots which have been maintained for the past five years appear to yield two important results—

(*a*) that bone superphosphate combined with a nitrogenous manure yield the highest return ;

(6) bat that cowdung is the cheapest and relatively the most fertilizing manure which the cultivator can use.

Cowdung is the most easily procurable and the least expensive manuie. The net Result of applying it was a crop exceeding in value the crop raised on the unmanured plot by Rs. 8JL-0 per acre or nearly 16 per cent.

4. *Ville series.*—In the Ville series of plots the experiment^again show that for a cereal crop soluble nitrogen is essential. Previous experiments had already established this fact. Further demonstration does not appear to be needed, and this series of experiments may now be dropped.

5. *Green soiling.*—Green soiling with hemp was continued. It is established that the fertilizing effect of hemp is not exhausted in a single year, and as a consequence that a field into which green hemp has been ploughed for two years yields a larger Crop than a field to which it has been applied for the first time. There appears some ground for believing (Table VII of Report) that hemp which has itself been manured w^k gypsum is a more powerful fertilizing agent than unmanured hemp. Tae increases in value of produce obtained in plots Ia, IIa, and IIia, to which the gypsum-manured hemp was applied, are Rs. 11, 177, and 44*2 respectively.

6. The experiments with indigo, hemp-water, indigo-water, and indigo refuse, although not of very great importance, may be continued. The results of the rotation of wheat with lucerne grass are more likely to be useful.

7. *Fertilization of tisar.*—The experiments in fertilizing lisar were scarcely calculated to be successful or conclusive. The treatment was rather too much of a nursery nature to be of much utility. The depth of the soil in the boxes was—so far as I could judge—not more than eight inches, and the boxes were about three feet by

two feet. If usar is to be treated it must be treated *in situ* and not u> boxes of gathered soil. The experiment, however, is a really useful one, and will be continued on a wider basis. The Superintendent of the Farm has selected four blotched plots in a neighbouring lisar plain and experimentally treated them with gypsum. Crops of barley, peas, and gram have been sown. The result will be an interesting one. No effort will be spared to find some means of reclaiming the vast usar and reh plains. A cheap and easy means of reclamation would be invaluable to the provinces.

8. *Beepploughing.*—The experiments in deep ploughing are perhaps the most conclusive and useful of all. It appears to be established, as far at least as the soil of the farm is concerned, that a th orough up-turning and exposure of the soil is sure to yield in return a high crop. The increased rate of productiveness which followed the deep ploughings may be said to be almost in the direct ratios of the depths of the ploughings. Probably in 90 per cent, of the soil of the Doab of the North-Western Provinces a similar result would follow deep ploughing. No effort shouid be spared to inculcate this on the cultivators of the provinces.

9. *Irrigation experiments.*—The experiments in irrigation were of a twofold character—;*first,* to test the minimum number of waterings necessary to give a maximum amount of produce; *second,* to test the relative values of canal and well water. The first set of experiments do not appear to add anything to the knowledge* which the cultivator at piesent has, and prove, if anything, that no fixed rule is possible. The second set appear to establish that well water is *per se* better than canal water near Cawnpore. It is doubtful, however, whether the result can ever have any appreciable effect in practice, especially as the extra cost of well irrigation swallows up all the increased return.

10. *Jethro Tull method of cultivating wheat*—The Jethro Tull method of cultivating wheat was tried side by side with cultivation in the ordinary way. It consists in sowing on ridges—similar to the well-known method of potato cultivation and to the ridge and trench cultivation of sugarcane in the West Indies. A certain amount of success was achieved in so far that the crop on these unmanured ridges was equal in quantity to that on the most highly manured land in the farm. • Possibly wide ridges, narrow furrows, slightly thicker dibblmg, and a cropping of the furrows, with gram or peas, might end in the entire field yielding a high gross return not inferior to that of manured land. It does not appear that the cost of cultivating in ridges would exceed the cost of ordinary manuring. If it does not, the experiment will be well worth continuing. *It will be repeated on a larger scale in the coming season. The want of the enterprising farmer is certainly a serious drawback. But perhaps means may yet be found to meet this want.

11. The experiments with oats, barley, linseed, and poppy are encouraging, and will be continued.

12. *Silos.*—The plan of storing green fodder in silos has proved successful; and in my opinion there can be no reasonable doubt that the silo system of storage may yet be turned to excellent account in the province. The nutritive and stimulating qualities of the fodder are preserved, and cattle not only take to it but unmistakeably thrive on it. A good deal, however, remains to be done to adapt the dimensions and form of the silos to the resources and habits of the cultivators. The pressing of the fodder in the silo is an element of difficulty which cannqfrbe overlooked. In the faim bricks and stones are used to keep the fodder tightly pressed down. But bricks and stones are not to be had everywhere, although a heavy pressure is absolutely necessary to keep the fodder in condition. We must have silos of a size and at a cost and weighted with a material suitable to the resources and habits of the people. The experiments will in future be modified, so as, if possible, to compass this end.

13. *Duplex and Watt's ploughs.*—The Duplex plough, which is an implement devised to serve both as a weeder and cultivator and as a soil-inverting plough, appears to be more likely perhaps than any other to find favour with the ploughmen of the province. The convenience of the implement is, that it can be fitted up either as a plough or as a weeder and cultivator very rapidly and very simply. There are neither screws nor rivets, but only a big wrought-iron bolt which can be removed by a blow or two from a hammer or any heavy thing which may come handy ; so that when a cultivator wants to root the grass, weeds, or jungle roots from his field, all he has to do is to knock the bolt out, take out the plough fittings, put the weeder in its place, and bolt it on. The whole thing does not take more thfei a couple of minutes.

This and the Watt's plough seem at present the most promising implements on the farm.

14. *Water lifts.*—Not much has as yet been accomplished in water lifts. But they will be persevered in.

15. *Winnowers.*—In regard to winnowers I have my doubts/ They are, comparatively speaking, too costly for the irregular services which they are destined to render. Anything that will reduce the cost, such as application of direct friction instead of the complicated and expensive cog-wheel contrivance, will be of advantage.

16. *Fairs.*—The farm was usefully represented at a number of fairs throughout the provinces during the season. This is one excellent channel, although not perhaps the best, by which the benefits of the farm operations may be spread.

17. *Necessity of now endeavouring to get the cultivators of the 'province to adopt the improved methods and implements which have been proved to be suited to the country.*—I would remark in conclusion that in the past five years during which the farm has been, carried on certain practical improvements in the manner of treating the soil, in the kind of implements used, and in rotation of crops, appear to have been completely established. But these interesting and important improvements have for very obvious reasons not gone very far beyond the four corners of the farm itself. They have not reached the mass of cultivators, for whom they are intended, and for whom they ttiay be of very great value indeed. Such simple and inexpensive improvements as green soiling with hemp, manuring with brick-kiln refuse, deep-ploughing, cultivation of wheat in ridges after lucerne, the simple and efficient Duplex ploughs are of very real agricultural importance. Efforts should now be made to disseminate far and wide a correct knowledge of these improvements and to obtain by every possible means their adoption by the mass of cultivators. The money spent in the exj ariments of the past five years will have been absolutely wasted unless effectual means be now taken and money spent in inducing the cultivator to appropriate the results and put them in practice on his land. Neither pains nor money should be grudged. This matter is, however, scarcely perhaps pertinent to the present report, and I shall take an early opportunity of laying my proposals before His Honor the Lieutenant-Governor for accomplishing this object—an object which I regard as of paramount importance.

18. Bábu Lachhman Parshfid deserves great credit for the care and patience with which he has conducted the farm operations during the season. He is quite alive to the great importance of bringing the improvements to which I have alluded into currency among the people, and I am sure that he will do all in his power toward*fcis end,

I have the honor to be,

Silt,

Your most obedient servant,

D. M. SMEATON,

Offg. Director.

REPORT

ON TIMS

CAWNPORE EXPERIMENTAL EARM

FOB THE RABI SEASON OF 1883-84.

---

1. *Character of the season.—The* season has as usual to be characterised aa abnormal. Last year an unusually heavy fall of rain in the middle of the season was the chief disturbing cause. This year not a single shower fell between 19th September and the 9th May, 1884.

As a consequence the rabi crops were entirely dependent on artificial irrigation from seed time to harvest, and where irrigation was impossible the crops failed. The advantages of having canal water adjacent were never more apparent. It was all the greater pity, therefore, that for some reason or other the canal w^s closed for three weeks in February, just when high and dry winds were in full force shrivelling to some extent the ripening grain.

Much as such a season increased the labour and anxiety to the cultivator involved in continuous irrigation, it afforded a great advantage in the entire absence of rust and fungoid diseases, and in less damage than usual from frost. The area at the farm under wheat, the average outturn, and the maximum outturn, for the past three years, are shown below :—

	Area in acres.	A[illegible]	Maximum [illegible]
		lbs.	[illegible]
1883-84	17'6	1,453	3,061
1882-83	16-1	1,309	2,181
1681-82	16 8	1,390	2,820

2. *Operations of the season.*—These comprised experiments on—

(1) Manure.
(2) Ploughing.
(3) Irrigation.
(4) Improved methods of cultivation.
(5) Outturn of certain crops.
(6) Ensilage.
(7) Improved implements.

Experiments on manures.—These may be sub-divided into—

(a) The series in duplicate which have now been maintained with a few modifications for five years past.

(6) The Ville series illustrating by practical proof the respective and comparative value t9 a cereal crop of such chemical elements as are necessary in combination to maintain fertility.

(c) Experiments in green soiling.

(d) Miscellaneous.

(a) In the last rabi report it was pointed out that quite sufficient evidence had been adduced to illustrate the well-known fact that non-nitrogenous manures used singly are of small avail for cereal crops; the plots then which were formerly manured with bone dust, calcic sulphate, and bone superphosphate, *viz.*, VII, VIII, and IX, in Table I, were this year each reinforced by the addition of a nitrogenous manure, and as may be observed the superphosphate plot so reinforced has now taken the highest place. Table I illustrates the manure applied to the several plots and the crops raised in them during the past five years :—

Table 1.

No. of plot.		1879-80.		1880-81.		1881-82.		1882-83.		1883-34.	
		Manure.	Crop.	Manure.	Crop.	Manure.	Crop.	Manure.	Crop.	Manure.	Crop.
I.	Standard ...	Nil	Cotton,	NO.	Maize.	Dung ...	Maize & wheat.	Dung ...	Wheat..	Dung ...	Wheat.
	Duplicate ...	Do.	Ditto	Do. ...	Ditto	Ditto ...	Ditto ...	Ditto ...	Maize ...	Ditto ...	Ditto.
II.	Standard ...	Do.	Ditto	Do...	Ditto	Dung and bone dust.	Ditto ...	Dung and bone dust.	Wheat...	Dung and bone dust.	Ditto.
	Duplicate	Do.	Ditto	Do...	Ditto	Ditto ..	Ditto ...	Ditto ...	Maize ...	Ditto ...	Ditto.
III.	Standard ...	Do.	Ditto	Do....	Ditto	Dung and calcic sulphate.	Ditto ...	Dung and calcic sulphate.	Wheat..	Dung and calcic sulphnte.	Ditto.
	Duplicate ...	Do.	Ditto	Do....	Ditto	Ditto ...	Ditto ...	Ditto ...	Maize ...	Ditto ...	Ditto.
IV.	Standard ...	Do.	Ditto	Do....	Ditto	Ashes of dung.	Ditto ...	Ashes of dung.	Wheat...	Ashes of dung.	Ditto.
	Duplicate ...	Do.	Ditto	Do....	Ditto	Ditto ...	Ditto ...	Ditto ...	Maize ...	Ditto ...	Ditto.
V.	Standard ...	Do.	Ditto	Do....	Ditto	Potassic nitrate.	Ditto ...	Potassic nitrate.	Wheit...	Potassic nitrate.	Ditto.
	Duplicate ...	Do.	Ditto	Do....	Ditto	Ditto ...	Ditto ...	Ditto ...	Maize ...	Ditto ...	Ditto.
VI.	Standard ...	Do.	Ditto	Do....	Ditto	Potassic nitrate and bone dust	Ditto ...	Potassic nitrate and boue dust.	Wheat...	Potassic nitrate and bone dust.	Ditto.
	Duplicate....	Do.	Ditto	Do....	Ditto	Ditto ...	Ditto ...	Ditto ...	Maize ...	Ditto ...	Ditto.
VII.	Standard ...	Do.	Ditto	Do....	Ditto	Bone superphosphate.	Ditto ...	Bone superphosphate.	Wheat.	Potassic nitrate and bone superphosphate.	Ditto.
	Duplicate..	Do.	Ditto	Do....	Ditto	Ditto ...	Ditto ...	Ditto ...	Maize...	Ditto ..	Ditto.
VIII.	Standard ...	Do.	Ditto	Do....	Ditto	Bone dust,	Ditto ...	Bone dusty	Wheat...	Sheepdung and bone dust.	Ditto.
	Duplicate ..	Do.	Ditto	Do....	Ditto	Ditto ...	Ditto ..	Ditto ...	Maize ...	Ditto ...	Ditto.
IX.	Standard ...	Do.	Ditto	Do....	Ditto	Calcic sulphate.	Ditto ...	Calcic sulphate.	Wheat...	Sheepdung and calcic sulphate.	Ditto.
	Duplicate ...	Do.	Ditto	Do....	Ditto	Ditto ...	Ditto ...	Ditto ...	Maize ...	Ditto ...	Ditto.
X.	Standard ...	Do.	Ditto	Do....	Ditto	No manure	Ditto ...	No manure,	Wheat...	No manure.	Ditto.
	Duplicate ...	Do.	Ditto	Do....	Ditto	Ditto ...	Ditto ...	Ditto ...	Maize ...	Ditto ...	Ditto.

The treatment during the past season has been as under : —

Ploughings—Five.

Weeding—One.

Irrigation (exclusive of that necessary before the field could be sown).—Four times.

Seed—Soft white wheat, Muzaffarnagar variety, 120lbs per acre.

Manure—As in table.

Table II shows the outturn per aero :—

Table II.

Manure and rate per acre.	Grain.		Straw.	
	Standard.	Duplicate.	Standard.	Duplicate.
	lbs.	lbs.	lbs.	lbs.
Cowdung, 180 maunds ... — ...	1,427 8	3,031·0	2,329-2	4,988-0
Ditto, 180 „ bone dust 360959 ...	1-3431	2,S73-7	2,456 3	5,1122
Ditto, 180 „ calcic sulphate, 240H?s ...	1,364-2	3,0>>3*8	8,408-1	4,G94 8
Ashes of 180 maunds cowdung ...	1,134*3	2,323*2	2,311-1	3,817'5
Potassic nitrate, 240115s ...	1,3552	2,707-0	2,41')-9	5,64i'6
Ditto, 24Gffi9 bonedust 36()I&s ...	1,252-3	2,91109	2,068 0	6,7-26-3
Ditto, 240lb«i bone superphosphate 240lba...	1,984-4	3,061-3	3,8175	6,8624
Sheepdung, 120 maunds bone dust 36<<Ibs ...	1,143 4	2,389 7	1,887-6	4,434*6
Ditto 120 „ calcic sulphate 2401&3 ...	1,337-0	2,601-5	2,323-2	4,4709
No manure ... — ...	1,031-5	2,280 8	2,093-3	3,672*3

In the above it cannot fail to be remarked how greatly the outturn of the duplicate plots exceeds in every case that of the standard plots. This was partly due to the standard plots having borne the full brunt of the damage resulting from the canal being closed in February last, while the duplicate plots happened to be just irrigated in time and partly to the advantage which the duplicate plots enjoy over the standard plots in being cropped with kharif and rabi alternately—*viz.*, a fallow of 12 months every other year when maize has followed wheat. The effects of this plan, which was started in 1881-82, are only now perceptible. Nevertheless the general correspondence in values comes out clearly, and one series proves the other.

In the last rabi report it was stated that the plot manured with calcic sulphate alone would this year be green soiled in addition, but the point was accidentally overlooked in drawing out the rabi scheme, and sheepdung as may be seen was the form in which nitrogen was supplied. This, however, was of less consequence since au experiment in green soiling in a field dressed with calcic sulphate was undertaken on another part of the farm (*vide* Table VII)

Table III shows the value of the increase in outturn set against the price of the manure applied. Necessarily, however, the market price of farmyard manure is much above the actual cost of that which the cultivator usea :—

Table III.

Manure.	Value of outturn per acre. *			Cost of manure.	Net increase over the uninanured.
	Standard.	Duplicate.	Average.		
	Bs.	Bs.	Ks.	Bs.	
K Cowdung	44·3	94-2	69*2	90	8*1
2. Cowdnng and bone dust ...	42 7	90-9	66-8	13·5	1-2
3. Cowdung and calcic sulphate...	43 1	92 3	67·7	100	6·6
4. Ashes of cowdung ...	S7·»	72·2	64-6	90	6·5 loss
5. Potassic nitrate ...	42*9	88*9	65·9	7·5	6·3
6. Potas^ic nitrate and hone dust ...	41·4	94·0	67'7	12·0	3*6
7. PoUsnic nitrate and bone superphosphate,	63 9	90 5	81-2	22·0	7·1
S. Sheepdung and bone dust ' ...	35 6	76 3	65-9	13·5	9-7 loss
9. Sheepdung and calcic sulphate ...	42·0	81*6	61·8	IO'O	•3 loss
10. No manure	33·7	70-5	62·1	...	...

This table shows that by the results of this season superphosphate fortified by a nitrogenous manure gives the highest yield, but that cowdung is for the cultivator the cheapest manure to use.

The figures given below show the comparative yields for the past three years of potassie nitrate (saltpetre)† alone and combined with bone showing that ... of little benefit:—

† Crude unrefined nit«.

* Grain at Rs. 9 per maund. } Average rates prevailing at Cawnpore for the past month.
Straw at 5 maunds per rupee.

Table IV.

Designation of plot.		Manure.	1883-84.	1882-83.	1881-82.
Standard	£	Saltpetre	1,355*2	1,978-5	1,242-
		Saltpetre and bone dust	1,252-3	1,944-7	1,395'
Duplicate		Saltpetre	2,707 0	2,181-0	1,605-
		Saltpetre and bone dust	2,900 9	2,065-7	1,575-
Average		Saltpetre	2,031- i	2,079-7	1,423*5
		Saltpetre and bone dust	2,0766	2,000-2	1,485'0

With reference to the plots to which sheepdung was added an unavoidable omission was that of a plot for sheepdung alone. More plots have been formed for the coming year.

(6) *The Ville series.*—The treatment here is that followed during the past two year3.

Table V gives the treatment pursued during the past and present years :—

Table V.

Year.	*Previous treatment.*			*Treatment during* 1883-84.			
	Season.	Manure.	Crop.	Ploughing.	Seed per acre.	Irrigation.	Weeding.
1879-80	Kharif	*Nil*	Cotton				
	H»bi	Do.	*Nil*				
1880-81	Kharif	Do.	Sorgho				
	Rabi	Do.	Aif				
1881-82	Kharif	Same as	Maize				
	Habi	now applied	Wheat				
1882-83	Kharif		*Nil*				
	Babi	Do.	Wheat				
1883-84	Kharif		*mi*				
	Kabi	AB in Table	Wheat	Three ...	120lb3 wheat.	Four •••	Once.

Table VI gives results from which it is shown how a cereal crop suffers in the absence of soluble nitrogenous compounds :—

Table VI.

Number of plot.	Manure and rate per acre.		*Outturn per acre.*		*Increase over the unmanurml plot No. VI.*		Decrease over plot No. 1. which received all manures.	
			Grain.	Straw.	Grair.	Straw.		
	Calcic superphosphate,	*180lbs*						
	Ammonic chloride,	130						
	Potas-ic sulphate	90	1,777-1	3,388-0	1,014-8	1,911-8		
	Calcic sulphate	96						
n.	Ditto less caicic superphosphate*		1,417-2	3,267-0	654-9	1,790-8	359-9	121·0
in.	Ditto less ammonic chloride		1,001·2	1,597 2	238-9	121-0	775-9	1,790-8
IV.	Ditto less potassic sulphate		1,497 -3	3,025·0	735-0	1,548-8	279-8	363-0
V.	Ditto UBl calcic sulphate		1,323 4	2,€37-8	66H	1,161-6	453·7	760-2
VI.	No manure		762-3	1,476*2		...	1,014-8	1,911-8

(c) *Green soiling.*—These comprise—

(1) Determination of the value of ploughing in a crop of hemp.

(2) Ditto of applying fresh and old indigo refuse.

(3) Ditto of the value of ploughing in hemp against ploughing in indigo, and of each as against hemp and indigo water and indigo°vat refuse.

(4) Determination of the value of following a crop of lucerne with wheat.

Green toilhiff with hemp.—Two fair-sized fields and two experimental plots which last year were also green soiled with bemp, received this year similar treatment, save that in the case of the fields, a portion of each that was last year green soiled was this year left unmanurod. This was done in order to assay the unexhausted fertility remaining over from the green soiling of the previous year. The outturn is noted in Table VII-

Table VII.

Number of plot.	Manure.	Cost of manure.	Outturn per acre. Grain.	Outturn per acre. Straw.	Increase over the unmanured. Grain.	Increase over the unmanured. Straw.	Increase of profit after deducting the cost of manuring.
		Us.	lbs.	lbs.	lbs.	lbs.	Ba.
Ia.	Green soiled with hemp, manured with calcic sulphate in 1883, as well as in 1882.	3-5	1,612*2	2,353-4	580·7	72-6	WO
U.	Green soiled with hemp in 188) as well as in 18S2.	2·5	1,385-4	2,081-2	353*9	— 199-6	6-3
Ic.	No manure in >883 aa well as in 1883,		1,031-5	2,280-8	...	...	
IIa.	Green soiled with hemp, manured with calcic sulphate in 1883, as well aa in 1882.	"3-5	1,860·6	3,(1 • 8 2	715-7	914-6	17·7
HA.	Green soiled with hemp in 1883 as well as in 1882.	2*5	1,792-6	3,082 3	647·7	978-7	17-2
tic.	Green soiled with hemp in 1883 for the first time.	2*5	1,756·2	3,054*3	611-3	950-7	16-2
Hd.	No manure in 1883, green soiled with hemp in 1882.	...	1,263-8	2,098*3	118*9	- 95-3	2'5
He.	No manure in 1883 as well as in 1882.	...	1,1449	2,103-6	...	...	...
IIIa.	Green soiled with hemp manured with calcic sulphate in 1883 as well as in 1882.	"3 5	2.340-3	4,209*9	1,487-5	2,826·J	44'2
HI*.	Green soilel with hemp in 1883 as well as in 1882	2·5	1,449-4	2,947'9	596-6	1,564-1	18-4
Hie.	Green soiled with hemp in 1883 for the first time	2'5	1,262-2	2,256-7*	409-4	872-9	10-9
Hid.	No manure in 1883, green soiled with hemp in 1*82.	...	1,119-0	2,177·6	266 ·2	793-7	9-7
HI*	No manure in 1883 as well as in 1882...	...	852 8	1,383-8	...	...	...

The figures for the present year show—

(1) That calcic sulphate (gypsum) has a marked effect through its influence on the growth of hemp—4 result corroborated in the figures of the preceding two years:—

Table VIII.

Number of series.	Manure.	Outturn of wheat per acre. 1883-84.	1882-83.	1881-82.
M	Hemp and Gjpsum	1,612*2	1,856-8	2,244
	"enip	1,385-4	1,373 3	1,713
n. 1	Hemp and Gjpsum	1,860*6	1,851-6	...
	Henip	1,792-6	1,763-4	...
m.	Hemp and Gypsum	2,340-3	...	...
	Hemp	1,449-4	...	...

(2) That the portions which were green soiled with hemp in the present as well as in the preceding year gave a greater increase than the plots green soiled for the first time in the same series*

Table IX.

Kumber of series.	Detail of manure.	Outturn of wheat per acre.
II.	Green soiled in 1883 a* well a§ in 1882	1,792-6
	Green soiled in 1883 only	1,766-2
III.	Green toiled in 1883 as well as in 1882	1,449-4
	Green soiled in 1883 only	1/262-2

(3) That the effect of green soiling with hemp extends over more than one year.

Table X

Number of series.	Detail of manuring.	Outturn of wheat per acre.
II. ...	Unmanured in 1883, green soiled with hemp in 1882	1,263-8
	Unmanured in 1883 as well as in 1882 ...	1,144*9
III. ...	Unmanured in 1883, green soiled with hemp in 1882	1,119 0
	Unmanured in 1883 as well as in 1882 ...	852 8

The average increase due to green soiling with hemp, with hemp manured with gypsum, and that due to the unexhausted fertility of hemp ploughed in a year previous is noted below* The increase obtained in the preceding year is also noted.

Table XI.

	Increase per acre in the outturn of wheat.	
	[illegible]	1682-83.
	[illegible]	
Average increase due to green soiling for the first time ...	[illegible]	443-4
Average increase due to green soiling in the land which had been green soiled in the preceding year also.	[illegible]	308-5
Average increase due to green soiling when manured with calcic sulphate.	[illegible]	6841
Average increase due to green soiling effected in the preceding year.	[illegible]	...

* Average of the results of Series II and III.

Indigo refuse.—The experiments were repeated in the same 6eld as in the preceding year. Each of the portions which were then manured was divided into two, one of which received the same treatment as in the preceding year, and the'other was left unmanured, while, the portion which was not manured in the preceding year was now divided into three parts, one of which was kept unmanured and the other two treated with old and fresh refuse. The outturn of the several plots and the increase of the manured over the unmannred portions are noted in Table XII.

Table XII.

Number of plot.	Year.	Manure.	[illegible]	*Outturn per acre.*		*Increase over the unmanured.*	
				Grain.	Straw.	Grain.	Straw.
			Mds.				
I.	1883-84 ...	Freeh indigo refuse	120	1,961·9	3,404-9	1,355-2	2,238*5
	1882-83 ...	Lime	6				
II.	1883-84 ...	Fresh indigo refuse only	120	1,828-7	3,236-2	1,222a	2,069-S
	3882-83 ...	Old indigo refuse	...				
III.	1883-84 ...	Lime ...	120	2,080*4	3,705-2	1,473-7	2,538*
	1882-r>3 ...	Old indigo refuse only	6				
IV.	1883-84 ...	Old indigo refuse	120	2,030-6	3,522*1	1,423*9	2,3557
	1882-83 ...	Fresh indigo refuse	...				
V.	1883-84 ...		120	1,482-4	2,680*7	875-7	1,614-8
	1862-83 ...	No manure ,,;	6				
VI.	1883-84 ...	Old indigo refuse	120	1,265-7	2,200*6	659*0	1,0342
	1882-83 ...	No manure ,M	...				
VII.	1883-64 ...	No manure	...	1,1760	1,982*0	568 3	815*6
	1882-83 ...	Fresh indigo refuse	120				
VIII.	1883-84 ...	No mnnnre	...	8581	1,8985	2514	7321
	(882-83 ...	Old indigo refuse'.'.[	120				
IX.	1883-84 ...	No manure	...	6067	1,1664	...	...
	1882-83 .		...				

in ino present year old inrliV^ r refuse i

•while in the previous veZrl^Zf *" * f T\ ^^ **» ^ ^^

i >eariresJi refuse gave much the largest increase. Tha differ-enoo seems probably due to the fact that in the absence of a full rainfall the fresh refuse had not had time to become properly decomposed.

(3) To determine the comparative value of ploughing in a crop of hemp against ploughin£ in green indigo and of applying hemp water- and indigo water and indigo vat refuse nine plots were made out as follows :—

-*No. 1.*— Green soiled with hemp, which had been manured with gypsum, six maunds to the acre.

No. 2.—Green soiled with indigo, manured with gypsum at the rate of six maunds to the acre.

No. 3.—Green soiled with indigo without any application of gypsum.

No. 4.—Hemp water to a depth of 1 inch or 3,630 cubic feet to the acre.

No. 5.—Indigo water to a depth of 1 inch or 3,630 cubic feet to the acre.

No. 6.—Fresh indigo refuse 120 maunds and lime 6 maunds to the acre.

No. 7.—Old indigo refuse 120 maunds to the acre.

No. 8.—After a crop of indigo, the indigo plant being cut and sold in open market.

No. 9.—No manure.

Besides manure all plots received the following treatment:—

Ploughing—Five times.
Watering—Five times.
Weeding—Once.
Seed—1201bs to the acre.

Their outturn is shown in Table XIII. Plot No. VII, *to* which old indigo refuse was applied, not only gave a greater outturn than the plot manured with fresh refuse, but also greater than plots II and III, green soiled with indigo plant. This was probably due to the cause already noticed, vi«., the cessation of the rains and the consequent delay in the decomposition of the fresh refuse. To this may also be ascribed the increase in outturn of wheat being so small in the case of plot No. II (indigo ^vhich was manured with calcic sulphate, gypsum) over plot No. Ill (indigo which was not so manured), for the outturn of plot No. II in indigo plant exceeded the outturn of Plot No. Ill by 38-8 maunds per acre, the outturn of the two plots being 179-3 and 140-5 maunds per acre respectively, and it was expected therefore that the plot in which manured indigo was ploughed in would give a corresponding greater outturn of wheut. The outturn of plots manured with indigo refuse and indigo water was almost as great as of the plots green soiled with indigo-r-an interesting fact, as showing that by extracting the dye indigo loses but little of its manurial ingredients, and also that the water which contains its dissolved parts is as beneficial as the refuse.

Table XflL

No. of plot.	Specific treatment.	*Outturn per acre.* Grain.	*Outturn per acre.* Straw.	*Increifie over tk* unmanured.* Grain.	*Increifie over tk* unmanured.* Straw.
I.	Green soiled with hemp, which had been manured with calcic sulphate, six Tiinunda to the ncre.	2,260*4	4,847-5	745-7	2,215-8
II.	Green soiled with indigo, manured with calcic sulphate at the rate of six maunds to the acre.	2,395*8	5,003'3	881M	2 37T6
III.	Green soiled with indigo, without any application of calcic sulphate.	2,357*9	4,723-0	843 2	2,093-3
IV.	Hemp water to a depth of one inch or 3,630 cubic feet to the acre.	2,169-6	4,396*3	6519	1,766-6
V.	Indigo water to a depth of one inch or .%630 cubic feet to the acre.	2,060*0	3,430*3	545 3	798 6
VI.	Fresh indigo refuse 120 maunds and lime six muunda to the acre.	2,8360	4,846-0	821 8	2,2143
vn.	Old indigo refuse 120 maunda to the ncre	V>60 3	4,G43»3	1,065 6	2,011-6
Vin.	After a crop of indigo, the indigo plant being cut and sold	1,590-3	2,8O2	76'6	1815
IX.	No manure	1,514-7	2,631-7	...	...

In the case of hemp water it was expected that it would give as good results as hemp plants, since after steeping and extracting the hemp as is done for fibre, little beyond the fibre is removed from the vat. Caution, however, must be exercised before drawing inferences from the figures of a single year's results, and we must wait patiently for more facts. The outturn of the plot in which wheat was sown, after a crop of indigo had been removed, appears considerably les« than the outturn of the plot in which indigo was ploughed in; but if the value of indigo sold be taken into account, then the practice of following *heat after indigo is more to be commended from a financial point of view than ploughing in the crop green as shown below :—

Table XIV.

Specific treatment.	Value of produce.			
	Wheat.	Straw.	Indigo plant.	Total.
Indigo ploughed in	57 5	19-2	...	767
Following a crop of indigo	38'8	1P4	409	91-1

(4) *Determination of value of following a crop of lucerne with wheat.*—This was tried (!) in a plot in which wheat had alternated with lucerne since 1880, and which in 1882-83 had borne lucerne till September, 1883, and (2) in a field half of which had been cropped with lucerne in the two years immediately preceding and the other half been lying fallow since March, 1883. The lucerne in both plots was disestablished in September, 1883. Both the fields were—

Ploughed—Four times.
Watered—Four times.
Weeded— Once.

The outturn of both the plots is shown in Table XV and compared with adjoining unmanured plots similarly treated. Taking an average the two plots in which wheat followed lucerne gave an increase of 781"5tbs over the unmanured plot. In 1881-82 the outturn of the plot in which wheat had followed lucerne amounted to 1 395rt>s but there was no unmanured plot at that time with which its outturn could be fairly compared.

Table XV.

Number of plot.	Specific treatment.	Outturn per acre.		Increase over the «n-manured.	
		Grain.	Straw.	Grain.	Straw.
Ia.	Lucerne up to September, 1888	2,017-6	3,472*7	986-1	1,191-9
Ib.	No manure	1,031-5	S,28O 8	...	...
IIa.	Lucerne up to September, 1883	2,55] -5	4,9865	6*76-8	909-4
IIb.	No manure	1,9 74-7	4,077-1	...	...

Miscellaneous.—Under this heading may be enumerated the following.--

I.—Comparative trial of saltpetre, ammonic chloride (sal ammoniac) and sodium chloride (salt).

II.—Jeye's purifier.

III.—Value of the silt collected in clearing out annually the canal distributaries.

IV.—Comparative trial of the following manures—

(1) Brick-kiln refuse.
(2) Woollen refuse.
(3) Perished carrot seed.
(4; Ditto indigo seed.
(5) Ammonic chloride.
(6) Ashes of weeds.
(7) Ditto top dressed with saltpetre.
(8) No manure.

V. - Experiments with tisar soil.

Nos. I, II, III, and IV were each tried in separate fields. The results are ohown in TaUe XVI.

Table XVI.

Number of series.	Number of plot in the series	Manure and amount per acre.	*Outturn per acre.* Grain.	Straw.	*Increase over the unmanured.* Grain	Straw.
I.	*a.*	Saltpetre, 24"fl>9	1,974-7	2,671-5	613-5	316-2
	b.	Animonic chloride, 24OR53	2,057-1	2,905-8	695 9	650 5
	c.	Sodium chloride, 240lbs	1.MO'2	2,435 3	24»'O	80 O
	d.	No manure	1,361-2	2,355*3	...	...
II.	*a.*	Soaked in Jeye's purifier	,529 0	3,558-8	208-6	122-0
	b.	Not soaked ditto	1,320*4	3,436 8	...	...
III.	a.	Silt 1,000 maunds	1,322*0	2,7»8 8	56*7	961'9
	6.	No manuie — — ...	1,265 3	1,856 9	...	...
IV.	1	Brick-kiln refu.e., 120 mnunds ...	2,598*4	4,259 2	946 8	1,621*4
	2	Wooden refuse and lime, each 6 maunds ...	1,P63"2	3.158-1	31 1*6	520 3
	3	Perished carrot seed, 1 2 maunds ...	5?,366 4	4.38O-2	7O4-8	1,742-4
	4	Ditto indigo „ 12 „ ...	2,096 3	3,702-6	444*7	1,064-8
	5	^ahes of ISO maur.ds weeds	1,760 5	3,206-5	10H-9	568-7
	6	Ditto top dressed with Saltpetre, 240lbs ...	2.184-O	6,094-1	632 4	2,456 3
	7	**Ammonic chloride, 24o)t>s ... ...**	2,005*5	3,388-0	353 9	76U-2
	8	**No manure ... — ...**	1,651 6	2,^37*8	...	...

No, I. Aminonic cholride (sal ammoniac) gave a little increase over potassic nitrate (sal pet re), but the amount is so very small that is it scarcely worth noticing, while its price (Rs. 23·4 per maundj is considerably more than the price of saltpetre.

No. II. *Jeye's purifier or misdSble creasote.*—Before sowing the seed was soaked in a solution containing 1 pint of purifier to 12 gallons of water, or in proportion of 1 to 96. The increase in outturn though small in quantity is great in comparison to the cost of the application which is almost nominal, one gallon, the cost of which at Gawnpore amounted *to* Rs. 10*3, being sufficient for soaking seed, which would sow at least 10 acres of land ; and it deserves a more extended trial. The effect is to preserve the seed from animal depredations and possibly, as claimed for it, to produce a healthier plant. It is also said to be a fertiliser, but I am unaware as *to* how it acts in that way.

No. III. *Silt.*—Pond silt, especially where singharas *(trata natans)* are grown, is freely resorted to in Oudh wherever it can be had close at hand : its cost consisting of the cost of digging, carrying, and pounding, all of which operations the cultivator does himself.

No. IV. *Brick-kiln refuse* gave the largest increase; a top dressing of saltpetre on the plot manured with ashes of weeds increased its outturn by 423*5fbs per acre. Perished carrot seed gave an increase of 260*libs per acre more than perished indigo seed. The use of. the latter is pretty common in the district of Farukhabad and near the city of Lucknow, where it is plentiful at 8 to 12 annas per maund. The use of perished carrot seed is novel, and came about through a large quantity being handed over to the farm by Government for experiment. The seed was bought for the Unao district in anticipation of possible scarcity in 1880, but was happily not required. To auction it would have been to tempt the danger of its being resold as vital, hence its appearance here. A large portion of it, it may be observed, was used for feeding cattle, and, though the cattle at first rejected it, they subsequently took to it kindly and throve on it.

***Experiments with lisar sail with a view to render it, if possible, fertile.—For* these experiments 32 boxes, each 3' by 2' by *1'* were taken, filled wjth powdered lisar earth obtained from the worst description of lisar, and treated with the following substances, the boxes being in duplicate. In one series small holes were drilled in the Bides of the boxes to allow of drainage, while the other remained comparatively undrained, an arrangement corresponding to situations where kankar underlies the lisar plain—**

No. 1. No manure.
99 **2. Slaked lime.**
99 **3. Slaked lime and solution of common salt.**
9> **4. Milk of lime.**
9) **5. Fresh unslaked lime.**
%% **6. Ditto and indigo refuse.**

K*o. 7. Sand and lime (unslaked).
99 8. Sand.
99 9. Salt and lime (unslaked).
99 10. Brick-kiln refuse and lime (unslaked).
99 11. Calcic sulphate and lime (ditto).
„ 12. Calcic sulphate.
„ 13. Decayed lucerne (refuse from ensilage pit).
„ 14. Poudrette,
„ 15. Rotted indigo plant.
„ 1G, Ditto hemp do.

After exposure to the air for four months barley was sown in all of them- The seed germinated in all, but in none did the plants grow to more than one or two inches, save in the boxes treated with sulphate of lime in which the plants attained a height of fully six inches when they withered and died.

Barley, it may be remarked, was only sown as the season happened to bo passing, and it was not expected that any effect would be noticeable for at least six months of weathering under lime. Nor, may it be remarked, was success expected from several of the methods of treatment shown ; the only object in trying them being to avoid to some extent the inevitable question of " why did not you try this or that ?" Sand, freshly slaked lime, with or without nitrogenous matter, and calcic sulphate, were what I hoped to succeed with.

It was somewhat singular as a coincidence that only tho other day, long after tho last stalk of barley had succumbed, I received a letter from Mr. R. Warrington, F.C.S., the author of the " Chemistry of the Farm," and engaged at Rothamstead under Sir J. B. Lawes, expressing an opinion that calcic sulphate would be found tho best dressing for lisar soil. Further experiments will be made, but sulphate of lime, or calcic sulphate or gypsum, as it is variously called, will have to be much more plentiful and cheap than it is at present, before it can be applied to any useful extent to úsar plains.

Deep and shallow ploughing.—The experiments were repeated on the four plots tried last year. In addition to these a large field was taken up and divided into plots. The details of ploughings and the outturn of each is shown in Table XVII. The outturn obtained last year being quoted for comparison. The results obtained in the year under report corroborate those obtained in the preceding year :—

Table XVII.

dumber of plot.	Detail of ploughing.	*Outturn per acre.*				*Increase per acre.*			
		In 1883-84.		In 1882-83.		In 1883-84.		In 1882-83.	
		Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.
Series A. Plot I.	Ploughed to a depth of 9" one© in the rains and once at the time of bowing.	1,226-1	1,758-5	1,036-4	1,699*0	758-9	822-6	449-8	768*5
" II.	Ploughed to a depth of 5" once in the rains and once at the time of sowing.	6791	1,374-4	775-3	1,206*0	211·9	438-4	188-7	275-5
„ HI.	Ploughed with the ordinary native plough twice in the rains and twice at the time of sowing.	492*4	996*9	588-7	921-0	...	...	...	...
n IV.	Ditto ditto	442-0	876-2	584*5	940-0	...	...	...	...
Sei ies B. riot J.	Ploughed to a depth of 9" once in the raina and once at the time of sowing.	1,304*0	2,406-9	...	...	575-7	1,264-6	...	...
" II-	Ploughed to a depth of 5" once in the rains and once at the time of sowing.	1,006-6	2,005-9		...	278-6	803-6	...	...
„ in.	Ploughed with the ordinary native plough twice in the laius and twice at the time of sowing.	728-3	1,2023	...	...	...	...	...	...

Irrigation.—Two series of experiments are annually tried under this head—

(1) to determine the variations in outturn brought about by an increase in the number of waterings ;

(2) to test the comparative merits of well and canal water.

The experiments under (1) were repeated on the same six plots as last year. The number of waterings applied, ranged from one to five. One plot was kept unirrigatfed. Other treatment of the plots besides watering was—

Xlanuring—Nil.
Ploughing—Five times.
Weeding—Once.
Sowing—Wheat 120ft>s per acre.

" The utility of irrigating depends on the season. In the preceding year, due to the heavy rains of January, it was not possible to apply more than four waterings, and the fourth watering, though it produced some increase, was not much wanted. It was that the third watering produced the greatest effect. In the present year, however, the air was extremely dry, and very high and hot westerly winds were prevalent just when the grain was ripening ; consequently, timely and copious irrigation saved it from shrinking; and so the fifth watering produced the largest increase in the weight of grain, "while the application of three waterings only, which failed to save the grain from shrinking, gave little increase over two waterings.

Table XV111.

Number of watering.	*Outturn of grain per acre.* 1688-84.	1882-83.	*Increase due to each watering over the preceding one.* 1883-84.	1882-83.
	359-9	3.30 0	...	
One ...	768 9	412-5	409-0	82-5
[illegible] ...	b14 b	481-5	45 9	69*O
3*tree ...	b4ti*5	651*5	31-7	170O
*Our ...	998 2	698 2	151-7	46*7
ilv e ...	1,252*0	...	253-8	...

(2) The comparative merits of well and canal water.

These experiments were repeated on the plots of the preceding year and on two since laid out in order to duplicate the experiment. The outturn of the two series is noted in Table XIX. The well water, as in the previous years, gave a larger outturn than that of the caual, but the increase hardly covers the increase in cost of watering from well.

Table XIX.

Number of plot.	Detail of irrigation.	*Outturn per acre.* Grain.	Straw.	*Increase per acre.* Grain.	Straw.
Series A,					
I.	From well	864	1,836	144	S16
IX.	From caual	720	1,6*0	...	...
Series B.					
I. *	From well	1,824	2,746	245	82
11.	From cunal	1,679	2,UG-L	...	...
	Average increase due to well watering.	...	...	1945	149

	11.*
Value of average increase due to well watering	5 *
Increase in the cost of watering four times from well over watering four times from canal,	*•?*

*For details of coat, *vide* report of 1382-83, page 7.

New methods of cultivation.— The system of cultivating wheat first devised by Jethro Tull has of late been reattracting attention in England; and in an article by Mr. Bernard Dyer in the *Agricultural Economist* for September, 1883, the system was clearly described as one in which a field is divided into strips alternately raised and depressed. On the raised strips the crop is planted while the depressed strips are, during the growth of the crop, constantly cultivated. In the following year the strips change places, the cropped strips of one year becoming the fallow strips of the next. Thus half the field is cropped each year and half remains fallow, and the fallow portions may with advantage be occasionally * grown on a leguminous crop.

In this way Jethro Tull claimed that full crops of wheat could be grown year by year on the same field without manure.

It was resolved to give the system a trial on a field of fair size which was divided off into two portions. One section was sown after the native fashion behind the plough, while the other was divided off into raised strips four feet wide with the fallow strips five feet wide. Wheat was dibbled in on the raised strips in three rows, one foot apart, so that actually but one-third of the entire area was urnler crop. The field was not manured, it may be observed, in the previous year beyond being green soiled with hemp after which it was cropped with wheat.

Both the native cultivated plot and the Jethro Tull raised plots were weeded once and irrigated five times ; irrigation in the case of the latter being applied to the fallow-spaces which were cultivuted four times with an American hand-hoe. It may also be noted that before dividing off the field for experimont it was ploughed with a Watt's plough four times. The crops on the raised strips at one time looked as fine as any on the farm, but the exposed situation of the corn thinly sown on narrow strips lead to much of the seed being thrashed out by high winds which sprung up just when the grain was ripe and before it could be reaped*

The ears of wheat and the grain were undoubtedly the finest on the farm, but oddly enough while the grain on the native-sown plot retained its natural colour (white) that on the Tull plots was tinged red.

The following table shows the outturn :—

Table XX.

Specific treatment.	*Outturn per acre.* Grain.	Straw.	Remarks.
Sown on beds	988-2	1,378-4	Taking the whole area of the plots into account.
	2,964 6	4,185-2	Calculated on the area actually under crop.
Sown in the ordinary way ...	1.376-2	2,642-4	

Thus while on the whole field the onttnm was small the outturn on the area actually cropped was almost equal to the highest yield obtained by liberal manuring on on any other part of the farm.

Mr. Dyer contends, in the article referred to, that Tull's system would in time greatly impoverish the soil, owing to the active nitrification set up by the constant tillage and the loss again of nitrates so formed by drainage, thus rapidly exhausting the "inavailable nitrogen;" but I opine that cropping the spaces with peas or lucerne in alternate years would to some extent meet this objection.

The raised plots and drill sowing will be so managed next year as to leave fully half the area under wheat.

It may seem somewhat Utopian, but still it is by no means impossible, that by this system of growing wheat the cultivator can till outlying lands for which at present he can afford no manure with as much profit as his manured lands. The pity is that so great an issue should hang on a stray field at Cawnpore, and that there is not, as there would be in America, hundreds of farmers ready to test fully and practically any such idea that presented any glimmer of progress accepting cheerfully as inevitable that in experimental woik there must be more disappoiutment than success.

Sowing with a treble drill as practised in the Central Provinces.—One of these drills was kindly supplied from Nagpur by Mr. Fuller, who sent a man also from the Nagpur farm to explain its use.

The drill possesses the advantage of sowing three rows at once instead of one as is the case with sowing after the plough practised in these Provinces, but it requires a very powerful pair°of bullocks. At the farm it was used with two pairs of bullocks which drew it with difficulty. Another point of difference in this drill is that ils delivery tubes are rather wider apart than in the ordinary plough furrows. The lines of the former are much straighter, but it does not sow the seed as deep as when sown behind the plough. The plots sown in the two ways formed part of one field and were treated exactly alike in every other way.

The outturn is noted in the table below :—

Table XXL

Detail of sowing.	Outturn per acre.	
	Grain.	Straw.
Sown with Central Provinces' drill	1 353 3	2,099-5
Sown behind the plough	1,219*9	2,348*5

Outturn of certain crops.—Among these may be mentioned—

1. Cape oats. 1 3. Riga linseed.
2. English barleys. I 4- White linseed.

5. Poppy.

Cape oats.—This is the fourth year of our experience of Cape oats at the farm. The method of treatment of the three fields on whioh this variety was sown during the year under report and the outturn are noted in the Table XXII.

Table XXII.

Number* of plot.	Area of each plot.	Specific treatment.	Outturn per acre.	
			Grain.	Straw.
I- ...	1,343	Manured with poudrette at the rate of 100 maunds to the acre.	3,018*2	6,384-1
	2,307	Ditto ditto	2,756-9	6,429*5
& ::	2,177	Fallowed after m.-iize which was manured with poudrette 100 maunds to the acre.	1,952-0	6,233-4

The average outturn in the present year exceeded the outturn obtained in any-previous year, although more than one-third of the area had borne maize in the kharff immediately preceding.

Year.					Area on which average was struck. Acres.	Outturn per acre. Grain. Bis.	Straw, lbs.
1883-84	...	...	...	...	1·10	2,507	5,327
1882-83	...	...	...	...	''28	2,026	3,303
1881-82	...	...	...	...	•26	1,706	2,198
1880-81	...	m			Very small area sown with a handful of seed.	2,219	3,993

English barleys—TrivA of the four kinds of barleys experimented with during the previous two years were repeated in a field which had borne American cotton up to August, Ib83, when it was cleared and the field manured with poudrette at the rate of

100 maunds to the acre, and the following varieties of barley sown. The field was ploughed four times with the earth-turning plough, weeded once, and watered four times:—

Golden. | Peerless.
Beardless. | Kotgarh.
Desi (country barley.)

The outturn of all the acclimatized varieties was much better, it may be observed, than that obtained in any previous year : still for grain the country barley continues to hold its own.

Table XXIII.

Variety.	Outturn per acre*					
	1883-84.		1862-83.		1881-82.	
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.
Golden	1,751-3	3,822·1	1,248	2,683	1,000	1,828
Beardless	1,438*9	3,0*20-5	8S3	2.8*5	803	1,843
Peerleps	1,£4b-6	2,9?*9 7	1,112	2,788	741	2,198
Kotgarh	1,760-O	3,15."5 4	1,121	2,462	820	not noted
Country	2,465*6	2,857·0	2,018	2,437	1,591	1,319

***Riga linseed*—Was again grown on the same field as in the previous year. Ita treatment during the year is noted below :—**

***Manure*—Poudrette 100 maunds to the acre.**
***Plovghings*—Four.**
***Weeding*— One.**
***Waterings*—Four.**
Seed*—Seed scattered broadcast at the rate of 1£ maund to the acre

It was sown principally with the object of utilizing the stalks for paper material ;. a portion of it therefore was reaped when the seed was quite unripe, another when the seed was nearly ripe, and the third when it was fully ripe.

Pretty large quantities of stalks gathered at all three stages were sent to the Manager, Paper Mills, Lucknow : the results have not yet been communicated. The outturn of stalk and seed gathered iu the three stages of ripening are noted below :—

Table XXIV.

	Outturn per acre.	
	Seed.	Stalk.
Cat when the seed was quite unripe-	[illegible]	2,381-7
Cut when the seed was nearly ripe .. ... — ...	[illegible]	2,913-5
Cut when the seed was dead ripe ... ... — ...	[illegible]	2,666-5

***White linseed*—Was tried in a field of some size, off which a crop of sorgho was taken in October, 1883, when it was cleared and treated as follows :—**

***Manure*—Poudrette 100 maunds to the acre.**
***Ploughings*—Four.**
***Weeding*—One.**
***Waterings*—Four.**
***Seed*—401bs. to the acre.**

The crop was again frost-bitten in February when in flower, yet the outturn exceeded that of the previous year :—

	Outturn per acre.	
	1S63-84.	1882-83.
Seed	€24*9	319-
Stalk	1»156'7	887'

Poppy.—With a view to test the produce, two small plots and one fairly big strip of land was sown with poppy. The two plots had been lying fallow for two years, and on the long strip cotton was grown up to September, 1883. The treatment of all three plots was as follows :—

Manure—Cowdung 100 maunds to the acre.
Ploughings—Four.
Weedings— Two.
Waterings—Four.

The plants on all the three plots were much finer than those on any poppy field in the neighbourhood, but owing to strong winds by day and cloudy nights, just when incisions were made in the poppy-heads, the outturn was considerably reduced, especially of the large field the plants on which failed in yield after the second incision.

Table XXV.

Number of plot.	Outturn per acre. Opium.	Seed.
	lbs.	lbs.
I.	15·3	265·5
	15·6	327·4
	6·8	259·3

The opium which was gathered was placed in the highest class by the Sub-Opium Agent attached to the Benares Division.

ENSILAGE.

In the last kharif report mention was made of juár fodder having been ensilaged in three earthen pits and juár *(sorghum vulgare)* and sorgho *(sorghum saccharatum)* in two masonry pits. One of the earthen pits had been opened and its contents fed off to the farm bullocks at the time the kharif report was written. The other silos were subsequently opened and found equally successful. Their contents were fed off to bullocks, six of which were selected for experiments along with a buffalo, a mare, and a cow. These animals were fed for a month on such dry juár fodder as was available in the neighbourhood, and for an equal period on ensilaged fodder. At the end of each week each animal was carefully weighed on a platform weighing machine; while the milk of the cow, the quantity of fodder fed, and the droppings of the animals during the night were also carefully weighed. All these particulars are noted in tables at the farm, but for the purposes of this report averages have been struck as noted in the following tables ; the work performed for the two months during which the animals were kept under trial is also noted. These tables show—

(1) that the weight of the animal continually decreased so long as fed on dry fodder alone.

Table XXVI.

Animal.	Work performed by the animal.	Weight before put to feed entirely on dry juár.		Weight when fed on dry juár taken at the end of the 1st week.		2nd week.		3rd week.		4th week.	
		Mds.	s.	Mds.	s.	Mds.	s.	Mds.	s.	Mds.	s.
Bullock No. 1	Ploughing	7	33	7	26	7	28	7	21	7	16
Ditto „ 2	Ditto	7	36	7	33	7	29	7	13	7	11
Ditto „ 3	Working bucket	10	11	10	3	9	38	9	27	9	20
Ditto „ 4	Ditto	9	36	9	26	9	23	9	29	9	8
Ditto „ 5	Driving cart	9	2	8	39	9	1	8	37	8	31
Ditto „ 6	Ditto	9	21	9	15	9	16	9	13	9	8
Buffalo	Carting night soil	11	21	11	13	11	13	11	6	11	4
Cow	Nil	6	3	5	33	6	28	5	20	6	18
Mare	Nil	5	16	5	11	5	7	5	8	4	39

(2) when fed on ensilage their weight increased for two weeks, after which it decreased. The animals then showed a desire for change and ate less food.

Table XXVII.

Animal*	Work performed by the animal.	Weight before put to feed entirely on ensilage.		Weight when fed on ensilage taken at the end of							
				1st week.		2nd week.		3rd week.		4th week.	
		Mds.	s.	Mds.	s.	Mds.	s.	Mds.	s.	Mds.	s.
Bullock No. 1	Ploughing ...	7	16	7	31	8	6	7	34	7	29
Ditto „ 2	Ditto ...	7	11	7	30	7	32	7	31	7	28
Ditto „ 3	Working bucket ...	9	20	9	25	10	8	9	37	9	32
Ditto „ 4	Diito ...	9	8	9	16	9	22	9	17	9	10
Ditto „ 5	Driving cart ...	8	31	9	3	9	3	8	38	8	36
Ditto „ 6	Ditto ...	9	8	9	16	9	17	9	6	3	39
Buffalo ...	Carting night soil ...	11	4	11	14	11	22	11	8	11	7
Cow ...	Ml ...	5	18	5	32	6	36	6	37	5	27
Mare ...	Nil ...	4	39	5	9	5	16	5	6	5	4

(3) ™ith the cow the quantity of milk decreased when fed on dry jufir and increased when fed on ensilage :—

Table XXXVIII.

Period,	Average quantity of milk per day	
	When fed on dry juār.	When fed on ensilage.
	Seers.	Seers.
1st week	1-72	1-41
2nd week	1-50	1·89
3rd week	1*43	1·82
4th week	1-34	1-93

(4) The amount of food by weight in the case of every animal when fed on ensilage was more than treble the quantity consumed when feeding on dry jufir, but the droppings showed too corresponding increase, save to some extent in the case of the cow and mare.

Table XXIX.

Animal.	Average amount consumed daily.		Dry droppings.	
	Dry jufir.	Ensilage.	When fed on juār.	When fed on ensilage.
Bollock No. 1	4-9	17-4	1-2*	1-3*
Ditto „ 2	5-6	17 0	1·0 *	M *
Ditto „ 3	5-9	20-8	1-8*	1-5*
Ditto „ 4	6-7	19-6	1·1 *	1-5*
Ditto „ 5	6·2	15·0	1-2*	1-3*
Ditto „ 6	5*8	16-4	1-1*	1-6*
Buffalo	4-0	22*2	1-1*	1-3*
Cow	4-7	16·2	1-5f	2'2f
Pony	4-5	12-3	[illegible]	1-9f

The quantity of water drunk by each animal, though not measured, was observed to be considerably less when they were feeding on ensilage. During the latter period none of the animals showed signs of indisposition.

* During the night only.
t Ditto night and day.

The cost of digging silos and of roofing them in must necessarily vary with their dimensions. Figures for one of the pits whioh contained 163 maunda fodder and the cubical contents of which were 450 cubic feet are given below :—

	Ra. a. p.
Cost of digging at Re. 1-12-0 per 1,000 c. ft. •••	O 12 6
Cost of mud plastering at annas 6 per 1,000 square feet	o 11 s
Cost of tiling at Ks. 6 per 400 square feet — ••• •••	11 8 O
Cost of supports	1 O O
Total ...	is 15 9

Allowing interest on this at 6 per cent., and for repairs eight annas every year, the cost per annum due to construction may be taken at 13 annas per 100 maunds of fodder ensilaged.

The cost of cutting with the chaff-cutter per 100 rnaunds amounted to Be. 0-12-6 and cost of filling and treading amounted per 100 maunds to Re. 1-2-0.*

Thus the total cost of ensilaging 100 maunds juár amounted to fta. 2-11-6.

Thejuárat the time it was ensilaged was selling at about Us. 10 per 100 maunds ; allowing 20 per cent, for the quantity in the top-layer which was rejected as mouldy the cost per 100 maunds of ensilage amounted to Rs. 15-14-8. In the hot months when the silo was opened the dry juár fodder could with difficulty be had for Rs. 25 per 100 maunds in Oawnpore, and nearly one-fourth of this was rejected by the animals as uneatable.

In May last, I was present when a silo was opened at Bara Banki, which had Wn prepared under the directions of Major Noble, Deputy Commissioner. For the silo an old lime-kiln had been utilised, and the fodder was juár, about 75 maunds. Notwithstanding the fact that in the sinking process the descent of some portion of the weight had been arrested, the experiment was a decided success. From nine to ten maunds were considered unfit for use, constituting the usual mouldy top-layer. The whole of the rest was readily eousumed by bullocks, though it was found that they eat it better, after a time, when mixed with bhiisa, and this was the farm experience.

IMPLEMENTS.

Opinions regarding the working of the duplex plough distributed during last cold season have not yet been received for inclusion in the present report, but there seems to be little question about the plough being a success. The neighbouring cultivators, who have shown a steady front against all improved implements used at the farm, came forward last month to borrow the duplex for ploughing and sowing their kharif fields. Those in use at the farm continued to work satisfactorily and no further Modification has been found necessary. This plough was exhibited at the last Bahraich exhibition and was awarded a silver medal.

The chain water-lifts made at the farm have of late found favour with native owners of indigo factories, two of whom purchased eight pumps during the last month. The short lifts for raising canal water seem to be gradually winning appreciation from Native cultivators, several of whom borrowed lifts during last season to water their Tvheat and indigo crops. In the case of a cultivator whose fields were about two miles from the farm a fee of one anna per day was imposed as a test of sincerity* •the cultivator accepted the terms and used the pump for one month, paying one anna a day for the whole time. Trifling as this may seem, it is a beginning of a sort which is preferable to absolute indifference.

Winnowers.—Eight winnowere were issued during the season; but though the ones lately devised are superior to any of previous patterns, and work well for a time, it has not been found possible as yet to make them sufficiently solid and strong to stand continuous and heavy work, and until something more satisfactory has been devised their manufacture will be discontinued.

* In t*lc Ktuurif Heport for 1883, page 10,/or •• the coBt of cutting and tilling came to Kc. 1-2 0,*' «the cost of treading and filling came to 1-2-0 "

A weeder received from America was tried for hoeing the empty spaces between the rows of wheat sown on Jethro TuU's Bystem, and in the fields of guinea grass planted from two to three feet apart. It completely pulverized the soS and cleared' out the weeds. The cost of cultivating with the implement amounted to 12 annaa per acre; weeding with a native hoe costs from Re. 1 to Rs. 2 per acre, according to the amount of weeds. The work of the native hoe cannot compare with the American weeder, as the latter not only outs the weed from the root, but buries it down completely, and pulverizes the soil as much as a native plough would do. It sells in America for *$5,* but its cost at Oawnpore amounted to Rs. 32.

Cornsheller.—A very simple and effective cornsheller has been devisefl and patented by Mr. W. B. Wishart, of the firm of Messrs. Begg, Sutherland, & Co. In principle it differs little from the American cornsheller in use at the farm, but has the merit of great simplicity and is much cheaper. Iron cog-wheels have been dispensed with and the fittings could be repaired or replaced by a good native mistri. Its price is said not to exceed Rs. 25. The machine was brought for trial very late in the season, at a time when it was difficult to get good cobs in any quantity • hence the trial was short.

The following table gives the results compared with the American pattern, bearing in mind that in Mr. Wishart's pattern only one cob is operated on at a time, while the American pattern is double-barrelled.

Table XXX.

Mode of shelling.	Detail of labour.	Time taken per lOOBs of grain shelled.	Cost of shellingper lOOlbs of shelled grain.
I. Shelter devised by Mr. Wiahart.	1 man to feed 1 man to drive #>. 1 boy to supply fresh cobs for shelling and to remove shelled cobs. 4 boys for removing Btruggling grains in the shelled cobs.	1st shelling 19-7 minutes, 2nd shelling 11-7 ditto. Removing") ditto. hand.	> 2-46 pice.
II. American shelter	2 men to feed ... 1 man to drive ... 1 boy to supply fresh cobs for shelling »"<* to removing shelled cobs. 4 boys to supply fresh cobs for shelling and to remove shelled cabs,	2 st shelling, 17*4 minutes 2nd shelling, not required. R p [illegible] [illegible] [illegible] by hand. [illegible]	1-99 pice.
III. Shelling by stick, which is the cheapest mode of shelling among the natives ascertained in 1882.	6 bays	129-7 minutes	7-73 pice.

The farm was represented during the year at the agricultural shows at Aligarh Bnlandshahr, Sahâranpur, Meerut, Bahraich, and Partâbgarh, at all of which awards were gained for implements and produce.

The farm has remained under the superintendence of Bâbu Lachhmnn Parshad Barma, who has managed it with great care and intelligence, striving at all times his best to graft what appears valuable on to the indigenous system of agriculture.

D. G. PITCHER, MAJOR,

Assistant Director for Oudh,

In dung of Experimental Farm, Catvnpore.*

PBPNTBD AT THE H.-W. P. AND OUDB OOTKRMMttXT PUSS, [illegible]

REPORT

ON THB

CAWNPORE AGRICULTURAL STATION

FOR THE KHARIF SEASON, 1884.

ALLAHABAD:

MORTH-WE8TEBN HOVIN0ES AND OBDH GOVERNMENT PRESS.

1885.

No. 520A. OF 1885.

FROM

THE DIRECTOR, DEPT. OF AGRICULTURE AKD COMMERCE,
NORTH-WESTERN PROVINCES AND OUDH,

To

THE CHIEF SECY, TO GOVT., N.-W. P. AND OUDH,
REVENUE DEPARTMENT,
ALLAHABAD.

Dated Cawnpore, the 10th of March, 1885.

SIR,

I HAVE the honor to submit, for the perusal and orders of His Honor the Lieutenant-Governor and Chief Commissioner, the report of the Cawnpore Agricultural Station for the kharif season 1884.

2. The manure experiments show that for kharif orops as for rabi cow-dung is perhaps after all the cheapest and most profitable fertilizer, as it is most certainly the manure most readily procurable by the Indian cultivators.

3. In this kharif as in the last rabi a thorough inversion of the soil has proved decidedly advantageous compared with the mere piercing of the land with the native implement. It is in the end cheaper and gives a larger outturn for the labour worked.

4. In the experiment Ridge-sowing *versus* Broadcast-sowing of cotton the country method comes off best. But a further testing must be applied before a final verdict can safely be given.

5. It appears plain that, under existing conditions of Indian cultivation, it is a distinct disadvantage to take two crops of cotton from the same plant. It is better to take the one crop and then plough up the land in the spring either for another kharif crop or a cereal in the following spring.

6. New Orleans cotton failed. But there are other varieties which remain yet to be tried, and the successful introduction of an exotic cotton of a more marketable kind than the indigenous variety is not to be despaired of.

7. In regard to maize, which is a very important crop, it is proposed to attempt, in the coming kharif, the American method of sowing in " hills " or " squares," The secret of the success of this process lies in the free ventilation and sunlight secured to the plants. The success of the " hill" or " square " cultivation in America has been remarkable.

8. The ensilage experiment is still on its trial. If the fodder proves really serviceable'to working cattle, there seems every reason to hope that ensilage may yet become an institution in Indian farming. The whole cost of the silo up to packing and closing it is less than the cost of digging and lining an ordinary kutcha well, so that on the score of expense the cultivator cannot well complain.

9. The matter of ploughs is not an easy one. The same fashion of plough does not suit all soils and all sorts of cultivation. Experience, however, is being gained, and the Duplex plough will shortly be put to a practical test elsewhere.

10. Babu Lachman Prasad carried on the kharif operations at the Station in kU usual careful and discriminating way.

I have the honor to be,

SIB,

Your most obedient servant,

DONALD SMEATON,

Offg Director.*

REPORT

ON THB

CAWNPORE AGRICULTURAL STATION

FOR THE EHARIF SEASON OF 1884.

THE crops suffered this year considerably from heavy and inopportune falls of rain at the time of cotton and sorghum being in flower. The only crop which benefitted was juar on sloping ground of poor soil, which ordinarily would have given but a poor crop.

The following table shows the rainfall at the Station compared with that in the city adjacent to it and compared with the mean of the past 15 years :—

Month.	RAINFALL IN IMCHES.		
	At the Station in 1884.	*At ike city.*	
		In 1884.	Mean of 16 years.
June ... ..i ».. ...	2·67	2*2	2·61
July ».. *tt #.. * ...	8·11	6'4	9ª60
AugUBt .«« ..« ^ c*. "	2**47	26-6	7-80
September »tl —t —% ...	9-32	9-6	8-81
October M« ... ..«	«*17	6*6	1-06
Norembev .M . M !.. t»*	[illegible]	[illegible]	[illegible]
Total	50 64	51-3	26-66

The following experiments were carried out :—

(1) Manures.
(2) Ploughings. .
(3) Sowing in drill and on ridges against broadcast
(4) Cropping cotton a second year.
(5) Exotic cottons.
(6) Sorgho.
(7) Outturn of indigenous plants.
(8) Ensilage.

(1) Manures.—(a) *Experiments in a series of duplicate plots.—±The* number of plots in each series was this year increased to 13, three new plots being added to each, one for sheep-dung alone, one for poudrette, and one for ashes of dung top-dressed with saltpetre.

The manures applied to each plot during the last five years and the crops raised therefrom are noted in Tabb I.

Table I

Number of plot.		1880-81.		1881-82.		1882-83.		1883-84.		1884-85.	
		Manure.	Crop.	Manure.	Crop.	Manure.	Crop.	Manure.	Crop.	Manure.	Crop.
I	Standard ...	Dung	Maize and wheat.	Dung	Maize ...	**Dung**	Maize	Dung	Maize ...	Dung	Maize.
	Duplicate.	M7	Maize ...	Do.	Maize and wheat...	Do. ...	Do.	Do.	Wheat ...	**Do.**	Do.
II	Standard ...	Dung and bone-dust ...	Do. and wheat.	Dung and bone-dust ...	Maize	Dung and bone-dust	Do.	Dung and bonedust...	Maize ...	Dung and bone-dust	Do.
	Duplicate ...	*Nil*	Maize ...	Do.	Maize and wheat...	Do. ...	Do.	Do.	Wheat ...	Do.	Do.
III	Standard ...	Dung and calcic sulphate.	Maize and wheat.	Dung and calcic sulphate.	Maize ...	Dung and calcic sulphate	Do.	Dung and calcic-sulphate.	Maize ...	Dung and calcic sulphate.	Do.
	Duplicate...	***mi***	Maize ...	Do.	Maize and wheat...	Do. ...	*Do.*	Do. ...	Wheat ...	Do	Do.
IV	Standard ...	Ashes of dung	Maize and wheat.	Ashes of dung	Maize ...	Ashes of dung ...	Do.	Ashes of dung ...	Maize ...	Ashes of dung ...	Do.
	Duplicate...	*Nil*	Maize ...	Do.	Maize and wheat...	Do. ...	Do.	Do.	Wheat ...	Do. ...	Do.
V	Standard ...	Poudrette	Maize and wheat.	Poudrette	Maize ...	Potassic nitrate	Do.	Potassic nitrate ...	Maize ...	Potassic nitrate ...	Do.
	Duplicate...	*Nil*	Miize ...	Potassic nitrate	Maize and wheat...	Do. ...	Do.	**Do.**	Wheat ...	Do. ...	Do.
VI	Standard ...	No manure	Fallow ...	No manure	Fallow	No manure ...	Fallow	Potassic nitrate and bone-dust.	Maize ...	Potassio nitrate and bone-dust.	Do.
	Duplicate...	*Nil*	Maize ...	Potassic nitrate and bone-dust.	Maize and wheat...	Potassic nitrate and hone-dust.	Maize	Do. ...	Wheat ...	Do. ...	Do.
VII	Standard ...	Bone superphosphate...	Maize and wheat.	Bone superphosphate ..	Maize	Bone superphosphate...	Do.	Potassic nitrate and bone superphosphate.	Maize ...	Potassic nitrate and bone superphosphate.	Do.
	Duplicate...	*Nil*	Maize ...	*Do.* ...	Maize and wheat...	Do. ...	Do.	Do.	Wheat ...	Do.	Do.
VIII	Standard ...	Bone-dust	Maize and wheat.	Bone-dust	Maize ...	Bone-dust ...	*Do.*	Sheep-dung and bone-dust.	Maize ...	Sheep «dung and bone-dust,	Do.
	Duplicate...	*Nil*	Maize	*Do.*	Maize and wheat...	*Do,* ...	Do.	Do.	Wheat ...	Do,	Do.
IX	Standard ...	Calcic sulphate	Maize and wheat.	Calcic sulphate	Maize	Calcic sulphate ...	Do.	Sheep dung and calcic sulphate.	Maize ...	Sheep-dung and calcic sulphate.	Do.
	Duplicate...	*Nil*	Maize ...	Do	Maize and wheat,..	Do. ...	Do.	Do.	Wheat ...	Do. ...	Do.
X	Standard ...	No manure	Maize and wheat.	No manure	Maize	No manure	Do.	No manure ...	Maize ...	No manure ...	Do.
	Duplicate...	*Nil*	Maize ...	Do.	Maize and wheat...	Do. ...	Do.	Do.	Wheat	Do.	Do.
XI	Standard ...	Do.	Pulses ...	Dung ...	Cereals	Green soiled with hemp	Barley ...	**Do.**	Sorgho	Ashes of dung **and** saltpetre.	Do.
	Duplicate...	Do. ...	Maize ...	No manure	Cotton	No manure	Juar and gram.	Ashes of dung and saltpetre.	Sorgho and wheat.	Do.	Do.
XII	Standard ...	Do. ...	Pulses ...	Dung	Cereals	Green soiled with hemp,	Barley	No manure ...	Sorgho	Sheep-dung	Do.
	Duplicate...	Do.	Maize	No manure	Cotton ...	No manure	Juar and gram.	Sheep-dung ...	Sorgho and wheat.	Do.	Do.
XIII	Standard ...	Do.	Pulses ...	Dung	Cereals	Green soiled with hemp	Barley ...	No manure ...	Sorgho	Poudrette	Do.
	Duplicate ...	Do.	Maize ...	No manure	Cotton	No manure	Juar and gram.	Poudrette ...	Sorgho and wheat.	Do.	Do

Other treatment of the 26 plots was as follows : —

Ploughings—Three.
Weedings—Two.
Irrigation—*Nil.*
Seed and rate per acre—Maize, six seers to the acre.

The outturn of grain and stalk during the present and the preceding year obtained from each plot is noted in Table 1L

Table II.

"Si 1 i	Manure and rate per acre.	Year.	OUTTURN PER ACRE. Grain. Standard.	Grain. Duplicate.	Stalk and leaf. Standard.	Stalk and leaf. Duplicate.
			Ib.	Ib.	Mds.	Mds.
i	Cow-dung, 180 maundfl ••• •••	1884	1860*0	1580-4	89-6	75-2
		1883	1462 5"	1170-0	42-9	31-3
2	How-dung, 180 mauuds; bone-dust 3601b...	1884	1632 0	1508 4	76-8	8R6
		1883	1720-5	1377 0	47 3	37 9
*	Cow.dung, 180 maunds ; caleic sulphate, 2401b	1884	1914 0	1524-0	96 0	80-8
		1883	16440	979'0	45*5	32-2
4	Ashes of 180 maunds dung ... .*.	1884	12300	806 4	69 6	48*8
		1883	1073 25	712-5	38-6	28 4
5	Potassic nitrate, 2401b	1884	1608-0	876 0	776	58 4
		18a.J	IOGS'0	829-5	45-3	•28 3
6	Ditto bone-dust, 360» ... —	1884	1644 0	12000	73*6	56-8
		18b3	179325	1244-25	476	32-3
7	Ditto bone superphosphate, 2401b....	1884	1260-0	852 0	760	£5-2
		1883	1335 25	104775	45 4	34*6
8	Sheep-dung, 180 maunds ; and bone dust, 360 lbs.	1881	1518 0	1062 0	80-8	53*6
		1883	1797*75	9 '9 0	42*5	271
9	Ditto and calcic sulphate, 2401b. ...	1884	1359-6	10740	70-4	584
		1883	3485-0	1341 0	35-3	34-4
10	No manure — —	1884	1044*0	5640	70-4	43 2
		1883	9900	801-75	34-7	32 3
II	Ashes of ISO maunds dung and potassic nitrate 240ft.	1834	15144	11340	73'6	68-*
		1883	---	--		
12	Sheep-dung, 180 maunds ...	18St	1316-4	1167 6	"*73 6	"69-6
		1833	...	---		
13	Poudrette, 180 maunds — ...	1881	1932*0	1728-0	"'96-8	"86-4
		1883	...	---		•••

The outturn of tho standard plots in every case is in excess of the duplicate plots. This is due to the fact, that the standard plots are cropped every year with maize, *> that they enjoy a fallow of more than seven months before they bear a crop, while in the duplicate plots maize follows whpat, and thus the fields remain fallow for three Months only.

Poudrette in each case heads the list and cow-dung seems to be more suited for maize than sheep-dung.

Saltpetre, which in the case of wheat gave almost as good results as dung, does not appear to as great an advantage with maize. In the duplicate plots the addition of bone-dust to saltpetre gave a good increase, in others, bone-dust as well as gypsum ^ are not of much use.

(ft) *Experiments to determine the comparative value of certain animal manures and *<*ltpetre.*— These were tried in a field divided into eight plots. The manures applied and the crops raised daring the previou* five years and in the present year are shown ia Table I1L

Table III.

ber of at.	1879-80. Manure.	1879-80. Crop.	1880-81. Manure.	1880-81. Crop.	1881-82. Manure.	1881-82. Crop.	1882-83. Manure.	1882-83. Crop.	1883-84. Manure.	1883-84. Crop.	1884-85. Manure.	1884-85. Crop.
i.	Guano.	Wheat	Sheep-dung.	Wheat.	*Nil.*	Cotton.	*Nil.*	Wheat.	Woollen refuse.	Maize and barley.	Woollen refuse.	Maize.
ii.	Do. ...	Do. ...	Do. ...	Do. ...	Do.	Do. ...	Do.	Do. ...	Do.	Do. ...	Sheep, dung.	Do.
in.	Do. ...	Do. ...	Do. ...	Do. ...	Do.	Do. ...	Do.	Do. ...	Brick-kiln refuse.	Do. ...	Cow-dung.	Do.
IV.	Do. ...	Do ...	Do. ...	Do ...	Do	Do. ...	Do.	Do. ...	Poudrette.	Do. ...	Foudrette.	Do.
V.	Do. ...	Do. .	Do. ...	Do. ...	Do.	Do. ...	Do.	Do. ...	*mi* ...	Do. ...	Horse-dung,	Do.
VI.	Do. ...	Do. ...	Do. ...	Do. ...	Do.	Do. ...	Do	Do. ...	*Nil* ...	Do. ...	Pigs dropping.	Do.
VII.	Do. ...	Do. ...	Do. ...	Do. ...	Do.	Do. ...	Do.	Do.	*Nil* ...	Do. ...	Saltpetre.	Do.
VIII.	Do. ...	Do. ...	Do. ...	Do. ...	Do.	Do. ...	Do.	Do. ...	*Nil* ...	Do. ...	*Nil* ...	Do.

Other treatment of the plots during the year was as follows :—

Floughings—Three.
Weedings—Two.
Irrigation—*JMl.*

Seed and rate—Maize, six seers to the acre.

The outturn of each plot is noted in Table IV.

Table IV.

Number of plot.	Manure and rate per acre.	Outturn per acre. Grain.	Outturn per acre. Stalk and leaf.
		2b.	Maunde.
1	Woollen refute, 120 Maunde	1,604 4	126*4
2	Sheep-dung, 120 »	924 0	79*2
3	Cow-dung, 120 ii	1,128-0	86*6
4	Poudrette, 120 9%	1,560 0	101 6
5	Horse-dung, 120 »	1,104-0	81-6
6	Pigs dropping, 120 ,, ...	918-0	80-0
7	Potassic nitratei (saltpetre), 3 maunds	7800	71-2
8	No manure	6840	62-4

As this is the first year in which this field was brought under these experiments, no conclusion can safely be drawn. It is satisfactory to note, though, that woollen refuse, which last year was a failure chiefly because it had no time to rot, has this year topped the list and given a higher outturn than even poudrette. Its price on the spot is four annas a cart-load, or Rs. 1-4-0 per 100 maunds, which is only half the price of poudrette charged by the Cawnpore Municipality.

(c) *Brick-kiln refu$e and ashes of weeds.*—For these a field was divided into four plots. Fast and present treatment are noted in Table V.

Table V.

Number of plot.	Past treatment. Year.	Past treatment. Manure.	Past treatment. Crop.	Manure.	Present treatment. Ploughing.	Present treatment. Weeding.	Present treatment. Irrigation.	Present treatment. Crop.
I. ...	1881-82 ...	*Dung ...	Wheat and barley.	As in table VI,	2	2	*mi.*	Maize
II. ...	1882-83 ...	Green soiled with hemp.	Oats ...					
III. ...	1883-84 ...	*Nil.*	Sorgho ...					
IV. ...	...	...	...					

The outturn obtained from each plot is noted in Table VI.

Table VI.

Number of plot.	Manure and rate per acre.	Outturn per acre. Grain.	Outturn per acre. Stalk and leaf.
		lbs.	Maunds.
1	Brick-kiln refuse, 120 maunda ... — —	864-5	83*4
2	Ashes of 120 maunds weeds ... — ...	874-0	67 7
3	Ditto and pofcassic nitrate, 3 maunds	965-6	81-1
4	No manure	587*5	74*1

(2) Ploughing,—These experiments were repeated on the two series of plots experimented upon last year, which were ploughed as below :—

Series A., No. 1.—Ploughed twice with country plough.
99 79 2.—Ploughed once with earth-turning plough 5" deep.
99 77 3.— Ditto ditto ditto 9" ,,
99 ,, 4.—Ploughed twice with country plough.
Series B., ,, 1.— Ditto ditto.
99 91 2.— Ditto once with earth-turning plough 5" deep.
99 99 3.— Ditto ditto ditto 9" ,,

No manure was applied ; all plots were weeded twice.

The outturn obtained in the present year is shown in Table VII along with the outturn obtained in the two previous years.

Table VII.

Number of plot in the series.	Detail of ploughing.	Outturn per acre in 1884. Cotton.	Outturn per acre in 1884. Seed.	Outturn per acre in 1883. Cotton.	Outturn per acre in 1883. Seed.	Increase per cent, over country ploughed in 1884. Cotton.	Increase per cent, over country ploughed in 1884. Seed.	Increase per cent, over country ploughed in 1883. Cotton.	Increase per cent, over country ploughed in 1883. Seed.
Series A.		lb.	ft.	lb.	lb.				
Plot I.	Twice with country plough ...	36-8	78-4	110-9	249-0	...	...	...	...
	Once with earth-burning plough 5",	48*0	96*0	141-1	308-5	22	12	18	19
&	Ditto ditto *9",*	6H-8	324-8	136-1	304-5	55	45	14	17
	Twice with country plough ...	416	92-8	1280	269*2	...	...	...	...
Series B, Plot I.	Ditto ditto ...	31-2	60*6	93*4	198*7	...	—	—	...
II.	Once to 5" with earth-turning plough.	34*8	70-2	104-9	232 4	11	15	12	17
III.	Once to 9" with earth-turning plough.	37-2	76-8	1147	238-4	19	26	22	20

(3) Broadcast *versus* drill.—This was tried in five fields, two of which were sown with country cotton, two with Nankin and one with New Orleans cotton ; the last, *however*, came to grief, being covered with water for several days. Each field was divided into four plots and sown as follows :—

(1) On tops of ridges.
(2) On slopes of ridges.
(3) In lines.
(4) Broadcast.

Other treatment and outturn of the fields are noted in Table VIII.

Table VIII.

Number of plot in the series.	tō c IS 3 S	Manure.	tic ja G*	Seed.	Detail of sowing.	*Outturn per acre in* 1884.	
						1 8	© v
Series A. No. 1 ...	2	*Nil* ...	2	Kul pahar cotton.	On top of ridges ...	75 6	159 4
Ditto „ 2 ...	2	*Nd* ...	2	Ditto ...	On slopes of ridges ...	72 0	144·0
Ditto „ 3 ...	2	*Nil*	2	Ditto ...	In lines ...	67*3	139 3
Ditto „ 4 ...	2	*Ai/* ...	2	Ditto ...	Broadcast ...	93-7	196-5
Series B. „ 1 ...	2	Cow-dung, 20U maunds to the acre.	2	Ditto ...	On top of ridges ...	49 0	1129
Ditto „ 2 ...	2	Ditto ...	2	Ditto ..	On slopes of ridges ...	44 2	100 4
Ditto „ 3 ...	2	Ditto ...	2	Ditto ...	In liues ...	40*6	92-6
Diito „ 4 ...	2	Ditto ...	2	Ditto ..	Broadcast ...	56-8	1147
Series C. „ 1 ...	2	Poudrette, 200 maunds to the acie.	3	Nankin * cotton.	On top of ridges M«	51 1	169 4
Ditto „ 2 ...	2	Ditto ...	3	Ditto ...	On slopes of ridges ...	*4G* 2	15S-6
Ditto „ 3 ...	2	Ditto ...	3	Ditto ...	In lines ...	[illegible]	[illegible]
Ditto „ 4 ...	2	Ditto ...	3	Ditto ...	Broadcast ...	52-2	174-8
Series D. „ 1 ...	2	Ditto ...	3	Ditto ...	On top of ridges ...	41-9	146-8
Ditto „ 2 ...	2	Ditto ...	3	Ditto ..	On elopes of ridges ...	28-9	91·1
Ditto „ 3 ...	2	Ditto ...	3	Ditto ...	In lines ...	27-0	100-0
Ditto „ 4 ...	2	Ditto ...	3	Ditto ...	Broadcast ...	48-1	168-7

Ridges as in the last year were made by running a plough in opposite directions. Sowing on tops of ridges gave a better yield than sowing either on slopes or in lines, but sowing broadcast gave this year the largest outturn. This WHS due to the heavy rains resulting in a rapid growth of weeds amongst the ridges and lines, which in the moist state of the ground could not be removed fast enough. In the portions sown broadcast the plants, being much closer than in other plots, served to keep down the weeds, while in the otheVs the plants themselves were quite overpowered by weeds.

(4) Cropping the plants for a second year-—One field of New Orleans and one of Nankin cotton were left standing over from last year and a portion of each was ratooned. Their treatment and outturn are shown in Table IX.

Table IX.

•3 Numb plot.	Particulars of sowing and ratoouing.	*Manure and rate per acre.*		•M S o	c I	ei JB 1	*Out urn per acre*		*Outturn per acrt in preceding year.*	
		1883-	18S4.				CottOD.	Seed.	Cotton,	Seed.
							Ib.	Ib.	Ib.	Ib.
1a	Sown in lines ID July, 1S83, and ratooned in April, 1884.	Poud rette. 200 mannds to the acre.	Woollen Fefuse, 50 maunds to the acre.	I	2	*Nil*	24 9	44-6	126	388-2
Ib.	Do., uot ratooned.	Ditto ...	Ditto ...	1	2	*Nil.*	14-8	38*4		
11a	Sown on ridges in July, 1883, and ratooned in A|>nJ, 1884.	Ditto ...	Poudrette, 100 raaunds to the acre.	1	2	*Nil.*	49-1	93 3	188 5	497-0
116	Do., not ratooned,	Ditto ...	Ditto ...	1	2	*Nil.*	37·7	73 7		

The cotton gathered from each field was inferior in quality to that gathered from the same fields in the preceding year and to the cotton gathered from fields sown this year with similar varieties of cotton. The value of cotton seed is so very smalt and the labour so very cheap in this country that no advantage seems to be gained by keeping the crop on the ground for a second year and losing the advantage of ploughing up the land in March or April and leaving it in open furrows.

(5) Exotic cottons.—New Orleans has already been noticed as having completely failed owing to excessive rain, and it may be noted that both in the Duab and in Bundelkhand the cotton crop failed more or less. In some parganas it was ploughed under and rabi sown.

Nankin cotton : three varieties of Nankin cotton were tried in the present year:—

(1) Procured from Yarkand.

(2) Received from China through the Government of India.

(3) Acclimatized in Station.

There is a marked difference in the habits of the three varieties. Nos. 1 and 2 appear to be of the oriental variety, having few bunches and small deeply indented leaves similar to the ordinary cotton of these provinces. No. 3 is distinctly occidental or similar in growth and habit to American cotton. The China seed was, under orders from the Government of India, distributed to the neighbouring cultivators to cover about 20 acres of ground and about five acres of Station land were sown with similar seed. Germination was very irregular. Field's sown at the rate of 18 to 20 seers of seed per acre had not as many plants as fields sown with 3 seers of the acclimatized variety. The plants were very stunted ; most of them died before October and those which survived bore scarcely any cotton. The fate of plants raised from the Yarkand seed was not much better. The fields sown with acclimatized seed fared comparatively well. The treatment and the outturn of these fields are showa in Table X.

Table X.

Number of field.	Manure.	Ploughing.	Weeding.	Manner of sowing.	Area.	Outturn per acrt.	
						Cjottun.	Seed.
					Acre.	Tbs.	Hi*.
I-a ...	Poudrette, 200 maunds to the acre.	2	3	On top of ridges.	·18	51·1	169·4
b ...	Ditto ...	2	3	On slopes of ridges.	·18	4G-2	358·6
c ...	Ditto ...	2	3	In lines ...	·18	43 0	15^ V*
d ...	Ditto ...	2	3	Broadcast,	·18	52 2	171 S
II-a ...	Ditto ...	2	3	On top of ridges.	·18	41*9	14t> 8
b ...	Ditto ...	2	3	On slopes of ndg«*i.	·20	28 9	91·1
c ...	Ditto —	2	3	In lines ...	-on	27 0	100·0
d ...	Ditto ...	2	3	Broadcast,	·20	4S 1	35C17
III ...	Dnnpr, 100 maunds to the acie.	2	2	Do. ...	1·16	S8 7	115·9

It is to be noted here that the season for picking this cotton is not yet over ; the plants are still laden with bolls and about ome-third at least more than what has been gathered may yet be realized.

(8) Sorghum.— Red and amber varieties of sorghum were sown in ovor threo acres of land. The plants had attained a height of over 6 feet in September, whea. the heavy rains and strong winds of that month laid the crop flat beyond recovery, It was, therefore cut and used ior fodder.

(7) Outturn of indigenous plants.—To determine the average produce the following crops were selected for this season :—

1. *Knknn* (Sehiria italica).
2. *Sanwaii* (Panicum frumentacenm).
3. *ALarua* (Eleusino coracana).
4. *Kodon* (Puspalum scrobiculatura).
5. *Bajra* (Penicillaria spicata).
6. *Juar* (Sorghum vulgare).

7 *Mung* (Phaseolns mungo).
8 *Moth* (Phaseolus aconitifolins).
9 *Lobia* (Vigna catiang).
10 *Ord* (Phaseolus radiatus).
11 *Sanai* (Crotalaria juncea).
12 *San* (Hibiscus cannabinus).
13 *Maize* (Zea mays).

All these crops excepting maize, sanai and patsan were tried in two series of plots; one of these series was manured with cow-dung at the rate of 120maunds to the acre and the other kept unmanured. Both consisted of light soils. The soil of the series kept unmanured was, however, the poorer of the two, but it possessed the advantage of good drainage, and so, notwithstanding the natural poverty of the soil and want of manure, in many cases these plots gave better yield than the plots which enjoyed comparatively better soil, and had received manure.

Sanai and patsan were sown in light soils, but maize was sown in rich heavy loam.

The treatment and outturn of these plots are shown in Table XI.

Table XL

No. of plot.	Crop.	Manure and rate per acre.	Ploughings.	[illegible]	Outturn per acre. Grain.	Outturn per acre. Straw.
					lbs.	Mds.
1a	Kakun ...	Dung, 120 mds.	2	1	602-4	38-2
16	Ditto ...	*Nil*	2	1	644-4	43*0
2a	Sanwan ...	*Bung,* 120 mds.	2	1	354-0	34*8
26	Ditto ...	*Nit*	2	1	192-0	19-3
8a	Mania ...	Dung. 120 mds.	2	1	639 6	33 9
36	Ditto ...	*Nil*	2	1	578 4	36 3
4a	Kodon ...	Dung, 120 mds.	2	1	606-0	21*3
46	Ditto ...	*Nil*	2	1	708-0	16*3
5a	Bajra ...	Dung, 120 mdi.	2	1	738*0	102 0
56	Ditto ...	*Nil*	2	1	444·0	89*3
6a	Juar ...	Dung, 120 mds.	2	1	531-6	85 2
66	Ditto ...	*Nil*	2	1	564 0	115-6
7a	Mung ...	Dung, 120 mds.	2	1	102-0	53-4
76	Ditto ...	*Nil*	2	1	1800	57-0
8a	Moth ...	Dung, 120 mds.	2	1	1152	40-2
86	Ditto ...	*Nil*	2	1	204-0	47-8
9a	Lobia ...	*Dung,* 120 mds.	2	1	576·0	42-7
96	Ditto ...	*Nil*	2	1	636·0	44*5
10a	Urd ...	Dnng, 120 mds.	2	1	438*0	43-6
106	Ditto ...	iVi7	2	1	366·0	25*5
11	Sanai ...	Dang, 120 mds.	2	1	548-4	...
12	Patsan ...	Ditto	2	1	348·0	...
13	Maize, country ...	Poudrette, 120 mds.	3	2	• No. of cobs, 16,911 Weight ... 1,668-7 lb	169-0
	Ditto Jaunpur ...	Ditto	3	2	* No. of cobs, 13,140 Weight ... 2642-1 lb	152-2
	Ditto Kashipur ...	Ditto	3	2	• No. of cobs, 17,823 Weight ... 385331b	170-3

• Cobs kept for seed and so not shelled.

(8) **Ensilage.**—Fodder was this season ensilaged in 10 earthen pits and three masonry pits, the crops ensilaged being juar, sorghum, Guinea-grass and common grass. The first three were grown at the Station and the last purchased from grass-cutters at one anna per 82 lbs. The grasses were cut while going to flower. The sorghum and a portion of the juar were also cut while in flower, but most of the juar was cut when the cobs were fully formed and ripe enough to allow of their bein^ cut and stored ; the stalks were quite green, though they had lost a good deal of moisture. Juar, sorghum and a portion of the Guinea-grass were chaffed before packing, while the common grass was packed entire. The earthen pits were all either elliptical or circular in form, a little broader at the top than at the bottom, so as to give a slope to the walls, and of varied capacity. Seven of the pits were provided with "*cfiappars*" to shelter them against the rain, and over three only a sloping mound of earth three feet high was made similar to the way in which heaps of cow-dung fuel are preserved in villages. A silo of this description has been made by neighbouring cultivators in which they haro

ensilaged about 100 maunds of juar. In the case of the larger pits an opening was cut at one of the sides to allow passage to a bullock for treading down the stuff. The silos, as in previous years, were filled by suocessive layers; each layer after it was trodden down was sprinkled over with a little salt and covered over with *bhusa* about two inches in thickness. The intermediate layers were weighted with pieces of bricks and the final layer with a layer of earth two to three feet deep.

Details of cost and the quantity ensilaged are shown in Table XII.

Table XII.

Number of silo.	Form of silo.	Cost of digging.	Cost of *chhapar.*	Pillars.	Cost of chopping.	Cost of filling, treading and weighting.	Fodder filled in
1	2	3	4	5	6	7	8
		Us. a. p.	Rs. a. p.	Rs. a p	Rs. a p	Rs. a. p.	Mds.
1	Circular, 6' diameter, 10' deep ...	0 8 0	0 6 0	...	2 2 3	0 15 6	Juar ... 71
2	Ditto ditto ...	0 8 0	0 5 0	...	1 12 6	0 10 6	Juar ... 74
3	Ditto ditto ...	0 8 0	0 5 0	...	2 9 3	0 13 0	Juar ... 62 Sorgho ... 23
4	Ditto 6' diameter 10'deep...	0 8 0	0 11 6	...	1 6 6	0 8 0	Juar ... 61
5	Ditto 6' diameter 20'deep...	2 0 0	G 13 6	...	4 13 0	1 10 3	Juar ...180
6	Ditto 10' diameter 6' deep ..	0 12 0	2 8 0	...	5 3 6	1 8 0	Juar ...171
7	Elliptical, longest diameter 18' shortest diameter 10', depth 10'.	3 12 0	21 4 0	6 6 0	Not chopped.	3 8 9	Common grass 725
8	Ditto ditto ...	3 11 0	20 7 0	6 6 0	13 13 0	2 8 0	Juar ...490
9	Ditto longest diameter 25' shortest diameter 10', depth 12'.	6 8 3	22 7 0	7 6 0	20 1 6	4 11 0	Juar ...756
10	Ditto longest diameter 30' shortest diameter 18', depth 13'.	13 9 0	39 10 6	15 13 0	43 13 3	7 14 3	Juar 1,417 Guinea-grass, 416
11	Square 10' by 10' depth 5' ...	Disused	masonry	pits.	Not chopped,	1 11 0	Common grass, 58
12	Ditto		Ditto.		ditto.	2 4 0	Ditto .. 212
13	Ditto		Ditto.		ditto.	2 1 0	Guinea-grass, 191

It is to be noticed that the cost of digging would have been much less but for the Kalpi Railway line, which engaged almost all the labour of the neighbourhood, and labourers for digging could not be had for less than three annas a day at the time these silos were being made. The cost of chaffing also would have been much less bad the chaff-cutters ordered from England been received earlier, as in their absence most of the fodder ensilaged had to be out by country choppers. Chaffing, however, had to be resorted to in any case whether the fodder is ensilaged or not, and its cost, therefore, should not be taken into account in connection with the silos.

IMPLEMENTS.

JP/ow^As.—For working heavy soils Duplex ploughs were made after the " Watts" pattern and on trial were found to work with great ease. Further modifications are under contemplation to strengthen the stilt and get rid of the step, so as to assimilate the pattern more to that of the plough used in the Meerut Division than that of the plough used in the lower Doab.

Pumps.—Iron wheels have been substituted for wooden ones, being greatly preferred by zamindars. In Rohilkhand 14 were sold through an agency, while in the neighbourhood of the Station the short lifta were freely borrowed by cultivators.

American sugar evaporators.—Pans have been sent to the Sháhjahánpur district in charge of an apprentice, to be worked practically in view of the cultivators. The result will be noticed in the rabi report.

I was absent on leave during the time that the greater portion of the CM ops were being harvested. Babu Lachman Prasad, the Superintendent, has had the whole responsibility, carrying on the work under some difficulties, as he has had to conduct at the same time the statistical work of the Assistant Director, North-Western Provinces. He deserves great credit for the way in which he has carried out his work.

D. G. PITCHER, MAJOR,
Assistant Director for Oudk,
In charge of Agricultural Station, Cawnpore.

REPORT

ON THE

CAWNPORE EXPERIMENTAL STATION

FOE THE.EABI SEASON, 1884-85

ALLAHABAD:
HOBT«.\V KSTESN FBOVINOBS AND OUDH 0 0 V B R H H *T,* K T FE.ISS
' I 8 8 5 .

No. 1581A OF 1885.

DEPARTMENT OF AGRICULTURE AND COMMERCE, N.-W. P. AND OUDH.

DATED CAWNK>RE, THE 15TH OCTOBER, 1885.

FROM

DONALD SMEATON, ESQ., M.A., C.S.,

OFFG. DIR., DEPT. OF AGRI. AND COMMERCE,

N.-W. PROVINCES AND OUDH,

To

THE CHIEF SECRETARY TO GOVERNMENT,

N.-W. PROVINCES AND OUDH.

SIR,

I HAVE the honor to submit the following report by Mir Muhammad Hosein of the results attained in the Cawnpore Experimental Station during the past *rabi* (1884-85) season.

2. The character of the season of 1884-85 differed widely from that °f its predecessor. In 1883-84 the rains ceased after the middle of September, and fields had to be watered before sowing. In 1884-85 heavy r&in fell late in October ; the land was for a time water-logged ; when sowing time came the soil was too wet for vigorous, healthy germination : consequently the plants came up rapidly and sickly. A little later on, ^hen irrigation became necessary to strengthen the young crop, the canal supply was found insufficient and it came too late. The result has been a considerable falling off in outturn. Wheat, which yielded 24§2 bushels on an average in 1883-84 and 21-8 bushels in 1882-83, only yielded 17§7 bushels in the year under report. Season.

3. In the series of duplicate plots saltpetre gave the largest yield of all the single manures. The results of applying this fertilizer appear to be always, or nearly always, certain: and for cereals it would appear undoubtedly the best. The increase which it has given, compared with ordinary cowdung during the last four years, is as follows:— Manures.

	Increase per cent, over unmanured land.	
	Saltpetre.	Cowdang.
1881-82	83	7
J882-33	101	61
1883-84	22	34
1I84-85	84	42

Among the combined manures bone superphosphate yielded fair results when applied in combination with saltpetre. It is doubtful, however, whether this manure can ever at present prices coma into ordinary use by the Indian cultivator.

In the *Ville Series* the results of the present season confirm tho'se of previous years, *viz.,* that for a cereal crop a soluble nitrogenous manure is essential. This fact is now completely established. The series will therefore be dropped.

4. . *Application of excrement of different kihds.—The* series appears for the first time. Poudrette heads the list. Sheep-dung comes last

5. *Green soiling.*—Indigo ploughed in green yielded a net increase of Rs. 27-8 per acre, against Rs. 19 obtained last year. This difference in favour of the present season is chiefly due to the heavy late rains, which thoroughly rotted the green plants and allowed of rapid and easy assimilation of the fertilizing ingredients.

Uiar.

6. Usar soil in the vicinity of Cawnpore was treated *in situ* with calcic sulphate in the rains of 1884. Barley, -gram, and peas were sown, but the land evidently had not time to be pulverized, and the plants, after coming up a few inches above the ground, withered and died. Samples of soil from the usar plain where these experiments were tried have been analyzed, at my request, by Dr. Romains, Chemical Examiner, British Burma. He is of opinion that the fault lies more in the mechanical texture than in the chemical nature of the soil. The report which Dr. Romains very kindly prepared is appended.

Deep ploughing.

7. *Deep ploughing.* -Taking the average of all the experiments, deep plouging gave an increase over the ordinary shallow country ploughing of 53*5 per cent, when the land was ploughed 9 inches deep and 43*5 per cent, when ploughed 5 inches deep, although the number of shallow ploughing^ was twice as many as of the deep ploughings. In order to give practical proof of the wisdom of deep ploughing, ploughmen from this experimental station, under the charge of apprentices, have been sent out to five selected districts with the new (duplex) plough, and are now touring about in these districts, ploughing for cultivators wherever they get a chance. It is no use exhibiting a new plough when ploughing operations are over. The important matter is to catch the people while ploughing is going on and drive the new plough in the fields side by side with the common country implement. The work done thus in ordinary course naturally draws the attention of the cultivator. If we are ever to get deep ploughing into the heads of the people, this, it seems to me, is the only way. The district officers of the five selected districts and some of the selected zamindars and talukdars have cordially co-operated. The reports of progress received up to date are encouraging.

Irrigation.

8. *Irrigation experiments.*—The two series of experiments tried last year under this head were repeated in the present year. The one was to ascertain the maximum number of waterings requisite to obtain the maximum quantity of produce. As observed in the review of the last year's report, it is not possible to say what is the exact number of waterings

nece ssary under all circumstances. The number must vary with thedryness of the season and with the nature of the manure applied. Last year the 5th watering gave an increase of Us. 6 over the 4th watering, and the latter an increase of Rs. 3*7 over the 3rd watering; while this year the 5th and 4th waterings gave an increase of Rs. 2'9 and 1-6 only over the 4th and 3rd waterings respectively. Thus, if the cost of watering be taken into account, any watering after the 3rd would seem to have been hardly remunerative in the present year, while in the previous year it paid the cost more than three times over. The 2nd set of experiments was to ascertain the value of well against canal water. This year the well water gave a net increase of more than Rs. 6 over the canal-watered plot.- Last year the increase was almost entirely absorbed by the greater cost of watering from the well.

Effect of soil on color of wheat.

9. Clay soils appear to have a tendency to redden the colour of wheat.

The JethroTull method

10. This experiment was a little modified in the present year, inasmuch as the ridges were made wider and alternate furrows were sown with peas. The produce was superior in quality ; but for quantity the ordinary method is best when the entire area of the field is taken into calculation. The furrows and ridges must be alternated for a few years, and a number of crops must be taken off the corresponding plot sown in the ordinary way before a final opinion can be arrived at.

Acclimatised and imported seed.

11. The outturn of Cape oats during the year showed a falling off of ^J 14 per ceift. in comparison with last year. This is satisfactory, seeing that wheat declined by 27 per cent.

Outturn of certain mixed crops.

12. These experiments were undertaken at my desire. The addition of gram as well as peas to wheat and barley crops seems to result in a large aggregate yield. This explains why the Indian farmer is so fond of mixtures.

[illegible]

13. So far as experiments on the experimental station are concerned, the results have been very satisfactory. Similar experiments have been started in several districts through private agency. The results are awaited with interest and will be compared with those obtained here.

14. The rabi operations under review were under the charge of Babu Lachman Parshad, who conducted them with his accustomed care and vigilance. The report is altogether the work of Mir Muhammad Hosein, who has taken pains to make it as complete as possible.

DONALD SMEATON,

Offg. Director.

REPORT

ON THE

CAWNPORE EXPERIMENTAL STATION

FOE, THE RABI SEASON OF 1884-85-

ON the 6th of February last I joined the department, and about the ond of March the farm was placed under my charge, but being away from the station on duty I could not return to head-quarters till the last month of the season, and did not find opportunity to attend to the works on the farm till the beginning of the present kharif season. * In fact, the rabi crops had been sown before my joining the department and harvested when I was out in camp. Under such circumstances I cannot do better than to frame this report on the plan of the last one and with the materials supplied to me by the Superintendent of the Farm.

2. *Character of the teason.-The* complaint about the unfavourableness of the season is as usual. It is said to have been worse than any experienced at the farm for several years past.

The rain at the end and after the rainy season was unusual and abnormal, with hardly any break long enough to allow the flat land of the farm to dry up sufficiently for obtaining good tilth for rabi. Rain late in October is considered a plague to the *heat crop/even a slight shower spoils the unsown fields. About that time the fields nre just ready for being sown. If any rain falls the pulverized and loose soil gets silted up, and provides a pasty bed for the seed, which in case of wheat is by no mean, favourable. Wheat thrives best in a cold climate, but requires dry soil.

The seed sown on the farm germinated too quickly and the first blade which appealed wtunullly long and*weak. A fortnight after the plumules commenced turning pale and sickly.

Water-Wed or highly saturated subsoil does not allow free access to heat and uir S a t most essenll for dry crops (especially wheat) at the fame of germi-

ot their food accumulated in ™» »««•

'oo forward soon perished from want of nourishment in their tender state

Similar complaints are made by samindars who aided in the wheat:forecast

I noticed inSaharanpur and Musaffarnagar that the, fields which had been watered before Christmas rains suffered a good deal by tbe excess of moisture.

The crop in them in comparison to'that grown in *khaki* or unirrigated land looked shrivelled up, pale and unhealthy.

3. ***At the timeof need canal u>ater „«* not available*>-While Nature on one hand** has been extravagant in giving wator, but untimely, unfortunately on the other band the artificial'source of the supply of water, the canal, proved to be inadequate at the time of need. The supply of canal water continued scanty throughout the season Except the .experimental plots, which are close to the canal dxstributary, other fields m the farm with difficulty received water twice and some only once.

4. *So diseases* appeamf.-Fortunately there has not been any noticeable complaint about the fungoid diseases of wheat which generally appear m a wet season,

otherwise the crop would have suffered still more. Only one plot was attacked bv mildew, the others remained quite safe.

5. *Average yield per acre.*—The outturn of wheat on an area of 14%7 acres *v»s 1,0611b = 17-7 bushelsvper acre against 1,453ft « 24-2 bushels in 1883-84 and 1,3091b *» 21*8 bushels in 1882-83. A very good average in England is about 30 bushels per acre.

FIELD EXPERIMENTS.

6. *Operations of the season.*—The programme of experiment for the season stand thus—

Experiment on the effect of—

(a) The various kinds of manure.
(6) The ploughing.
(c) The watering.
(d) The sowing.
(e) The soil on the color of wheat grain.
(/) The outturn of certain mixed crops, pulse and oilseeds.
(g) The outturn of acclimatized and imported seeds.

7. For the sake of having a result thoroughly confirmed and of determining, by applying a certain manure in the same field year after year, at what point its effect becomes stationary or what residue the manure leaves for *he succeeding crop*, ant &o forth, most of the above experiments are necessarily kept unaltered.

8. By growing foreign or imported seed side by side with the indigenous ones and keeping both of them subject to the same treatment, their vitality or productive power is estimated.

9. *Suggestion for new trial.*—In connection with the determination of the above-mentioned chemical, physical and mechanical effects in favor of the ordinary crops, I must suggest that a series of experiments respecting the economy "of farming would be worth while trying : certainly it is a natter of the first importance too.

10. *A.* Manures.—These are classed into—I, experiments on a series of plot? termed " standard and duplicate" with nitrogenous manure applied singly and combined with non-nitrogenous fertilizers ; II, experiments in determining the wants of the soil for maintaining its fertility—in other words, finding out what constituent of plant-food gets exhausted after a crop of wheat and is to be supplied artificially ; III, experiments to ascertain the comparative manurial value of certain animal excrement and salt-petre ; IV, green manuring ; V miscellaneous.

11. /—*Experiments with nitrogenous and non-nitrogenous manures.*—For tli. last six years, twenty plots have been reserved for these experiments. They are divided into two series, one of which is called the " standard" and is cropped every year with wheat, the other is termed " duplicate" and js cropped one year with maize and the year following with wheat. To each of the series three mgre plots have been added in the year under report—

(1) For sheep dung alone.
(2) For ashes of (lung and saltpetre.
(3) For bonedust.

The treatment during the season under review has been as under— *m*

Manure as in the following table :—
Ploughings .-• 4
Waterings ... 4
Weeding ... 1

The outturn per acre of the season and of two preceding ones i ......
following table —

Table I.

Number of plot.	Manure and rate per acre.	Year.	Grain. Standard.	Grain. Duplicate.	Straw. Standard.	Straw. Duplicate.	Remarks.
			lb.	lb.	lb.	lb.	
1	Cowdung, 180 maunds ...	1884-85	900-2	1,466-5	1,318 9	1,6?9-8	
		1883-84	1,427-8	3,031 0	2,329-2	4.988'0	
		1882-83	1,713 0	1,623 0	3,126'0	2,958'0	
2	Cowdung and bonedust, 360lb. ...	1884-85	1,016 4	1,516-1	1,4278	1,742-4	
		1883-84	1,343*1	2-873 7	2,456*3	5,112-2	
		1882-83	1,584-0	1.400-6	2,634-0	2,412 0	
3	Cowdung and gypsum, 240lb. ...	1884-85	88G 9	1,396*3	1,464 1	1,718 2	
		1883-84	1,364*2	3,0038	2.408 1	4,694 8	
		1882-83	1,76 JO	1,886*2	3,270 0	2,778-0	
4	Ashes of 180 maunds dung ...	1884-85	704 2	1,089*0	1,-2 22-1	1,4*8-*	
		1883-84	1,134 3	2.323-2	2,311-1	3,817-5	
		1882-83	1,383 0	1,417 5	2,412-0	2.436-0	
5	Saltpetre, 240lb. ...	1884-85	1,323-7	1.741-1	1,899*7	2.-J71-G	
		1883-84	1,355*2	2,707 0	2,410*9	5,641-6	
		1882-83	1,978-5	2,i8i-0	3,036'0	3,!JO6-O	
6	Saltpetre and bonedust, 360lb. ...	1884-85	1,170-0	1,6-23-8	1,6-21-4	2,565-2	
		1883-84	1,25*2-3	2,900-9	2,668'0	6,726*3	
		1882-83	1,944-7	2 -J557	3,690*0	3,8 '14 0	
7	Saltpetre and bone superphosphate, 240lb.	1884-85	1,508*8	2,007-3	2,081-2	2,795*1	
		1883-84	1,984-4	3,0^1-3	3,817-5	5,8622*4	
		1882-83	...	...	...	...	
8	Sheep dung and bonedust, 360lb.	1884-85	826-4	1,615-3	1,258-4	1 936·0	
		1883-84	1,143·4	2,389-7	1,867-0	4,434 6	
		1882-83	...	...	...	...	
9	Sheep dung and gypsum, 240lb. ...	1884-85	756-2	1,276-5	1,391-5	1,899-7	
		1883-84	1,S37-O	2,601*5	2,323-2	4,470-9	
		1882-83	...	...	...	...	
10	No manure	1884-85	635-2	1,024-8	1,004*3	1,452-0	
		1883-84	1,031-5	2,280-8	2,093-3	3,6723	
		1882-83	1,0650	999-0	1,764 0	1,704*0	
11	Ashes and saltpetre, 240lb. ...	1884-85	1,149'5	1,686-3	1,669 8	2,057-0	
		1883-84	...	...		...	
		1882-83	...	...		...	J3J2
12	Sheep dung, 180 maunds ...	1884-85	889-3	1,4*4S-3	1,51)0-4	2,"153-8	
		1883-84	...	...	...	...	
		1882-83	...	...	...	...	
13	Poudrette	1884-85	1,074-4	1^491-9	1^06-8	1,730*3	
		1883-84	...	...	...	...	
		1882-83	...	...	...	...	

The above table (1) shows—

(a) the comparative effects of several manures;

(b) the advantage of rotation.

12. (a) *Single manures.*—From the above table it is seen that saltpetre during the season again gave the largest yield of all the manures applied singly. It has always given a good outturn.

The most efficacious manures for wheat are those classed nitrogenous. " The cereal crops generaly find the supply of nitrate in the soil insufficient for their full growth, and the supply of phosphates more or less inadequate. " Phosphatic manure for wheat is, though beneficial, yet not indispensable ; moreover, wheat has the power to avail itself more or less of the potash and phosphoric acid from the natural stores in the soil. Further, wheat takes its nitrogen from no other sources but nitrates.

Owing to all these circumstances it is evident that saltpetre supplies the most Necessary requisite to a wheat crop and in a most ready and available form.

13. *Manurial ingredients in saltpetre.*—*Saltpetre* contains two essential ingredients of plant-food, nitrate and potash ;" of course, by its application alone and forcing vegetation thereby, the natural store of phosphate in the soil will be exhausted sooner or later, then the crop will fail. It is to be seen how long the soil itself is capable of continuing the supply.

14. *Top-dressing good in wet season.*—Instead of manuring the field with nitrate of potassium (saltpetre;, which is a dift usable manure, top-dressing, just at the time

when the plants arc ready for it, is most advantageous and economical, especially in wet countries. The difference of the two processes is worth finding out, and will be estimated next season, though it has begun from last year.

15. *Why the saltpetre isfiot-tised by native farmers.*—The only obstacle to its not being used at all, or as freely as one would like, is, that for saltpetre the cultivator has to pay, while the other manures in his use do not cost him anything perceptibly. 3f he were to purchase all his manures, he would, no doubt, decide in favour of saltpetre.

If the manufacture of saltpetre for manorial purposes is allowed to farmers unhampered with excise law rules, the *use* of it in the shape of manure will soon make its way throughout the country.

16. *The result of saltpetre compared with cattle dung.*—Its result compared with cattle dung or farm-yard manure during the past four years is noted below. The figures represent outturn per acre :—

Year.	Standard.		Duplicate.	
	Saltpetre.	Cattle dung.	Saltpetre.	Cattle dung:.
	lb.	lb.	lb.	lb.
1884-85	1,323·7	90(T2	1,741*1	1,466-5
1883-84	1,355*2	1,427-8	2,707-0	3,031-0
1882-H3	1,978-5	1,713-0	2,181-0	1,623-0
1861.82	1,242*6	918*0	1,605-0	738-O

17. *Combined manures**—Of all the combined manures bone superphosphate with saltpetre gave a ,<jood increase. But tho cost of this manure in India, owing to the high price of sulphuric acid (which is a constituent in disolved bone) is so great that it ibsorbs the profit which its application produces. The following table shows the results of the last two seasons :—

Year.	Increase per acre by addition of hone superphosphate to saltpetre.		Value of increase per acre.	Cost of bone superphosphate.	Net result.
	Grain.	btraw.			
	Ife.		Us.	Bs.	Rs-
18S4-P5	225-6	302*5	68	14-5	—7-7
1883-84	491-8	8137	15-3	14-5	+ 0-8

18. *Bone superphosphate is not a handy manure to Indian farmers.*—It is doubtful whether this manure can ever be .of much use to, and within the reach of, Indian farmers. Because, 3stly, it is more especially of use to pastures, grasses, and root crops, which form no part in the rotation of the Inclian farming; and, 2ndly, supposing that tho difficulty of the scarcity of the acid might be overcome, still it is impossible to find tho very cheap thing " bone " enough for Indian agriculture. In England, where the bone in various forms is imported from the different Darts of the world the supply is not equal to the demand. Tn a vegetarian country like India, whence could it be got ?

19 *Coprolile can be of some use.*—The rumour of the discovery of coprolite up at jMussooree and of the fossil bones in the alluvium of the Jumna if, fortunately, it be true and they contain more than 50 per cent of trioalcic phosphate, the supply would then become abundant and the use of the superphosphate can advantageously be made for stimulating vegetation, especially in the proposed fodder reserves.

From the agricultural point of view, a thorough investigation of this discovery «nd analysis of the samples are matters worthy of attention.

20. *The result and advantages of cow dung compared with otlitr manures*—Cow dung* applied x 180 maunds per acre in the shape of farm-yard manure) yielded more than—

(1)" Unmanured by 42 per cent.
(2) Dung and gypsum by 4 per cent.
(3) Ashes of dung by 32 „
(4) Sheep dung by 1 „
(5) Ditto gypsum by 16 „

From the above figures it is deafly seen that—

(i) well seasoned farm-yard manure is better than gypsum, bonedust, ashes of the dung, &c.

(ii) Manured land in every case has advantage over unmanured land.

(iii) Ashes of dung are not so beneficial as the dung itself. It is, of course, due to the loss of ammonia by burning. It is to be regretted that the farmers cannot keep this sure and cheap fertilizer solely for the use of their fields instead of burning it.

21. *Experiments to be tried neat season.*—Experiments in the use of fresh dung and of the folding of cattle and sheep in field is worth trying. In the coming season attention will be paid to it.

One thicg more deserves experimenting, *i.e.*, a field always manured with cow dung should be top-dressed with saltpetre at about 1 cwt. per acre. This will prove (1) when the effect of the dung or of the poudrette reaching a certain point becomes stationary and the increase of their amount does not increase the yield, how far they can be stimulated by the addition of the potaasic nitrate. (2) Saltpetre alone is of course very expensive, to use it in addition to dung and to see how far its effect can be economized in this way. In the next season's programme a place will also be given to the above experiments.

22. *Sheep dung and gypsum.*—Sheep dung although in India considered a richer manure than cattle refuse, yet it has not proved to be so on the farm : there can be two reasons for this—(1) the sheep are being kept entirely on grass, while the cattle have received some concentrated food during certain part of the year ; (2) cistead of folding sheep in the field by which both solid and liquid excrements are supplied, rotten dung alone was used. However, it is yet to be seen which is the better of the two. Gypsum and bonedust did not prove of much benefit on the farm, Gypsum is most favourable to leguminous crops, hence perhaps its effect on wheat was not visible. The effect of bonedust is very slow. Before being prepared for the use of plant-food, it has to undergo several reactions in the soil. It perhaps might show some result in future.

23. *Which is the most handy and economical manure ?*—Now the question is, which of the manures is most economical and available or handy to the farmers ? No doubt, as it has already been proved and said before, it is the " farm-yard manure." If the farmer by some means can find and secure enough of it, no doubt it would add a good deal to his prosperity. This is a general manure and indispensable in farming, When its effect has reached its highest point, then some other " forcing " artificial manure would be necessary.

The following table will show the value of the increase of outturn set against the price of the manure applied. In this season the profit is quite nominal, but it is due to the low produce on account of the bad season. The last column of the table added from the repoit of the season before last gives a fair example, and the report in favor of the Manure in question says " superphosphate fortified by a nitrogenous manure gives the highest yield, but that cow dung is for the cultivator the cheapest manure to use."

" Necessarily, however, the market price of farm-yard manure is much above the actual cost of that which the cultivator uses. "

Indeed, to the majority of the cultivators who do not live in the neighbourhood of a large town, the cost of this manure is, as a matter of fact, nothing.

Table II.

Manure.	Value of outurn per acre.			Cost of manure.	Net increase over the umnanured.	
	Stand-ard.	Dupli-cate.	Aver-age.		1884-85.	1883-84.
	Bs.	Bs.	Bs.	Bs.	Bs.	Rs.
Cowdung	27-2	42 5	34-8	90	+0 -6	+ 8-1
<\>wdung and bonedust	30 6	44-0	37*3	13'5	-1-4	+ 1-2
Cowdung and calcic sulphate	27-5	41-0	34 2	10-0	— 1-0	+ 5-6
Ashes of cowdung	22-1	32*6	27-3	9-0	— 6*9	—6-5
Ashes of cowdung and saltpetre	34*8	47 0	40-9	16*5	-0-8	
Fotassic nitrate «..	39*9	52-0	46-9	7'5	+ 13:2	+ 6*3
Potassic nitrate and bonedust ^	35*1	50-0	42-6	12 0	+5-3	+ 3 6
Potassic nitrate and bone superphosphate ...	46-2	60-2	52 7	22-0	+ 5 5	+ 7 1
Sheep dung	27-8	44*0	85 9	9 0	+ 1-7	...
{Sheep dung and bonedus.t	25-1	47-2	36-1	13-5	- 2 6	—9-7
Sheep dung and calcic sulphate	24-0	38-8	31-£	10-0	— 3 8	—0 3
Poudrette	31-5	43 4	37*4	10-4	+ 1-8	...
Mo manure	19-6	30-9	25 2	...	...	...

24. (6) *Advantage of rotation.*—The table I above referred to indicates that almost with every kind of manure the duplicate plots in which maize and wheat are sown in alternate years gave again in the season under report much larger yield than the standard plots in which wheat is sown every year. Of course, both of the series have been treated qjmilarly. A full year's bare fallow alone is not sufficient to account for this, but also here the scientific theory that the roots of one crop are beneficial to, and accumulate prepared nourishment for, the succeeding crop (if it is of a different nature) holds good.

25. //.— *The Ville series or experiments on determination of what constituents of plant-food get exhausted by cropping wheat in succession.—In* the absence of the chemical laboratory for finding out what essential ingredients are exhausted by sowing a crop over and over in the same land, the experiments after the method of what is called the Ville series is very good indeed for practical purposes.

It is conducted with a series of plots, sowing in one of them a mixture of manures, in eaoh of which a known substance of plant-food preponderates, and the manures are withheld one by one while applied in other plots of the series.

This experiment on the farm is four years old now. The treatment and yield are shown below—

Treatment—

Ploughings	4
Waterings	4
Weeding	1

Table III showing manures and outturn.

No. of plot.	Manure.	Outturn per acre in 1884-85.		Increase over the unmanured plot Vi (unmanured)		Decrease over plot I, which receives all manures.	
		Grain.	Straw.	Grain.	Straw.	Grain.	Straw.
		lb		ft.	tt>.	ft.	ft.
1	Calcic superphosphate ,,,)80fl5 1; Ammonic chloride ... 130; Potassic sulphate ... 90; Calcic sulphate	1,459-2	2,480-5	701-8	1,318 -9	...	...
2	All except calcic superphosphate	1,452-0	V 4 6 7	694 6	1,685-1	—7-2	+266-2
3	All except arum on ic chloride	608 2	1,427-8	40 -8	266-2	—651*0	—1,052-7
4	All except potassic sulphate	1,398-7	9,250*6	641-3	1,089-0	- 6 0 5	—229-9
5	All except calcic sulphate	1,210-0	2,178-0	462 6	1,016*4	—249-2	—^O2'6
•	No manure	757-4	1.161-6	...	...	— 701-8	—1,318-9

The present results confirm whot were obtained in previous years, *viz*, the chief want of the farm soil for cereals lies in nitrogen.

	Outturn of grain per acre.		
	., 1884-86.	1883-84.	1882-83.
	℔.	℔.	℔.
Obtained by application of all manures ...	1,469*2	1,777-1	1,7*26*6
Obtained by applying all except ammonic chloride	808-2	1,0Jl -2	1,192-5
Obtained by applying no manure	757*4	762-3	1,045*5

The importance of nitrogen in case of wheat and the necessity of providing it by means of manure has already been briefly stated in the foregoing paragraph. In one word again, wheat comparatively has less power for availing itself of the nitrogen in» the soil, though it does not require the element more in quantity than many other crops do,

26, (777) *Experiment on ascertaining comparative manurial value of saltpetre and of certain animal refuse.—'This* experiment was tried in a field divided into eight plots which had borne a crop of maize in the preceding kbarif, with the same manures as now put in. Barley was the crop sown in these plots.

Besides manures all the plots received the following treatment : —

(1) Manure as in the succeeding table
(9) Floughings 3
(3) Waterings ... ••• ... — ••• 3
(4) Weeding ... ... — ... ... 1 *

The outturn is shown in table IV.

Table IV.

No. of Mot.	Manure.	*Outturn per acre in 18*4-85.*		*Increase over the un-manured.*	
		Grain.	Bhusa.	Grain.	Bhusa.
		m.	ft.	ft.	m.
1	Woollen refuse ••• ••• •••	892·3	1,113-2	372 0	435*6
2	Sheep dung ... ••• ...	689-7	774-4	169-4	96'8
3	Cow dung ••• ••• •••	810-7	943-8	290 4	266-3
4	Poudrette ••• ••• ...	995*2	1,210-0	474-9	532'4
5	Horse dung	822*8	919'6	302'5	242-O
6	Vigs droppings	798-6	965-9	278-3	278-3
7	Saltpetre	1,082-9	1,427-8	662*6	750*
8	No manure	620 3	677-6	...	...

The above results have proved true to the long-established scientific theory, *© the increase in the outturn is proportionate to the amount of *available* nitrogen in the substances applied as manure.

27. *Woollen refuse.*—Woollen refuse has given more yield than sheep, cow, horse and pig dung. Of course shoddy contains much more nitrogen than any of the dungs ; about 5 to 10 per cent, unwashed wool contains about 4 per cent, of potash. Both of these are the essential constituent of plant-food, as its effect is not quick, and it requires certain changes before being available to crops, therefore it did not give any larger yield, which otherwise it might have done. But its effect will spread over several years, perhaps next season it may show a still better result.

28- *Sheep dung.*—Sheep dung here, again, has not shown any difference against the one noted above. The cause might be considered to be the same.

29. *Horse and pig dung.*—Horse dung has shown a very little increase against tho cow excrement, though generally the horse is fed on highly concentrated food. It shows that the horse makes the best use of his food as the pigs decidedly do. JQence foe manures of these two animals are poor. Poudrette is the best of all the animal excrements and saltpetre best of all kinds of manures.

30. *Poorer manures yielded more gtain than straw.*—One thing here is worth noticing, that all these manures have shown different effects on straw. The poorer

manures have given in proportion larger increase in grain, and among them sheep dung heads the list in this respect. While the richer manure made the straw more luxuriant, and in this case saltpetre is at the top of all.

31, *(IV.) Green Manuring.*—Experiments were tried in four series (a, 6, c_9 *d)* of 19 plots.

Series (d\ contained 9 *plots.*
Ditto *(b)* „ 2 99
Ditto (c) „ 3 99
Ditto *(d)* „ 5 „

The treatment and the description of the experiments together with the produce will be seen from the following tables :—

Table V.

Treatment.					a.	b.	c.	d.
Manure	...	...	...	...	*Vide* Table. VI.			
Ploughings	...	...	...	...	3	4	4	4
Waterings	...	...	...	...	4	4	4	4
Weediug	...	...	...	...	1	1	1	1

Table VI.

Number of plot.	Manure.	*Outturn per acre in 1884-85.* Grain.	Straw.	*Increase over the un-manured, per acre.* Grain.	Straw.
		Ib.	m.	Ib.	Ib.
A. series.					
I	Green-soiled with hemp manured with gypsum,	1,476*2	2,577-3	853*1	1,452-0
2	Green-soiled with indigo manured with gypsum.	2,159.8	2,940-3	1,636*7	1,815 U
a	Green-soiled with iudigo without any application of gypsum. .	1,944*4	2,492-6	1,321*3	1367-3
4	Hemp water to a depth of 1 inch or 3630 cubic feet per acre.	994·6	1,585-1	371*5	459 8
5	Indigo water to a depth of 1 inch or 3630 cubic feet per acre.	934*1	1,476-2	311-0	350-9
6	Fresh indigo refuse, 120 maunds. ...	1,581·4	2,262-7	958-3	1,137 4
7	Old indigo refuse, 120 mauuds	1,430-2	1,869-4	807 M	744·1
8	After a crop of indigo	1,107-1	1,778 7	484-0	653-4
9	No manure	623·1	1,125-3	...	...
B. seiicB.					
1	Hemp ploughed in	1,399*6	2,553-1	670 9	1 500-4
2	No manure	728 6	1,052-7	...	...
C series.					
1	Hemp and gypsum	1,431-3	3,026-7	841*0	1,956-8
2	Hemp	1,353 7	2,722-2	763*4	1,662 3
3	No manure	590*3	1,069-9	...	...
Z>. series,					
1	Fresh refuse and lime	1,363-3	2,354*3	925-3	1,267-5
2	Fresh refuse only	1,1160	2,323*2	678·0	1,236'4
3	Old refuse and lime	713-8	1,404-4	275·8	317-6
4	Old refuse alone	811 6	1,506-8	373-8	422*0
5	No manure	438·0	1,086 8	...	...

32. *Indigo, perhaps, is best for green-soiling.*—From the above table it appears that indigo ploughed under as green manure gave the larger and mixed with gypsum the largest increase. This shows (1) that probably it is a fact that among all the green manures indigo is the best fertilizer : *(2)* that gypsum, though directly is of little U&B to wheat, yet through the medium of indigo or some leguminous crop it can be made beneficial.

33, *Hemp and indigo water.*—Hemp *BJid* indigo water have been giving a fair increase over unmanured plots. The wheat fields near indigo factories and near the ditches where hemp stocks are steeped can be profited by the water which commonly is wasted.

34. *fresh and old indigo refuse.*—Fresh indigo refuse yielded more than the old etqff. This result does qot agree with what was obtained last yepr. Perhaps the difference

in the character of the two seasons is a reason for this. In 1883, rains were scanty so the fresh refuse could not putrify quickly and nitrification did not take place in due time. This year heavy rains helped the rotting and made the manurial property available in time.

Wheat, after a crop of indigo, has given a very fair increase too. By this the advantage of rotation is apparent.

35. *Bare fallow is not necessary.—'Ab* any rate, the income to a farmer, taking two crops in a year (indigo and wheat), would be greater than that of one who takes only one crop of wheat after a bare fallow ; therefore by all means it seems advantageous that by the aid of manure if available, and good farming, land should be kept under crops and must not be left fallow or useless.

- It is a wrong notion that the land does require a fallow. If at all necessary it is for foul land, which in this province is scarcely seen.

If manure is available, weak land must be kept particularly under cropping. This "will add humus to the soil and will improve it; it is far more beneficial than giving a bare fallow to raise its strength.

But the question would be. Have all the farmers got erfough manure ?

36. *V Miscellaneous.*—This comprises a trial of the following manures on ordinary and special kinds of land (the usar). The experiments may be classed in the following series:—

(a) *Result qf—*

1. Brickkiln refuse.
2. Silt.
3. * Perished carrot seed.
4. * Ditto indigo seed.
5. Ammonic chloride,
6. Ashes of weeds.
7. Ditto top-dressed with saltpetre.
8. No manure.

(6) Slaked lime, gypsum, &c, applied to usar soil in boxes.

ic) Gypsum in four plots each of a quarter acre made in usar soil.

37. *A. series.*—For this one field was divided into eight plots.

Treatment and result are shown below—

1. Manure as in the following table.
2. Ploughing three times
3. Watering four „
4. Weeding once

Table VII.

Number of plots.	Manure and rate per acre.	Outum per acre in 1884-85. Grain.	Outum per acre in 1884-85. Straw.	Increase aver the unmanured. Grain.	Increase aver the unmanured. Straw.
		tt>.	H>.	Ib.	Ib.
1	Brickkiln refuse, 120 maunds ...	1,1761	1,808 9	296-6	284 3
	Silt, 1,000 maunds	1,058-7	1,591-1	179-1	66-5
a	Perished carrot seed, 12 matmds ...	1,101-1	1,802-9	2215	378 3
4	Ditto indigo seed, 12 „ ...	1,282*6	3,020-7	403*0	496*1
	-Ashes of 120 maunds weeds ...	1,082-9	1,730-3	203 3	205-7
	Ashes, 120 maunds weeds and saltpetre, 2-ftolb	1,303 1	1,936 0	423-5	411'4
	Ammonic chloride, 240tt> ...	1,448 4	2,190*1	568-8	665*5
	No manure	879*6	1,524*6	...	...

Ammonic chloride.—Ammonio chloride gave the largest increase in produce, next came top-dressing with saltpetre, and third, perished indigo seed.

* Why the cariot and indigo seeds are need as a manure is explained in the last year's report.

The above, being nitrogenous manures, acted as they generally do.

Brickkiln.—Brickkiln refuse contains a good deal of ammonia, as large particles of ammonium carbonate remain mixed in it, also ashes and brick powder absorb ammonia: hence the refuse acts as a fertilizer. Near towns, if this can be had in sufficient quantities and carted cheaply, it can be advantageously used by farmers. But whether its continuous use is advisable is a question.

Silt.—Silt has given the least increase of **all.** As its value depends on various circumstances, therefore it cannot be determined fairly by a trial in one place. The silt composed of the denudation from stony hills or primary rocks must be very rich, and no doubt will act as one of the richest manures in valleys or at the bottom of the hills. But the further it is taken away by the water the weaker it is sure to become. Silt from all hills and places can of course not be of the same value ; silt left by the current of water on the banks of rivers makes the sand productive. But this fertilizer is provided more by natural than by artificial means, hence it may not be classed as a manure for the plains of this country. In valleys it can be utilised advantageously. By a silting up process pieces of usar land have been made fertile near canal banks, but the cost of the same was found to be too great.

Weeds ashes.—The application of green weeds will answer better than their ashes, because in the former state beside the ash constitnents they will supply nitrogen also to the soil. Those weeds that are a pest should be burnt or be used in making compost.

38. *Experiments on usar land*— Experiments b. and c. were made with slaked lime, gypsum, &c, on usar soil in boxes and *in situ.*

Four plots each a quarter of an acre were made in usar, in two of these in the proceeding rains gypsum was applied at 50 maunds per acre, and in the other two at 25 maunds per acre.

In the *(b)* series the boxes treated with gypsum and poudrette produced a handful of corn ears ; the plants in the other boxes died before bearing any ear. In *(c)* the land was not sufficiently pulverised. It resumed its original texture by the time the sowing season approached. The manure could not therefore have produced any result. A few ears appeared here and there, and this was all.

Researches for fertilizing usar land are important, but there is no space for discussing the subject here. There is every reason to hope of the usars becoming productive.

Sowing wheat after lucerne had not been tried this year, as the lucerne is kept on the ground for two years,

• 39. ***B.* Determination of the result of deep and shallow ploughing.—**Theso experiments continued on the same series *(two* in number) which were under the same test in previous years.

Their treatment and outturn are as follows :—

Treatment-

Manure, *nil.*

Ploughing as in next table.

Watering four times.

Weeding once.

Table VIII.—Outturn.

	Area in square yards.	Particulars of ploughing.	Outturn per acre. Grain.	Outturn per acre. Straw.	Increase per cent, over shallowploughing. Grain.	Increase per cent, over shallowploughing. Straw.
				lb.	lb.	lb.
A. series.						
1	300	Ploughed 9" twice	721-2	1,113-2	35	39
2	300	Ditto 6" ,, ... ---	850'2	1,274-5	59	60
3	300	Ploughed with country plough 4 times ...	572*7	903*5	...	...
4	300	Ditto ditto ditto ...	495-2	693*7	...	...
B. series.						
1	2,362	Ploughed 9" twice	736*0	1,118*8	72	89
2	2,588	Ditto 6" ,, ...	546·1	884·0	28	46
3	2,579	Ploughed 4 times with country plough ...	427-3	593*0	...	...

40, *Deep ploughing produce more, as usual.*—Deep ploughing by improved plough, in comparison to shallow ploughing with indigenous implement produced more, as usual, but, on the whole, the yield is small. It is perhaps partly due to the unfavourableness of the season and partly to the want of manure, which the fields have not received for the last five years, and after each cropping are becoming exhausted more and more.

41. *Number of ploughing* not being sufficient.*—The Superintendent is of opinion that the number of ploughings (two in case of deep and four in case of shallow ploughing) are insufficient for a wheat crop. He says—notwithstanding the regular weeding, grass is increasing every year in these plots.

42. *Results differ in different series.*—From the above table it appears that two series with similar treatment have given results quite different. In series A the plot ploughed up nine inches deep yielded only 35 per cent, more grain than the plot under the country plough, and that ploughed only five inches deep gave an increase of 59 percent. On the other hand, in B series, the plot tilled nine inches deep produced 72 per cent, more than the plot worked *hy* ordinary plough, and the plot ploughed up only five inches deep yielded about as much as the one ploughed nine inches in the A series. Last year the results have been somewhat proportionate.

43. *No rule can be made from these results.*—However, with these results there cannot be made any rule, but they prove in favor of the theory that the result of the deep and shallow ploughings depends on the nature of the soil and subsoil. No doubt subsoil impregnated with obnoxious matter or deficient in nutritive substances will do harm by being turned up on the surface.

Deep ploughing by itself (with no manure) does not seem to do much with the improvement of impoverished or exhausted land.

44. *C.* Watering.—Two series of experiments were tried under this head—

(1) to ascertain the increase in produce by the increase in the number of waterings ;

(2) to determine the value of well against canal water.

(1) *Influence of water on the increase of produce.*—No. (1) was repeated in a series of six plots which have been under this experiment for the last five years.

Their treatment and outturn are noted below :—

Manure, *nil.*
Ploughing three times.
Watering as in the next table.
Weeding once.

Table IX.

Number of waterings	Area in square yards.	Outturn per acre.		Increase in yrain due to each watering over the preceding.				Increased cost of irrigation over the preceding plot.
				In weight.		In value.		
		Grain.	Straw.	1884-85.	1883-84	1884-85.	1683-84.	
		m.	tto.	ft.		Hs.	Ks.	KB.
*H	400	3O2-6	960-1	--	--		•••	
IJne ...	400	598-9	l,O89'0	296*4	409·0	"*7-2	9*9	ft
Two ...	400	661*8	1,185*8	62-9	45·9	1-5	1-1	
Ibree —	400	951'O	1,294-7	289*2	31·7	7·0	0-7	1-1
four ...	400	1,016·4	1,827-1	65-4	151-7	1·6	3 7	1-1
Five ...	400	1,125*3	1,876·5	1O8-9	253-8	2-7	6-2	1-1

In comparison with the yields of the last two years, the outturn, on the whole, seems to have a tendency to fall off.

It may be due to a want of manure, which has not been applied since the time the plots have come under this operation. Each additional watering has added something to the produce.

45. *Water in itself has manurial property.*—No doubt water in itself has a manurial value. It has been proved that if the water be made to run over land at a velocity of about two inches per hour in regular and short intervals, no other manure will be necessary for the land. Irrigation in colder parts of the European countries is simply made for the sake of its manurial quality. Thousands of acres of pure sand in Belgium (Neerpelt) France (county Siene) and all over Germany have been made fertile by this process. Water meadows are good proof of this.

46. *Without some concentrated manures no good outturn of seed can be expected.*—But here one fact attracts the attention, *i. e.,* without a concentrated manure (on an impoverished land) the quantity of fodder or straw would be abnormally large in proportion to the grain, and the grain cannot reach the highest point in good quality. For example, on the farm unwatered and unmanured plot produced 324 per cent, straw compared with the quantity of the grain. The seed shrivelled up, did not become plump and full, hence the quantity of straw weighed considerably more. And the crops with no manure, but forced up by means of aqueous stimulant, had their succulent parts more benefited by it. One of the crops with five waterings yielded 166 per cent, straw against the grain : one with four waterings produced still more, while the crop which received four waterings and the poucirette and saltpetre as manures yielded straw only 112 and 144 per cent, on their grains respectively *(vide* Table I). This *shows* that the manure without water or *vice versâ* is deficient in doing thorough good. The full effect of the one depends on the other.

47. *Whether water manured crops are perfect in their chemical composition is a question.—Whether* the grain or the straw produced simply by the influence of water are as good and perfect in their chemical composition and in the amount of the nutritious substances as the crops raised with the aid of manure and watering, is a question. There not being a chemical laboratory handy we cannot enter into these minute details. However, from the fact that water meadow grasses (especially when green) are poorer in nutritive value than the lawn and the pasture grasses of the kind, there is reason to believe that the crop in question may not be ad perfect and true in its quality as the other is.

48. *Well against canal water.*—This was tried in the same plots which were under this experiment in previous years.

The treatment and outturn are as follow :—

Manure, *nil.*
Ploughing four times.
Watering three times.
Weeding once.

Table X.

	Detail of irrigation.	Area in square yards.	Outturn per acre. Grain.	Outturn per acre. Straw.	Increase over the canal watered. Grain.	Increase over the canal watered. Straw.	Value of increase per acre.	Increase in cost oi watering per acre.
1	2	3	4	5	6	7	8	9
			m.	Ib.	ft.	ft.	Bs.	Rs.
A. series.								
1	From well	400	1,028*5	1,476-2	387-2	496-v	11-4	3-6
2	From canal	400	641-3	980-1	...	...	...	...
B. series								
1	From well	400	1,205*1	2,032-8	289-2	314*6	8-4	3-6
2	From canal... ...	400	916-9	1,7182	...	...		...

49. *Well water is more beneficial than canal water.*—The excess of **the** produce from the well watered plot over **the** plot watered from canal is greater this year than in any

previous years. The general treatment, the number of waterings, and the quality of land were the same in both series, but the number of waterings was less in each case than that of the last year.

This is a recognized fact that well water is more beneficial to vegetation than canal water, but why it is so is perhaps not clear yet.

Canal water may be supposed to carry more manurial ingredients in suspension than the well water, but the latter as a matter of fact does more good. Perhaps this may be due to its gradually permeating the land, and advancing slowly from one bed to another and thus not disturbing the texture and not increasing the tenacity of the soil, while the rush of the canal water makes the fine particles of a pulverized field clog together, and by choking up the surface soil when dry the work of the atmospheric agencies in favor of providing nourishment to the plants ceases.

50. *D.* **Sowing.**—*Jethro Tull or Lois Weeden system of sowing.*—The cultivation of wheat by the Tull system was repeated this year in the same field in which it was tried last year, and in two more fields, one of which consisted of poor soil not manured for some years past and which was rented at the low rate of Rs. 4 per acre. In every alternate fallow strip of the two fields added this year, peas were sown,

51. *Where this system can be of some use.*—This is a very old system of cropping, perhaps hardly in practice now in any part of Europe. They now consider it better making use of the whole land by the aid of the artificial means than leaving it uselessly lying in bare fallow. Very likely in India, where the sources of artificial fertilizers are scarce, the system of the sowing in question might prove advantageous but only in those fields which may be at some considerable distance from the population and where manure cannot be reached easily.

The treatment and outturn are shown below :—

Manures	*Nil.*
Ploughing	3 times
Watering	3 „
Weeding	once
Grubbing fallow strips of plots sown after Tull ...	3 times

Table No. XL

Number of field.	Manner of sowing.	Area in square yards.	Actual outturn, Grain.	Actual outturn, Straw.	Outturn per acre calculated on the total area of the plot. Grain.	Outturn per acre calculated on the total area of the plot. Straw.	Outturn per acre calculated on the cropped area alone. Grain.	Outturn per acre calculated on the cropped area alone. Straw.
			lb.	lb.	lb.	lb.	lb.	lb.
15 a	Tull's ...	Under wheat [illegible] Fallow ... [illegible] Total ... [illegible]	257-7	425·0	653·7	1,078·1	[illegible]	[illegible]
16 ft	Ordinary ...	... [illegible]	291·5	459-5	712·5	1,123-2	...	...
1 1	Tull's ...	Under wheat 200) Wheat Under peas 100.) Fallow 100.) Peas Total ... 400	61·0 36·5	80·0 45·0	738-1 441-6	1,040-6 544	984-1 588·8	1,387·5 [illegible]
A 2	Ordinary...	... 400	82-7	150-5	1,000-6	1,821-5	...	...
84-a	Tull's ...	Under wheat 848) Wheat „ peas 460) Fallow 453) Peas Total ... 1,761	220·0 176·0	451-0 200·0	608-1 486-5	1,246·6 552-8	820·3 656-2	1,681-7 745-7
84 b	Ordinary...	... 1,669	395-0	580·0	1,145-5	1,681-9	...	...

The results are more favourable on poor and exhausted soils than on pretty good ones, which can support a larger number of plants than the other.

The system is worth a trial on poor soil where manure cannot reach, and which consequently grows less profitable crops such as bajra or some kharif pulses.

52. E.—Effect of the soil on the color of wheat grain.—This experiment was made at the instance of the Bengal Government, which had referred to us for verification of the statement made by one of the Bengal District Officers, that the color of white wheat when sown on clay soil turns red.

A quantity of hand-picked pure white wheat seed was sown in clayey soil close to the farm.

On threshing, the grain did not present an appearance as white and shining as the seed possessed, but none of the grains had turned quite red. The same seed will be repeated for the next two or three years, and the changes in color, if any, will be noticed.

In order to confirm this fact, the Collector of Hamirpur, which is a noted stiff clay district, was asked to try the experiment. Pure white Muzaffarnagar wheat was sent to him for seed which was grown in five different places. The samples of the produce, which the officer has been kind enough to send to us, show quite a change in three and marked differences in two cases. He remarks as follows :—"Portions of the white wheat sent by him were sown in the stiff clay of tahsils Muskara and Hamirpur. Five specimens of the produce are enclosed with a sample of the seed, whereby it will be seen that in every instance the produce is very much redder in color than the parent seed."

The upper [illegible] when he was Phasing wheat in Muzaffarnagar (the best white wheat growing district) he found there to be a [illegible] custom among the cultivators of the village Baral, which has clayey soil, to import every fourth year their wheat seed from Rajpur, a village close by, and the reason for this which every one of them gave was that after three years their wheat becomes *gojar*, (red and white mixed) by the influence of the soil. Hence, to produce pure white grain, they are obliged to import seed from Rajpur.

. . the effect of the soil on the color of the produce is a recognized fact. As clay soil is generally richer in iron compounds, hence probably the [illegible] affected.

The treatment and outturn of the plots experimented on are—

1. Manure	...	..	...	Nil.
2. Ploughing	...		...	
3. Watering	...	"	"	4 times.
Outturn per acre {	...	...	...	O "
	...	...	...	

53. F. Outturn of (1) certain mixed crop, (2) pulses and oilseeds, &c.—The mixture tried in three series, *a*, *b* and *c* are—

1. Wheat-barley.
2. Wheat-gram.
3. Wheat-peas.
4. Barley-gram.
5. Barley-peas.

Their treatment and results are as follow ;—

Treatment.

				Series (a)	Series (b)	Series (c)
Manure						
Ploughing	..	*	-V	[illegible]	[illegible]	[illegible]
Watering		"	...	3	3	[illegible]
Weeding		"	—	[illegible]	3	[illegible]
		"	"	1	1	1

These mixtures were sown exactly after the native way.

Tatle XII.

Number of plot.	^ Crop.	Area in square yards.	OUTTURN PER ACRE — Grain — Outturn of each crop.	Total outturn.	Straw. (Total).	Money value per acre.
A seiies.			ft.-	lb.	ft.	Rs.
1	Wheat	750	882*2	882-2	1,239-1	26'5
•i	Wheat Barley	7*50	453-0 522-7	} 975-7	'1,542-3	25-9
•i	Wheat Gram	750	685-3* 1,040-3	} 1,725; 6	1,664*9	43-7
}	Wheat Peas	750	598-2 922-8	J 1,621-0	2,439-4	40-5
B 1	Wheat	1,171	1,043-6	1,043-6	1,611-9	31-9 "
{	Wheat Barley	2,255	407[a]8 582-7	990-6	1,579-7	26-0
3 {	Wheat Gram	1,123	817-6 905-1	} 1,722-7	1,853-2	•45-3
4 {	Wheat Peas	929	640-0 732-0	} 1,372-0	2,771-7	40-4
	Barley	1,1 G4	1,411-7	1,411-7	1,654-9	30-2
• • {	Barley Gram	1,137	868-6 790-5	1,659-1	1,647-4	36-9
7 {	Barley Peas	9S9	1,021-1 896-2	} 1,9173	2,797-8	44-4
C l	Wheat	400	1,000-6	1,000-6	1,815-0	31-8
3 {	Wheat Barley	400	540-8 770-7	1,311-5	1,645-6	32-7
{	Wheat Gram	400	689 7 895*4	} 1,585* 1	2,081-2	43*2
	Wheat Peas	400	626-3 819-1	] 1,345-4	2,178-0	36-0
6	Barley	400	1,458-0	1;458'0*	1,621-4	30-9
6* {	Barley Gram	400	949 a 792-tf	} 1,7^2-3	1,875-5	39-3
{	Barley Peas	400	[illegible]	1,681-9	2,093-3	37-1

The practice of sowing gram with wheat and barley appears desirable.

The total crop gives a larger outturn for sale or food.

54. Of the oil seeds and pulses the following were tried in three series a, *b* and c..—

1 Gram.
2* Peas.
3 Chatar.
4 Masur.
5 Arhar.
6 Sarson (mustard/.
7 Labi -^
8 Sehuan) rape-
9 Linseed.
10 Castor.

Following tables will give their treatment and outturn per aofe :—

Treatment—

Table XIII.

	Series (a)	*Sirie** (6)	*Series* (c)
Manure	Mil	Nit	Dting, 120 maunds per acre.
Ploughing	2	5	2
Catering	{ Gram Nil } M»<jur 1 (. Peas 2	Linseed 2 Others 1	1
Weeding	1	1	1
Crop	Gram, peas Chatar, iiiasur	Sarson, lahi Buhuan, husccd.	Arhar, castor.

Table XIV.

Number.	Crop.	Area in square yards.	Outturn per acre.		Value per acre in Rupees.
			Grain.	Straw.	
1	2	3	4	5	6
			lb.	lb.	Rs.
1	Gram ...	800	960-7	1,185 8	23-2
3	Peas ...	800	1,905-2	2,371*6	30-0
3	Masur ...	800	654 6	955*9	17-7
4	Chatar ...	800	1,652-9	1,089-0	28-y
5	Arhar ...	800	521-9	988*7	17-8
6	Sarson. ...	568	5309	2,243*0	212
7	Lahi ...	596	6659	1,9734	222
8	Sehua ...	598	8174	1,893-9	23-3
	Alsi ...	595	341-6	1,171-3	13-G
10	Castor ...	400	1,113*2	740-5	34

55.- *C.* **Acclimatized and imported seeds.**—The follwing were tried during the season:—

1 Cape oats.
2 Barley, golden.
3 „ peerless.
4 „ beardless.
5 „ Kotgarh.
6 „ chevalier.
7 Wheat, Australian.
8 German rapeseed.
9 Italian turnips.
10 Carrots.
11 Mangold.

From Nos. 1 to 5 are the grains sown from seed grown on the* farm for some years past.

No. 6 wasToceived from the Commissioner of Settlement and Agriculture, Panjab.

No. 7 from the Superintendent of Botanical Gardens, Sah&ranpur.

No. 8 from Bombay Chamber of Commerce. This seed was received through the Local Government in 1884,-but the time for its sowing being then expired it was reserved for the present year.

No. 9 was recoJved from Government of India with the object to try it on *dty* land chiefly, being said that it requires little or no irrigation.

Nos. 10 and 11 were procured from Messr3. Sutton and Sons of Reading (England).

From Table XV their treatment and outturn will appear.

Table XV.

No.	Crop.	Area in quart* rards.	Outturn per acre.		Manure.	[illegible]	[illegible]	[illegible]	Value of crop per acre.
			Grain.	Straw.					
			lb.	lb.					Rt.
A 1	Cape oats ...	2,167	2,423*3	3,419-6	Poudrette, 100 mds. per acre.	3	1	8	58-0
2	Ditto	891	2,620*6	4,8292	Poudrettc, 400 rods, per acre	4	1	4	70*0.
3	Ditto	2,304	?,2698	3,793'9	1'oudrette, luO UJU3 JIGI Ut I fr*	2	1	?	567
4	Ditto	1,333	2,425*4	4,462-4	Ditto	*>	1	3	62^
5	Ditto	2,070	79(V3	] 022*7	Nil			2	84'**
	Barfey, golden	440	1,074 7	2,860 0	Hemp & Toud-rctte, 100.nids. per acrd.	4	!	4	-
B	Ditto peerless	413	609-4	3,293-1'	Ditto	4	1	4	fi.
	Ditto beardless	891	466 6	3,168*8	Ditto	4			4	
	Ditto Kotgarh	3W	786*9	2,006 8	titto	4	1	4	23-8
	Ditto country	462	1,613*3	1,843*8	Ditto	4	1	4	34-*
C	Ditto chevalier	596	1,676-4	3,8U65	Ditto 200 mds. per acre.	5	1	4	43*3
	Ditto country	627	2,716-4	2,4856	Ditto 1 ...	5	1	4	5&<t
	Wheat, Australian	240	452*6	4,7219	fyudrctto, 200 mils, ptsr acre.	4			4	30*3
	Ditto Muzaffarnagar ...	141	1,808*9	2.668*9	Ditto	4	I	4	549
	Rape, German	399	433-1	*••	Nil.	5	1	1	15'5
	Ditto country	59	580-9		Ditto	6	1	1	• 1-2

Table XV— (continued).

No.	Crop.	Area in square yards.	Outturn per acre. Grain.	Straw.	Manure.				Value of crop per acre.
			Mds.						Rs.
1	Carrot, Belgium, on ridges ...	260	153-5	...	Poudrettc, 260 mds. per acre.				38*4
	Ditto in lines ...	£55	1138	...	Ditto		6	7	28*5
	Carrot, country, on ridges ...	252	355*3	...	Ditto				88*8
	Ditto in lines ...	250	315-5	...	Ditto				78-9
2	Carrot, Belgium, on ridgei	485	227-5	...	Ditto				31-9
	Carrot, country „ ...	473	235-6		Ditto	5	3	6	58-9
3	MaDgold in lines ...	546	73 8	...	Ditto				36-9
	Ditto on ridges ...	551	85-2	...	Ditto		4	7	42*6
4	Ditto „ ...	862	120-7	...	Ditto	5	3	8	60-3
5	Italian turnip in lines, watered,	4*	52-2	...	Poudrette, 200 mds. per acre.				26-1
	Ditto not watered ...	44	*Nil.*	...	Ditto	4	3	6	*Nil.*
	Italian turnip on ridges watered,	44*	63-2	...	Ditto				31*6
	Ditto not watered ...	44	*Nil.*	...	Ditto				*Nil.*

Although perhaps owing to the unfavourable character of the season generally the yield of the above crops compared to the last year was low, still they indicate the facts (1) the acclimatized seed produces more than the newly imported one; (2) the native barley has again enlarged its produce among its foreign species, and so the Muzaffar-fcagar wheat gave much larger yield than the Australian one.

Of the German and country rape seeds lOtb seed of each was pressed for determination of *the* quantity of oil they produce.

Country oil press (the kolhoo) was employed in crushing the seed. The result is as follows:—

Description of seed.	*Quantity of seed pressed.*	*Oil expressed.*	*Percentage of oil on seed.*
Country rape	... lOtbs	3-28	32·8
German rape	... 10 „	2-37	23-7

Not only in the quantity of produce but in quality too (fatty matters) the country seed camd out best. Among the root crops the foreigu seods do not seem to have any great advantage over the country ones, as far as the quantity of the produce is concerned. The yield from indigenous seeds was dduble and threefold.

Mangold <rivo vorv noor crou :.its fair average is from 25 to 30 tons per acre.

Money \aiuo oi a crop oi country carrot per acre, as roughly estimated, is Bs. 84*8, much too higTi indeed than any cereal. To the cultivators near large town-carrot is a very good speculation.

56. *Ensilage.*—During the season before last thorough attention has been paid to the experiment of keeping fodder in sites, and estimating its nutritive value by feeding some working cattle of the farm on the stuff.

During the season under review, the fodder was ensilaged in much larger quantities. The following statement gives the detail of the number and dimensions of the pits, of their cost, and of the quantity of fodder ensilaged.

Table XVI.

No. of silo.	Date on which closed.	Date on which opened.	Form of silo.	Cost of digging.	Cost of roofing or raising mound of earth for shelter.	Pillars.	Cost of chopping.	Cost of filling, treading and weighting.	Total cost.	Fodder filled in.	
1	2	3		0	6	7	8	9	10	11	
				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		Mds.
1	12th December, 1884,	8th June, 1885 ...	Circular 6' diameter, 10' deep ...	0 8 0	0 6 0	...	2 2 3	0 15 6	3 15 9	Jwar ...	71
2	14th ditto, „	18th ditto ...	Ditto ditto ...	0 8 0	0 5 0	...	1 12 6	0 10 6	3 4 0	Jwar ...	74
3	18th ditto, „	Not opened ...	Ditto ditto ...	0 8 0	0 5 0	...	2 9 3	0 13 0	4 3 3	(Jwar ...	62
										(Surgho ...	23
4	3rd November, „	Ditto ...	Ditto ditto ...	0 8 0	0 11 6	...	1 6 6	0 8 0	3 2 0	Jwar ...	61
5	7th ditto, „	10th April, 1885 ...	Ditto ditto, 20' deep ...	2 0 0	0 13 6	...	4 13 0	1 10 3	9 4 9	Jwar ...	180
6	11th ditto, „	Not opened ...	10' diameter, 6' ditto ...	0 12 0	2 8 0	...	6 3 6	1 8 0	9 15 6	Jwar ...	171
7	6th October, „	10th May, 1885 ...	Longest diameter 18' ... *Shortest diameter* 10', *depth* 11'	3 12 0	21 4 0	6 6 0	Not chopped.	3 8 9	34 14 9	Common grass,	725
8	1st November, „	Not opened ...	Ditto ditto ...	3 11 0	20 7 0	6 6 0	13 13 0	2 8 0	46 13 0	Jwar ...	490
9	22nd December, „	Ditto ...	Ditto longest diameter 25' ... *Shortest diameter* 10', *depth* 12'	6 8 3	22 7 0	7 6 0	20 1 6	4 1! 0	61 1 9	Jwar ...	756
10	30th ditto, „	12th June, 1885 ...	Ditto longest diameter 30' ... *Shortest diameter* 18', *depth* 13'	13 9 0	39 10 6	15 13 0	43 13 3	7 14 3	120 12 0	(Jwar ...	1,417
										(Guinea grass...	416
11	4th September, „	19th February, 1885...	Square 10' by 10', depth 6' ...	...	Masonry pits.	...	Not chopped.	1 11 0	1 11 0	Common grass,	159
12	Ditto ditto,	17th March, 1885....	Ditto ditto ...	...	...	...	Ditto,	2 4 0	2 4 0	Ditto,	212
13	21st ditto, „	11th February, 1885,	Ditto ditto ...	...	...	...	Ditto,	2 1 0	2 1 0	Guinea grass...	191
			Total ...	32 4 3	108 13 6	35 15 0	95 10 9	30 11 3	303 6 9		6,007

Three of the 'above thirteen pits were masonry, which were formerly connected with subsoil drainage, and since 1883 are used as silos, the remaining 10 pits were simply excavations on a piece of high ground, seven of these were covered with chhappers, and three were protected from the rains simply after the native fashion of pre-c''~ving their dung cake heaps, *viz.,* a cone shape earth-hill was raised over them.

The fodder ensilaged consisted of j war and sorghum, guinea and common grasses. Some jwar was cut when in flower, but most of it filled in at the time the seed bunches were maturing. The grasses cut when they were in flower. Sorghum and jwar were chopped up into bits of about an inch .in length, but the common and half of the guinea grass were packed in uncut. •All the siles were stuffed gradually after what is called SIQW process, by layers varying from two to four feet in thickness according to the size -of the silo. The interval between the two successive fillings was about two "days. .After thei pits were filled they; were, covered with a laryer of earth two to three feet thick.

The masonry pits were opened while I was in Lalitpur, but I# saw samples of the ensilage and found it exceedingly good. .One of the pits (No. 2-) was opened, when Mr. Allen, S. C, M. R. A. 0., the .Assistant Director of the Department of Agriculture of Bengal, happened to be .here at the farm. It is very satisfactory that he considered the ensilage to be first rate. Except in some pits, about six inches of the fodder at the top and around the sides had turned mouldy, and \his is not an unudual rate of the waste. Besides this, the whole of the fodder was'iu an excellent state of preservation. The temperature at the depth of about two feet stood between 110 and 120. It was freely, rather eagerly, eaten not only by farm bullocks, which have learned the taste of it, but by the bullocks which neyer had it before.

As far as the matter of preservation of fodder is concerned, I am pretty certain we were quite' successful, but whether the thing in itself is a' good food for animals is of course an open question and requires long consideration and trial. Also it is to be ascertained yet which is the best process for preserving the fodder, that the albumenoids may be less converted into amoids and acetic acids.. In the next ^experiments these points "will be aimed at and necessary reforms will be adopted. There is no space here to describe how this should be done.

IMPLEMENTS.

57. *Supply of.*—The implements -turned out in the farm workshop and stippliod are—

1. Ploughs (Kaisar and Duplex;*
2. • Waterlifts or chainpumps of 5, 10, 15 and 2Q feet in length.
3. Sugar evaporators.

Watts? plough and chaff-cutte'r are imported And supplied.

The following table shows their distribution during two years—

Implements.	1883-84. Sold.	1883-84. Seat for trial.	1884-86. Sold.	1884-86. Sentfor trial.
Ploughs-				
Watts'	25	3	23	*Nil.*
Kaisar ... ^ ...	183	3	•60	*NU*
Duplex	67	28	81	*7
Pumps	26	*Nil.*	44	*Nil.*
Eraporators	5	*Nit.*	14	*mi.*

58. The Kaisar'is getting out of,fashion lately or since the improved duplex was invented and pushed on. As the latter does both works; cultivating and sowing, it is really of greater use to farmers ahd is more admired too than the old Kaisar.

Watts'is unquestionably the best for first ploughing on stubble and is valued bj those who become aware of its quality. Arrangements have been made for diffusing broadcast the advantages of the modified and improved plough, tha Duplex, during the next rabi season. Apprentices with ploughs*and ploughmen have been sent out to several districts with instructions to tour through the districts and plough for all who will consent. The Collectors have interested themselves for the experiment.

59. *American plough.*—This plough was seut from America by Mr. Wilson, the late Engineer connected with this department, and was tried in last May. The Superintendent's report on the same is as follows : —•

1. " It turns over the soil very welf, but not better than Watts'."
2. " It requires a powerful team of cattle to draw it. We had yoked one of our strongest pairs, and even then it could be driven with difficulty."
3. •" It can be used both as a "short and long be^m plough, and this is the only point of novelty about it, otherwise it does not differ much from the Kaisarr"
4. " To ,sui£ it for different heights of cattle it has got a hoop of iron with a number of holes. After placing the, beam at the required inclination, a bolt is passed through the holes of the hoop and the beam rests there. This is, howevdr, ftot soisimple as the wedges which we use in the Kai^ar and Duplex.

60. *Pump.*—The Pump is getting more and more popular. The one of five feet is most economical and useful for the irrigation done by the side of the canal distributaries in the. fields which a*e higher than the water-lenel.

61. *Sugar evaporator'.*—Like sugar millet most probably it seems to push on itself very rapidly. The only complaiut heard of it is that it is made of thin sheets of iron by which, of course, it is liable to break and *go* out of use soen.

By jisiijg durable materials it will become more costly. However, it is to be searched out to make it cheap and good.

62. *Seed separator.*—A new seed separator has been received during the year under report. Th6 Superintendent's note on its trial is quoted below.

" Seed separator was tried in June for separating the big grains of wheat for seed. It servfes very well for separating the bigger grains from the smaller ones, but it fails to remove the larger impurities which remain with the big grains."

63. *Show of implements.*—A collection of various kinds of ploughs and useful machinery is kept in the farm premises for show, and new things added at opportune times.

In the district fairs the Duplex, pumps- and evaporators' had been exhibited widely and generally approved of by the committee.

64. *Seed distribution.*—The following Hs* shows the amount of seed distributed during the year under review. As far as the results have been ascertained, they agree with the results obtained on the farm.:—

	ft.
Nankin cotton seed	2,808
^ew Orleans	365
Sorghum	-1,986
Maize	978-
Wheat, Mnzaffarnagor*	12,123
Ifcitto, Mundia	786
Cape oats	4,011
Barley, acclimatized	20a

65. TJie Superintenttent, Babu Lachraan Pershad Burmah, has shown his usual activity and has taken a hearty interest in conducting tho works on the farm.

SAYYID MUHAMMAD HUSSAIN, M.B.A.C,
In charge of Experimental Farm, Cawnporc

APPENDIX.

Notes on Usar and Reh soils, by DR. R. ROMANIS, D, SO., *Chemical Examiner, British Burmah.*

THE specimens examined were—

1st—Specimen of surface soil, usar plain, near Cawnpore.
2nd—Samo place, 4-10 inches below surface*
3rd—Well water, same place.
4th—Reh taken from wheat field, Bulandshabr.
5th—Reh from a field at Nethra-Hasanapura, about three miles from Bulandshalr.
6th—Reh, same place, 1-4 inches below surface.
7th—Reh, 6-10 inches below surface.
8th—Soil from surface, same place.
9th—Soil, 6-10 inches below surface.

There was no reh on the surface of the lisar plain at Juhi near Cawnpore.

It seems to me that its barrenness is caused by the natural poverty of the soil and its physical nature.

A specimen of the salt bush planted there looked unhealthy: not because the reh does not agree with it, but because there is no food for it. This soil contains a fine clay that remains suspended in water for days, and no doubt it chokes the roots of plants.

A sample from the surface of the soil contained no phosphoric acid : the other essential constituents in sufficient quantity.

The subsoil contains a moderate amount of phosphoric acid : the other constituents in larger quantity than the surface.

The subsoil water contains a notable amount of alkali, *and a trace is found in the soil. So far as I sec, it is the physical more than the chemical nature of the soil at Juhi that is at fault. It'is possible that the presence of alkali causes that peculiar state of semi-solution of the alumina in which it passes through filters, and remains suspended in water for many days, for when acid is added tho solution clears quickly ; also if a salt of iron is added.

* [illegible] grains per ga[illegible].

At Nethra-Hasanapura there was a barren plain covered with alkaline reh. Some of this scarped off the surface had the following composition :—

Carbonate of sodium. ... ... < ...	72-57
Sulphate	20-41
Chloride	6'43
	99-41

The layer, about ½ inch deep, contained 14 per cent, of reh and 86 of sand ; therefore about 11 per cent, of sodium carbonate. There was no borax, which I hoped to find.

Tho quantity decreased rapidly downwards.

From one inch to four inches there was 0*7 per cent, alkali, and from six inches to 10 inches 0*6 per cent.

At Bulandshahr a sample was taken near tho municipal boundary pillar on the road to tho Railway. It was taken from the middle of a wheat field. The composition was—

Carbonate of sodium	[illegible]
Sulphate "	[illegible]
Chloride "	[illegible]
Organic matter and un It tPriiiiiwrl	[illegible]
	100'00

Tho reh contained 80 por cent, of sand anil 20 per cc:......>alts ; therefore tlir surface layer containod OR of alkali. Tho wheat looked well enough, except wlimv "to aalt had effloresced on tho surface.

It is well known that an alkaline substance like sodium carbonate is far more injurious to plants than neutral salts like the sulphate and chloride ; but we have no experiments to show what is the minimum of any of these, salts* that will prove injurious.

The alkali can be neutralised by sulphate of lime (gypsum), which produces carbonate of lime and sulphate of sodium ; sulphate of magnesium, which produces sulphate of sodium ; and basic carbonate of magnesium, or sulphate of iron, which will produce sulphate of-sodium, oxide of iron, and carbonic acid.

I should like to s6e the latter especially tried, as I fancy it would improve the physical condition of the soil.

But these substances could only be profitably applied where the alkali is in comparatively small proportion, as at Bulandshahr or the sub-soil at Nethra-Hasnapura.

Where there is a large quantity, it must be removed mechanically. Whether this can be done profitably^ depends on various circumstances^

(1) If where the crust of reh is removed from the surface, the sub-soil reh is not in sufficient quantity to prevent vegetation (Ex. at Nethra-Hasnapura it is 0*7 per cent.):

(2) If, since the source of the reh is the subsoil water, the land being once cleared, it takes a sufficiently long period before the alkali accumulates at the surface by capillary attraction and evaporation to make the process of clearing again necessary :

(3) If the improved value of the s*pil and the value of the reh repay the cost of collecting.

These, then-, are the points which require to be settled. The only point on which I can give any data is the last. Litres 61 cubic inches of reh from Nethra-Hasnapura gave 72'6 grains of alkali, which is at the mte of lib per 380 cubic inches. Supposing the layer scraped off was £ inch, wo have lib. per 1,520 square inches of surface, or nearly 2 tons per acre of dry carbonate (37cwt.), or 98cwt. of soda crystals, the price of which at Liverpool is about £4 to £5 per ton. If the Nethra-Hasanpura reh is of uniform quality, it should yield about £20 of carbonate per acre.

What we have now to ascertain is the area and composition of the alkaline reh (jn addition to the points mentioned above;. There is, I understand, a survey of the reh country in progress. If not already done, it would be easy to determine this by means of standard acid, and a burette, the simplest of all analytical operations. We should then know the value of the material, and could calculate the profit of removing it.

The soils vary greatly in composition. The following is the composition of the part soluble in hydrochloric acid :—

	tJsar, Cawnpore.		*IVethra-Hainopura.*	
	Surface \ in.	Subsoil 4 to 10 inches.	Surface.*	Subsoil 6-10 inches.
Potash	0-294	0808	O-26O	0*608
8°°*	... -O-174	0271	O*09	O675
Lime	... O-coo	I^IO	not determined	1*450
Magnesia	... o*220	O-35O	...	o•2O
Alumina, not weighed	...	8 900	...	7•,6
Phosphoric acid trace	...	0-055	0*064	0*11

This shows the subsoil to be twice as good as the surface, and richer imi'i »u best Burmese soils I have examined. In the case of the Cawnpore soil it is evidently the physical nature of the soil that is at fault. At Nethra-Hasnapura it is the reh.

The water of a well in the liaar plain at Cawnpore contained 36 grains per gallon of residue, of which 22 grains were carbonate of soda and 14 grains carbonate of lime. The soil also contains minute traces of alkali.

R. ROMANIS, D. Sc,
Chemical Examiner, British Btirmah.

• This surface soil was the residue from the reh.

REPORT

ON THE

CAWNPORE EXPERIMENTAL STATION

FOR THE KHARIF SEASON, 1885.

ALLAHABAD:
NORTH WESTERN PROVINCES AND OTJDII GOVERNMENT PRESS.
1880.

No. 683A OF 1886.

DEPARTMENT OF AGRICULTURE AND COMMERCE, N.-W. P. AMD OUDH.

DATED CAWNPORE, THE 26TH MAY, 1886.

FROM

LIEUT.-COLONEL D. G. PITCHER,

OFFG. DIE., DEPT. OF AGRI. AND COMMERCE,

N.-W. PROVINCES AND OUDU,

To

THE CHIEF SECRETARY TO GOVERNMENT,

N.-W. PROVINCES AND OUDH.

SIB,

I HAVE the honor to submit for the information of His Honor the Lieutenant-Governor and Chief Commissioner the report for the kharif season of 1885 of the Cawnpore Experimental Station, now in the charge of Mir Muhammad Husain, M.R.A C, Officiating Assistant 'Directory by whom the report has been compiled.

2. The report was due officially in December last ; but owing to the lateness of tlie cotton crop, particularly in regard to exotic varieties, it has never been found practicable to render the report within the time fixed, and this year experiments with certaiu kharif mixed crops has delayed the report still further.

3. *Character of the season.*—The season was marked by early and heavy rain with early cessation. Sorgho and maiz& suffered, but cotton appears to have done fairly well.

4. *Experiments with manures.*—Notwithstanding the eccentricities of the seaspn, the established precedence of the various manures was fairly maintained ; but the yield of both grain and straw was remarkably low all through and would appear to indicate that ordinary cultivators must have suffered considerably. That they did so was very practically established later on by the scarcity amounting to very grave inconvenience throughout the country of that winter fodder which in ordinary years is derived from the stalks and straw of kharif crops.

5. *Comparative experiments: Saltpetre against certain organic manures.*—In these saltpetre maintained the lead. The most interesting fact in the table is the high value now obtained from woollen refuse, a waste product of the Cawnpore Mills which the latter at one time found the greatest difficulty .in getting rid of on any terms The figures for pigs' droppings and for poudrette embody facts interesting to students of rural sanitation.

6. *Experiments in sowing maize after the American method.*—The sowings were personally conducted by the American gentleman at whose suggestions the experiment was carried out, but the results were not satisfactory ; and as the season was so unfavourable, it is hoped that next year may show better.

7. *Experiments with cotton.*—Used as the test crop in trial of deep *versus* shallow ploughing, the deep-ploughed plot as usual gave the best results. Tested for various methods of sowing, that of broadcast sowing proved most suitable for the slender plants of country cotton, while for the more bushy occidental varieties sowing in lines is better adapted. Cow-dung manure nearly doubled the produce as compared with that on unmanured plots. Eight different varieties were grown for comparison, with the result that Saháranpur seed gave the best results, ordinary country cotton and New Orleans following with about equal success.

8. *Oilseeds.*—Some very useful experiments were instituted this year under this heading in view of ascertaining the comparative outturn and value in the system of growing oilseeds alone and mixed. A connected series will in due time furnish figures now greatly needed for the annual harvest forecasts for the provinces.

Another useful series termed in the report " miscellaneous " was inaugurated to test the value of the method largely followed of sowing nrixed crops in the kharif, one of which is reaped with the rabi harvest and the other with the kharif harvest, instead of sowing a full kharif crop one year and a full rabi the next. The series will be continued until sufficient figures have been collected to admit of true deductions being drawn.

9. A small experiment was tried [in growing sugarcane according to the Mauritius method as compared to that in vogue in the district. So far as the experiments went, the Mauritius method proved no more superior to the local methods than did the Demarara plan tried on the farm about two years ago.

10. *Ensilage.*—This system can no longer be considered in the light of an experiment, as it has been successful on the Station for some three years past and silos form a regular part of the establishment. The inopportune rains and consequent failure of kharif fodder proved this y^ar the opportunity of ensilage. In the previous year a great deal more fodder had been ensilaged than could at the time be got rid of, and it was reserved as an experiment against time. When opened after 18 months it was found so good that the farm cattle were fed almost exclusively on the ensilaged ju&r for about two months, keeping excellent condition. The result was a large saving in money which would otherwise have had to be expended in buying fodder at the very high rates ruling.

Grass was not so successful as jiuir. It is to be noted that the offensive smell so often complained of in regard to silos is not a concomitant of those at Cawnpore.

11. *Implements.*—Of these mention has already been made in the annual list of implements, &c., tried, which has been submitted to Government. The centrifugal sugar separator introduced by the makers of the Behea mill promises to be a most useful addition to implements suited to the country. In regard to Rogers' sugar mill, it is true that the weight renders it less portable than mills with wooden stands; but, on the other hand, weight lends stability, an object most desirable to attain in working any mill.

Bull's improved dredger has proved a decided success. Four are now in use and orders have been received for six more, which are now on their way from Bombay. It greatly cheapens and expedites well-sinking when sand is met with.

12. Mir Muhammad Husain was in entire charge of the farm for the period under report and had much difficulty to contend with in the character of the season.

I have the honor to be,

SIR,

Your niost obedient servant,

D. G. PITCHER, LIEUT.^COL.,

Offg. Director.

REPORT

ON THE

CAWNPORE EXPERIMENTAL STATION

FOB THE KHARIF SEASON 1885.

1. *Cause of delay in submission.—As* kharif report includes cotton and ensilage experiments, and in the season under report it included arhar and sugarcane, therefore the submission of this report ha3 necessarily been delayed. The picking of Nankin cotton kept on as late as the last week of January, and of other varieties a little earlier than that; arhar was harvested only a day or two before the writing of this report was commenced; milling sugarcane was not over till the end of •January, and the silos were opened on the 16th of April last.

2. *Rainfall.*—As a rule, the rainfall is sever or very seldom up to the satisfaction of agriculturists: there always remain more or less complaints of its being inopportune and unfairly distributed.

Last year the complaint was greater at the beginning : just at the very ploughing and sowing time it had been excessively heavy, while at the end it ceased altogether. It affected every crop, especially sorgho and maize. Nankin cotton stood more vigorously against the unfavourable circumstances than other varieties* On the whole, cotton did not suffer much on the farm.

3. The following table will show the rainfall of last two years : —

Month.	RAINFALL IN INCHES.			
	At the Station.		*At the City.*	
	In 1884.	In 1885.	In 1885.	Mean of 15 years
June	2'57	68	6-69	2*61
July	S'11	160	14*62	9*6>
August	2447	18*8	15-06	7*89
September	9''32	2*2	1-57	5'3 S
October	6-17	...	0'29	I'06
November	...	.		...
December	..*	"o«9	"i-56	26*56

4, *Major heads of experiments.*—In the season under review the following operations comprised experiments :—

I.—MAIZE.

(a) Treatment of standard and duplicate plots as usual.
(6) Effect of certain animal manures,
(c) Effect of special manures.
{d) American way of sowing *versus* country fashion.

II.—COTTON.

(a) Effect of deep and shallow ploughing from improved and country ploughs.
(6) The produce from different varieties of seed,
(c) Effect of different kinds of sowings on country seed.
\d) Effect of different kinds of sowings on Nankin seed.

III.—OILSEED.

(a) Black til.
(i) White til: (1) early variety; (2) late variety.
(o) Mixed crop (til, maize, cotton, pulses, &c.)

IV.—SUGARCANE.

(a) Sugarcane *versus* sorgho.

(6) Effect of different kinds of sowings.

V.—MISCELLANEOUS.

(a) Money value of mixed kharif crop against a crop of wheat.
(b) Outturn of pulses and millets.

VI.—ENSILAGE.

(a) Silo opened after 18 months.

(b) Silo opened within 9 months.

5. A copy of the programme which was drawn up for the works of this season is appended at the end of this report. It will show the detail of the operation of the kharif sowing.

6. *Maize.*—(a) *Experiment in a series of* 26 *plots termed standard and duplicate, each division having* 13 *plots.*—Twenty out of the plots (26) have been under the same experiments for the last six years. Three new plots have been added in each division from 1884 for sheep-dung, ashes of cowdung top dressed with saltpetre, and poudrette Respectively. Each plot is 400 square yards.

The manure applied and the crops sown for the last five years are shown in the following return :—

Table I

Number of plot.		1880-81. Manure.	Crop.	1881-82. Manure.	Crop.	1882-83. Manure.	Crop.	1883-84. Manure.	Crop.	1884-85. Manure.	Crop.	1885-86. Manure.	Crop.
I	Standard,	Dung ...	Maize & wheat,	Dung ...	Maize	Dung ...	Maize ...	Dung ...	Maize	Dung ...	Maize,	Dung ...	Maize.
	Duplicate,	Nil	Maize	Ditto	Maize & wheat,	Ditto	Ditto ..	Ditto	Wheat	Ditto	Ditto,	Ditto	Wheat.
II	Standard,	Dung and bone-dust,	Maize & wheat,	Dung and bone-dust,	Maize	Dung and bone-dust,	Ditto ...	Dung and bone dust,	Maize ...	Dung and bone-dust,	Ditto,	Dung and bone-dust,	Maize.
	Duplicate,	Nil	Maize	Ditto	Maize & wheat,	Ditto	Ditto ..	Ditto	Wheat	Ditto	Ditto,	Ditto	Wheat.
III	Standard,	Dung and calcic sulphate.	Maize & wheat,	Dung and calcic sulphate.	Maize ...	Dung and calcic sulphate.	Ditto...	Dung and calcic sulphate.	Maize	Dung and calcic sulphate.	Ditto,	Dung and calcic sulphate.	Maize.
	Duplicate,	Nil	Maize	Ditto	Maize & wheat,	Ditto	Ditto...	Ditto	Wheat	Ditto	Ditto,	Ditto	Wheat.
IV	Standard,	Ashes of dung ...	Maize & wheat,	Ashes of dung ...	Maize	Ashes of dung	Ditto ...	Ashes of dung ...	Maize	Ashes of dung	Ditto,	Ashes of dung ...	Maize.
	Duplicate,	Nil	Maize	Ditto	Maize & wheat,	Ditto	Ditto ...	Ditto	Wheat	Ditto	Ditto,	Ditto	Wheat.
V	Standard,	Poudrette ..	Maize & wheat,	Poudrette ...	Maize	Potassic nitrate	Ditto ...	Potassic nitrate ...	Maize	Potassic nitrate ...	Ditto,	Potassic nitrate ...	Maize.
	Duplicate,	Nil	Maize	Potassic nitrate ...	Maize & wheat	Ditto	Ditto...	Ditto	Wheat	Ditto	Ditto,	Ditto	Wheat.
VI	Standard,	No manure	Fallow	No manure	Fallow	No manure ...	Fallow.-	Potassic nitrate and bone-dust.	Maize ...	Potassic nitrate and bone dust.	Ditto,	Potassic nitrate and bone-dust,	Maize.
	Duplicate,	Nil	Maize	Potassic nitrate and bone-dust.	Maize & wheat,	Potassic nitrate and bone dust.	Maize ...	Ditto	Wheat	Ditto	Ditto,	Ditto	Wheat.
VII	Staudard,	Bone superphosphate.	Maize & wheat,	Bone superphosphate.	Maize	Bone superphosphate.	Ditto ...	Potassic nitrate and bone-dust superphosphate.	Maize ...	Potassic nitrate and bone superphosphate.	Ditto,	Potassic nitrate and bone superphosphate.	Maize.
	Duplicate,	Nil	Maize ...	Ditto	Maize & wheat	Ditto	Ditto...	Ditto	Wheat	Ditto	Ditto,	Ditto	Wheat.
VIII	Standard,	Bone-dust	Maize & wheat,	Bone-dust	Maize ...	Bone-dust	Ditto...	Sheep-dung and bone-dust.	Maize	Sheep-dung and bone-dust.	Ditto,	Sheep-dung and bone-dust.	Maize.
	Duplicate,	Nil	Maize	Ditto	Maize & wheat,	Ditto	Ditto ...	Ditto	Wheat ...	Ditto	Ditto,	Ditto	Wheat.
IX	Standard,	Calcic sulphate ...	Maize & wheat,	Calcic sulphate ...	Maize ...	Calcic sulphate	Ditto ...	Sheep dung and calcic sulphate.	Maize	Sheep-dung and calcic sulphate.	Ditto,	Sheep-dung and calcic sulphate.	Maize.
	Duplicate,	Nil	Maize	Ditto	Maize & wheat,	Ditto	Ditto...	Ditto	Wheat	Ditto	Ditto,	Ditto	Wheat.
X	Standard,	No manure ...	Maize & wheat,	No manure	Maize	No manure	Ditto ...	No manure	Maize ..	No manure	Ditto,	No manure ...	Maize.
	Duplicate,	Nil	Maize	Ditto	Maize & Wheat,	Ditto	Ditto ...	Ditto	Wheat	Ditto	Ditto,	Ditto	Wheat.
XI	Standard,	"	Pulses	Dung ...	Cereals ...	Green soiled with hemp.	Barley..	Ditto	Sorgho ...	Ashes of dung and saltpetre.	Ditto,	Ashes of dung and saltpetre.	Maize.
	Duplicate,	"	Maize	No manure	Cotton ...	No manure	Juar and gram	Ashes of dung and saltpetre.	Sorgho and wheat.	Ditto ...	Ditto,	Ditto	Wheat.
XII	Standard,	"	Pulses	Dung ...	Cereals	Green soiled with hemp.	Barley...	No manure	Sorgho	Sheep-dung ...	Ditto,	Sheep dung	Maize.
	Duplicate,	"	Maize	No manure	Cotton ...	No manure	Juar and gram.	Sheep-dung ...	Sorgho and wheat.	Ditto	Ditto,	Ditto	Wheat.
XIII	Standard,	"	Pulses ...	Dung ...	Cereals	Green soiled with hemp.	Barley...	No manure ...	Sorgho	Poudrette	Ditto.	Poudrette	Maize.
	Duplicate,	"	Maize	No manure	Cotton ...	No manure ...	Juar and gram.	Poudrette ...	Sorgho and wheat.	Ditto	Ditto,	Ditto	Wheat.

Other treatment of the plots in question was as follows :—

Ploughing	... [illegible]
Weeding	... [illegible]
Irrigation	... Nil
Seed maize	... 12 lb. per acre.

The following table shows the outturn obtained from each plot during the year under report and the year before it:—

Table II.

No.	Manure and rate per acre.	Year.	Outturn per acre. Grain. Standard.	Grain. Duplicate.	Stalk and leaf. Standard.	Stalk and leaf. Duplicate.
			lb.		Mds.	Mds.
1	Cowdung, 180 maunds ...	1885 ...	266*2	605-0	30-3	43-2
		1884 ...	1860-0	1680-4	89-6	75-2
2	Cowdung, 180 maunds; bone-dust, 360 lb. ...	1885 ...	471-9	629-2	61-6	44-7
		1884 ...	1632*0	1568*4	76-8	85-6
3	Cowdung, 180 maunds; calcic sulphate, 240 lb.	1885 ...	435-6	641-3	40-5	37-1
		1884 ...	1914-0	1524-0	96-0	80-8
4	Ashes of 180 maunds dung ...	1885 ...	326-7	314-G	37-9	27-7
		1884 ...	1230-0	806-4	69-6	48-8
5	Potassic nitrate, 240 lb. ...	1885 ...	871-2	484-0	60-05	34*5
		1884 ...	1608 0	876-0	77-6	58-4
6	Ditto bone-dust, 360 lb. ...	1885 ...	435-6	629-2	45-1	43-3
		1884 ...	1644-0	1200-0	73-6	56-8
7	Ditto bone superphosphate, 240 lb. ...	1885 ...	520-3	762-3	36-8	40-4
		1884 ...	1260 0	852-0	76-0	65-2
8	Sheep-dung, 180 maunds; bone-dust, 360 lb.	1885 ...	508-2	508-9	46-1	41-0
		1884 ...	1518-0	1062-0	80-8	53-6
9	Sheep-dung, 180 maunds; calcic sulphate, 240 lb.	1886 ...	329-7	520-3	23-9	38*3
		1884 ...	1359-6	1074-0	70-4	68'4
10	No manure	1885 ...	338-8	193-6	38-3	36-0
		1884 ..	1044-0	564-0	70-4	43-2
11	[illegible]	1885 ...	726-0	SUS'4	79-3	71*5
		1884 ...	1514-4	1134-0	73-6	68-8
12	Sheep-dung, 180 maunds ...	1885 ...	290-4	847-0	24-05	60*4
		1884 ...	1316-4	1167-6	73*6	69-6
13	Poudrette, 180 maunds ...	1885 ...	460-7	869-1	38-7	43-2
		1884 ...	1932-0	1728-0	96-8	86-4

From the figures tabulated in the foregoing statement the effect of bad season is clearly visible. It is said that throughout the province maize and early-sown cotton crops have suffered a great deal. The plots, being situated on somewhat low-lying ground, never got free of water when the plants were growing. Although due attention had been paid to drain off the water by surface drainage, yet, owing to the continuous rain of day and night, the incoming quantity of it always exceeded the amount discharged out.

Although the season had been very unfavourable and the outturn extremely poor, still in most cases the fertilizers experimented upon have proved true in their effects,—the farmyard manure stimulated with some artificial fertilizer has given better result than the former applied singly; for instance, cow-dung and calcic sulphate, sheep-dung and bone-dust, &c

Potassic nitrate too did not fail to produce its recognised effect, but gave a comparatively better crop. Poudrette has proved to be a better manure than cattle-dung.

The excess of rain has not only injured the grain but produced the same effect over the stalks of the crop.

Duplicate plots in which maize and wheat arc sown alternately have nearly in all cases given a better crop this time than the standard plots in which maize 1s sown year after year. But this is contrary to the previous results. This exception may be attributed to the excess of rain, which, perhaps, decomposed organio matters deposited by the roots of the previous wheat crop quickly and made it available for maize in the time of need. The other fertilizers applied to the plots no doubt were washed away to a great extent by surface drainage, while the organic matter left by the previous crop, the wheat, was being decomposed and got ready just in time for being used by the plant.

7. (6) *Experiments to determine the comparative value of certain animal manures and saltpetre.*—The following table Shows the crops produced during the current and the last five seasons in the eight plots under this experiment: —

Table III.

No. of plots.	1880.		1881.		1882.		1883.		1884.		1865.	
	Manure.	Crop.	Manure.	Crop.	Manure.	Crop.	Manure.	Crop.	Manure.	Crop.	Manure.	Crop.
I	Sheep dung.	Wheat	*Nil.*	Cotton	*Nil*	Wheat	Woollen refuse.	Maize & barley.	Woollen refuse.	Maize.	Woollen refuse & lime.	Maize.
II	Do.	Do.	Do.	Do.	Do.	*Do.*	Do.	Do.	Sheep-dung.	Do.	Sheep-dung.	Do.
III	Do.	Do.	Do.	Do.	Do.	Do.	Brickiln refuse.	Do.	Cow-dung.	Do.	Cow-dung.	Do.
IV	Do.	Do.	*Do.*	Do.	Do.	Do.	Poudrette.	Do.	Poudrette.	*Do.*	Poudrette.	Do.
V	Do.	Do.	Do.	Do.	Do.	Do..	*Nil.*	Do.	Horse-dung.	Do.	Horse* dung.	Do.
VI	*Do.*	*Do.*	*Do.*	Do.	*Do.*	*Do.*	Do.	*Do.*	Pigs' droppings.	*Do.*	Pigs' droppings.	Do.
VII	*Do.*	*Do.*	*Do*	Do.	*Do.*	Do.	Do.	Do.	Saltpetre.	Do.	Saltpetre.	Do.
VIII	Do.	Do.	Do.	Do.	Do.	Do.	Do.	Do.	*Nil.*	Do.	*Nil.*	Do.

Other treatment of the plots during the year was as follows :—

Ploughings	2
Weeding	1
Irrigation	*Nil.*
Seed and rate per acre	Maize. 12 lb.

The outturn of each plot is shown in the following table :—

Table IV.

No. of plots.	Manure and rate per acre.	Outturn per acre.	
		Grain.	[illegible]
		lb.	Mds.
1	Woollen refuse, 120 mds.	1,185-8	80-7
2	Sheep-dung, 120 „	780-4	72-7
8	Cow-dung, 120 „	780-4	54*4
4	Poudrette, 120 „	847*0	75-1
6	Horse-dung, 120 „	[illegible]	73-3
6	Pigs' droppings, 120 „	1,016-4	80-1
7	Potassic nitrate (saltpetre), 3 mds.	1,806-8	76-1
8	No manure	660*8	41-5

The produce from these plots is much greater than that from the duplicate and standard plots treated before. It should not be considered that the different kinds of fertilizers used in this case have to account for it, the true cause being that these plots, being on a slope, did not allow water to lodge in them.

After saltpetre, woollen refuse has given the best results and has again proved to be better than poudrette for maize. By the results of the past two years the conclusion can safely be drawn now that it is a good manure. If the blanket-manufacturing class in the country, who as a rule are cultivators too, may become aware of the fact and learn it that they can utilize the waste of their manufactory in fertilizing their fields, they can derive immense good by it. They already know the effect of their sheep excrement, but do not know the value of the woollen refuse, which is simply wasted. Cow and sheep-dungs have given just equal results. Poudrette exceeds them here again. Horse-dung and pigs' droppings are still better, but this is an exception in the present case : generally they have not proved to be so* Saltpetre tops the list.

8. *(c) Brick-kiln refuse and ashes of weeds.*—These series consist of four plots. Past and present treatment stands as below :—

Table V.

No. of plot.	*Past treatment.* Year.	Manure.	Crop.	*Present treatment.* Manure.	Ploughing.	Weeding.	Irrigation.	Crop.
I ...	1881-82 ...	Dung	Wheat and barley.	AB io table VI.	9	a	2	Maize.
II ...	1882-83 ...	Green soiled with hemp, JSil.	Oats ...					
III M·	1883-84 ...							
IV ...	1884-85 ...	1. Brick-kiln refuse. 2. Ashes of weeds. 3. Ditto *nd potassic nitrate. 4. ML	Sorgho. Maize.					

The outturn is given in the following table:—

Table VI.

No. of plot.	Manure and rate per acre.	*Outturn per acre.* Grain.	Stalk and leaf.
		℔.	Mds.
1	Brick-kiln refuse, 120 maunds	387-9	64-3
2	Ashes ot 1*0 maunds cow-dung	726 0	46-4
3	Ditto and potassic nitrate, 3 maunds	762 3	[illegible]
4	No manure	302*5	[illegible]

Brick-kiln refuse in this instance too has proved to have manurial value in it. Its quality, of course, would depend on the nature of fuel burnt in it.

Ashes of cow-dung have also always proved to act as fertilizer, but of course they are not so good as the unburnt dung.

Saltpetre in every case has shown its good effect.

9. (d) *Experiment of sowing maize after American fashion, what is called'on hi\ls, against country way of soioing.~?he* idea of this method of sowing has been taken from American papers, which have highly advocated in its favour, and a trial for the iirst time was given to it in this season.

The plots were prepared and sown under the direction and supervision of an American gentleman named Dr. L. Hauser.

Four plots of equal size being measured off, treated as follows:—

Manure, cowdung, 200 mannds per acre-
Ploughing, three times.
Weeding, twice.

In one plot seed had been sown after plough according to fee native fashion, and in three plots it was sown in lines 2, 3, and 4 feet apart. The blanks between the two lines were grubbed, and earth hills or mounds raised up around the roots of the pla*ts which had been sown in tuft.

The following table shows the result:—

Table VII.

		Outturn per acre.	
		Grain.	Stalk and leaf.
		lb.	Mds.
1	Maize country sown 2 feet apart ...	[illegible]	16·8
2	Ditto 3 „ ...	[illegible]	44·4
3	Ditto 4 „ ...	[illegible]	21·0
4	Maize country sown behind plough	[illegible]	11·8

Owing to the excessive and untimely rain the seed did not germinate well : thus the loss in thinly sown plots was greater. The blanks were filled up by plants transplanted, but they did not bear good cobs. Under the above circumstances, no conclusion can be drawn safely by this first trial. In next season this would be experimented again.

10. *II.—Experiments on cotton.*—In tl^ season cotton has given much better crop than last time. Kulpahar cotton sown broadcast heads the list.

(a) *Effect of deep and shallow ploughing.*—This experiment is tried in two series, A. and B., of 4 and 3 plots respectively.

There is no difference of any treatment between the two, but the area of B. series is larger than A.

In other words in (5) series the same experiment is confirmed in a larger scale. No manure is applied.

The other treatment is as follows :—

Irrigation	...	...	...	...	...	*NIL*
Weeding	—	...	...	...	—	3
Grubbing	...	...	...	...	...	*Nil.*

Process of sowing.—The result obtained during the last two years is shown in the»following statement:—

Table VIII.

No. of plot in the series.	Detail of ploughing.	Outturn per acre in 1885.		Outturn per acre in 1884.		Increase per cent. over country ploughing in 1865.		Increase per cent. over country ploughing in 1884.	
		Cotton.	Seed.	Cotton.	Seed.	Cotton.	Seed.	Cotton	Seed.
Series A.		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Plot I. ...	Twice with country plough, ! foot.	185-5	338*8	36-8	78-4	...	...	...	...
„ II. ...	Once with earth-turning plough, 5 inches.	225*8	407*3	48-0	9G-0	15-4	26-7	22	12
„ III. ...	Ditto ditto, 9 inches,	209*7	387·2	60-8	124-8	7-2	16-5	55	45
„ IV. ...	Twice with country plough.	20ft-7	371*06	41-6	92-8	...	...	...	...
Series B.									
Plot i. ...	Twice with countjy plough.	218-5	438*5	31-2	60·6	...	...	...	...
„ II. ...	Once to 5 inches with earth-turning plough.	223-4	549-0	34-8	70-2	2-2	50*5	11	15
„ III. ...	Once to 9 inches with earth-turning plough.	223-7	486-9	37·2	76·8	2'3	22-1	19	26

It has been confirmed again that deep ploughing with a mould board plough has great advantage over the country plough for cotton crop.

11 *(b) Outturn from different varieties of country and foreign seeds compared separately.*—In eight plots of the same size eight different kinds of seeds were sown all in lines, but country seed 2 feet and foreign 3 feet apart.

Other treatments were :—

Manure (poudrette)	...	...	...	...	200 maunds.
Irrigation	...	...	...	...	*Nil.*
Weedings	...	...	...	...	2

The result is tabulated as below :—

Table IX.

No. of plots in the seties.		I	Variety of cotton.		Outturn per acre.	
					Cotton.	Seed.
					lb.	lb.
Country seed.						
Series A.	I	2	Nankin	cotton	79·7	160·2
Ditto	2	2	Country	ditto	97·1	265·1
Ditto	3	2	Sahāranpur	ditto	148·8	[illegible]
Ditto	4	2	Nagpur	ditto	91·8	178·6
Foreign seed.						
Series B.	I	[illegible]	New Orleans	ditto	97·7	236-1
Ditto	2	[illegible]	V pland Georgian	dit to	78·6	186-1
Ditto	3	[illegible]	LO usiana		98·3	1932
Ditto	4	[illegible]	De la Lousiana		89·6	2 IS* 2

Of the native varieties Sah&ranpur heads the list and among foreign seed De la Lousiana and New Orleans gave a larger yield.

Owing to the peculiarity of the seafbn no stress can be laid upon the present result.

12. (c) and (d) *Effect of different kinds of sowing.*—Under this operation two varieties of cotton were experimented : (1) Kulpahar; *(2)* Nankin. No manure was applied, but other treatments were just the same as in the foregoing experiments.

The operation was to sow the seed—•

(1) on top of ridges ;
(2) on slopes of ditto ;
(3) in lines ;
(4) broadcast.

To compare the unmanured crop with a manured one, a plot of an eqnal size was manured with 200 maunds of cow-dung.

Broadcast sown plot yielded a larger crop and the manured one largest. In lines Nankin cotton thrived better. As the plants of Nankin cotton get more bushy they require more room: hence sowing in line is advantageous; but the country variety grows thinner, so thick sowing does not prove detrimental. The results are given in the following table:—

Table X.

Mo. of plot in the series.	i 9 S	Manure*	Weeding.	Seed.	Detail of sowing.	Outturn per acre in 1880. Cotton.	Seed.
						lb.	tb.
Series -£. No. 1 ...	2	[illegible]	2	Kulpahar cotton,	On top of ridges,	132·0	273'6
»» » » 2 ...	2	Do.	2	Ditto	On slopes of ridges.	194*3	241·8
»» >i 91 d ...	2	Do.	2	Ditto	In lines ...	75-0	150*0
» ^»)> 4 ...	2	Do.	2	Ditto	Broadcast ...	219-0	" 462-6
" '5' " *	2	Do.	3	Nankin cotton,	On top of ridges,	127·8	298-3
»» M)» 2 ...	2	Do.	3	Ditto	On slopes of ridges.	134*9	300*7
M 9» 9> 3 ...	2	Do.	3	Ditto	In lines ...	116*0	246^9
9* »• >» 4 ...	2	Do.	3	Ditto	Broadcast ...	116-0	243·8
» *• ,, I ,..	2	CoTV-dung, sou maunds to the acre.	a	Ditto	In lines ...	229-6	600'ff

13. *III.— Oilseeds.*—In connection with the forecast of oileeds, plots were made to determine the outturn of *til** sown separately and with other crops. Three varieties of *til* had been experimented upon: (1) black ; (2) white early, and (3) white late varieties.

The trial was undertaken in four series, each censisting of five plots and each plot measuring 400 square yards.

•Xil = [illegible] oricntalis.

The result is shown in the following table :—

Table XI.

No. of plot.	Crop.	Area in square yards.	OUTTURN PER ACRE. Grain. Outturn of each crop.	Total outturn.	Straw (Total).
			lb	lb	Mds.
A. Series 1	Til (black) ...	400	142·17	142 17	30 25
2	Til (ditto) ...	400	81-67	107-32	55-41
	Juár (a) ...		25*65		
3	Juár ...	400	121-0	121-0	20-3
4	Til (black) ...	400	Nil	Nil	Nil.
	Bajra (b) ...		114-95	114-95	15*97
5	Bajra ...	400	169*4	109-4	V5-04
B- „ 1	Tili (katkahi) (c)	400	Nil.	Nil.	Nil.
2	Tili (ditto)	400	Nil.	226-87	37-51
	Juár ...		22687		
3	Juár ...	400	276-3	278-3	49-61
4	Tili (katkahi)	400	Nil.	[illegible]	lb
	Country cotton ...		205 7		393-2
5	Country cotton ...	400	193-6	193*6	Mds. 474-9
C „ 1	Tili (Bhadeli) (d)	400	217-8	217*8	53-2
2	Tili (ditto)	400	157-3	210-0	13·15
	Country cotton ...		152-7		lb 326-7
3	Ditto ...	400	204-1	204-1	421-9
4	Tili (Bhadeli)	400	93-05	492-35	Mds.
	Country maize ...		35*9-3		25-65
5	Ditto ...	400	435*6	435·6	19-36
D. „ 1	Country cotton ...	400	178 4	178·4	363-O
2	Ditto ...	400	134-6	134-6	279*8
	Castor ...		Nil.		
3	Castor ...	400	Nil.	Nil.	Nil.

The til, especially the " white early," was considerably damaged by the excess of rain. The results as they stand are summarized below :—

(a) Black til sown by itself gave larger yield than the crops of til and juár put together, which were grown in one field: so the juár sown separately has thrived better. This result leads to the idea that the native fashion of sowing til with other crops is no good.

But this may not be considered a criterion as being the first trial.

Til with bájra did not grow at all. This is due to bad season of course, but bájra sown separately has done better than sown with til, though the til did not yield anything.

(b) The early variety of white til totally failed to give any crop,

(c) Late variety of white til gave better crop than black til and has also thrived with maize well.

Castor failed to give any result.

14. *IV.—Sugarcane.*—(a) *Sugarcane* versus *sorgho.*—It has been said before that the bad season had effected sorgho considerably. The crop was so far injured that it was hardly fit to feed cattle upon it: the stalks turned quite red and worthless : so it was not competed with sugarcane.

(b) *Effect of different kinds of sowing.*—In two plots of the same size and under equal treatment sugarcane *(barohha)* was sown in two ways : (1) as in vogue in this country, *i.e.*, in furrows behind ploughs ; (2) on top of ridges 4 feet apart. The latter method of sowing has been brought by Messrs. Thomson and Mylne of Behea from sugarcane-growing American or French settlements and introduced into this country.

The cane were sown in rows, leaving a wide-space between the two lines. The blanks wore kept on grubbing and the canes earthed up each time the digging was done.

NOTE—(a) Juár—Sorghum vulgare. (c) Katkahi—late variety.
(b) Bájra—Penicillaria spicata. (d) Bhadeli—early variety.

The following statement shows treatment and outturn :—

Table XII.

So. of plot.	Ploughing.	Manure.	Weeding.	Grabbing.	[illegible]	Seed.	Detail of sowing.	*Outturn per acre in* 1885. Cane.	Juice.
								Mds.	Mds.
1	11	Poudrette, 200 maunds per acre.	1	5	7	Barokha.	4 feet apart ...	196-2	80*1
2	11	Ditto ...	1	5	7		Behind plough,	203*1	84-5

None of the plots shovred any marked superiority over the other in respect of the appearance of the cane or the quantity and quality of its juice. A little *rdb* was made from the juice of each: without any difference,

15. *V.—Miscellaneous.*—It being quite customary in the province that the cultivators in kharif prefer sowing a mixed crop of the grains specified in the following table, which mature in succession, beginning from August and lasting as late as the end of April, therefore it was resolved to determine the money value of the said outturn with a crop of wheat which is aown only once in a year.

For this a plot 2,422 yards in area of a pretty fair soil and strength was taken and sown after the country fashion :—

Treatment.

Manure ...	*Nii.*
Ploughing ...	2
Weeding ...	2

The following seeds were sown : —

t1) Black til *(Sessamum orientale).*
(2) Urd or mash *{Phaseolus radiatus).*
(3) Juár *(Sorghum vulgare).*
(4) Patsan (hemp).
(5) Arhar *(Cajanus indicus).*

First of all til was harvested, then other crops came in succession thus :—hemp, nrd, juár, and arhar.

The result is shown in the following tablo. Though growing wheat looks more profitable than the mixed crop, but if *the* cost of irrigation be added to it the real profit will decrease considerably : *-

Table XIII.

Name of grain.	Quantity of seed sown.	Outturn harvested.	Outturn per acre in tt>.	Money value.	A rerage outturn of wheat per acre.	Money value.
	Mds. s. c.	Mds. s.		Bs. a. P.		Bs. a. P-
Til, black ...	0 0 2	35 O	69 9	3 16 0		
Urd ...	0 0 8	131 0	361 8	4 9 0		
Patsan ...	0 O C	5 0	10 0	0 10 0	984	24 0 O
Juár ...	0 ' 1 0	79 6	158 6	2 5 0		
Arhar ...	0 1 0	216 O	431 6	7 11 O		
				19 2 0		

16. To ascertain the outturn of certain indigenous crops they were sown again this year. Their outturn and treatment are shown below :—

Table XIV.

No. of plot.	Crop.	Manure and rate per acre.	Ploughings.	Weedings.	OUTTURN PER ACRE. Grain. 1884.	Grain. 1885.	Straw. 1884.	Straw. 1885.
					lb.	lb.	Mds.	Mds.
1	Kakun (*Setaria italica*) ...	Nil	2	2	644-4	290-4	43-0	10-5
2	Sawan (*Panicum frumentaceum*)...	"	2	2	192-0	508-2	19-3	151-34
3	Mama (*Eleusine coracana*) ...	"	2	2	578-1	459-8	36-1	32-67
4	Kodon (*Paspalum scrobiculatum*),	"	2	2	708-0	[illegible]	16-3	12-7
5	Urd (*Phaseolus radiatus*) ...	"	2	2	366-0	121-0	25-5	12-1
6	Mung (*Phaseolus mungo*) ...	"	2	2	180-0	375-1	57-0	24-41
7	Moth (*Phaseolus aconitifolius*) ...	"	2	2	204-0	217-8	47-8	16-4
8	Lobia (*Vigna catiang*) ...	"	9	2	630-0	381-15	44-5	25-41
9	Bhutwas ...	"	S	2	...	865-15	...	25-65
10	Sanai (*Crotalaria juncea*),	"	2	Do.	...	917-8	...	...
11	Do. (Katkahi)(Ditto),	"	S	Nil	...	193-6	...	...

Owing to the difference of season the result has come out quite different from that of the last year.

Some crops suffered by the excess of rain and gave very poor outturn, while others profited by it and yielded more.

This clearly proves the effect of the season on agricultural success.

All plots had been sown unmanured, and the result of the unmanured plots of the last year is compared with them. The weeding was done twice this year, while only once last year. Other treatments in both years were the same.

17. *VI.—Ensilage.*—To confirm the previous experiments five silos had been filled with the following stuff:—

(1) With common succulent grasses of early rainy season filled in clear weather: rapid-filling process.
(2) With common succulent grasses of late season stored in rainy days: slow-filling process.
(3) Guinea-grass.
(4) Guinea-grass, juár cut as chari, *viz.,* before bearing cobs.
(5) Guinea-grass, juár cut as chari, *viz.,* after bearing cobs.

The following table gives details of cost:—

Table XV.

No. of silo.	Form of silo.	Date of filling.	Date of opening.	Cost of digging.	Cost of chappar.	Cutting and filling.	Cost of treading.	Fodder filled in.	M.	s.	c.
				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.				
1	Circular, 6 feet diameter, 10 feet deep.	17th	16th	1 8 0	6 8 6	4 S 0	1 2 0	Common grass in clear weather,	59	25	8
2	Ditto ...	16th	Do.	1 10 0	6 10 6	4 3 0	0 14 6	Ditto in rainy weather ...	60	22	0
3	Ditto ...	21st-23rd Sept.	Do.	1 12 0	7 8 0	3 4 9	2 13 6	Guinea-grass ...	76	36	1
4	Ditto ...	25th-26th	Do.	0 10 0	...	2 8 0	1 7 9	Juár cut as chari, *viz.,* before bearing cobs ...	52	0	0
5	Ditto ...	...	Do.	0 10 0	...	2 6 6	0 3 0	Do. after cobs ...	60	32	0

18. The chappar which was put to covet the pit to prevent water going in was by itself an object of experiment.

It was inade of the water-proof Willesden paper, which is so highly spoken of throughout the world. A wooden frame being made was covered with this paper, aud it served the purpose of a moveable chappar, the cost of the frame only has been shown in the statement.

The frames were from 6 to 8 feet by 4 feet, the cost of paper is Re, 1 per square yard. The result of this will be mentioned under the head of experimental machinery and appliances.

19. All the silos were opened one day, *i.e.,* on the 16th of April last, when there was a meeting of the Agricultural Association. Every stuff came out as good and with as little of its characteristic smell as could be and was decidedly of the best quality,

• 20. This year, at the desire of the Government, measures were taken to get the experiment confirmed by and hare the idea spread through the co-operation of a few private persons in different districts. The instructions appended at the end of this report were issued and the assistance of the Committee of Meerut Demonstration Station ; of Pandit Ajudhia Prashad, the Honorary Assistant Director ; of Kuar Lutf Ali Khan of Chhatari and of Muhammad Ali Kban of Aligarh, was requested. The result of this is a matter of a separate report, which will be submitted so soon as the reports have been received from the above-named gentlemen.

21. There is one thing quite novel and worth noting here for drawing attention of the public to it, *i. e.,* some of the silos filled in the year 1884, not being used, were kept clpsed till 18 months after they were stuffed. They were of juār chari and one of grass. In the middle of February last a grass and a juār pit was opened. The grass seemed to have been spoilt, but the ensilage of juār was as good as of a fresh silo a month old. The cattle greedily ate it.

The stock of fodder for farm cattle had exhausted, and it was intended to purchase a quantity of *bhūsa* enough to last till the following rabi harvest, as the new silos, which had been filled in about that time, were not ready to be opened. But when it was found that the cattle had eaten the old stuff heartily, the idea of purchasing fodder was given up, the beasts for last two months had entirely been fed on the ensilage 18 months old. This stuff made the staple food of theni throughout the autumn season, only now and then some green weeds from rabi fields or sliced turnips and carrots which were grown on farm were mixed with it.

The cattle undoubtedly looked very much improved in condition and seemed to have gained flesh ; of course they had no hard work in those days.

There is no arrangement on farm for weighment of the cattle and no laboratory to find out the feeding value of the two stuffs; however, arrangement is being made to feed in stall two lots of young bullocks, six in each lot, and four cows on the two kinds of ensilage (new and old). The stuff will be given alone as well as mixed with other food and the result of the experiment will be recorded as far as perceptible.

The following figures will show the physical differences which have been noted between the two ensilaged stuffs :—

Table XVI.

Description of silo.	Temperature under 14 inches, the nit an at the time being 84° in shade.	Weight per bushel of fresh stulf.		Weight per bushel of the sun-dried stulf.		Weight of ashes.		Remarks.
		lb.	oz.	lb.	oz.	lb.	oz	
Opened after 18 months,	100°	12	1J	[illegible]	4	[illegible]	12	Fresh stuff taken out of silos and given to cattle ; who did not cure much tor the old one in preference to the new ensilage.
Ditto 9 ditto,	[illegible]	18	14	[illegible]	12	[illegible]	2	

22. *VII.—Implements and appliances.—This* subject is treated in a separate report submitted to Government annually, but briefly it is noted hero also as usual.

It may be noticed that decisive opinion cannot safely be formed by giving a machine one trial; it requires some time to learn its real merits.

During the year the undermentioned implements and machines were tried.

23. (a) Rogers' improved patent sugar-mill.
(b) The centrifugal sugar purifier.
(c) The Bchea shallow pan (sugarcane juice-boiler).
(d) Bull's new patent dredger.
(e) The new Barakar plough.
tf) Willesden paper.

(a) Rogers' mill.—Ihis has been competed with the old Behea and the Fakir Muhammad's (of Boorkee) pinionless grooved rollered mill.

The result stands as recorded below : —

Table XVII.

Description of mill.	No. [illegible]	[illegible]	Tension,		[illegible]	Weight of cane pressed.	Time when [illegible]	[illegible]	Duration during which the mill worked.	Weight of juice expressed.	[illegible]	[illegible]	Percentage of juice on the weight of cane crushed.	Weight of cane crushed per hour.
			[illegible]	With cane.										
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Ft. in.				Mds. s. c.	II. m.	H.m.	Minutes.	Sr. c.	Sr. c.	Sr. C.	Mds. s.	Mds. 8.
Bogers ...	I.	8 0	[illegible]	9°		[illegible] 0 IS	[illegible]	[illegible]	41	2ft 9	18 10	[illegible]	[illegible]	[illegible]
	II.	[illegible]	[illegible]	[illegible]		1 0 14	[illegible]	[illegible]	35	21 8	19 [illegible]	[illegible]	[illegible]	[illegible]
	III.	[illegible]	[illegible]	[illegible]		[illegible] 0 10	[illegible]	[illegible]	31	J1 14	18 12	[illegible]	[illegible]	[illegible]
Average ...	[illegible]	[illegible]	[illegible]	[illegible]		[illegible] 0 12	[illegible]	[illegible]	~80	[illegible]	18 J6	[illegible]	53 5	1 Cl
Thomson and Mylne's 6" in. Mill	i.	7 9	[illegible]	[illegible]	Chaal	[illegible]	II 15	11 53	30	20 14	20 10	0 0}	[illegible]	[illegible]
	11.	[illegible]	[illegible]	[illegible]		[illegible]	1 35)	2 14	39	20> 8	19 14	[illegible]	[illegible]	[illegible]
	in.	[illegible]	[illegible]	[illegible]		10 0 12	3 20	3 55	^5	20 6	20 [illegible]	[illegible]	[illegible]	[illegible]
Average ...	[illegible]	[illegible]	[illegible]	[illegible]		io o~Ti	[illegible]	[illegible]	Jl	20 9	16" 5	--	50 3	L 66
Fakir Muhammad's Mill.	I.	7 8	[illegible]	[illegible]		1 0 6	11 15	12 0	45	20 10	19 12	[illegible]	[illegible]	[illegible]
	II.	[illegible]	[illegible]	[illegible]		1 0 4	I 35>	2 9	34	20 12	19 8	[illegible]	[illegible]	[illegible]
	III.	[illegible]	[illegible]	[illegible]		I O [illegible]	3 20	3 55	32	20 12	SO 0	0 1	[illegible]	[illegible]
Average ...	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	8?	[illegible]	T9 [illegible]	—	61 2	1 04

* Degrees of dionometer.

Decidedly Rogers' mill is greatly improved, and since it has been more so, the friction seems to have been reduced in it to the lowest point The arrangement of keeping the lever loose and playing over spindle's head reduces the liability of breaking it. The spindles at the bottom rest on two brass screws, by turning which the cylinders are regulated in vertical directions, and by this arrangement the pinions or cog-wheels of the rollers remain true to each other : hence there is less danger of damage.

Between the bearing and spindles a very simple kind of washers are inserted, which reduce the friction and keep the parts clean and lubricated.

Moreover, the patentee alludes that he is to get the best steel rollers oil tempered from England, which certainly would add a good deal to the stability of the machine. Lately the rollers had been shown in Moradabad Show.

Under the circumstances, it can safely be said that the Rogers' mill has proved to be better than tho mills competed with. One or two disadvantages which attracted the attention are :—

(1) The weight of the mill: as its whole frame is made of rail iron, so it makes it too heavy and not so easy to carry about as the wooden-framed mills are, but at the same time it is much more durable. The weight has been much reduced since, still it is comparatively heavier.

(2) Its construction looks to a ncu SHM HH-XJII 1 icnced eye complicated. Perhaps necessarily the use of nuts and bolts has been made more than in the machines yet

in vogue in the province, and this is a thing which makes the people to criticise on it. It has been shown in several local shows, and the above remark was invariably made by the public everywhere. However, the people seem ready and willing to have it, and I am sure when they will use it they will admire it better.

24. (6) Tbe *centrifugal sugar-making machine.*—This portable machine, which does not require any skill or scientifical aid in working it, seems to be very well suited to the want of sugar-making districts. I went to see it first in Behea and saw it being used by a private zemindar who has been working it for the last two seasons and seemed highly satisfied with it. He said its cost was Ks. 460, which is nothing in comparison with the work it does. It of course requires a very best kind of *rdb* of very large grain for its feed, which I had not seen in these Provinces. I brought a machine with me together with two men expert in rát-making, and the first trial of it was made in Meerut Show. The men unfortunately did not succeed in making so good a *rdb* there as was required. This was of course on account of the *rdb* being wanted every day for show, and hence enough time could not be allowed to let it granulate.

However, from the *rdb* raw sugar was made, but of course neither so good nor as quickly as I had seen in Shahabad district (Bengal).

As the finer crystalline particles of the sugar came out of the mesh in the machine by centrifugal force, therefore the quantity of treacle obtained was disproportionately large, also more time was taken to purify it. As a rule 30 seers of *rdb*, after putting it into the tub and setting it to revolve, ought to be converted into raw sugar from 5 to 7 minutes; but here even half and one-fourth of the quantity took as much time as more than half an hour, and the yield of sugar was proportionately much less.

Sháhjah&npur and Cawnpore *rdbs* were obtained, but were no better.

It remains to be seen next year whether such a good *rdb* as of Shahabad can be made here; and if it can, no doubt the machine is most valuable, otherwise some modification in the machine will bo necessary. As it was late in season when the machine was got in, hence good *rdb* could not be obtained; therefore it was not competed with the indigenous way of sugar-making and no result of its produce arrived at.

25, *(c) Behea shallow pan {sugarcane juice-boiler).*—Two of these pans were received from *Behea,** one round aud the other of oblong shape. \

In Rae Bareli show they were competed with pans termed M, three in number.

The shallow pans made *rdb* and *gur* in half the time, but one-third of the quantity that was made by *bil* syatem, though full dose of juice, was not given to the latter. The produce from shallow pan was of course far better than that from the other.

The pan in question needs farther trial and competition with common deep pan and with American evaporator, which, owing to their coming late in season, could not be done. The pans were shown in the Meerut Show and Cawnpore Meeting of Agricultural Association.

26. (d) *BvXVs new patent dredger.*—This was tried by the Court of Wards Engineer, Mr. Copeland, whose report is apppended. It was shown in Meerut Fair, Cawnpore Meeting, and Moradabad Shoiy, and lias greatly attracted the attention of the public. One order for it was received in Meerut and one at Moradabad. In MoraSabad district, near Kanth in Newada village, two wells have been lately made iB which the dredger was used. It did its work throughout most satisfactorily.

27. *(e) Barakar new plough.*—This plough has lately been invented by the Director of the Agricultural Department, Bengal. It is of cast-iron, every joint of the iron part being cast in one mass. It Was exhibited in the Barapore Show, district Shahabad (Bengal).

In the improved pattern a movable share, but which is also of cast-iron, is added.

The plough seems well built, strong, and cheap enough in price. It is supposed to be well suited to Bengal soil, which perhaps never in any time of the year gets as hard as up-country land, that requires a very strong, sharp, and malleable share. It was tried in the Meerut Show and was very much liked by the visitors where they first saw it; but owing to the defect in its share, which is too thick and blunt, it could not tear up the land so well as Watts or the Duplex did, and for the same reason required a harder pull too.

In other respects it was said to be very good and strong next to Watts'.

Of course this is also not free from that common deficiency which all the improved ploughs have but the Duplex, *viz.*, it can only plough up the soil, but cannot be used for sowing.

The trial in the show can by no means be taken as a decisive one, so the implement is given to a practical k&shtk&r, who takes interest in these matters, to work it for one or two seasons and then to report upon it.

28. *(f) Willesden paper.*—This paper, as mentioned before, was used in making sheds for silos, in order to see how far it is useful for agricultural needs in this country.

It is of different thickness, but in this case what is termed two ply was used. It is quite waterproof and stood the whole rainy season very Well, but the defects are :—

(1) By the heat of summer it gets so brittle that even the small gravels in dust-storm are enough to split it up ; hence it is no good for. out-door use in this country.

(2) Its price is very heavy—Re. 1 per square yard ; perhaps corrugated iron sheet can be had cheaper than that.

Lately, another shed has been made of it ; in this little thicker paper than the above-noted one was used, but this is also torn into pieces,

S. MUHAMMAD HUSAIN, M.R.A.O.,
Assistant Director.

APPENDIX I.

Programme for Kharif 1885.

I.—Manures to be tried, as in the last year, on the plots called kharif and alternate, *vide* paragraphs 2 and 3 of last report.

2. Brick-kiln refuse and ashes of weeds as in the last year in F. 28, Tatfe VI., page 5.

3. Different kinds of dung, woollen refuse and saltpetre in A plots, *vide* page 4 of the last report.

II.—Deep and shallow ploughing experiments to be continued in tiie A. U plots, *vide* paragraph 5 of last report, Table VII.

HI.__Sowing of cotton in line, 4c, and broadcast in Fo 15.

IV.—Maize in the American fashion in F. 14.

V.—Sorghum, half of F. 28,

Ditto F. 14 ;

Whole F. 26.

VL—*China grass.—In* F. 90 a little under shade and F. 89 and 73.

YII.x— *Cottons.*—American and Indian in 8 plots, F. 16 and 17.

V1IL__*Til*—In the various ways sown by natives to determine their yield.

IX.—*Castor.*— Ditto ditto ditto.

X.—*Millets and kharif pulses* —To determine their yield in plots made for them last year, *vide* page 7 of last year's report.

XL—*J'udr for enplane.*—In Collector's Bagh and the ground between the office and the garden.

XII.— *Sugarcane.*—Balf of F. 20. *

XIII.—*Sanaifor manure for wheat.*— In F. 21, 22, and A. *(a)* plots.

XIV.—In a field of about one or half an acre a mixed crop of juar, urd, til, *san* and ferhar be sown after native fashion, to be followed by sawan or maize in the hot months, when all these crops are off the ground, and in the rains next by kakun and ma£Jfo after a strong dose of some strong manuring, and in (lie rabbi by p^as^nd so on, to keep the land always under one cw>p or th$ other, lts'income during a year to be compared with the income frojp wheat which is £own after a year's fallow.

•XV.—In two big fields the several varieties of American tobacco, seed of which has been received this year, should be planted along with two good country varieties to compare thoir outturn ; the produce of each plot to be cured after the American fashion.

*XJ'I—In one plot *san* to be sown very early, to be followed by barley and subsequently by rye grass, which is to be sown as a catch crop, and the income from the three to be compared with that from a single crop after a bare fallow.

JvVIT.—A small heap of compost manure to be made for trial during the next rabi—*Composition* : —

11) Weed from kharif fields.
(2) Unslaked lime.
(3.) Stable refuse.
(4:.)' Road-sweeping (if available).

"*I* VTTT.—On a very small plot of known dimension maize plants to be transplanted when about C inches high, to see whether they bear transplanting. A little farmyard manure to be applied to each plant at the time it is transplanted.

* Thia will go in the rabi icport.

APPENDIX II.

Note on Bull's Improved Dredger hy MR. COPELAND.

This dredger was tried on a well in Bawatpur, in the district of Cawnpore, which had silted up and was 55 feet deep.

The dredger worked particularly well, coming up on each occasion quite filled with silt, except when a piece of Kankar got jammed between the scoops, when it came up empty.

The dredger was emptied eight times in 20 minutes and came np twice empty. It would work much faster when the workmen have got used to the machine. The only fault that can bo found with the machine as a whole is with the frame-work, which is very weak, ill-fitted, and shaky.

The dredgor, therefore, is a very good one and will do at least four times the quantity of work with fewer men, but the frame is decidedly weak and badly fitted.

Instructions for ensilaging the luxuriant vegetation of the rains.

1. JVa^Mr«o//>i<5.—Experiments to be tried in earthen pits Creoles dug down into the ground.

2. *Site for the pits.—"She* ground selected for making these pits should be a little higher than the general level of the surrounding ground, and should possess an ea9y drainage, so that in the event of any heavy rains inter may not lodge over the pit^

3. *Number* o/pito.-r-Four pits to be made in alll One in August, one in September, one in October, and one in November.

4. *Shed.*—Over the pits made in August and September a cheap *ehappar* should be thrown like the temporary sheds made by cultivatoB^ftji their fields to shelter them against the rains, when they watch their crops durin£the period of their ripening. No shed to be made over the pits dug in October and November.

5. *FormoftRe pits.*—The pits should all bo cylindrical and their sides should be a little sloping.

6. *Size of the pits.*—Each pit should be 10 feet deep, unless the distance of water in the neighbouring wells ifamld bo less than 15 feet from the surface of the ground, in which case the depth of the pit should not exc eed 6 feet. The diameter of the pit at its mouth should measure 7 feet and at its bottom 5 feet.

7. *Crop to be ensilaged.—Tfyif* grasses which spring up spontaneously during; the rains should be. ensilaged, care being taken that only those grasses are put ia which are eaten by bullocks or horses.

8. *Cutting.*—The grass should bo cut with a *hansia* (sickle) leaving an inch or two from the ground, so that the stuff ensilaged should not get muddy.

9. *Chopping.*—The grasses should bo packed entire without any chopping.

10. *Weighing, filling, treading, and clocing.*—As soon as the grasses are cut, they should be carefully weighed and then thrown into the pit, four or five men being at the same time directed to get down into the pit and to level and tread down the grass as each' load is thrown into the pit. Thirty or forty maunds should thus be ensilaged on the first day. This weight should fill nearly half of the pit. After the mass has been trodden dovva. for about an hour, a layer of earth two feet thick should be placed over it, and the pit should thus remain closed for 48 hoars. It should then he opened and the mass trodden down to press out the air and tho gaseous compound which may have formed during this interval. The top layer with which earth may have mixed up should bo carefully removed and its weight deducted. A second filling should then be made exactly like the one made on tlie first day till the pit is completely filled, when-all the earth dug out of the pit should be piled over it in the form of a sloping mound. As the fodder settles the pile of earth will sick down, and openings and oracks will be noticed, especially around the edges. Care should be taken to close these cracks as soon as noticed.

H# *Time of opening.*—No pit should be opened before four months from the date of its closing.

12. *Weight of fodder preserved in good condition**—The weight of the portion which should be found to have become mouldy should be carefully determined separately from tho weight of the portion found in gofed condition, and a cubic foot of the fodder from each silo should bo sent to this Department for inspection as soon as any silo is opened.

[redacted] [illegible] 85.

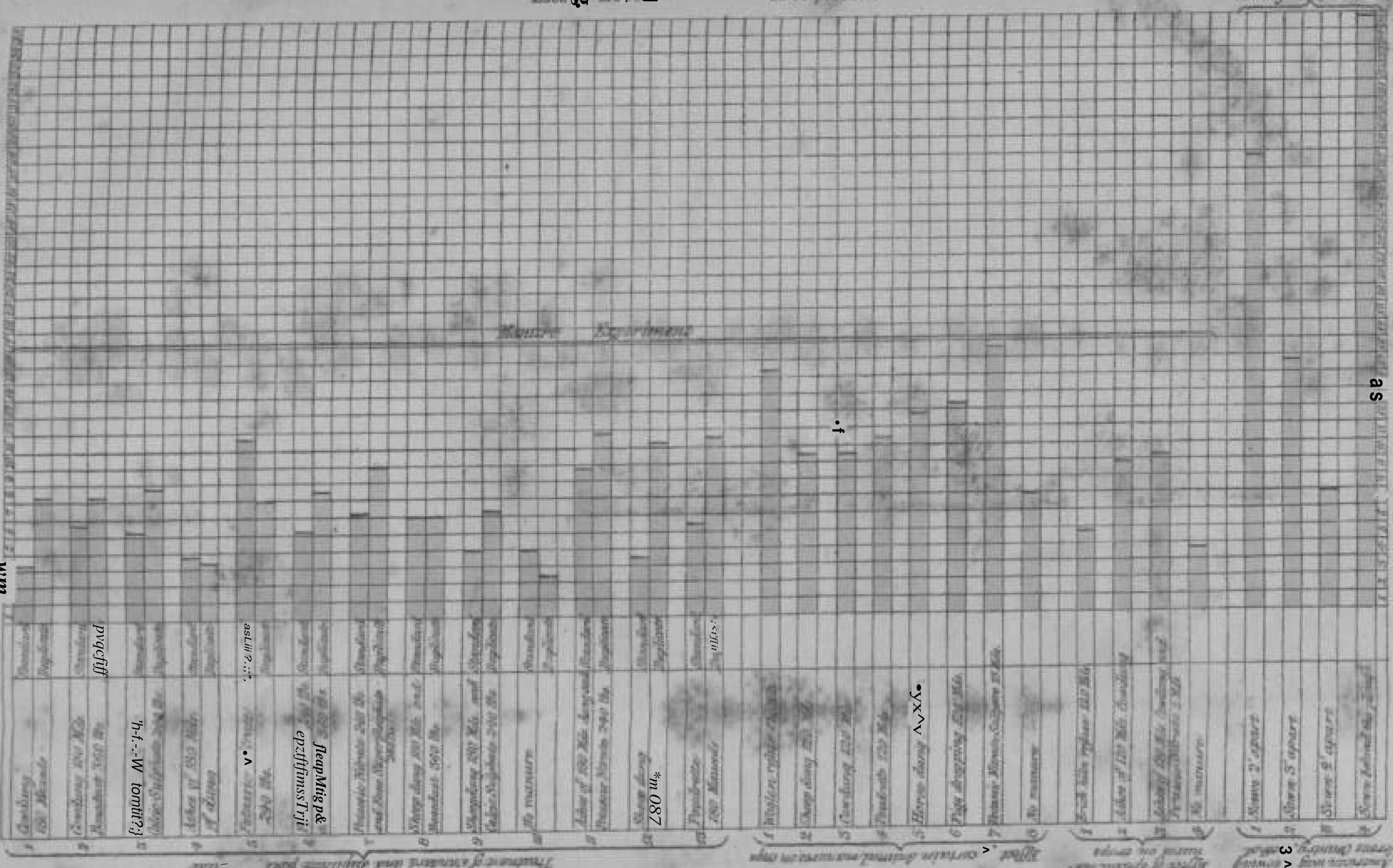
Ch[illegible] [illegible]ing the result of manure and sowing experiments.

C[illegible] EXPERIMENTED UPON—MAIZE.

Each [illegible] are [illegible] [redacted] [illegible]d of produce.

[redacted]—The chart shows the yield of grain on [illegible]

In [redacted] case yield per acre has been g[redacted]

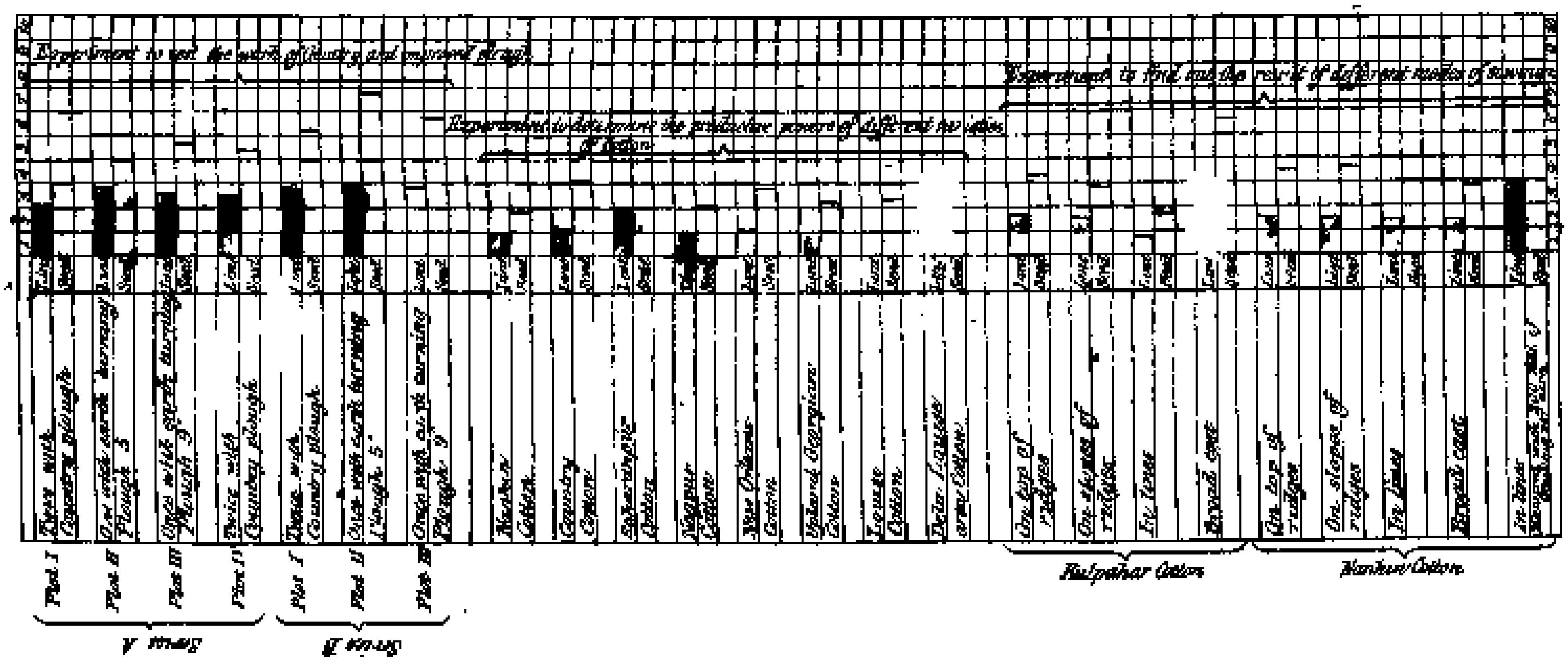


APPENDIX/V

SHARIF, 1885.

CROP EXPERIMENTED UPON-COTTON,

The Onttnrn in every case ii given per acre.
Each square represents one taaunfl. .



REPORT ON THE

CAWNPORE EXPERIMENTAL STATION

FOR THE RABI SEASON OF 1885-86.

ALLAHABAD:

NORTH-WESTERN rnovracss AND ODDH (SOVERNMEKT PRESS.

1886.

No. ygg OF 1886.

DEPARTMENT OF AGRICULTURE AND COMMERCE, N.-W. P. AND OUDH.

DATED CAWNPOBE, THE 9TH DECEMBER, 1886.

FROM

DONALD SMEATON, ESQ., M.A., C.S.,
DIR., DEPT. OF AORI. AND COMMERCE,
N.-W. PROVINCES AND OUDH,

To

THE CHIEF SECRETARY TO GOVERNMENT,
N.-W. PROVINCES AND OUDH.

SIR,

I HAVE the honor to submit, for His Honor's orders, the report of operations in the Cawnpore experimental station during the rabi season of 1885-86.

The report has been written by Mir Muhammad Husain, Assistant Director, himself, as Superintendent of the operations. It is too long and detailed, and hence, in great measure, the delay in its submission. I have asked Mir Muhammad Husain to bring these reports in future into a much smaller compass, and, as far as possible, deal in detail only with Operations and results that are new, referring very briefly to such confirmations of previous results as are likely to be useful. The tables of treatment and outturn will be curtailed and placed in an appendix. Henceforward I would recommend that this, the rabi season narrative, be incorporated in the annual report and not issued separately at all. The kharif season narrative must, I imagine, continue to be separately issued, but its dimensions will also be considerably curtailed.

2. To glance at some of the principal results.

Among the permanent experiments, we find that after all ordinary farmyard manure is the cheapest and most efficient that the cultivators of the country can have. It never fails to ensure a good return : and it is always available. Saltpetre is shown to be an excellent fertilizer. Were there no salt excise, I verily believe that saltpetre would come to be extensively used, and with great advantage, by the people. The dread of the *"permit"* authorities is deep-seated, and it will be hard to rid the people of it. If by any means the simple manufacture of crude saltpetre could be allowed to spread, the way would be opened for introduction of this fertilizer. But there are, I admit, serious difficulties while the salt excise remaining an important source of public revenue.

The new experiment of manuring with the dung of cake-fed cattle has been a success. The cultivator would have better and stronger cattle by feeding them with cake, and would at the same time have better crops by using the manure than he now has. Bat the invariable question of cost intervenes and renders it very doubtful if the cultivator can ever really put in practice what the experiment teaches.

Another result, not a new one, is that the rotation of wheat with maize is, for both crops, probably the best. But the cultivator knows this as well as we do.

The results of green-soiling are only conformatory of previous experience. The Superintendent's conclusion in regard to deep and shallow ploughing in the absence of manure is deserving of attention.

The outcome of the watering experiment is conformatory of previous experience.

The Jethro Trill system of sowing is apparently good, but is scarcely likely to appear so to the cultivators, who will beprone to aver that it is a waste of good land. I do not think this experiment need be continued.

3. Looking now to what are called the temporary experiments, we find that lucerne, like clover in Europe, is a good preparation for cereals.

Linseed was a failure owing to destruction of the crop by an insect pest. Attention will be paid to developing the white variety which is so highly spoken of by experts in England.

The tobacco experiment was new. It is doubtful whether this experiment can serve any useful end. The people themselves do not care for a highly cured article : and it is pretty certain that no export trade in tobacco grown in North-Western India can ever spring up.

Ensilage shows really good and useful results. *Cham*·<Ir thickly-sown, early cuty^ar, proves to be an excellent fodder for storage in the T £ *n* f *W* ago. o I ^ months ifc WaS aS frGSh and aS palatable -> new. The only thing is that, unluckily, the cultivator cannot generally afford to grow more *chart* than is necessary for one season : so that he never can have much to store.

The L I ^ w * and Duplex plouShs appear to be ^king some head. maLTn i Gr 18 againSt lfc But * haS been foun* possible to price and *I* *T* ^ P 1 ^ ** little mo~ than half the American price, and it is hoped that this may be useful.

cheapt/ I ^ ^*T*^' ^ P 0 ^ * *han the ori^nal and much cheaper, is also being made and samples are being circulated.

the ^\ near T ?n approach the appearance and weight and cost of our teaching. more likely we are to induce cultivators *o *M*o".

belief T^e*stribution of «eed has been on an extensive scale : and I the quality ^ raised by the people in an improvement of £ ZZ: *:l*^Z The fine white wheat

zeal and a <?£££*."^*T* *" devote f himsel ' ^ »»»•«*•

, <%, xurenegence to the experimental operations.

Ali Husain, the Overseer, has also been most industrious and useful.

I have the honor to be,

SIR,

Your most obedient servant,

DONALD SMEATON,

Director.

REPORT

OK THE

CAWNPORE EXPERIMENTAL STATION

FOR THE RABI SEASON OF 1885-86.

Character of tlie season.—Tho rainfall recorded during the season under review is shown in the following table :—

Month.	RAINFALL IN IITCHBS.			
	At the Station.		*In the City.*	
	ID 1884-85.	In'1885-36.	In 1884-85.	IQ 1885-86.
September ... ••• ••• •-	93C	220	8 70	1-57
October ... . ••• ••• •••	6 10	•••	650	•29
November ,M — •*• •••	•••	•••	•«	•••
December ... '•« •••	•10	0*90	•10	2-56
January ••• ••• •« •••		019	•11	•19
February ... ••• ••• •••	•••	•••	•••	...
March ... «• ••• •••	•••	0-34		•34
Aptil ••• ••• ••• •••		•••	•••	•••
Total	*15-50*	3*63	15-41	4-95

It ceased all of a sudden and very early this time. This as well as the dry westerly winds, which blew in those days, caused a rapid loss of the moisturo from the soil, and necessitated the finishing and sowing of the fields within a very limited time.

Tho crops, up to the ripening time, looked most promising, but unfortunately strong, dry winds began to blow, just when the grain was in the dough state, which increased evaporation and deprived the grain of its nourishment at the very time when it needed mo*t. The grain shrivelled and the yield generally was poor. The wheat commonly suffered throughout the provinces a great deal.

2. *Diseases.*—With the exception of some slight appearance of mildew, no disease or insect pest disturbed any of the rabi crops. Of the varieties of wheat tried at tho station, the *kathya* and beardless proved to be more susceptible to mildew than the Muzaffarnagar white variety. The Muzaffarnagar wheat, grown with different kinds of fertilizers, remained very healthy, excepting ona or two plots of the green-soiling, series where the plants were slightly attacked by the yellow fungus called *girwi.*

3. *Average yield per acre.*—There were about 25 acres under wheat of different descriptions. Of these 13*69 acres were under various experiments and 7*4 acres under ordinary cultivation, sown simply for seed.

Ten plots of 400 square yards each, under tho influence of tho best fertilizers, produced at an average as much as 33*6 bushels,* or 26 maunds* and 10 seers per acre—tho average of 30 bushels per acre is considered a good yield in England —

•Standard bushel of wheat * e * lb.

82 Jb. *m* 1 maund.

While 10 plots which have received no manure for years, and are kept as standards to compare the result of good farming or of simple ploughing, watering, &c, gave an outturn of only 5*31 bushels.

The yield of the plots kept unmanured is getting lower and lower every year.

EXPERIMENTS.

4. The experiments may be classed—

L— Permanent.

II. —Temporary.

These experiments are to determine—

(1) Whether wheat can be grown year after year by the aid of artificial manures.

(2) Whether to obtain a good crop rotation proves indispensable.

(3) For how long and to what amount without artificial means a soil remains capable of nourishing the plant-life and its growth.

(4) Which constituent in soil or in a manure is more essential for wheat, and needs to be provided artificially in the case of its absence.

(5) For how long the residue of a manure remains available for a cereal, especially wheat.

(6) Whether simply deep-ploughing and watering ia enough for obtaining a good crop or an application of manure still required, and what the real effect of the different kinds of ploughing and of watering in the absence of a fertilizer is.

In order to confirm previous results most of the experiments are kept unchanged, and some of them are tried in duplicate and triplicate plots ; not only side by side, but at some distance, and in somewhat different soils.

5. The following are the permanent experiments, the area which they cover and the year when they were first started are noted below—

Experiment on the effect of—			*Area under experiment.*	*Year when started.*
A —Different manures	...	...	4.94	1880.
B.—Green soiling	...	...	4.45	"
C.—Poughing	...	...	1-80	"
D.—Watering	...	...	•90	"
E —Sowing	...	...	1-60	"
	Acres	...	13-69	

6. The following is a brief summary of the experiments conducted during the season under report :—

A. Experiments on Manures—These may be classed into—

I.—Farmyard aqd artificial manure.

11.—Oil-cake used as manure.

111.—Miscellaneous.

L—Experiment ttith fdrmyard and artificial manure.* These are carried on in two series :—

(1) The standard series.

(2) The duplicate series.

These series consist of 26 plots—13 in each. In the standard series wheat is grown year after year. In the other series plots are cropped with wheat and maize alternately. All the treatments in every plot remainth© same, *vU.* ;—

Ploughing with Watt's—twice.

Ditto country—ditto.

Watering—three times.

Weeding—if necessary.

Manure as in the following table.

The result of the experiment i* tabulated below : —

Table II.—J2,u/* of Standard Series.*

1	2	3	4	5	6	7	8	9	10	11		12			13	14	15
	Comparison of outturn with the unmanured plot in the serif.*									*Comparison of cost and income with the ordinary kind of cultivation in vogue in the country.*							
[illegible]	Detail of Bpecial treatment with the rate of its cost.	[illegible] threshed	Weight of grain	[illegible]	Weight per bus[illegible]	Percentage of [illegible]	[illegible]	Increase or decrease over standard plot in the series.	[illegible]	*Actual outturn per acre.* [illegible]	[illegible]	*Value of outturn.* Grain at [illegible] per [illegible]	[illegible]	Total.	Loss per acre cost [illegible] of ordinary [illegible] Rs. 30.	Loss per acre value of outturn against ordinary kind of cultivation assumed to be Rs. 18.	Net profit or loss against the assumed income of Rs. 38 from ordinary cultivation.
	Quantity of manure opplitdptr acre.	Tb.	lb.	lb.	lb.		».	lb.	lb.	lb.	lb.	Rs as.	Rs. as.	Rs. as.	Rs. a.	Rs. a.	Rs. a.
*	Cowdunjr, 180 maands per acre, at Rs. 3-0 per 100 mannds.	644	127	264	67*	48	208	+514	+ 624	1,537	3,194	37 8	8 0	45 8	— 2 6	+ 78	+ 52
-	Cowdung, 180 maunds per acre, st Rs. & per 100 maunds, and bone dust, 3C0 It, at 11 annas per 82 tb.	669	156	200	66|	78	128	+ 801	+ 975	1,888	2,420	46 0	6 1	52 1	— 5 6	+ 14 1	+ 8 11
8	Cowdunjr, 180 trannds per acre, nt Rs. 3 per 100 maunds, and gypsum, 240 tb per acre, at He. 1-12-0 per 82 tb.	583	153*	219	67	70	143	+ 78	+ 914	1,857	2,650	45 5	6 10	51 15	— 7 8	+ 13 15	+ 67
7	Ashes of ISO maunds cowdung per acre at Rs 3 per 100 mnunAs.	544	791	178	68i	46	224	+ 4	+ 49	962	2,154	23 7	6 6	28 13	— 2 6	— 9 3	—11 9
11	Ashes of 180 maunds cowdung at Ks. 3 per 100 roannds, and saltpetre, 240 lb per acre, at Ks. 3-3-0 per 82 Ib.	60S	80	200	67*	40	250.	+ 44	+ 55	96S	2,420	23 10	6 1	£9 11	-12 10	— 8 5	—20 15
0	Sheep dun*', lbO m*unds per acre, at Rs. 3 per 100 m.mnds	576	125|	198	67 7/8	63	153	+ 50	+ 605	1,518	2,396	37 0	6 0	43 0	— 2 6	+ 50	+ 2 10
9	Sheep dung, 180 maund*, at Rs. 3 per 100 m«unds, and bone dust, 360 Ib per acre, at 11 annas per 82 lb.	594	117	170	67|	69	145	+ 41*	+ 503	1,416	2,057	34 9	5 2	39 11	— 5 «	+ 1 11	— 3 11
10	Shrep dung, 130 maun Is, at Rs. 3 per 100 mHnnda, and gyj sum, 240 lb per acre, at Re. 1-12-0 per 82 Ib	629	933	160	68	59	170	+ 18*	+ 221	1,131	1,936	27 10	4 13	32 7	- 7 8	+ 69	— 1 15
12	*Poudrette,* ISO maunds per acre, at Rs. 4 per 100 maunds.	598	1014	162	68	63	158	+ 26	+ 315	1,228	1,960	29 15	4 14	34 13	- 7 3	— 3 3	—10 6
1	Saltpetre, 240 tb per acre, at Rs 3-8-0 per 82lb.	639	141*	250	C6r	67	177	+ 66	+ 79©	1,712	3,025	41 12	7 9	49 5	- 7 4	+ 11 5	+ 4 1
2	Saltpetre, 240 Hi per aero, at Us. 3-3-0 per 82 K) nd bone dust, 240 ft per acte, at 11 unnas per 82 Ib.	653	16G	253	66	62	161	4-844	+ 1,023	1,936	3,122	47 4	7 13	55 1	— 10 4	+ 17 1	+ 6 13
9	Saltpetre, 240 Ib per acrr, at Its. 3-8-0 per 82 ft and superphosphate, 240 Ib per acre, at Rs. 4-8 per 112 tb.	646	90*	162	68}	56	179	+ 15J	+ 185	1,098	1,960	26 12	4 14	31 10	—19 4	—6 6	-25 10
11	No manure .., ... M·	613	75;	110	63|	69	146	...	-	913	1,331	22 4	3 5	25 9	+ 30	—12 7	— 9 7

Not!.—(1) Column 1 contains not serial numbers, but farm map numbers.
(2) The total of columns 4 und 5 would not agree with the eutry of colamn t, because though the sheaves were weighed after a fixed time, yet they were not equally dry at the time of weighmeot.
(3) Plus (+) indicates gain ami minus (-) loss.
(4) The entries of column 9 is the difference of the outturn of unmanured plct and other plots in the series respectively.
(5) Extra cost of siug.e »r compound manure ovsr Rs 3 cost of 100 maunds farmyard manure, (included in the cost of standard plot) is shown in col a HM 13.
(6) In the cnlr ilations the fractioiiR after seers, ounces, and annas have been left out ; and in the case of its being more than half is taken as a whole number*
(7) Bntriea oi colimm 14 are the d.fcreuce of the total in column 12, and of Us. 38, (the ftflaumed income from an acre of wheat, raised by ordinary kind of cultivation,) *1,312 Ib at 41 Ib per rupee = Bs. 32 ; and 2,400 Ib straw at 400 tb per rupee=IU. 26.

Table III.—Result of ... Series.

Comparison of outturn with ... manured plot in the ... kind of cultivation.

Number of plots as per map of the farm.

Details of manure ... applied per acre, the rate of its ... .

Weight of unthreshed sheaves.	9	580 1	g S	2 fco	S	570	645 1	579	576	584 1	520	635	§	B	
Weight of grain.	9	167	[illegible]	[illegible]	[illegible]	190	[illegible]	130	19O	149 1	116	[illegible]	[illegible]	S	
Weight of straw.	9	CO	8	i5	8	10	00	250	252	[illegible]	[illegible]	§	[illegible]	S	
Weight of grain per bushel.	P	S	[illegible]	oa 00	[illegible]	[illegible]	Mto	S	[illegible]	S	a	S	[illegible]	o*	
Percentage of grain on strav.	P	en	S	S	2	tn	cn	Oi cn	cn	cn to	CI	cn CO	S	%	
Percentage of straw on grain.	»	186	S	S	g	186	[illegible]	154	[illegible]	[illegible]	154	188	[illegible]	[illegible]	
Increase or decrease over standard plot in the series.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Increase or decrease per acre.	[illegible]	to	fe	S	§	454	S	[illegible]	454	[illegible]	[illegible]	974	%	[illegible]	
Grain.	ge r	[illegible]	i:	«	V	1,5[illegible]	1,S	1,[illegible]	1	1,[illegible]	1,404	[illegible]	[illegible]	[illegible]	
Straw.	[illegible]	CO	'S	is	g	[illegible]	3,690	3,025	[illegible]	3,073	cn	Vo cn	2,057	to	
Grain at Re. 1 per 41 lb.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Straw at Re. 1 per 400 lb.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Total.	Rs.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	S	3	[illegible]	
Gain or Loss per acre in the cost against the cost of ordinary cultivation, assumed to be Rs. 30.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4	
Gain or loss per acre in the value of outturn against ordinary cultivation, assumed to be Rs. 38.	»	+ 20 12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+ 22 15	[illegible]	[illegible]	
Net profit or loss against the assumed income of Rs. 38.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

Value of ...

7. In comparing the above and the following results, the undernoted points must be borne in mind :—

(1) The results must not be considered unchangeable, as they are subject to various circumstances.

(2) Too qlose comparison must not be made, a* it is impossible to keep any two fields under the same conditions throughout a season.

(3) The rates of manures are taken from the farm report for the year 1880-81, but they depend on various circumstances, i-e., under some chance the cost of a manure could be reduced to almost nothing; but, on the other hand, it is possible that this item under other circumstances would become ten times higher than what is actually paid at Cawnpore.

(4) By reducing all the results to one scale, *viz.,* in money value, there remains nothing complicated and misleading in weighing the real value of an operation.

8. *Detail of the results shown in Tables II and ILL*—One very important lesson can be learnt from the results of the foregoing tables, *vi$.,* for good and high farming rotation is indispensable.

Table II shows the fact that, although a fair crop of wheat can be got year after year from a land with the aid of artificial fertilizers, but it caunot keep its fertility up to that point like the land kept under the rotation of crops. The fact is quite visible by columns 14 and 15 of Tables II and III.

Five out of thirteen plots of the standard series did not cover even their expenses, and it was only in one case that the net profit of Rs. 8 (the profit over ordinary cultivation) was attained ; while in the duplicate series treated just the same way, there was profit in nine out of the thirteen plots, and the net gain in five cases exceded the profit under ordinary cultivation.

This fact is further confirmed by comparing the results of the series in question for the last five years in the following table :—

Table *IV,—Showing the comparative results of the standard and duplicate series for the last four years.*

Manures.	Grain per acre.				SJraw per acre.			
	1882-83.	1883-84.	1834-85.	1885-86.	18S2-83.	1883-84.	1884-85.	1885-86.
	lb.	lb.	lb.	ra.	*m.*	lb.		lb.
Cowdung ... Standard...	1,713	1,427	902	1,537	3,126	2.329	1,319	3,194
Duplicate,	1,623	3.031	1,166	2,014	2.958	4.938	1,670	3,763
Cowdung and bone dust. Standard...	1,584	1.343	1.016	1.883	2.684	2,456	1,427	2.420
Duplicate,	1,400	2,873	1,516	1,554	2,412	5,112	1,742	3,025
Cowdung and gyp-«ni. Standard...	1,740	1,364	886	1,857	3,270	2,408	1,464	2,650
Duplicate,	1,886	3,004	1,396	2,063	2,778	4,695	1,718	3,267
Ashes of ^ ^ { g j TM ^ . .	1,383	1,134	704	961	2.412	2,311	1,222	2,154
	1,417	3,323	1,089	1,549	2,436	2.817	1,488	3.098
Saltpetre ... Standard...	1,978	1,356	1,383	1,712	3,636	2,411	2,412	3,025
Duplicate,	2,181	2,707	1,417	1,397	3,406	5,642	2,436	2,15*
Saltpetre and bone <*U8t- Standard ..	1.945	1,252	1,170	1,936	3,690	2,668	1,621	3,122
Duplicate,	2,056	2 901	1,624	2,093	3,834	5,726	2,565	3 945
Saltpetre and bone superphosphate. Standard...	...	1,984	1,509	1,098	...	3,817	2,031	1,960
Duplicate,	...	3,061	2,007	1,404	...	5,862	2,795	2,057
Sheep duug and bone dust. Standard...	...	1,143	826	1.416	...	1,888	1,258	2,057
Duplicate,	...	2,391	1,615	1,966	...	4,435	1,936	3,025
Sheep dung and gypsum Standard !.	...	1,337	756	1,146	...	2,323	1.391	1,936
Duplicate,	...	2.601	1,276	1,573	...	4,471	1,900	3,049
No manure Standard ..	1,065	1.031	635	913	1.764	2,093	1,004	1,331
Duplicate.	999	2,280	1,025	1,119	1,764	8,672	1,452	2,928
Ashes of dung and saltpetre. Standard !.	...	...	1,149	963	...	...	1,670	2,420
Duplicate,	...	...	1,586	1,573	...	...	2 057	2,928
Sheep dung Standard...	...	...	889	1,518	...	...	1,500	2,396
Duplicate,	...	...	1,443	1,984	...	...	2,158	3,690
Poudrttte Standard ..	...	...	1.074	1,2*23	...	...	1,307	1,960
Duplicate,	...	...	1,492	1,802	...	...	1,730	3,073

In the majority of cases the plots alternated with wheat and maize have given a better yield than the plots in which wheat was sown successively.

By the light of the theory which on the farm has now proved true beyond doubt, we can safely affirm that, for good cropping, rotation is as necessary as the manure is.

9. The effect of each manure in question may briefly be described thus:—

Cotodung alone and combined with other substances.—By comparing the results it will be seen that cowdung is the most handy and cheap manure for a common k£sht-kar. It has *always* proved to be so.

By the application of dung alone the percentage of grain over straw was not very good, but the weight per bushel very fair. Against unmanured plots in the series it has given nearly double yield.

Dung applied with bone dust gave still better yield, and it has shown the same result during the last three seasons. So the dung with gypsum in many instances (though not steadily) has proved to be better than dung alone. In both cases the percentage of grain over straw has been very good, being 78 and 70 respectively.

The ashes of dung have never proved to be-a good fertilizer—at all events never so much as the unburnt dung. The percentage of grain over straw in this case is worst of all ; from the weight per bushel it seems that there was no defect in the quality of the grain.

Even with saltpetre the ashes do not seem to have ever shown any remarkable effect. The last experiment has existed for the last two seasons only.

STieep dung.—The sheep dung singly and with other fertilizers has again proved not so good as the cowdung. There can be no other reasons for this but those stated in the last report, para. 21, *viz.* ;—

(1) The sheep on the farm are kept entirely on grass, while the cattle in some months are fed on grain.

(2) Folding sheep on a field provides better manure for it than putting their rotten excrement.

As promised in para. 22 of last year's report, the experiment of folding she ep was tried. The plot on which sheep were folded yielded ^19*7 maunds per acre against 18-5 maunds as produced in the plot of this series which was manured at the rate 180 maunds of rotten sheep dung per acre. Th« result, however, cannot at present be pronounced to be decisive.

Poudrette.—To the great astonishment tbi9 manure has remained behind the cattle dung : no cause for this can at present be assigned. From an economcial point of view, this manure gave the worst result. But it must be noted here that, under circumstances, on the farm we have to pay a very high price for it, while to tho owners of fields near the village site it does not cost even as much as the farmyard manure.

Saltpetre alone and with other fertilizers.—This over-successful fertilizer alone and with bone dust has always left some margin of net profit after recovering its own cost, but the 'question is whether the use of the same can possibly be made by the cultivator in this country. Under the present circumstances, being a purchased manure, it does not prove very tempting to a common kâshtkâr.

The yield with saltpetre combined with superphosphate has been very poor. The reason for this too, like *poudrette*, is not apparent. Economically, it has shown the greatest loss, i.e., of Us. 25-1Q-0 per aero; more than 2£ times against the unmanured plot.

10. *Percentage of grain over straw.*—It is worth noticing that the ashes of dung in both, and tbe saltpetre in two out of three farms being applied to, gave a less percentage of grain over straw.

This point, that the saltpetre made the stock grow more luxuriantly, and produced proportionately less grain, had been noticed in last year's report {*vide* para. 30) But whether this is a fact is yet to be confirmed.

With simple cowdung also the percentage of straw was much too large, but with sheep dung it was very fair, being 48 and 63 respectively.

The plots with bone dust and gypsum combined with cowdung, sheep dung and saltpetre have produced grain in larger proportion.

11. *Eetracost of manure.*—From column 13 of Table I. it is seen that the most expensive manures are those applied to plots Nos. 4, 5, 13, 8, 10^ 12, 1, 2 and 9. Of these Nos. 4, 5, 1 and 2 recovered their expenses and left some net profit. The largest profit was left by the cowduag and bone dust.

12. *Duplicate series.*—The plots of this series, as a rule, have comparatively given much larger yields than the plots of the standard series. The greatest profit seems with simple oowdung and sheep dung.

Poudrette—In this case has given a fair result, and so the saltpetre and bone dust.

The greatest loss in this instance also is in the case of saltpetre and superphosphate applied combined.

18. *II.*—The following is one of the two new manure experiments started from this season : —

Determination of the effect of different oil-cakes, and of the cake-fed dung.

In a concentrated form this experiment, too, will be kept permanent.

For this seven series each of seven plots and each plot of 400 square yards were made.

The kinds of cakes experimented upon were : —•

(A.) Mustard cake.
(B.) Cotton seed cake.
(C.) Linseed do.
(D.) Til do.
(E.) Saffiowe* do*
(F.) Poppy do.
(Q.) Castor do.

Of the seven plots in each series, one was kept unraannrdd, and ia three th9 cike >vas applied at the rate of 5, 10 and *20* maund3 per acre respectively, and in the remaining three plots the dunsj of the cattle fed upDn the sancn cake was put at the rate of 50, 100 and 200 maunds per acre.

The other treatment was—

(1) Ploughing with Watt's twice.
Ditto country do.
(2) Watering three times.

The result is shown tu the following table : —

Table No. V.

1	2	3	4	5	6	7	8	9	10	11		12			13	14	15
	Comparison of outturn with the unmanured plot in the series.									*Comparison of cost and income with the ordinary kind of cultivation in vogue in the country.*							
Number of plots of the Farm.	Detail of special treatment with the rate of its cost.	Weight of unthreshed sheaves.	[illegible] grain.	[illegible]	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	*Actual outturn per acre.* Grain.	Straw.	*Value of outturn.* Grain at Rs. 1 [illegible] lb.	Straw at 1 per 400 lb.	Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation, assumed to be Rs. 20.	Gain or loss per acre in the value of outturn against ordinary kind of cultivation, assumed to be Rs. 38.	Net [illegible]
	Quantity of manure applied per acre.	ft.	ft.	ft.	lb.	ft.	ft	lb.	ft.	ft.	ft.	Rs. as	Rs. as	Rs. as.	Rs. as.	Rs. as	Rs. as.
A 1	Mustard cake, 5 maunds per acre, at Re. 1 per 30 seers.	598	147	297	67|	49	202	24	291	1,779	3,598	43 6	9 0	52 6	−3 11	+ 14 6	+ 10 11
2	Ditto 10 „ ditto ditto.	410	115	194	67|	69	169	8	97	1,391	2,347	33 15	5 14	39 13	•10 5	+ 1 13	− 8 8
[illegible]	Ditto 20 „ ditto ditto.	492	153	246	67f	62	161	30	368	1,851	2,977	45 2	7 7	52 9	−23 11	+14 9	− 9 2
[illegible]	Drag from mustard cake, 50 maunds per acre, at Its. 4 per hundred.	4S4	86	195	671	44	227	37	447	1,041	1,359	25 6	3 6	28 12	+ 1 0	− 9 4	− 8 4
[illegible]	Ditto ditto 100 „ ditto.	656	164	307	[illegible]	[illegible]	187	41	496	1,984	3,715	48 6	9 5	57 11	−1 0	+ 19 11	+18 11
[illegible]	Ditto ditto 200 I, ditto.	574	153	297	67}	52	194	30	363	1,851	3,595	45 2	9 0	54 2	5 0	+16 2	+ 11 2
[illegible]	No manure. .	416	123	246	67}	50	200	+	+	1,488	2,977	36 5	7 7	43 12	4-3 0	+5 12	+8 12
fil	Cotton seed perished, 5 mtunds per acre, at Be. 1 per 29 [illegible]	430	122	184	67|	66	151	13	157	1,476	[illegible]	36 0	5 9	41 9	−3 14	+ 3 9	−0 5
	Ditto 10 „ ditto ditto,	799	225	348	67»	65	155	90	1,089	2,722	4,211	66 6	10 8	76 14	−10 13	+ 38 14	+28 1
a	Ditto 20 „ ditto ditto.	518	164	328	671	50	200	29	351	1984	3,964	48 6	9 15	C8 5,	−24 9	+20 5	−4 4
[illegible]	Dung from cotton seed, 50 mannds per acre, at lie. 4 per hundred.	332	95	153	67J	62	161	40	484	1,14*	1,851	28 0	4 10	32 10	+1 0	− 5 6	−4 6
[illegible]	Ditto 100 „ ditto,	410	92	190	67|	48	207	43	520	1,113	2,299	27 2	5 12	32 14	−1 0	− 5 2	−6 2
[illegible]	Ditto 200 „ ditto.	492	170	246	67J	69	145	35	424	2,057	2,977	50 3	7 7	57 10	−6 0	+ 19 10	+ 14 10
[illegible]	No manure.	492	135	246	67|	65	182	+	+	1,633	2,977	39 13	7 7	47 4	+ 3 0	+9 4	+12 4
[illegible]	Linseed cake, 6 maunds per acre, at Re. 1 per 21 seers.	443	1103*2	188	67|	65	182	6*14	82	1,247	2,275	30 7	5 11	36 2	−6 8	−1 14	− 8 6
[illegible]	Ditto 10 „ ditto ditto.	612	»148-14	225	67*	66	151	5210	636	1,801	2,722	43 15	6 13	50 12	−16 1	+12 12	− 3 5
[illegible]	Ditto 20 „ ditto ditto.	434	125J	235	671	53	1-88	29 0	351	1,516	2,843	37 0	7 2	44 2	−35 2	+ 6 2	•29 .0
[illegible]	Dung from linseed cake, 50 maunds per acre, at Rs. 4 per hundred.	27G	1 8 0 1	125	67i	65	155	15*6	187	978	1,512	23 14	3 12	27 10	+1 0	−10 6	− 9 6
[illegible]	Ditto ditto 100 „ ditto.	49:1	142		[illegible]	63	158	46 0	556	1,721	2,722	42 0	6 13	48 13	−1 0	+10 18	+9 18
[illegible]	Ditto &tV> VW »» ditto.	689	164 0	276	[illegible]	59	168	6712	819	1,984	3,340	48 4	8 6	56 10	−5 0	+18 10	+13 10
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+	+	1,165	2,347	28 7	5 14	84 5	+ 3 0	−3 U	i − 0 11

D1	Til cake, 5 mauods per acre, at Re, 1 per 27 seers,	Hi	113	164	671	69	145	42	508	1,867	1,984	38 5	4 15	38 4	-4 6	+0 4	-4 2
2	Ditto 10 ,/ ditto ditto.	471	123	205	671	60	167	62	629	1,488	2.480	36 5	6 3	42 8	-11 13	+4 8	-7 5
3	Ditto 20 f, ditto ditto.	543	147	225	67*	65	153	76	920	1,779	2,722	43 6	6 13	50 3	-26 10	+12 3	-14 7
4	Dung from til cake, SO maunds per acre, at Be, 4 per hundred maunds,	807	78	102	67	76	131	7	85	944	1,234	23 0	3 1	26 1	+1 0	-11 15	-10 15
S	Ditto 100 „ ditto.	463	143	215	67}	67	150	72	871	1,730	2,601	42 3	6 8	43 11	-1 0	+10 11	+9 11
6	Ditto 200 „ ditto.	430	143	205	67}	70	143	72	871	1,780	2,480	42 3	6 3	48 6	-5 0	+10 6	+5 6
7	No monuie.	406	71	123	67	5S	173	I.I	•••	859	1,488	20 15	3 11	24 10	+3 0	-13 6	-10 6
E1	Safflower cake, 5 maunds per acre, at Re. 1 per 27 seets.	451	151	217	6?.	.70	144	376	452	1.827	2,626	44 9	6 9	51 2	-4 6	+13 2	+8 12
2	Ditto 10 „ ditto.	488	153	225	67	68	147	396	476	1,851	2,722	45 2	6 13	51 16	-11 13	+13 15	+2 2
3	Ditto 20 „ ditto.	430	133	213	67*	62	160	19-6	234	1,609	2 577	39 4	6 7	45 11	-26 10	+7 11	-18 15
4	Dung from safflower cake, 50 maunda per acre, at Bs. 4 per hundred mnuuds,	451	nil	215	671	52	193	22	25	1,349	2,601	32. 14	6 8	39 6	+1 0	+1 6	+2 6
5	Ditto ditto 100 „ ditto.	461	143	219	67*	65	153	29-6	355	1,730	2,650	42 3	6 10	48 13	-I 0	+10 13	+9 13
6	Ditto ditto 200 „ ditto.	451	129-10	217	673	60	167	160	193	1.568	2,626	38 4	6 9	44 13	-5 0	+ 6 13	+1 13
7	No manure.	400	11310	201	67*	56	177	in	...	1,375	2,432	33 9	6 1	39 10	+3 0	+1 10	+4 10
F1	Popp>y cake, 5 maunLs per acre, at Ke. 1 per 30 seers,	449	153	221	C8	69	144	1	12	1,851	2,674	45 2	6 11	51 13	-3 11	+13 13	+10 2
'2	Ditto 10 „ ditto ditto.	533	148)	242	68	61	163	5*8	66	1,797	2,928	43 13	7 5	51 2	-10 6	+13 2	+2 13
3	Ditto 20 „ ditto ditto.	471	147	238	68	62	162	7	84	1,779	2,880	43 6	7 3	50 9	-23 11	+12 9	-11 2
4	Dung from poppy cake, 50 maunds per acre, at KB. 4 per hundred maunds.	574	1)614	287	68	62	162	22'14	277	2,140	3,472	52 3	8 11	60 14	+1 0	+22 14	+23 14
5	Ditto 100 M ditto.	348	153	829	68	67	150	1	12	1,851	2,771	45 2	6 15	59 1	-1 0	+14 1	+13 1
6	Ditto 200 „ ditto.	393	131}	235	68	56	179	22*12	275	1,588	2,843	38 12	7 2	45 14	-5 0	+7 14	+2 14
7	No manure.	574	154	235	68	66	158	III	•a.	1,863	2,843	45 7	7 2	52 9	+3 0	+14 9	+17 9
G1	Castor cake, 5 maunds per acre, at 13) annas per maund.	674	139	235	651	59	169	11	133	1,682	2,843	41 0	7 2	48 2	-1 3	+ 10 2	+8 15
2	Ditto 10 „ ditto ditto.	602	144J	229	651	68	159	U\	196	1,745	2,771	42 9	6 15	49 8	-5 7	+11 8	+6 1
3	Ditto 20 „ ditto ditto.	336	82	170	651	48	207	46	559	990	2,057	24 2	5 2	29 4	-13 14	-8 12	-22 10
4	Dung from cattle not given any cake, 50 maunds per acre, at tis. 3 per hundred maunds.	369	108	166	65*	65	154	20	242	1,307	2,0'9	81 14	5 0	36 14	+1 8	-1 2	+0 6
5	Ditto ditto 100 „ ditto.	473	127	235	651	54	185	1	12	1,537	2,843	87 8	7 2	44 10	+	+6 10	+6 10
6	Ditto ditto 200 „ ditto.	461	82)	215	651	38	261	45)	551	998	2,6ul	24 6	6 8	30 14	-3 0	-7 2	-10 0
7	No manure.	440	128	235	651	54	184	ii*	+■	1,549	2,843	37 12	7 2	44 14	+3 0	+6 14	+9 14

These plots were made on a land which is naturally rich and had enjoyed dead fallow of one year. The previous crops on it were wheat and oats mostly.

Being a new experiment, it cannot be said how far the natural richness of the soil is to account for the good produce obtained this year. Many of the unmanured plots have given a very good crop indeed. The more the land will get exhausted of its natural fertility, the more correct the result of the experiment will be obtained.

However, from the table it is seen that in the majority of cases five maunds of cake and 100 maunds of cake-fed dung have given the best economical results. In many instances the increase in the quantity of cake and the dung has increased the yield but the simultaneous increase in the cost of manure has absorbed the profit; although it may be said that the increased cost cannot be considered to have gone into dead loss since its effect will, no doubt, extend to future years.

14. The theory of the English practical farmers, that the best and most economical manure for a farmer is the cake-fed dung, has proved to be true in the instance under review too.

The cost of the dung to a farmer is nothing. He feeds his cattle on cake to eive them good nourishment, and he gets good manure by this in the bargain. In every case, instead of using cake as a manure, it will be wise to convert it into dun" The undernoted figures prove the fact. They are the averages of the cost and of "the net profit per acre, as shown in foregoing table :—

			ontOf	Net profit or loss.
			^ a. p.	He. a. p.
Cake, per acre	...	...	+ 39 12 3	_ 9 2 0
Cake fed dung, per acre	...	.«	+ 4 8 0	+13 8 0
No manure, per acre	...	...	_ 3 0 0	+ 6 0 0

75. (///.) *Miscellaneous manure experiment—(a)* Of the two new experiments, the second one is to determine for how many years a manure leavos its residue available for succeeding crops.

For this a field was divided into 10 plots aad in the year under report they were manured as follows :—

No. of plot.	Area.	Manure applied.	Quantity per acre.
	Square yards.		Maunds.
1	40(5	Cowdutig	300
2	463	*Poudreitd*	200
3	£02	Cake	300
4	463	Woollen refuse	120
5	496	Cowdung and boae dust	200 and 3 cwts,
6	ir,7	Cx>copost	300
7	450	Green manure	...
8	400	Saltpetre	240tb.
0	445	Ammonic chloride	240H>.
10	532	No manure	...

No mwrnre will be applied f«r the fi™ .-.cewdiog year3, and ore ear every year a year after .0

The following table shows results of the present season. To draw any conclusion we must, however, wait for future years' results :—

lableSo. VI.

		Comparison of outturn with the unmanured plot in the series.								*Outturn per acre and iU value.*				
1	2	3	4	5	6	7	8	9	10	11		12		
										Actual outturn per acre.		*Value of outturn.*		
Number of pi.ots as per map of the farm.	Detail of special treatment with the laie of its cost.	Weight ot uuthreshed sheaves.	Weight of graic.	Weight of stra.	'8 &b ill per bu- •s-g	it ol gram on	si +4 o 0) straw ou	liicrtase or decrease over standard plot in theseiies.	Increase or de<rr g. acre.	S	Straw.	Grain @ Us. 2 per 82 lb.	C3o	Total.
	Quantity of manure applied per acre.	tb.	ft.	1b.	lb			Rs.	Rs.	lb.	ft.	Ks. a.	Us. a	Rs.a.
1	CowduDg at Us. 3 per 100 maunds—per acie, 300 mds.	278	92	170	63}	54	185	—39	—243	949	1,754	23 2	4 6	27 8
2	*Poudrette* at Rs. 4 per 100 mau rids—per acre, 2u0 niaunds.	385	115	172	65*	67	149	—16	+ 10	1,202	1,798	29 5	4 8	33 13
3	Cake at Re. 1 i»er 30 'seers —per acre, 300 maunds.	455	84	186	65|	45	221	—47	—382	810	1,793	19 12	4' 8	24 5
4	Woollen refuse at Rs. 2-8 per 100 maunds—per acre, 120 niHunds.	397	881	, 178	65|	50	201	—424	—267	925	1,861	22 9	4 10	27 3
5	Cowdung and bone dust—per acre, 2<Kl'«naunds.	387	108	190	65|	57	176	—23	--138	11054	1,854	25 11	4 10	30 4
6	Compost per acre, 300 mauDtls—at Rs. 8 per 1C0 maunds.	326	92	• 170	65|	54	185	- 3 9	—218	974	1,800	23 12	4 8	23 4
7	Green m A mired with mustard (will be sown with wheat next season).	...	...	...	...	...	...	...	...	...	...	...	...	...
8	Salpetre, per acre 240 15 at Ks 3-8.	351	96	196	65|	50	200	—33	—224	968	1,936	23 10	4 13	28 7
9	Ammonic chloride, 240 ft. per acre, at Rs. 15 per 100 lb.	373	83	184	65f	45	222	—48	—289	905	2,001	22 0	5 0	27 0
10	No manure ...	391	131	183	65|	72	140	...	...	1,192	1,665	29 1	4 3	33 4

From the foregoing table it will be seen that the result has come out quite extraordinary. Excepting one, no manured plot has given better results than the unmanured. This can only bo ascribed to a difference in the conditions of the Roil, arising probably from their previous treatments and cropping being somewhat different.

16. *Miscellaneous (b)—Experiment on determination of what constituents of plant-food get exhausted by sowing wheat year after year on the same land.*—It is operated with a series of six plots, thus : —

In one of the plots four manures, in each of which a known substance of plant-food makes an essential part, is applied, and the manures are withheld one by oue in the other four plots, while the last is kept unmanured.

The treatment of the plots was as follow : —

(1) Manure, as in the following table.

(2) Ploughinge, four.

(3) Waterings, three.

Table No. VII.—Showing manures and outturn.

Comparison of outturn with the standard plot in the series.										Outturn and it* value.				
1	2	3	4	5	6	7	8	9	10	11		12		
										Outturn per acre.		Value of outturn.		
Number of plot.	Detail of special treatment with the rate of its costs.	Weight of outturn.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Grain.	Straw.	Grain at Rs. 3 per 82 lb.	Straw at Re. 1 per 400 lb.	Total.
	Quantity of manure applied per acre.	lb.	lb	lb.	lb.	lb	lb.	lb	Rs.	lb.	lb.	Rs. as.	Rs. as.	Rs. as.
1	(1) Calcic superphospate, 180 lb. (2) Ammonio chloride, 138 lb. (3) Potassic sulphate, 90 lb. (4) Calcic sulphate, 96 lb per acre.	221	584	135	67}	43	231	341	829	1,416	3,267	34 9	8 3	42 12
2	All but caloio superphosphate.	213	554	131	67*	42	236	31J	756	1,343	3,170	32 12	7 15	40 11
3	All but ammonic chloride	192	39	141	66»	28	362	14J	357	944	3,412	23 0	8 8	31 8
4	All but potassio sulphate,	17€	42*	147	66i	29	346	[illegible]	[illegible]	1,023	3,555	25 1	8 14	33 15
5	All but calcic sulphate...	[illegible]	32	137	66	23	428	[illegible]	[illegible]	774	3,315	18 14	8 5	27 3
6	No manure. ...	1634	24*	11o	62)	21	473	...	187 ...	587	2,«07	14 5	7 0	21 5

The present results confirm what were obtained in previous years, *vis.*, " the chief want of the (farm) soil for cereals lies in nitrogen."

The following figures are quoted for comparison from previous years' reports : —

	Outturn of grain per acre.			
	1885-86.	1884-85.	1883-84.	1882-83.
	lbs.	lbs.	lbs.	lbs.
Obtained by application of all manures ...	1,416	1,459	1,777	1,726
Obtained by applying all except ammoiiic chloride,	944	808	1,002	1,192
Obtained by applying no manure —	587	757	762	1,045

The importance of nitrogenous manures for wheat has unquestionably been settled now.

17, *Miscellaneous* (c).—This series consists of eight plots of 400 square yards each.

Their treatments and result are shown below :—

(1) Manure, as in the following table.

(2) Ploughing—four times.

(3) Watering—three times.

Table No. [illegible]

	[illegible] of outturn [illegible] in the series.									Comparison of cost and income with the [illegible] in the [illegible]						
1	2	3	4	5	6	7	8	9	10	11		12			13	14	15
Number of plots as per map of the farm	[illegible] of special treatment with [illegible] of its cost	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Actual Outturn per acre. Grain.	Straw.	Value of outturn. Grain at Rs. 2 per 82 lb.	Straw at Re. 1 per 400 lb.	Total.	Increase or decrease per acre in the cost over common cultivation, assumed to be Rs. 30.	Gain or loss per acre in the value of outturn against ordinary kind of cultivation, assumed to be Rs 38.	Net profit or loss against the assumed income of Rs. 38.
	[illegible] applied per acre.	lb.	lb.	lb.	lb.			Rs.	Rs.	[illegible]	[illegible]	Rs. a.	Rs. a.	Rs. as.	Rs. as.	Rs. as.	Rs. as.
1	Brick kiln refuse, 120 maunds, at [illegible] per 100 maunds, per acre.	291	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	215	1,[illegible]	[illegible]	25 11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Silt 300 maunds [illegible] per [illegible]	283	[illegible]	[illegible]	[illegible]	[illegible]	211	[illegible]	227	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Compost 3[illegible] [illegible] f100 [illegible] per acre.	270	[illegible]	[illegible]	[illegible]	[illegible]	205	[illegible]	130	[illegible]	[illegible]	23 10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Road scrapings, [illegible] per 100 [illegible] acre.	311	[illegible]	[illegible]	[illegible]	[illegible]	207	[illegible]	130	[illegible]	[illegible]	[illegible] 10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Ashes of [illegible] per 100 maunds, per acre.	272	[illegible]	[illegible]	[illegible]	[illegible]	192	[illegible]	163	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+ [illegible]	[illegible]	[illegible]
[illegible]	Ashes and [illegible] 3-8 per [illegible] lb., per acre ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	400	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Ammonic chloride, [illegible] 15 per [illegible] acre ...	305	[illegible]	[illegible]	[illegible]	[illegible]	191	[illegible]	381	1,219	[illegible]	29 12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	No manure ...	2S5	[illegible]	[illegible]	[illegible]	[illegible]	218	[illegible]	[illegible]	838	[illegible]	[illegible]	[illegible]	[illegible]	+ [illegible]	[illegible]	[illegible]

From the above figures it is seen that anything given in the shape of manure, if it is not very expensive, is better than producing a crop without any manure.

II.

18.—The next class under the permanent experiments, is that of green or vegetable manure (4*45 acres). It consists of five series.

The 1st series, consisting of thirteen plots, is the main one, and the other four are its duplicate. The latter are kept up simply to confirm the results obtained from plots in the main series.

The treatment and the results were as follows:—

Treatment

(1) Manure, as in table IX.

(2) Ploughing—four times.

(3) Watering—three times.

Table No. IX.

1	2	3	4	5	6	7	8	9	10	11		12			13	14	15
	Comparison of outturn with the standard plot in the series.									*Comparison of cost and income with the ordinary kind of cultivation in vogue in the country.*							
Number of plot on map	Detail of special treatment with the rate of its cost.	Weight of sheaves.	Weight of	Weight of	Weight of bushel.	Percentage grain to straw.	Percentage straw to grain.		Increase or decrease per acre.	*Actual outturn per acre.* Grain.	Straw.	*Value of outturn.*			Gain or loss	Gain or loss on the value against the cultivation	Net profit on the assumption of Rs. 38
	Quantity of manure applied per acre.	lb.	lb.	lb.	lb.	lb	lb.	lb.	lb	lb.	lb.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.
I. 1	Old indigo refuse 120 maunds, at Re. 1 per 100 maunds, per acre,	518	108£	200	'63	54	184	— 4]	— 54	1,313	2,420	32 0	6 1	38 1	+ 1 13	+ 0 1	+ 1 14
2	Fresh ditto 120 maunds, at Be. 1 per 100 maunds, per acre,	532	114	223	671	51	185	+ 1	+ 12	1,379	2,698	33 10	6 12	40 6	+ 1 13	+ 2 6	+ 4 3
3	Indigo water 3,600 cubic feet per acre, at Re. 1 per 1,200 cubic feet	779	92	188	66|	49	204	-21	+ 254	1,113	2,275	27 9	5 11	32 13		- 5 3	— 5 3
4	Hemp water ditto ditto at Re. 1 per 1,200 cubic feet	439	106	202	67J	53	190	— 7	— 84	1,283	2,444	31 5	6 2	37 7		— 0 9	— 0 9
5	No manure	492	113	211	68}	53	187			1,367	2,553	33 5	6 11	40 0	+ 3 0	+ 2 0	+ 5 0
6	Green-manured with indigo, at Rs. 8 per acre	4<J7	1-284	244	63	50	Ifc8	+'104	+ 127	1,494	2,952	36 7	7 6	43 13	— 5 0	+ 5 13	+ 0 13
7	After indigo crop	512	143	264	67|	56	178	+ 35	+ 424	1,791	3,194	43 11	8 0	51 11	+ 3 0	+ 13 M	+ 16 31
8	Green indigo ploughed in as manured with six maunds of gypsum at Re 1-12 per 82 lb. per acre	5i3	152}	283	68	53	186	+ 3H	+ 478	1,845	3,424	45 0	8 9	53 9	-1 5 8	+1 5 9	+ 1 6
9	Green hemp ploughed in as manured with six maunds of gypsum at Re. 1-12 per 82 lb. per acre	573	89}	769	67}	53	189	—234	—284	1,(83	2,051	26 7	5 2	31 9	— 5 0	— 6 7	—11 7
10	No manure	4S7	1084	198	674	55	1(3			1,313	2,396	32 14	6 0	38 ?4	+ 3 0	— 0 14	+ 2 2
11	Alternate, with lucerne	f76	123	219	67||	56	178	+ 144	+ 175	1,488	2,650	36 5	6 10	42 15	3 0	+ 4 15	+ 7 15
12	After hemp crop	490	84	186	67||	45	221			1,116	2,250	27 4	5 10	b2 14	+ 3 0	— 5 2	— 2 2
13	Green manured with hemp, at Rs. 3-8 per acre	479	[illegible]	190	634	50	202	+ioi	+ 122	1,138	2,299	27 12	5 12	33 8	+ 0 8	— 4 8	— 4 0
II. 1	Fresh indigo refuse 12 maunds and lime six maunds per acre, at Re. 1 per 100 maunds and Rs. 20 per 100 maunds.	608	170J	337	67}	50	197	—10	-56*6	968	1,910	23 10	4 12	28 6	+ 0 10	— 9 10	— 9 0
2	Ditto ditto ditto only	520	175}	.3*3	•684	53	190	- 5]	-29-7	9S5	1,887	24 4	4 11	28 15	+ 1 13	— 9 1	- 7 4
3	Old indigo refuse 120 maunds, and lime six maunds per acre	.712	194	344	68}	56	177	+ 13*	+ 75-1	1,099	1,950	26 13	4 14	31 11	+10 0	— 6 5	— 5 11
4	Ditto ditto ditto only	706	181|	313	684	17	175	+ 1	+ 5-7	1,030	1,802	25 2	4 8	29 10	+ 1 13	- 8 6	— 6 9
5	No manure	676	ISt?	352	68	53	189		...	1,054	1,995	25 11	5 0	bo 11	+ 3 0	— 7 5	— 4 5
6	Ditto	678	175J	327	68|	54	Ib6	...	...	995	:,853	24 4	4 10	28 14	+ 3 0	— 9 2	— 6 2
III. 1	Green-manured with hemp	1,756	609|	919	68}	66	151	+	...	836	1,259	23 2	3 2	*26 4	+ 0 8	-11 12	—11 4
2	No manure	9.63	296|	631	68£	56	179	+	...	986	1,765	24 1	4 7	28 8	+ 3 0	— 9 8	— 6 8
IV. 1	Green-manured with hemp...	1,067	252	496	66]	5J	197	+ 26}	+ 51	484	952	11 13	2 6	14 3	+ 0 8	—23 13	—23 5
2	No manure	1,041	2254	505	66$	45	224	+	+	433	969	10 9	2 7	13 0	+ 3 0	—25 0	—22 0
V. 1	Ditto	262	80	117	66|	68	146	1		968	1,416	23 10	3 9	27 3	+ 3 0	-10 13	+ 7 13
2	Ditto	387	75	157	66|	48	209		+	907	1,900	22 2	4 12	26 14	+ 3 0	-11 2	— 8 2
3	Alternate with lucerne	584	145}	291	68}	50	200	+ 68	+ 826	1,761	3,521	42 15	8 13	51 12	+ 3 0	+ 13 12	+ 16 1

As noticed before, plots in series Nos. III and IV were injured by mildew *(girui)* ; hence it would not be fair to include them for comparison.

From the total in column 7 of the above statement it is seen that in most cases the yield has been good, and by no' means inferior to other kinds of fertilizers, *i.e.,* farmyard and artificial manures; but the margin of profit was only in the case of six plots, the other eleven having resulted in loss.

In two cases it is due to the high price of manures applied. But if the price of the crops of indigo and hemp taken from some of the plots and sold be included, the amount of loss will be much diminished.

On the whole, it can fairly be said that indigo and hemp havo proved again to be good and economical fertilizers. Sowing wheat after lucerne is just as good as cropping it after indigo.

This year, wheat alternated with lucerne heads the list when net profit is taken into account. In one plot it has given a profit of Rs. 13-8-0 and in the other of Rs. 16-11-0 per acre.

By putting lucerne seed on oats or barley if one can afford giving two or three waterings from April till June, a very good catch-crop of fodder can be obtained, and the field will be left prepared for sowing wheat.

C.

19.—*Determination of the effects of deep and shallow ploughing.*—This experiment is under operation for more than six years, and the plots set aside for this have never received any kind of manure since then.

The natural fertility of the land is getting more and more exhausted every year.

It is obvious that deep ploughing without manure is detrimental to the crop. The exhausted sub-soil coming up on the surface contains nothing to nourish the plant that grows upon it. The following table gives tho figures. It shows that the outturn per acre is very poor indeed.

In next season the farmyard manure will be given to each of the plots, and then the result of the deep and shallow ploughing will fairly be compared.

Table No. X

Comparison of outturn with the standard plot in the series,										Comparison of cost and income with the ordinary kind of cultivation in vogue in the country.							
1	2	3	4	5	6	7	8	9	10	11		12			13	14	15
										Actual outturn per acre.		*Value of outturn.*					
No. of plots as per plan of the farm.	Detail of special treatment with the rate of its cost.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard in the series.	[illegible] decrease	Grain.	[illegible]	Grain at Re. 1 per 41 lb.	Straw at Re. 1 per 400 lb.	Total.	[illegible]	[illegible]	[illegible]
	Ploughing,	ft.	ft.	ft.	ft.	ft.	ft	ft.	ft.	ft.	lb.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.
1	Ploughed 5" deep (twice) at annaa 12 per each ploughing	80	13	65	60i	[illegible]	500	121	206	210	1,04[illegible]	5 2	2 10	7 12	+7 8	-30 4	-22 12
[illegible]	Ploughed four times with country plough at annas 12 per each ploughing.	92	17	69	60	[illegible]	406	+	+	274	1,113	6 11	2 13	9 8	+ 6 0	-28 8	-22 8
[illegible]	Ploughed four times with country plough at annas 12 per each ploughing.	162	344	106	CO*	32	312	+	+	557	1,710	13 9	4 4	17 13	+6 0	-20 3	-14
[illegible]	Ploughed 9" deep (twice) at annas 12 per each ploughing!	156	16	73	60*	[illegible]	456	[illegible]	157	258	1,178	6 5	2 15	9 4	+ 7 8	-28 12	-21 4
[illegible]	Ploughed 9" deep (twice) at annas 12 per each ploughing.	734	2061	40i	62J	51	196	26)	53	413	808	10 1	2 0	12 1	+ 7 8	-25 15	-18 7
[illegible]	Ploughed 9" deep (twice) at annas 12 per each ploughing.	744	217	387	62J	56	178	37	71	415	741	10 2	1 14	12 0	+ 7 8	-26 0	-18 8
[illegible]	Ploughed four times with country plough at annas 12 per each ploughing.	760	180	402	62J	45	223	+	+	335	748	8 3	1 14	10 1	+ 6 0	-27 15	-21 15

The difference.*)! the value of manure, Rg. I per acre, and of ploughing for eight times, at annas 12 each time=Bs 6, is ehown in column 1$.

The present experiment shows that simple ploughing, whether deep or shallow, is no good. Good farming needs good ploughing, good manuring, good watering and good seed.

D-

20.—Watering.—As usual, two series of experiments were tried tinder this head:—

(j).—To ascertain the increase in produce by the increase in the nnmber of waterings.

(2).—To estimate the value of well against canal water.

There have been some winter rains in odd times during the season under report, which has spoilt the purity of the experiment.

However, it seems that the increase of water has somewhat increased the produce too.

But, on the whole, the outturn is much below the plots with manure and only three waterings.

Well water this year has proved in one case better than the canal; but in other cases canal water has given a slight increase.

As stated before, on account of the rain no fair conclusion can be made this year by the experiments.

The following table gives the detail:—

Table No. fc

Number of plots as per map of the farm.	Detail of special treatment ... SI Qcmh.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per Here.	Actual outturn per acre. Grain.	Actual outturn per acre. Straw.	Value of outturn. Grain at Kg. 2 per 82 It).	Value of outturn. Straw at Be. 1 per 400 tt>.	Value of outturn. Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation, assumed to be Bs. 80.	Gain or loss per acre in the value of outturn against ordinary kind of cultivation, assumed to be Bs. 38.	Net profit or loss against the assumed income Bs. 38.
1	2	3	4	5	6	7	8	9	10	11		12			13	14	15
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. as.	Rs. as.	Rs. as.	Rs.	Rs. as.	Rs.
1	... each water	431	[illegible]	148	67	58	[illegible]	[illegible]	[illegible]	[illegible]	1,730	21 6	6	28 10	[illegible]	[illegible]	[illegible]
2	... each water	431	[illegible]	88	66	100	[illegible]	[illegible]	[illegible]	[illegible]	1,041	23 4	10	27 14	[illegible]	[illegible]	[illegible]
3		246	61	82	67	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	902	18 0	8	20 8	[illegible]	[illegible]	[illegible]
B.a.																	
1	3 ... from well at Rs. 1-15 ... time	147	[illegible]	85	[illegible]	61	107	−8	[illegible]	[illegible]	788	[illegible]	1 15	11 11	[illegible]	6	−24 0
2	3 ... from canal at Rs. 1-4 ... water	158	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	...	[illegible]	714	[illegible]	1 14	12 7	+8	8	[illegible]
B.B.																	
1	... times at Rs. 1-4-0 per each ... from canal	[illegible]	80	[illegible]	[illegible]	42	[illegible]	27	[illegible]	[illegible]	[illegible]	23 10	[illegible]	[illegible]	+0	[illegible]	[illegible]
2	... times at Rs. 1-4-0 per each	[illegible]	[illegible]	[illegible]	[illegible]	18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	21 2	[illegible]	[illegible]	+1	[illegible]	[illegible]
3	... times at Rs. 1-4-0 per each	[illegible]	[illegible]	[illegible]	[illegible]	13	[illegible]	[illegible]	[illegible]	841	[illegible]	20	[illegible]	[illegible]	+3	[illegible]	[illegible]
4	2 times at Rs. 1-4-0 per each	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16	[illegible]	[illegible]	[illegible]	20	[illegible]	[illegible]	+4	[illegible]	[illegible]
5	1 time at Rs. 1-4-0 per each	[illegible]	[illegible]	[illegible]	[illegible]	28	[illegible]	10	[illegible]	742	[illegible]	18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	641	[illegible]	15 7	[illegible]	[illegible]	[illegible]	[illegible]	11

The difference of the value of manure, Rs. 3 per acre, and of the labour of three waterings, Rs. 3-12-0, is shown in column 13.

* 2.—In well watering extra cost of labour against canal water (as. 11) is included.

E.

21. — *Sowing.*—The experiment of sowing by the Jethro Tull or Lois Weedon system was again tried this year in two places.

The following table shows the result: —

Table No. XII.

[illegible]	Manner of sowing.	Area in square yards.		Actual out-turn.		Outturn per acre calculated on the total area of the plot.		Outturn per acre calculated on the cropped area alone.	
				Grain.	Straw.	Grain.	Straw.	Grain.	Straw.
1	2	3		4	5	6	7	8	9
				lb.	lb.	lb.	lb.	lb.	lb.
26a	Tull's ...	Under wheat ...	828	265	448	672	1,136	1,549	2,619
		Fallow ...	1,080						
		Total ...	[illegible]						
266	Ordinary...		1,980	249	438	609	1,070	...	...
		Duplicate.							
34a	Tail's ...	Under wheat ...	903	201	287	556	793	1,077	1,538
		Fallow ...	348						
		Total ...	[illegible]						
[illegible]	Ordinary...		1,665	328	674	951	1,665	...	...

The above table shows that in one case Tull's system of sowing has given good yield, but in the other case not so good. However, in both cases it shows some advantage over the ordinary kind of sowing. So where manure cannot reach, this system of sowing may advantageously be followed.

SECOND CLASS OF EXPERIMENTS.

Temporary or Variable.

22.—During the last season 8·86 acres of land were under these experiments, and the following crops were grown :—

1. Wheat of sorts.
2. Barley.
3. Oats.
4. Leguminous crops.
   (a) Gram.
   (b) Peas.
5. Linseed.
6. Imported seeds.

Wheat.—Four different kinds of wheat were tried: the following table shows their result :—

Table No. XIII.

1	2	3	4	5	6	7	8	9		10			11	12	13	14
	Out[illegible]							Comparison of cost and income with the ordinary [illegible] of cultivation in [illegible] in the 2 crops.								
								Actual outturn per acre.		Value of outturn.						
No. of plots as per map of the farm.	Detail of [illegible]	Weight of undthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Grain.	Straw.	Grain at Re. 1 per 41 lb.	Straw at Re. 1 per 400 lb.	Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation, assumed to be Rs. 30.	Gain or loss per acre in the value of outturn against ordinary kind of cultivation, assumed to be Rs. 38.	Net profit or loss against the assumed income Rs. 38.	Remarks.
	Quantity of manure applied per acre.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	
	No. 1.—Ghajaria [illegible]															
42	[illegible]ung, 300 maunds, at Rs. 3 per 100 maunds.	2170	470	916	66	91	110	1423	1587	35 11	3 14	38 9	— 6 0	+ 0 9	— 5 7	
	No. 2.—Muzaffarnagar soft white wheat.															
10	[illegible] 200 [illegible] and [illegible]	3190	648	[illegible]	[illegible]	45	222	1617	4041	44 8	10 2	54 7	— 7 12	+16 7	+ 8 11	Seed was [illegible] and sown broadcast.
11	Poudrette, 200 maunds, at Rs. 4 per 100 maunds.	2600	[illegible]	[illegible]	[illegible]	[illegible]	269	1374	3869	33 8	8 15	42 7	— 5 0	+ 4 7	— 0 0	[illegible]
	No. [illegible]															
39	Sheep folded a week at Rs. 8 [illegible]	886	1133	107	110	[illegible]	91	1618	1463	39 7	8 10	48 1	+ 1 8	+ 5 1	+ 6 9	
	No. 4 [illegible]															
9	[illegible] 300 maunds, [illegible]	418	67	209	57	32	312	578	1108	0 3	2 15	12 2	— 5 0	—25 14	—30 14	

No. 1.—Gujaria. This variety was sown under Government Order No. 12, dated 22nd September, 1885, and the quantity cropped has already been despatched to the India Office. Only 1 maund and 15 seers of S3ed was received from the* Superintendent, Botanical Garden, Saharanpur. It came rather late in the season, but with due care a fair crop was obtained. It gave a very good yield of grain, the percentage over straw being 91.

No, 2.—Muzaffarnagar white wheat. The sowing of this Variety was connected with an experiment tried for the first time at the station. The seed before sowing was pickled in a solution of copper sulphate. This process of pickling is almost universal in England, but in this country it is quite unknown. One of the two fields in which this experiment was conducted was also top-dressed with saltpetre, after the English fashion of sowing wheat. The result seems to be very successful. The top-dressed plot produced a crop worth Rs. 54-7-0 per acre, while the other which was not top-dressed with saltpetre yielded a crop worth Rs. 42-7-0 only. In the first case there was a clear profit of Rs. 16-11-0 over and in excess of what is obtained from the ordinary method followed by the caltivators.

No. 3.—Beardless. It was sown after the fashion in vogue in the country, to serve as a standard for comparison of the results of all experiments in money value. Though the field was to some extent affeoted by smut, yet the outturn was, on the whole, very good.

No. 4.—Kathya. This variety is a especial produce of the *mar* land of Bundelkhand. The result shows no success, and it may be assumed that no other SQU but *mar* is suited to it.

Barley.

23. The following varieties were tried, their roaulta a*e shown in the table .below : —

1. Rasuli (unhusked).
2. Chocolate.
3. Ordinary country variety of the Doab.

Table No. XIV—Barley.

1	2	3	4	5	6	7	8	9	10	11		12			13	14	15
Outturn.										*Comparison of cost and income with the ordinary kind of cultivation in vogue in the country.*							
[illegible]	Detail of special treatment with the rate *of* its cost.	Weight of unthreshed sheaves.	Weight [illegible]	[illegible] of straw.	[illegible]	Percentage of grain [illegible]	[illegible]	Increase or decrease over [illegible] 8-9 [illegible]	Increase or decrease per acre.	*Actual outturn per acre.*		*Value of outturn.*			[illegible]	[illegible]	[illegible]
										Grain.	Straw.	[illegible]	[illegible]	Total.			
	Quantity of manure applied per acre.	lb.	lb.		lb.			lb.	lb.	lb.	lb.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.
							No. 1—Chocolate colour variety.										
306	No manure, 2 waterings at Rs. 2-12 each,	202	47	94	64	50	200	...	...	1109	2209	18 2	4 8	22 10	+ 5 12	—15 6	—9 10
							No. 2—Unhusked or naked variety.										
[illegible]	Ditto ditto ...	157	12	78	64	15	650	...	...	538	3496	8 13	7 2	15 15	+ 5 12	- 22 1	- 16 5
							No. 3—Country barley.										
15	No manure, 2 waterings at Rs. 2-12 each,	1398	526	768	53	*69*	*U6*	...	...	1697	2478	27 13	5 1	32 14	+ 5 12	- 5 2	+ 0 10
16A	Lucerne ploughed in at Rs. 8-4 per acre and 2 waterings at Rs. 2-12 each.	296	106	84	53	126	79	...	...	2094	1659	34 5	3 6	37 11	—2 12	—0 5	- 2 7
							No. 1—Country barley.										
P.	Poudrette, 120 maunds per acre, at Rs 4 per 100 maunds, and 2 waterings at Rs. 2-12 each.	1430	678	567	53 3	119	83	...	103	1172	980	19 3	1 15	21 2	+ 0 15	- 16 14	—15 15
[illegible]	No manure, 2 waterings at Rs. 2-12 each,	3924	1561	882	53*8	177	[illegible]	...	...	1349	762	22 2	1 9	23 11	+ 5 12	- 14 5	—8 9

NOTE—The assumed figures are—

(1) Value of outturn of an acre of barley—

		Rs.
(a) Grain, 16 maunds @ Re. 1-8 per maund	=	24
(b) Straw, 24 ditto @ 6 maunds per Re.	=	4
Total ...		28

(2) Assumed cost of cultivation per acre is Rs. 20.

(3) The difference of the actual cost of the different experiments on barley and of the assumed cost of wheat (Rs. 38) is entered in column 13.

(4) The figures in column 15 show the loss or gain against or above the income from an acre of wheat (Rs. 36).

Nos. 1 and 2 were under Government orders procured from Sahāranpur. The seed received was, however, very small in quantity and so the crop raised was not much. Their produce is carefully preserved for next season.

Country barley.—The field in which it was sown after lucerne gave very good yield. This again con firms that, like clover in England, lucerne in India prepares the land for cereals. *Poudrette* here too, as in the case of wheat, produced no effect, but this looks extraordinary.

24.—Oate.—The cultivation of Cape oats was repeated. The following table shows its results :—

Table No. XV (Crops only).

1	2	3	4	5	6	7	8	9		10			11	12	13
	Outturn.							Comparison of cost [illegible] of the ordinary [illegible]							
								Actual outturn per acre.		Value of outturn.					
Number of plot as per map of the Farm.	Manure.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Grain.	Straw.	Grain at Re. 1-8 per 82 lb.	Straw at Re. 1 per 492 ft).	Total.	Increase or decrease per acre in cost against the cost of ordinary cultivation of wheat.	Gain or loss per acre in the value of outturn against wheat cultivated in the ordinary way.	Net profit or loss compared with the profit from wheat cultivated in the ordinary way.
			lb.	lb.				lb.	lb.	[illegible] as.	Rs. [illegible]	[illegible] as.	Rs. as.	Rs. as.	Rs. P.
22b	Quantity of manure [illegible] 100 maunds [illegible] 100 maunds, 76 [illegible] per 100 maund, Rs. 10 per 100 m[illegible]	[illegible]	834	900	[illegible]	40	252	2,324	5,861	[illegible]	17 [illegible]	40 6	+7 8	+22 6	+14 [illegible]
[illegible]	Cowdung, 200 maunds at Rs. 8 per 100 maunds.	1083	384	782	40½	50	201	1,834	—	38 8	[illegible]	44 13	+8 0	+ [illegible]	+8 [illegible]
[illegible]	[illegible] ploughed in Rs. 8-4-0 per [illegible]	998	113	149	41	79	127	1,808	—	38 [illegible]	[illegible]	18 15	+5 4	—9	—14 [illegible]
[illegible]	[illegible] 200 maunds at Rs. 3 per [illegible]	784	205	689	40½	50	212	1,012	[illegible]	18 8	[illegible]	26 [illegible]	+8 0	—8 [illegible]	—[illegible]
	Total	4,086	1,107	2,572	142½	[illegible]	[illegible]	6,460	14,359	113 7	43 14	163 4	+1 [illegible]	+10 4	[illegible] 8
	Average	3,016	277	643	41	50	[illegible]	1,610	[illegible]	8 10	10 15	40 9	+[illegible]	+[illegible]	—[illegible] 2

The above figures prove that growing oats is very profitable. With woollen refuse it gave an outturn worth Rs. 60 per acre, far in excess of any crop, even wheat. In one of the two fields to which it was applied, cowdung too gave good results.

Lucerne ploughed in as a green manure has not shown any excess here.

LEGUMINOUS CHOPS.

26.—As a rule, gram in this oountry is grown without any manure or watering, and even with no good tilth. The cost of sowing gram is the least of all grains, being only about Rs. 15, and its outturn is usually worth about Rs. 20. The figures in the following table show that by good culturer and good treatment the outturn, and thereby the net profit, can be considerably increased. Similar remarks are applicable in the case of peas also. The following table gives the result:~~

Table No. XVI.

Number of plots as per map of the farm.	Detail of special treatment with the rate of the cost.	Outturn.* Weight of unthreshed sheares.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Comparison of cost and income with the ordinary kind of cultivation in vogue in the country. Actual outturn per acre. Grain.	Straw.	Value of outturn. Grain at Re. 1-8 per 82 lb.	Straw At Re. 1 per 492 lb.	Total.	Increase or decrease per acre in cost against the cost of ordinary cultivation.	Gain or loss per acre in the value of out turn against ordinary cultivation of wheat.	Net profit or loss against the assumed income, by cultivation of wheat Rs. 38.
1	2	3	4	5	6	7	8	9		10			11	12	13
	Quantity of manure applied per acre.	lb.	lb.	lb.	lb.	lb.	lb. Gram.	lb.	lb.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.
26	Sheep dung 200 maunds at Rs. 3 per 100 maunds and one watering at Rs. 2-12-0 = 8-12-0.	1,246	678	516	62	131	71	2,681	1,608	36 9	6 2	42 4	+2 8	+4 4	+6 12
9	Saltpetre 1 cwt. at Rs 6-8-0 per 82 lb and one watering at Rs. 2-12-0 = 9-8-0.	818	205	312	62	66	152	1,367	1,966	22 9	7 11	30 4	+3 12	—7 12	—4 0
1	No manure, one watering at Rs. 2-12-0	153	39	86	62	35	287	640	1,647	8 7	6 1	*15 8	+8 2	—22 8	—14 0
9	Lona 4 cwt. at Rs. 1-8-0 per 82 lb = 3-2-0 and one watering at Rs. 2-12-0 = 5-8-0.	124	92	160	62	57	174	721	1,253	13 10	4 14	17 8	+5 13	—20 8	—14 12
	Total ...	2,240	1,066	1,075	248	336	690	4,609	6,339	80 12	24 12	105 8	+20 8	—45 8	—33 0
	Average ...	561	281	269	62	73	172	1,152	1,658	20 3	6 8	26 6	+5 2	—11 10	—8 8
							Peas								
29a	Mixture of cowdung, sheep dung, poudrette 200 maunds, at a total cost of Rs. 10 and one watering at Rs 2-12-0.	1,723	578	1,016	62	56	176	2,311	4,074	35 15	15 14	52 13	—1 8	—14 13	+13 5
24	Poudrette 200 maunds at Rs. 4-0-0 per 100 maunds and one watering at Rs. 2-12-0.	1,255	395	633	62	63	168	740	1,172	11 14	4 9	16 7	+0 8	—21 9	—21 1
	Total ...	3,282	968	1,638	124	119	334	3,054	5,246	48 13	20 7	69 4	—1 0	—6 12	—7 12
	Average ...	1,641	484	819	62	59	167	1,527	2,623	24 6	10 3	34 10	—0 8	—3 6	—3 14

* Suffered from waterlogging in the fields.

27.—*Linseed.*—Two varieties of linsped, (1) Riga, (2) country, were sown ; both destroyed by insect pest *{aphis)* called *mahun.*

Experiment on foreign seeds.

28.—During the season under report the following seeds were obtained from the English seedsmen, and tried on the farm : —

(1) Field bean, two varieties— } Received from Messrs. Praschkauer and Co., England.
- (a) Dwarf.
- (b) Creeping.

(2) Green peas.
(3) Egyptian lentil.
(4) Canary seed.

(5) Mangold (golden tankard.) } Messrs. Sutton and Sons, England.
(6) Belgium carrot.

Tho first three, notwithstanding every possible care and exertion, either did not germinate or the plants perished soon after germination.

They were sown in three different places and some of them two or three times. A few plants of the bean which germinated and grew a foot high were attacked and destroyed by *aphis.*

Canary seed succeeded very well. It was sown in two places and both plots gave good yield.

Mangold and Belgium carrot.—A large supply of these seeds was obtained fresh from England and distributed in the country. At the station mangold was grown in two plots. The plot, which received saltpetre and superphosphate as manure, yielded 22,854 tb per acre, which at the rate of only four annas per maund is worth about Us. 70. Though the expenses of cultivation exceeded by Rs. 8-2, yet the net profit was not small, being Ra. 24-15 against Rs- 8 yielded by a crop of wheat. In tho second plot a mixture of very good farmy»rd manure with gypsum was applied, yet without saltpetre and superphosphate it gave a very poor outturn. However profitable the growing of mangold may be, but commonly Ihere being no use of it in tho country, there can be no hope that the people would take it up.

Carrot seed also gave a very good crop, but the produce of several fields was fed off to farm bullocks in odd times.

Tobacco Experiment.—During the season two varieties of American tobacco and one of native was sown and cured after the Burmese and native fashions, and the samples sent to Pusa tobacco factory for opinion. The results did not turn up as satisfactory as were expected.

Ensilage.'—As promised in the last kharif report, para. 21, page 12, the experiment of feeding cattlo on two kinds of ensilage was tried.

Two batches of cattle, sis in each, were fed on tho two kinds of ensilage. In each batch the beasts were selected of nearly equal age and condition. To determine the effect of the fodder on milk, four cows were also fed and the result recorded Tho experiment kept on for four weeks, beginning from tho 22nd of May when there was no grass and other kind of fodder to be had. The beasts were kept in stall, only being turned out in fresh air for an hour or two.

The result is recorded as per following table :—

7.—Experiment with regard, to gain in flesh.

No.	Age Years.	Age Months.	Kind of fodder given, with quantity.	Quantity of fodder left unconsumed.	Weight on the 1st day of experiment. M. S. C.	Weight at the end of 1st week. M. S. C.	Weight at the end of 2nd week. M. S. C.	Weight at the end of 3rd week. M. S. C.	Weight at the end of 4th week. M. S. C.	Difference between the first and last week. Increase in weight. M. S. C.	Difference between the first and last week. Decrease in weight.
1	4	...	Old ensilage alone, 10 seers ...	[illegible]	6 4 8	6 3 8	6 4 12	6 9 4	6 10 0	0 5 8	
2	3	...	Ditto ditto, 7 ,, ...		4 18 0	4 18 4	4 18 0	4 20 0	4 20 0	0 4 0	
3	3	6	New ensilage alone, 10 ,, ...		5 1 0	4 39 0	5 0 0	5 4 0	5 5 8	0 4 8	
4	3	...	Ditto ditto, 7 ,, ...		3 23 0	3 20 0	3 21 0	3 27 0	3 30 0	0 7 0	
5	3	...	Half old and half new ensilage, 10 seers.		2 28 0	4 24 8	4 25 0	4 32 0	4 33 0	0 5 0	
6	2	6	Ditto ditto, 8 seers ...		4 28 4	4 26 4	4 28 0	4 33 0	4 35 4	0 7 0	Nil.
7	2	6	Half new ensilage and half bhusa, 12 seers.		4 24 12	4 28 0	4 24 0	4 27 0	4 29 0	0 4 [illegible]	
8	2	...	Ditto ditto, 8 seers ...		4 16 8	4 14 8	4 15 4	4 18 8	4 20 0	0 3 [illegible]	
9	2	3	Bhusa alone, 12 seers ...		[illegible]	[illegible]	[illegible] 13 0	4 15 4	xo	u x [illegible]	
10	2	...	Ditto, 8 ,, ...		3 18 12	3 20 4	3 22 0	3 25 0	3 25 12	0 7 0	
11	2	...	Half mangold and half bhusa, 10 seers.		4 36 0	4 35 0	4 35 8	5 0 0	5 2 0	0 6 [illegible]	
12	2	...	Ditto, ditto ...		4 ia 0	4 13 0	4 14 8	4 16 4	4 18 0	0 5 0	
			Total ...	...	57IT 0	54 14 8	54 21 8	55 27 4	56 6 0	1 20 [illegible]	

II.—Experiment on the effect of fodder on milk.

No.	Fodder.	Quantity of milk given at 1st week.	Quantity of milk given at the end of 4th week.
1	San* a mixture of bhusa cake and water as much as they can eat.	0 1 8	0 1 11
2	Usual sani with sliced mangold as much as they can eat.	0 2 0	0 2 6
3	18 months old ensilage and cabbage ... ... 9 months old eusiluge and cabbage.	0 2 0	0 2 7

The above figures show that by the change of food the animals lost some weight in the first week, but gradually increased after it. The total increase at the end of the 4th week was 1 maund and 20 seers, proving that both the old and the, new ensilage had feeding value by no means inferior to hhusa, which in the country is considered first-rate fodder for cattle. The eighteen-months[1] old ensilage by no means seems to contain less nutritive ingredients than any of the fodders compared with. On milk too it has shown no bad effect.

Determination of the nutritive value of inga dulcis *and of babul* (acacia arabica) *pods.*—Ten ^heep of pretty equal age and condition were fed on each kind. They were turned out in fresh air for only two or three hours every day to graze. Five seers of pod of each kind was the ration per head.

* The result stands thus :—

Description.	By feeding *inga dulcis.* M. s. c.	By feeding babul pods. M. s. c.
Total weight of ration given to ten sheep for 27 days at 5 seers per head.	3 15 0	3 15 0
Total weight of fresh excrement	3 35 0	4 14 0
Total weight of ton Hheep on the 6th May, 1586	5 2 0	6 4 0
Total weight of ten sheep on the 1st of June, 1886... ...	5 20 0	6 15 0
Total increase in weight	0 18 0	0 11 0
Increase per cent.	8·9 0 0	4'5 0 0

From the above figures it will be seen that the sheep fed on *inga dulcie* gained «even seers more weight than those fed on babul. Moreover, the excess in the weight of solid fresh excrement of the sheep fed on babul beans leads to two points, *(a)* either the stuff is not so well assimilatad as the *inga dulcis, (b)* or it made the sheep drink water in excess. The former fact, however* seems more reasonable, because it is confirmed by the sheep gaining more weight by eating *inga dnlcis,* being nearly 9 per cent, while in the other case the increase in weight is only 4*5 per cent.

Implements, supply of.—The following comparative statement will show the progress in the sale of the improved implements, made in the workshop aud imported from other countries :—

	Ploughs.				Pumps.			Sugar pan.			Grain kibbling mill.			Chpff-cutter			Drtd-yer.		
	Sold.	Sent for trial.	Sent to district.	Total.	Sold.	Sent for trial.	Total.	Sold.	Sent for trial.	Total.	Sold.	Sent for trial.	Total.	Sold.	Sent for trial.	Total.	Sold.	Sent for trial.	Total.
From 1st January to 15th August, 1885.	82	3	...	85	8	—	8	4	4	8	5	...	5	6	...	6	1	...	1
From 1st January to 15th August, 1886.	106	27	107	240	31	11	42	4	...	4	10	...	10	7	...	7	4	1	5

The ploughs are coming more and more into use now. It can be positively said that almost iu all districts a few at least are being* used by *bond fide* kāshtkūrs, and those who can afford buying it and have learnt using it properly, do really like them. The plough which decidedly is considered to be the best of all is Watt's For foul land the people uuobjectionably prefer using it, but there are two great draw-backs in the way of its success, (1) the high price, as it cannot be imported for less than eleven or twelve rupees, *{2)* its breast and mould board, rather the whole body being broader and larger, requires drafUcattle stronger than the bullocks commonly used for ploughing.

Since last rabi season in some selected districts in the united provinces tho ploughs are sent with traiued *men* to be worked in ploughing seasons, in order to let the people have an opportunity of judging the result of its work at their very doors. At present in nine districts the ploughing campaign is going on : about 80 ploughs are at work. It is hoped that after seeing the advantages of the improved imple-ment, the people will have more reason to appreciate it.

Pump.—The demand for pump is on an increase. It is owing only to its high price that it is not used more freely by common people. Attempts are being- made to make it cheaper. It has unquestionably been admitted by practical farmers now that fur the places where canal water requires lifting, it is an unequal appliance. Eleven pumps are sent to canal officers for trial and to make the people acquainted with its advantages. Thirty-one were soM daring the period nnder report against eight during the corresponding period last year.

Sugar ecap >vator.—Whether this pan is good for the large manufactory of " gur" i* a question yet to be decided. Those who have purchased it doubt of its being of much use to them.

Grain kibbling mill and chaff-cutter.—These two machines are growing more and niore popular. Their price is Rs. 35 a piece. They are imported from England. The purchasers seem highly satisfied with them.

Seed.--The* following comparative statement shows success in the distribution of the seeds : —

	Muzaffarnagar white wheat.	Cape oats.	Barley.	Sorgho.	Nankin seed.	Guinea grass.	Linseed.	Tobacco.
	lb. oz	lb oz	lb. oz.	lb. oz	lb. oz	lb. oz	lb. oz	lb. oz.
Distributed from 1st January to 15th Augufct, 1835.	344 0	164 0	52 0	126 4	832 2	6 6	11 0	1 0
Distributed from 1st January to 15th AuguBt, 1886.	14,112 0	92 0	41 0	517 0	712 8	37 14	17 10	1 15

Wheat.—During the last eight months 14,112 lb. or over 172 maunds were sent out from the farm produce, while indents for 1,563 maunds are in the course of satisfaction. After the rains, as far as possible, these will be satisfied. There are over 200 maunds of selected seed in the farm stock, and the remaining quantity, as much as the grant will permit, will be purchased from Muzaffarnagar.

*Oats and barley**—Good barley can be had almost at every place, while indents for oats are every year satisfied after the rains*.

Sorgho, guinea grass and lucerne.—These seeds hare bden distributed in larger quantities than in last year. The guinea grass is widely sown this year by the officers of the Irrigation Department on the banks of the canals.

SAYYID MUHAMMAD HUSAIN, M.R.A.C.,
AseU Director, in charge of Experimental Station.

REPORT ON THE

CAWNPORE EXPERIMENTAL STATION

FOR THE KHARIF SEASON OF 1886.

ALLAHABAD:

HOBTH-WESTUBN PROVINCES AND OUDD GOVERNMENT PRESS.

1887.

DEPARTMENT OF AGRICULTURE AND COMMERCE, N.-W. P. AND OUDH.

DATED CAWSPORE, THE :>2SD JANUARY. 1887.

FROM

DONALD **SMEATON,** ESQ., **M.A., C.S.,**

Din., DEFT, OF AGHI. AND **COMMERCE,**

IS^T.-W. PaoyiFOES AND OUDII,

To

THE CHIEF **SECRETARY TO** GOVERNMENT,

N -W. rnovisfCEs AND OIDII.

SIR.

] HAVE the honor to submit, for the consideration of his honor the Ueutcnnnt-Gnvernor, **the report** written by Mir Mahomed Iloscln, **Assistant** Director **of Klmrif** Operations on the Cawnpore Experimental Station.

2. The heavy **hailstorm** in the end of October destroyed most ati<i **damaged** the **remainder** of the crops on the station.

Mir Mahomed **Horaehi** accordingly has only noticed the continued experiments **in** cotton and maize culture.

3, The most important of the **cotton experiments was that which** luis confirmed tlic belief that—

(I) Deep **ploughing** is **better than** shallow **ploughing** for cotton ;

(II) And that **the efect** of deep ploughing is greatly enhanced by **manuring.**

4 As regards maize, **the experiment** has shown that although the weight of the **yield obtained by** cultivating on the American fashion is **less,** the cobs are larger and plumper.

Further experiment may show that the American method, called the " hill " method, will yield a larger gross yield, the theory **of** the American* **beiDg that** the more sunlight the plants get **the Wore** and the larger cobs **they** will yield.

5. The rest of the experiments do not call for **special mention.**

I have the honor to be.

Sis,

Your most **obedient** servant.

DONALD **SMEATON,**

Director.

REPORT

ON'THB

CAWNPORE EXPERIMENTAL STATION

For the Kharif Season of 1886.

*Character of tl*e season.—Tha* season had beea quite an extraordinary and unfortunate one in many ways for the crops. The experimental station was an especial victim of it Tho rain eommeaeed very early and the season seemed to be very promisinw, but a long break of the rain in August just at the time it was greatly needed caused snort deul iunnge to mafee crops. It ceased for about 20 days altogether, and we were obliged to protect some of the fields by irrigation. After that, till about the end, the monsoon had been very reguhir and favourable, but at the time the poises and millet crops were ready for being liar vested, and only four or five times cotton pioking was done, a most severe hailstorm killed the former crops all of a sudden and damaged tho latter (cotton) considerably. In some fields Hie hailstones accumulated as thick as three inches, and did not melt altogether for 3G hoars. The fearful storm did not only spoil the kharif harvest entirely, but has done great harm to the present *rabi crops* too. *Jho enrly sown cereals were- beaten down flat and plucked off to some extent, and tho seed which was not come out yet, owing to fife tilth of the fields being silted up did »ot germinate welt. The great damage which it has done is spoiling the culture of the rabi fields, which more or less will affect the crops on the whole.

Under the circumstance the results of experiments in review are-not worth laying 'iny stress upon. However, the result of the cotton and maize crops have been recorded, and of the pulses- and millet which did not give any produce are left off.

The cottou and maizes experiments are very old on the farm, and by continuous Operations ibeir' results have beea fairly confirmed. It ia therefore intended that from the next season for three succeeding years indigo and sugarcane culture which has got a very High place in Indian farming, *iU bo added id tlie list of experiments.

For the sake of teaching the Bgnooltoriab "tat bow and ia what way *their* business can be more paying) the experimonta mostly will be tried not from the scientific "•" from Ihe economical point of view. The tables herewith appended will *tr'wv* the ^fctiiil of the special treatments, and the'results of the experiments.

Under the head of cotton the experiments were—

(a) *Keeping nankin* or *khaki cottoa-plots-for* 2 *or 3-year.i in a fidd half ratt*ooned *»nd half unratooned* to see:—

0) The comparative produce of the ratooned against the unratooned portion of the' field.

(2) Tho comparative yield of them against the field sown annually.

IS} The effect of" the long standing over the color of the cotton.

(4) The effect and economy of purchased fertilizer against the common farmyard manure.

Both er the [dots {ratooned and unratoonod) were grubbed twice and weeded once. Saltpetre and jmperpho,sph:itc ;;it the rate of 2 cwt per acre applied, There was no other cost abova that,

From table No. I *h* will be aeen-

(1) That unratooned portion gavo more cotton and less seed than the ratooned one.

(S) Comparing with the result of the same kind of cottoa fresh sown, the result "f which is tabulated in statement No. 2, it will be seen .thnt this has given much larger yield.

This may be attributed partly to the effect of the artificial manureapplied to.

(3^ There was no difrerence of color between the two crops in this (first) year.

The economical result of applying costly manure is no good, but itmaybeowing to the bad season.

(b) The tame cotton town in tuo plot, side-by side, in one before and in the other after rain :—*

Each plot was of 1286 square yards; the one sown before rain was irrigated once, ! Farm }'ard manure at 200 maunds per acre was given to both.

All other-treatments for both were the same.

The Statement Mo, II will show that the cotton sown after rain gave comparatively better yield. This ia however extraordinary. Early sowing'for cotton, as a rule, is always better.

The economical result of either is not good.

{c) Country cotton sown UUre and after rain with four different kinds of manure. To determine—*

(1) The result of early and late sowing.

(2) The effect of the manures applied.

From statement No. **Ill,** it will'be seen that the cotton sown before rain has an average shown better result than that E°wn after n\nf being 84 against 59 ft>s. per acre.

(3) The effeot of the manures on the two kinds of sowing appeared to be changeble. This may be due to the unfavorable season.

(d) lo determine the tfect of- deep and shallow plovphlng, with the improved and country ploughs alone, and with and without manure:—

(1) Four plots of 300 square yards each were treated as follows. They did not receive any manure :—

One **with** "Watt's plough, 9 inches deep.

One „ Duplex „ 5 „ „

Two „ Country „ 3 » „

(2) Six other plots were divided into two portions *A* and /?, each being of 800 square yards. They wore operated as under—No. 5 *a* and *b* ploughed 9 inches with the "Watt's plough—No. 6 *a* and *h* ploughed 5 inches deep, No. 7 a and l> **ploughed** 3 inches deep. Ta all *A* plots 100 maunds per acre farm yard manure was applied. AII the *B* plots were left unmanurod.

The appended statement No. IV confirms the result that the deep ploughing lias; advantages over the shallow one and the deep plongbing with manure is still more advantageous.

The experiments on maize were conducted as follows:—

(a) Sowing maize after American fashion Us determine (1) its advantages again.*:, the country way ci' sowing, (2) to find out the difference between the cost of the two processes.

A field was divided into 4 plots of | of f acre each. One of them was sown after country fashion, i.e., seed thrown in the furrows behind a plough, and in three plots the need was sown in lines 2, 3, »nd & feet apart. The plants in all plots were earthed up.

The statement No. V. will show that—

(1) The country way of sowing has produced more.

(2) That the ihinner tho sowing the less the yield was.

Plot No. 1 produced 1,323 tt»s, of grain against 241 Its, obtained from No. 4 plot sown 4 feet apart.

(3) That in the cost of the two Itinds of sowing there is no marked difference.

There is however one fact to be noted, that the cobs of the plants 6O#n in lines were larger and more plump than those of the other plots.

{b) Determination of the effect of different fertilizers on maize grown year after year in 13 *pints termed Standard, and to compare their results with other* 13 *ploU named Duplicate, which are treated just in the same toay as above ones, but they are kept under rotation vf wheat and maite •alternately:—*

This is the oldest experiment on the farm. Ita obi eots are more scientific than economical. They may be noted thus:—

(1) To find out that by sowing one kind ,of grain and by **applying** one kind of manure for what time the strength of a soil can be kept on ?

(2) Does the rotation change the condition of the fertility ?

' Statements Nos. VI and VII will show the results. From the table number 6 it will be seen that even in the bad season the cowdung and saltpetre, singly and combined with other fertilizers, did not fail to give their usual results, and proved to be trne in their good effect, in all cases and in every circumstanoe.

The figures in the table No. 7 show a result contrary to that, which in the major- ' **ity** of cases has been heretofore recorded, *viz.,* the plots alternated with wheat and maize yielded much less than their counterparts. Perhapa **this** also may be due *to* the bad season.

(c) To compare the* mammal value of certain animal matter with the ordinary kind of fertilizers eight plots are kept under this experiment. The site of these plots .beincr most suitable for a wet crop, they are less affected by the unfavourableuess of tbe season. They are on high ground inclined to-one direction, so the rain water can never injuriously lodge in them, and there being irater-courses on both sides of them, they derive great benefit from the same. Wheu there is excess of rain the trenchment of the'water-courses help the plots in sabsoil draiuage, and otherwise the canal water running in them supply enough moisture to the subsoil.

They are the only plots which have produced a fair crop during tho season. Table NO. VIII will show the result. Woollen refuse, poudrette, find sheep dung have left a good margin of profit against their cost-

They have generally proved to do the same.

Unfortunately other experiments have been totally spoilt by the hailstorm, and their final results could not be noted, so they are left out here.

MIR MAHOMED HOSEIN, M.R.A.C.,

Asst. Director and Supdt. of Experimental Station, Number of plates per map of Farm.

assessed Income Rs. 45.

Xo, 3-y OF 18S7.

DEPARTMENT OF AGRICULTURE AND COMMERCE, N.-W. P. AND OUDH.

DATED CAWXPOUE, THE 22ND JANUARY, 1887.

FROM

DONALD SMEATON, ESQ., M.A., C.S.,
DIR., DEPT. OF AGRI. AKD COMMERCE,
^N.-W. PROVINCES AND OUDII,

To

THE CHIEF SECRETARY TO GOVERNMENT,
N -W. PROVINCES AND OUDII.

SIR,

I HAVE the honor to submit, for the consideration of his honor the Lieutenant-Governor, the report written by Mir Mahomed Hosein, Assistant Director of Kharif Operations on the Cawnpore Experimental Station.

2. The heavy hailstorm in the end of October destroyed most and damaged the remainder of the crops on the station.

Mir Mahomed Ilopsein accordingly has only.noticed the continued experiments in cotton and maize culture.

3. The most important of the cotton experiments was that which has confirmed the belief that—•

(I) Deep ploughing is better than shallow ploughing for cotton ;
(II) And that the effect of deep ploughing is greatly enhanced by manuring.

4 As regards maize, the experiment has shown that although the weight of the yield obtained by cultivating on the American fashion is loss, the cobs are larger and plumper.

Further experiment may show that the American method, called the " lull" method, will yield a larger gross yield, the theory of the Americans being that the more sunlight the plants get the more and the larger cobs they will yield.

5. The rest of the experiments do not call for special mention.

I have the honor to be.

SIR,

Your most obedient servant,

DONALD SMEATOX,

Director.

COTTON No. III.—Experiment of early and late sowing.

Quantity of manure applied per acre.	Value of manure.		No. of Plot per Map of Farm.	Weight of uncleaned cotton.	Weight of cleaned cotton.	Weight of seed.	Percentage of cotton on seed.	Difference.	Difference per acre.	Outturn per acre: Cotton.	Outturn per acre: Seed.	Value of outturn per acre: Cotton at ... 1 per 6 lbs.	Value of outturn per acre: ... 1 per 61 lbs.	Value of outturn per acre: Total.	Gain or ... per acre in the cost ... assumed to be Rs. 31-1-0.	Gain or loss per acre in the value of Outturn against ordinary cultivation assumed to be Rs. 45.	Net profit or ... over or against the ... income Rs. ...	Remarks.
	Rs. a.		1	2	3	4	5	6	7	8	8	9	9	9	10	11	12	13
Woods ash ... mds. at ...	6 4	Sown before rain and ... water given.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
... mds. at ...	7 4		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Poudrette ... per ... mds., ... Rs. 4-0-0	9 4		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Cow-dung 200 ... per 100 mds. ... Rs.	7 [illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Woods ash ... mds. at ...	5 0	Sown ... and ... seed.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Sheep-dung ... Rs. 3-0-0 per ... mds.	[illegible] 0		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Poudrette ... per 100 ...	8 0		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Cow-dung ... per 100 ...	6 0		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

REPORT

ON'THE

CA.WNP0RE EXPERIMENTAL STATION

For the Eharif Season of 1886.

*Character oj tl*e season.—The* season had been quite an extraordinary and unfortunate one in many ways for the crops. The experimental station was an especial victim of it. The rain commenced very early and the season seemed to be very promising, but a long break of the rain in August just at the time it was greatly needed caused good deal damage to maize crops. It ceased for about 20 days altogether, and We were obliged to protect some of the fields by irrigation. After that, tiH about the end, the monsoon had been very regular and favourable, but at the time the pulses and millet crops were ready for being harvested, ami only four or five times cotton picking was done, a most severe hailstorm killed the former crpps all of a sudden and damaged the latter (cotton) considerably. In some fields the hailstones accumulated as thick as three inches, and did not melt altogether for 36 hours. The fearful storm did not only spoil the kharif harvest entirely, but has done great harm to the present *rabi crops* too. The early sown cereals were beaten down flat and plucked off to some extent, and the seed which was not come out yet, owing to fine tilth of the fields being silted np, did wot germinate well. The great damage which it has done is spoiling the culture of the rabi fields, which more or less will affect the crops on the whole.

Under the circumstance the results of experiments in review are not worth laying any stress upon. However, the result of the cotton and maize crops have been recorded, and of the pulse* and millet which did not give any produce are left off.

The cotton and maizes experiments are very old on the farm, ^nd by continuous operations their results have been fairly confirmed. It is therefore intended that from the next season for three succeeding years indigo and sugarcane culture, which has got a very high place ift Indian farming, will bo added in the list of experiments.

For the sake of teaching the agriculturists that how and in what way their business can be more paying, the experiments mostly will be tried not from the scientific but from the economical point of view. The tables herewith appended will give the detail of the special treatments, and the results of the experiments.

Under the head of cotton the experiments were—

(a) *Keeping nankin or kliaki cotton plots for 2 or & years in a field half ratooned* «nd *half unratooned* to see:—

0) The comparative produce of the ratooned against the unratooned portion of the field.

(2) The comparative yield of them against the field sown annually.

13) The effect of the long standing over the color of the cotton.

(4) The effect and economy of purchased fertilizer against the common farm-yard manure.

Both of the plots (ratooned and unratooned) were grubbed twice and weeded once. Saltpetre and ^superphosphate at the rate of 2 cwt. per acre applied. There was no other cost above that.

From table No. I it will be seen—

(1) That unratooned portion gave more cotton and less seed than the ratooned one.

(2) Comparing with the result of the same kind of cotton fresh sown, the result of which is tabulated in statement No. 2, it wi'l be seen that this has given much larger yield.

This may be attributed partly to the effect of the artificial manure applied to.

(3; There was no difference of color between the two crops in this (first) year.

The economical result of applying costly manure is no good, but it may be owing to the bad season.

(b) The same cotton sown in two plots, side'by side, in one before and in the other after rain .—

Each plot was of 1286 square yards; the one sown before rain was irrigated once. Farm yard manure at 200 maunds per acre was given to both. .

All other-treatments for both were the same.

The Statement No. II will show that the cotton sown after rain gave comparatively better yield. This is however extraordinary. Early sowing'for cotton, as a rule, is always better.

The economical result of either is not good.

(c) Country cotton sown before and after rain with fotir different kinds of manures. To determine—

(1) The result of early and late sowing.

(2) The effect of the manures applied.

From statement No. III. it will'be seen that the cotton sown before rain has at an average shown better result than that sown after rain, being 84 against 59 lbs. per acre.

(3) The effect of the manures on the two kinds of sowing appeared to be changeble. This may be due to the unfavorable season.

(d) lo determine the effect of- deep and shallow ploughing, with the improved and country ploughs alone, and with and without manure ;—

(1) Four plots of 300 square yards each were treated as follows. They did not receive any manure : —

One	with	Watt's plough,	9 inches	deep.
One	,,	Duplex ,,	5 »	,,
Two	,,	Country ,,	3 ,,	,,

(2) Six other plots were divided into two portions *A* and /?, each being of 800 square yards. They were operated as under—No. 5 *a* and 6 ploughed 9 inches with the Watt's plough—No. 6 *a* and *b* ploughed 5 inches deep, No. 7 *a* and *b* ploughed 3 inches deep. To all *A* plots 100 maunds per acre farm yard manure was applied. All the *B* plots were left unmanured.

The appended statement No. IV confirms the result that the deep ploughing has advantages over the shallow one and the deep ploughing with manure is still more advantageous.

The experiments on maize were conducted as follows:—

(a) *Sowing maize after American fashion to determine* (1) its advantages against the country way cf sowing, (2) to find out the difference between the cost of the two processes.

A field was divided into 4 plots of £ of an acre each. One of them was sown after country fashion, i.e., seed thrown in the furrows behind a plough, and in three plots the seed was sown in lines 2, 3, and 4 feet apart. The plants in all plots were earthed up.

The statement No. V. will show that—

H) The country way of sowing has produced more.

(2) That the thinner the sQwing the less the yield was.

Plot No. 1 produced 1,328 tt>s. of grain against 241 fts. obtained from No. 4 plot sown 4 feet apart.

(3) That in the cost of the two 1dnds of sowing there is no marked difference.

There is however one fact to be noted, that the cobs of the plants sottn in lines were larger and more plump than those of the other plots.

(6) *Determination of the effect of different fertilizers on maize grown year after year in* 13 *plots termed Standard, and to compare their results with other* 13 *plots named Duplicatej which are treated just in the same way as above ones, but they are kept under rotation -of wheat and maize alternately :—*

This is the oldest experiment on the farm. Its obi eots are more scientific than economical. They may be noted thus:—

(1) To find out that by sowing one kind .of grain and by applying one kind of manure for what time the strength of a soil can be kept on ?

(2) Does the rotation change the condition of the fertility ?

Statements Nos. VI and VII will show the results. From the table number 6 it will be seen that even in the bad season the cowdung and saltpetre, singly and combined with other fertilizers, did not fail to give their usual results, and proved to be true in their good effect, in all cases and in every circumstance.

The figures in the table No. 7 show a result contrary to that, which in the majority of cases has been heretofore recorded, *viz.,* the plots alternated with wheat and maize yielded much less than their counterparts. Perhaps this also may be due to the bad season.

(c) To compare the* manurial value of certain animal matter with the ordinary kind of fertilizers eight plots are kept under this experiment. The site of these plots .being most suitable for a wet crop, they are less affected by the unfavourableness of the season. They are on high ground inclined to one direction, so ihe rain water can never injuriously lodge in them, and there being water-courses on both sides of them, they derive great benefit from the same. When there is excess of rain the trenchment of the water-courses help the plots in subsoil drainage, and otherwise the canal water running in them supply enough moisture to the subsoil.

They are the only plots which have produced a fair crop during the season. Table No. VIII will show the result. Woollen refuse, poudrette, and sheep dung have left a good margin of profit against their cost.

They have generally proved to do the same.

Unfortunately other experiments have been totally spoilt by the hailstorm, and their final results could not be noted, so they are left out here.

MIR MAHOMED HOSEIN, M.R.A.C.,
Asst. Director and Supdt. of Experimental Station.

NANKIN COTTON NO. *I.—Edyerirtunt of Rationing and Unratocning outturn,and result*

Quantity of manure applied, per acre.	CALOCLATIOM OF DUB RKWLT A*D COMPARISON OF OUTTOEN WITH THB "BTANDAHD PLOT IN THB SERIES.						CCMPARIBON OF COST AMD INCOME WITH THE OBDINABY KIND OF CULTIVATIOn IN VOGUE IN THIS COINTUT.								
		1	2	3	4	5	6		7			8	9	10	11
							Aetna! outturn ptr acre.		*Value of outturn.*						
	Value of manure.	[illegible]	Weight of cotton.	[illegible] of seed.	[illegible] of seed or cotton.	Increase or decrease per acre.	Seed.	[illegible]	at Rs. 1 per 4 lbs.	at Rs. 1 per 41 lbs.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Eg. a.	No. 8.	lbs.	Jbs.	lbs.	lbs.	H53	ft*.	Its. a.	Us. tf.	Rs. a.	Bs. a.	Bs. a.	Bs. a.	
Saltpetre and Dune superphosphate each 2 cwt.	18 9	**Rfltooned portion.**	23	6	35	- 8	46	130	11 8	3 3	14 11	— 9 11	- 30 5	— 40 0	
Ditto ditto. ditfo ...	18 9	**Un rationed** portion.	26	7	37	...	54	145	13 8	3 9.	17 1	- 9 11	- 27 15	- 37 10	

%* NOTE,—Deducted Us, 8-H-O fv,r ploughing, soed, manure, &c,; added Rs.' 18-9-C, the cost Q* purchased manure—the difference shown in column ?.

[illegible] No. II.—*Experiment of early and late sowing, outturn and* [illegible]

Quantity [illegible] applied.	Value of manure and one watering.	Number of plot as per map of Farm.	Weight of uncleaned cotton.	Weight of cleaned cotton.	Weight of seed.	Percentage of cotton on seed.	Percentage of seed on cotton.	Increase or decrease.	Increase or decrease per acre.	Actual outturn per acre: Cotton.	Actual outturn per acre: Seed.	Value of outturn: Cotton @ Re. 1 per 4 lb.	Value of outturn: Seed @ Re. 1 per 41 lb.	Value of outturn: Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 31-4-0.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 45.	Net profit or loss over or against the assumed income Rs. 45.	Remarks.
	1		2	3	4	5	6	7	8	9		10			11	12	13	14
	Rs. a.		lbs.	lbs.	lbs.	lbs.	lbs.	[illegible]	lbs.	[illegible]	lbs.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	
[illegible] watering...	7 4	P. 24 [illegible] rain.	22	8	17	20	283	[illegible]	[illegible]	[illegible]	88	6 8	1 [illegible]	[illegible]	* 2 12	37 15	40 11	
[illegible]	6 0	After rain ...	29	7	22	32	314	[illegible]	...	[illegible]	88	8 8	2 0	8 [illegible]	3 8	36 8	32 0	

* In first case column 11 includes the cost of [illegible] as well as of manure [illegible] case only of manure.

No. III.—Experiment of early and late sowing ... compared with ordinary cultivation ...

Value of outturn.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
No. of plots as per Map of Farm.	[illegible]	Sown after 3. ...	[illegible]	[illegible]	[illegible]	Sown before rain ...	[illegible]	[illegible]	[illegible]
Weight of uncleaned cotton.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Weight of cleaned cotton.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Weight of seed.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Percentage of cotton on seed.	Average	[illegible]	[illegible]	3	Average	[illegible]	[illegible]	[illegible]	[illegible]
Difference.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Difference per acre.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Actual outturn per acre. Cotton.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	125	[illegible]
Actual outturn per acre. Seed.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Value. Cotton at Re. 1 per 6 lbs.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Value. Seed at Re. 1 per 61 lbs.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Value. Total.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 31-4-0.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 45.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Net profit or loss over or against the assumed income Rs. 45.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Remarks.									

COTTON No. IV.—(*Kharif*) *Ploughing experiment.*

Kind of cultivation in	Value of ploughing and manure.	No. of plots as per map of Farm.*	Weight of uncleaned cotton.	Weight of cleaned cotton.	Weight of seed.	Percentage of cotton on seed.	Percentage of seed on cotton.	Difference.	Difference per acre.	Actual outturn per acre: Cotton.	Actual outturn per acre: Seed.	Value of outturn: Cotton at Re. 1 per 6 lbs.	Value of outturn: Seed at Re. 1 per 61 lbs.	Value of outturn: Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 31-4-0.†	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 45.	Net profit or loss over or against the assumed income Rs. 45.
	1		2	3	4	5	6	7	8	9		10			11	12	13
	Rs. a.		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.
Twice ploughing with country plough.	1 9	10 1	7	3 6	4 10	61	185	—	—	33	4	[illegible]	[illegible] 3	[illegible]	[illegible]	[illegible]	[illegible]
Once ditto 6" deep with improved plough.	0 13	2	10	5 7	6 9	69	181	+1 4	90	44	5	[illegible]	[illegible] 11	[illegible]	[illegible]	[illegible]	[illegible]
Ditto ditto 9" ditto with improved plough.	1 9	3	14	4 11	9 5	50	198	+9 8	40	74	0	1 [illegible]	[illegible] 7	1 [illegible]	+ 9	[illegible]	[illegible]
Twice ploughing with country plough.	1 9	4	6	2 1	3 15	54	181	3	[illegible]	34	3	[illegible]	[illegible] 0	[illegible]	+4 [illegible]	[illegible]	[illegible]
Once ditto 9" deep and manured with 100 maunds dung (a).	4 8	64	25	6 6	18 11	56	199	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] 10	[illegible]	+1 [illegible]	[illegible]	[illegible]
(b)	1 9	66	9	2 13	6 3	45	220	+	33	50	0	[illegible]	[illegible] 9	[illegible]	+4 [illegible]	[illegible]	[illegible]
Once ditto 3" deep and do. do.	3 13	67	17	5 13	11 3	52	192	[illegible]	[illegible]	37	87	[illegible]	[illegible] 1	11 [illegible]	+1 [illegible]	[illegible]	[illegible]
Ditto ditto	0 15	68	13	4 5	8 11	49	201	+4	0	44	67	[illegible]	[illegible] 13	[illegible]	+6 [illegible]	[illegible]	[illegible]
Twice ploughing with country plough and manured with dung 100 maunds per acre in (a).	4 8	74	10	6 3	10 6	62	191	+9	6	26	52	[illegible]	[illegible] 0	[illegible]	+0 [illegible]	[illegible]	[illegible]
(b)	1 9	76	13	4 7	8 9	51	198	[illegible]	[illegible]	97	61	4 3	0 13	5 6	+4 9	[illegible]	[illegible]

* NOTE.—From No. 1 to 4 each plot is 500 square yards, show the result of only ploughing and no manure. 64 to 7[illegible] each portion (a, and b) [illegible] square [illegible] result of manured against unmanured plots, all the (a) portions were manured and (b) were [illegible] [illegible] the [illegible] [illegible] as well as the

† The entries of column 11 are made up from the savings of the cost of manure and of the number of ploughing being [illegible] in or [illegible] of cultivation cost.

(L)

Treatment.	Seed sown at a distance of			
	ditto	ditto	ditto	[illegible]
Value of manure.	[illegible]	[illegible]	[illegible]	[illegible]
Weight of cobs.	996	835	842	[illegible]
Weight of grain.	336	200	[illegible]	[illegible]
Weight of stalks.	576	635	[illegible]	[illegible]
Weight of grain per bushel.	[illegible]	[illegible]	[illegible]	[illegible]
Percentage of grain on stalks.	[illegible]	[illegible]	[illegible]	[illegible]
Percentage of stalks on grain.	[illegible]	[illegible]	[illegible]	[illegible]
Increase or decrease over the lost plot.	[illegible]	[illegible]	186	275
Increase or decrease per acre.	[illegible]	1,538	[illegible]	1,087
Grain.	[illegible]	790	597	[illegible]
Stalks.	[illegible]	[illegible]	[illegible]	[illegible]
Grain at Re. 1 per 61 lbs.	[illegible]	[illegible]	[illegible]	[illegible]
Stalks at Be. 1 per 4,812 lbs.	[illegible]	[illegible]	[illegible]	[illegible]
Total.	[illegible]	[illegible]	[illegible]	[illegible]
Gain or loss per acre in the cost against ordinary cultivation aesumed to be Rs. 16&.	[illegible]	[illegible]	[illegible]	[illegible]
Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 20.	[illegible]	[illegible]	[illegible]	[illegible]
Net profit or loss over or against the assumed income Rs. 20	[illegible]	[illegible]	[illegible]	[illegible]

J{cnmiks

Maize No. [redacted] a dard—Manure experiment.

Out columns 1 to 9 give the results obtained by applying the manures ... in the ... plot in the season.

Columns 10 to 14 compare the value of the yields with the cost of cultivation of the ... in the ...

No.	Particulars	Values
	Quantity of manure applied per acre.	[illegible]
	Value of manure.	[illegible]
1	Number of plots as per map of Farm.	[illegible]
2	Weight of unthreshed cobs.	[illegible]
3	Weight of grain.	[illegible]
4	Weight of stalks.	[illegible]
5	Weight of grain per bushel.	[illegible]
6	Percentage of grain on stalks.	[illegible]
7	Percentage of stalks on grain.	[illegible]
8	Increase or decrease against unmanured plot.	[illegible]
9	Increase or decrease per acre.	[illegible]
10	Actual outturn, acre. — Grain.	[illegible]
	Actual outturn, acre. — Stalks.	[illegible]
11	Value of outturn. — Grain at Re. 1 per 61 lbs.	[illegible]
	Value of outturn. — Stalks at Re. 1 per 4,812 lbs.	[illegible]
	Value of outturn. — Total.	[illegible]
12	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 16-8.	[illegible]
13	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 20.	[illegible]
14	Net profit or loss over or against the assumed income Rs. 20.	[illegible]
15	Remarks.	

* Dung cake powder-ed and burnt for ashes.

MAIZE No. VII.—[illegible] Duplicate—Manure experiment.

Quantity of manure supplied per acre.	Value of manure.	1. Number of plots as per map of Farm.	2. Weight of unthreshed cobs.	3. Weight of grain.	4. Weight of stalks.	5. Weight of grain per bushel.	6. Percentage of grain on stalks.	7. Percentage of stalks on grain.	8. Increase or decrease over the unmanured plot?	9. Increase or decrease per acre.	10. Actual outturn per acre. Grain.	10. Actual outturn per acre. Stalks.	11. Value of outturn. Grain at Re. 1 per 61 lbs.	11. Value of outturn. Stalk at Re. 1 per 4,812 lbs.	11. Value of outturn. Total.	12. Gain or loss per acre in the cost against the cost of ordinary cultivation, assumed to be Rs. 16.	13. Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 20.	14. Net profit or loss over or against the assumed income Rs. 20.	Remarks.
			lbs.	lbs.	lbs.	lbs.	lbs.	lbs.											
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	483	[illegible]	[illegible]	[illegible]	[illegible]	326	532	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	11	479	[illegible]	427	[illegible]	[illegible]	[illegible]	[illegible]	314	520	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	12	562	[illegible]	529	[illegible]	[illegible]	[illegible]	[illegible]	193	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	13	311	17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	205	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

Maize No. VIII.—[illegible] as manure.

		CALCULATION OF THE RESULT AND COMPARISON OF DITTO WITH UNMANURED PLOT.									COMPARISON OF COST WITH THE ORDINARY KIND OF CULTIVATION IN VOGUE IN THIS COUNTRY.								
		1	2	3	4	5	6	7	8	9	10		11			12	13	14	15
											Actual outturn per acre.		Value of outturn.						
[illegible] applied per acre	Value of manure.	Number of plots as per map of farm.	Weight of uothreshed cobs.	Weight of grain.	Weight of atalk.	Weight of grain per bushel.	Percentage of grain on stalk.	Percentage of stalk on grain.	'Increase or decrease against unmaurued plot.	Increase or decrease per acre.	Grain.	Stalk.	Grain at Be. 1 per 61 I&s.	Stalk at Re. 1 per 4,812 lbs.	Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Us. 16$.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Hs. 20.	"Net profit or loss over or against the ussumed income Ks. 20.	Remarks.
	Rs. a.		lbs.	lbs.	lbs.	lbs.	lbs.	Rs.	lbs.	lbs.	lbs.	lbs.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. p.	
[illegible]		1	510	168	366	61	45	220	65	[illegible]	2,009	[illegible]	32 15	5 7	35 6	— 0 5	+13 8	+ [illegible] 0	
[illegible] 1 [illegible]	[illegible]	2	[illegible]	164	[illegible]	61	48	210	65	[illegible]	2,085	[illegible]	8 8	5 2	37 10	— 3 9¼	+ [illegible] 10	+14 [illegible]	
[illegible] 120	8 [illegible]	3	[illegible]	104	[illegible]	61	[illegible]	[illegible]	3	36	1,258	[illegible]	20 10	4 13	25 7	— 3 9¼	+ [illegible] 7	+ 1 10½	
[illegible] 120	3 1[illegible]	4	[illegible]	160	[illegible]	61	46	[illegible]	65	780	[illegible]	[illegible]	32 10	5 7	38 6	[illegible] 15½	+ 8 [illegible]	+12 8½	
[illegible] 120	8 [illegible]	5	[illegible]	110	[illegible]	61	39	[illegible]	9	149	1,331	[illegible]	21 18	4 14	26 11	— 8 9¼	+ 6 11	+ [illegible] 1½	
[illegible] 120	8 [illegible]	6	393	166	200	61	41	[illegible]	4	48	1,620	2,088	20 18	8 8	[illegible]	— 3 9¼	+ 4 10	+ 7 [illegible]	
[illegible] 240 lbs.	1 [illegible] 5	7	300	165	[illegible]	61	41	[illegible]	4	48	1,[illegible]	3,199	24 18	8 [illegible]	[illegible]	—10 5	+ [illegible]	— 6 [illegible]	
[illegible]	—	8	350	161	[illegible]	61	40	[illegible]	...	...	1,222	3,072	20 0	5 5	25 5	...	+ [illegible]	+ [illegible]	

roudrette here also has given tbe largest yield, leaving a net profit of Its. 15 par ~™ Last year the case was not so. Sheepdung is next ; ashes of wwdnng, with ^Itpetre, hare come out third, and cowdung with boueduat and sbeendun* with gypsum last.

In tho duplicate serio* the increase in yield of s0I1,0 of the plots against the unmannred ones is very great.

Cow and sheepdung, with saltpetre, saltpetre with bonedust and superphosphate, Jiave given larger percentage on straw.

(II.) *Grtm wiling.-The* statement No. I1l, herewith appended, shows the result. It indicates that in this year hemp and indigo water, as w,)l as indigo stubble, have not done any good. The reas.n may be considered that hy applying this fertUiz.r for years, which is m doubt very weak in action, tbe land has W a good deal ot its natural fertility.

Indigo crop plowed in and gypsum added have given tbe largest yidd.

Fresh indigo refuse with lime aUd hemp with gypeua feave done ^

Economically, t1* iniiigQ aud]lemp crops takell off> and t[)e 9 t l l b b l e ^ h e d fa ag manure, are most profitable-a net profit of Es. 22 and 3-14 are left U tbe two cases.

Last year, out of tie IS kinds of the green soiling, eight had left a profit of from 1 to 16 rupees.

(III.) *Miscellaneous* man««.-The statement No. V contains the result,

'lins is to ascertain how far some of tbe things, which are a mere waste, and ia some oases one does not know how to get rid of them, have any mammal value.

Eight plote are under this experiment which have not received VOf strong mUnure for years. In this case, of course, the vitality of the soil cannot be kept up.*

However, tbe result is that giving anything ia the shape of manure is better than no manure at all.

This year road scrapings have given a larger yield than even aromonial chloride.

Economically, the losses ure very great. Thia show*.that for good husbandry tho farmyard manure is the essential thing.

(IV.) *Watering.—The* statement No. VI contains tho result of the experiment, wtacb no doubt depends entirely on the season.

This year by five waterings tho largest outturn was obtained, and the decrease js proportionate to the number of waterings.

(V.) *Canal against well-watering.—The* statement So. VI shows, that the well has given the umalreipsh; that is, its effeotM better than canal water. Though the Wit of well-watering is Rs. 5-13-0 against Its. 2-10-0, yet the loss by the cauJ water U double> Lei"S B». 14-9-0 per acre against Us. 7-6-0.

tVI.) *Hemp and indigo asgrem manure.—*To confirm the effeotof indigo and hemp as OHarare • the experiment is tried on a large scale. In four different plots uenjp is p oughed in, and in five indigo, some with and some without lime.

The statements Nos. VII and VIII contain the average of tiio outturn of all tbe },1<)U tlreElted similarly. They show that tbe plot manured with lump has given Bkore thnn double grain against the unmanured plot and has left a profit of Ks 4 Ioduro *lth l:,,R1 sbl)1« better result than indigo by itself.

(VIL)—*Ploughing experimenti.* — Statement No. IX will-show the result of deep andshallow ploughing. As these plots have not received mauure for jews, the out-turn per aero ia verj poor. FrOm nest season manure will be applied to them.

B.—'temporary emperimetat.--Of the temporary experiments the result of the following has been recorded :—

I(a).—The effect of cake-feddtmg against the cake applied as manure;

It).—Tbe eflect of nndecorticated ooiton seed.

EEPOET OH TIE

CAWNPOKE EXPERIMENTAL STATION

FOR THE RABI SEASON OF 1886-87.

ALLAHABAD : •

NOBTH-WBSTBRN PROVINCES AND OODII GOVERNMENT PRESS.

1888.

II I.—English reheat experiment.—The following are the results of the experimental cultivation of wheat presented by ATessra. E. G. O;ikshott and Co., Reading. The seed was sowa at three stations, *viz.,* Experimental Station, Oawnpore, Lyall Farm, Ujhaoli, Budaun, and again on Babu **Luehman** Pershai's farm adjoining tho Oaivnporo Experimental Station. At the first two places it failed entirely, the results of that sown in the vicinity of the Experimental Station are noted below.

The seed wa^sown in four highly cultivated plots especially prepared for wheat. It was seriously damaged in transit, as informed in this Office No. 6017, dated 22nd November, 1886, and was therefore sown very thick, the quantity used being more than four times of what would **bare** been required for an equal itrea had the seed been sound. The germination was very irregular. The grain did not ripen till the end of April, and two of the plots, which were at a distance from tlia **canal** distributary, and could not be watered more than three times, did not yield a single grain. The other two plots, each of which was watered six times, yielded the following quantities :—

Ho.mber of plot.	Area of pluta in squire yards.	Actual "utlnra in lbs.	Outturn per aero Dfe
1	250	60	i.iet
2	V'.'J	76	1,228

Ensi!age.r—1. A nuiny season grass silo, filled in three years ago, was opened, and the contents found unfit for use. It wus scarcely expected that the result would be otherwise with grass after such a lapse of time.

2. From the 4th to 10th September, 100 in minds of grass, taken from one of the tisar plots, was ensilaged in an ordinary pit- The cost of filling and cutting was Es. 6-4-0i On the 20th of June the pit was opened, the npper layer weighing about 10 mauads had gone bad', but the rest was very good, and was consumed by tho cattle.

Sale of Implements.—The following statement **will** show the difference in the salo of implements made in the workshop and imported from other countries :—.

Miintb and date.	*Ploughs.*				•Pump*.			*Sugar puns.*			fJra in At mitf.			*Chiff cutters.*			*Dndgtn.*		
	So TJ	§ fur	.1 S ? S co	'3 0	I	1 5	3	\ Sold.	S for ;	1	Sold.	•a. fur ! Q.	a	[illegible]	4 1 a ai 15	3	t	rial I g 3	?;
tfrom 16th August, 1888 to 151I1 August, 183B.	W	M	1 \9	351	37	M	£1	—	1	a	12	...	12	[illegible]	...	[illegible]	.	1	[illegible]
from Itjtll Anqint, I8S6 Co 15ili Angust, 1887.	151	(i	[illegible]	m i	a	7	iO	3	1	[illegible]	23	...	[illegible]	IB	1	[illegible]	.	...	•

The great decrease in the number of ploughs is owing to extra ploughs not having been seat out to]the districts within this year (1887). During the **laat** two years in ploughing seasons, Moharirs were sent with **plongna** to **sell** them on credit. **1MB** experience of the last two years has shown that great inconvenience and some Jos results from selling ploughs **en the terms of payment By instalment**

Tbo cumber of ploughs actually sold lias also decreased by 16.

Pump or waler-UJt.— There is a slight decrease in the sale of this implement also. Seven were cot much taken **this** year.

No. 4632 OF 1887.

DEPARTMENT OF LAND RECORDS AND AGRICULTURE, N.-W. P. AND OUDH.

DATED CAWNPORE, THK 29TH NOVEMBER, 1887.

FROM

LIEUT.-COLONEL D. G. PITCHER,

OFFG. DIR., DEPT. OF LAND RECORDS AND AGRI.,

N.-W. PROVINCES AND OUDH,

To

THE CHIEF SECRETARY TO GOVERNMENT,

N.-W. PROVINCES AND OUDH.

SIR,

I HAVE the honor to submit for information the report on the Cawnpore Experimental Station for the rabi season of 1886-87, written by Mir Muhammad Husain, Assistant Director, who conducted the work of Superintendent. In paragraph 1 of the letter covering the report for last year, it was suggested that the report should no longer issue as a separate compilation, but be incorporated with the annual report of this department. It has, however, been finally decided—*vide* Government of India's Circular No. [illegible], dated 14th September, 1887, paragraph 6—that the report is to be published as heretofore, and I therefore now so submit it.

2. There is little of novelty to call for comment. Experiments ^ith manures, organic and inorganic, with green soiling, deep ploughing, and irrigation were continued with but little variation on the old lines, the results of which aro elaborately tabulated. Varying with the season, as the latter may be wet or dry, some manures show better in one season than others. It would only be after a long and continuous series, much longer than are yet available, that authoritative deductions could be drawn as to the precise gain or loss resulting from any particular treatment. For the past season the general outturn was very disappointing at least one-third less than we had reason to expect. The adverse causes were heavy hail, at seed time, and, most severe frost, at the time of flowering. On the other hand the crops were free to an unusual extent from fungoid growths.

Experiments were made with English wheat seed sent out through the India office. The condition of the seed on arrival was bad, but still there was enough with whioh to show what we have shown before, *viz.*, that we have better varieties or rather perhaps local varieties that suit us well, and have even a European reputation. Local varieties were as usual subjected to comparative trial, and one now introduced for the first time on the station and known as Baxar appears likely to compete sac-cessfully with the best of our own Provincial varieties. Of all [illegible]rimental work on the station there is none of greater [illegible] touching the selection of seed and trial of varieties.

Ensilage continues to be managed with success. One grass Silo kept for the purpose was opened a [illegible] penetrated and the contents were [illegible] that with grass the result [illegible] otherwise [illegible] was hardly to be expected [illegible] difficult of all to manag[illegible] úsar reserves gave good silage after being stored for the ordinary time.

The sale of implements appears on the whole to have been less brisk than formerly, exceptions being small English grain-crushers and chaff-cutters, for which there is increasing demand.

I have the honor to be,

SIR,

Your most obedient servant,

D. *G.* PITCHER, LT.-COLONEL,

Offg. Director.

REPORT

ON TUB

CAWNPOEE EXPERIMENTAL STATION,

FOR THE RABI SEASON OF 1886-87.

1. *Character of the season.*—As reported before at ther time of sowing, just when the seed was sown, a heavy hailstorm had done great damage, and in the month of February, just at the time when the fields were in full blossom, the abnormally bitter frost ruined- the success and the prosperity of the crops. Though it did not do much harm to the farm crops, yet the yield got reduced considerably. The field which promised to have 10 maunds hardly *g&ve* two-thirds of it.

2. Except the damage done by the hailstorm- and the frost, no diseases affected any variety of the wheat sown.

Classification of the experiments.—-The experiment? are—

(A) Permanent. (B) Temporary.

The appended statements, No*. 1 to 9, will show the results of the permanent, and the statements Nos. 10 to 12, results of temporary experiments.

Of the A series the result may be summed up thus—

(I.) *Whether wheat can he grown year after year by the aid of artificial manure.*—The plots under this experiment are termed standard and duplicate, being 26 in number ; in the 13 plots wheat is sown year* after year, and their duplicate plots are alternated with wheat and maize.

The treatment of these plots is the same as reported last year. The different fertilizers, the effect of which is being determined, are bhown in statements Nos» 1 and 2. This year saltpetre alone, and combined with other manures, has not shown any superiority over poudrette, cow and sheep dung, put in the standard plots. The largest yield is obtained from the plot manured with poudrette. The ashes of dung have again proved to be of no good. Against the unmanured plots in the series all the manured ones, except the one with the ashes of oowdung, have given greater yield. JPb udretto this time stands first. Saltpetre and bonedust second ; sheep dung and gypsum third.

Economically, there is no gain against the cost of any of the plots in the series.

This may be attributed to a certain extent to the effect of the frost, but greatly to the fact that by keeping land under one kind of crop for years without rotation, so mo ingredients in the soil, essential for plant food, are exhausted; therefore the fertility of the soil is decreased.

This fact almost in all cases has been proved by the duplicate series, which is treated in all respects just the same as the foregoiug one, except being sown alter* nately with whoat and maize.

Statement No. IE contains tho result of the duplicate series. It shows that the yield in all the plots is larger than their counterparts in the standard series, ashes of cowdung have again failed here. This proves that nitrogen is the most essential thing for wheat.

The economical result of the effect of the fertilizers in question, togelhor with the rotation, is not bad. In five out of 13 cases it has left a profit of froi" 2 to 15 rupees per acre.

Poudvette here also has given tbe largest yield, leaving a net profit of Rs. 15 per acre. Last year the case ^as not so, Sheepdung is next ; ashes of cowdung, with saltpetre, have come out third, and cowdung with bonedust and sheepdung with gypsum last.

In the duplicate series the increase in yield of some of the plots against the unmanured ones is very great.

Cow and sheepdung, with saltpetre, saltpetre with bonedust and superphosphate, Jiave given larger percentage on straw.

(II.) *Grren soiling.*—The statement No. Ill, herewith appended, shows tho result. It indicates that in this year hemp and indigo water, as well as indigo stubble, have not done any good. The reason may be considered that by applying this fertilizer for years, which is no doubt very weak in action, tho land has lost a good deal of its natural fertility.

Indigo crop ploughed in and gypsum added have given the largest yield.

Fresh indigo refuse with lime and hemp with gypsum have done good.

Economically, the indigo and hemp crops taken off, and the stubble ploughed in as manure, are most profitable—a net profit of Rs. 22 and 3-14 are left in the two cases.

Last year, out of the 13 kinds of the green soiling, eight had left a profit of from 1 to 16 rupees.

(III.) *Miscellaneous manure.-The* statement No. V contains the result.

Ihis is to ascertain how far some of the things, which are a mere waste, and in some cases one does not know how to get rid of them, have any manurial value.

Eight plotB are under this experiment which have not received any strong manure for years. In this case, of course, the vitality of the soil cannot be kept up.

However, the result is that giving anything in the shape of manure is better than no manure at all. •

This year road scrapings have given a larger yield than even amraonial ebloride.

Economically, the losses are very great. ™* shows that for good husbandry the farmyard manure is the essential thing.

(IV.) *Watering.*—The statement No. VI contains the result of the experiment, •which no doubt depends entirely on the season-

This year by five waterings the largest outturn was obtained, and the decrease is proportionate to the number of waterings.

K V) Canal against well-watering.-Tbo statement No. VI shows, that the well has given the usual result; that is, its effect is better than canal water. Though tho cost of well-watering is Rs. 5-13-0 against Rs. 2-10-0, yet the loss by the canal water is double, being Rs. 14-9-0 per acre against Bs- 7-6-0.

(VI.) *Hemp and indigo as green manure.*--To confirm the effect of indigo and hemp used as manure, tbe experiment is tried on a large scale. In four different plots hemp is ploughed in, and in five indigo, some with and some without lime.

The statements Nos. VII and VIII contain the average of the outturn of all the plots treated similarly. They show that the plot manured with hemp has given more thnn double grain against the unmanured plot and has left a profit of Rs. 4. Indigo with lime shows better result than indigo by itself.

(VIL) — *Houghing experiments.*-Statement No. IX will-show the result of deep and shallow ploughing. As these plots have not received manure for years, the outturn per acre is very poor. From next season manure will be applied to them.

B.—Temporary experiments.—O£ the temporary experiments the result of the following has been recorded :—

I(a)._The effect of cake-feddung against the cake applied as manure;

U>).—The eflect of undecorticated cotton seed-

The statements Nos. X and XI contain the result of the experiments. They show that the effect of both the cake-feddung and the cake is about the same, but "the use of dung is more economical.

The result of cotton seed experiment has not shown any success. The yield in either case has not been so good as with mustard cake and its dung.

The experiment is for five years, and this is the second year.

II.—*To determine for hoto long the residue of a fertilizer remains available for « <plant.*—This experiment wijl continue for five years. This is *tyie* second year.

!•—*Mundiya against Muzaffarnagar wheat.*—The statement No. XIII will show the result of the trial. The experiment will continue for five years. This is the firtffc year.

The present result is considerably against the Muzaffarnagar wheat, which has given an outturn of only 592tbs. per acre against l,2091bs.; but the former plot had suffered much by the hailstorm, hence the result is not much to be relied upon.

Miscellaneous.—Sowing a catch crop of lucerne on oats was tried in last j*ear, but this neither gave a good crop of oats nor of grass. However, the result is yet to te seen.

II.—Baxar wheat experiment.—Buxar wheat seed was received, when most of the fields had been occupied. No comparative trial of a scientific accuracy, which could only be made by sowing it in a big field alongside the Muzaffarnagar or the ordinary variety of the district, was then possible. The seed was distributed among three cultivators, Mirai Kiichbi, Locan Lodh, and Badlu Chamar, to be sown in such small plots of their holdings as did not happen to be sown at the time, the object of cultivation being to ascertain—

(a) its susceptibility to disease,
(b) time of maturity,
(c) suitability to the climate of this district,
(rf) general yield.

Of the three plots in which it was sown only two were manured, one of which had, {lowever, borne a crop of maize in the preceding khaiif.

The average outturn of the three plots amounted to 16'3 matmds per acre, which, considering the unfavourable character of the season, cannot by any means be said to below- The outturn of the several plots and their treatment are noted in the following table:—

Serial No.	Area of plots.	Past history.			Treatment in 18S6.					Outturn per acre.
		1884.	1885. Manure.	1885. Crop.	Crop in preceding kharif.	[illegible]	[illegible]	[illegible]	Waterlog.	
	Square yards.									Maunds.
1	900	Old fallow,	*Nil* ...	Fallow •*.	*Nii*	Woolen refuse.	6	*Nil* ...	4	21-5
2	1,350	Do. ..	,,	Jnår	,,	At/	8	,,	3	14*3
3	844	Do.	,, ...	Fallow	M,'ie ...	Cowdurg,	6	,,	3	1*0

The plants were of vigorous growth and the crop was exceptionally free from rust and other fungoid diseases; the only injury which it suffered from was frost. The grain came to maturity at least 10 days earlier than the Muzaffafnagar variety. This is not a small thing in its favour at a place where hot winds set in early and prove a ruin to the late varieties.

III.—English wheat experiment.—The following are the results of the experimental cultivation of wheat presented by Messrs. E. G. Oakshott and Co., Reading. The seed was sown at three stations, *viz.*, Experimental Station, Cawnpore, Lyall Farm, Ujhaoli, Budaun, and again on Babu Luchman Pershad's farm adjoining the Cawnpore Experimental Station. At the first two places it failed entirely, the results of that sown in the vicinity of the Experimental Station are noted below.

The seed was sown in four highly cultivated plots especially prepared for wheat. It was seriously damaged in transit, as informed in this Office No. 6017, dated 22nd November, 1886, and was therefore sown very thick, the quantity used being more than four times of what would have been required for au equal area had the seed been sound. The germination was very irregular. The grain did not ripen till the end of April, and two of the plots, which were at a distance from the canal distributajry, and could not be watered more than three times, did not yield a single grain. The other two plots, each of which was watered six times, yielded the following quantities :—

Number of plot.	Area of plots in square yards.	Actual outturn in ft*.	Outturn per acre lbs.
1	250	60	1.161
2	300	76	1,226

Ensilage,—I. A rainy season grass silo, filled in three years ago, was opened, and the contents found unfit for use. It was scarcely expected that the result would be otherwise with grass after such a lapse of time*

2. From the 4th to 10th September, 100 maunds of grass, taken from one of the tuar plots, wa, ensilaged in an ordinary pi*. The cost of filling and cutting was Ra. 6-4-Oi On the 20th of June the pit was opened, the upper layer weighing about 10 maunds hai gone bad", but the rest was very good, and was consumed by the eattle.

Sale of Implements.—The following statement will show the difference in the sale of implements made in the workshop and imported from other countries :-

Month and date.	*Ploughs.*				*Pumps.*			*Sugar pans.*			*Grain kibbling mills.*			*Chaff cutters.*			*Dredgers.*		
	Sold.	Sent for trial.	Sent with apprentices.	Total.	Sold.	Sent for trial.	Total.	Sold.	Sent for trial.	Total.	Sold.	Sent for trial.	Total.	Sold.	Sent for trial.	Total.	Sold.	Sent for trial.	Total.
From 16th August, 1885 to 15th August, 1836.	167	35	149	351	37	14	51	7	1	8	12	...	12	9	...	9	4	1	5
From 16th August. 1836 to 15th August, 1887.	151	5	36	192	33	7	40	3	1	4	23	...	23	15	1	16	2	...	2

The great decrease in the number of ploughs is owing to extra ploughs not having been sent out to the district* within this year (1887). During the last two years in ploughing seasons, Moharirs were sent with plougns to sell them on credit. The experience of the last two years has shown that great inconvenience and some loss results from selling ploughs on the terms of payment by instalment.

The number of ploughs actually sold has also decreased by 16*

Pump or water-lift.—There is a slight decrease iu the sale of this implement also. Seven were not much taken this year.

The sale of grain kibbling and chaflF-cutting machines is nearly doubled. Bull's dredgers and sugar evaporators do not yet find incteasing sale.

***Seed.*—Tfie following statement shows distribution : —**

Month and date.	[illegible]	[illegible]	Barley.	Sorgho.	[illegible]	[illegible]	[illegible]	[illegible]	Remarks.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
From 16th August, 1885 to 15th August, 1886.	62,630	1,205	247	517	712	39	94	2	
From 16th August, 1886 to 15th August, 1887.	37,190	3,854	[illegible]	330	1,218	12*	[illegible]	I*	

Many zamindárs, who took seed in previous years, have now a sufficient store of their own; this accounts for smaller sales during the year.

MIR MUHAMMAD HUSAIN, M.B.A.C, C,
Assistant Director, in charge of Farm.

STATEMENT No. 1.-STANDARD SERIES.

1	2	3	4	5	6	7	8	9	10	11		12			13	14	15	16
	Calculation of the result and comparison of outturn with the standard phi in Hie series.									*Comparison of cott and income with the ordinary kind of cultivation in vogue in this country.*								
Serial No.	Detail of special treatment with the rate of its cost.	Weight of unthreshed [illegible]	[illegible]	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease in the standard [illegible]	Increase or decrease per acre.	*Actual outturn per acre.* Grain.	Straw.	*Value of outturn.* Grain at Re. 1 per [illegible]	Straw at Re. 1 for 400lbs.	Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 33.	Net profit, loss or gain [illegible]	Remarks.
	Quantity of manure applied per acre.	tt)3	lbs.	[illegible]	tbs.	lbs	lbs.	[illegible]	[illegible]	lbs.	tb*.	Ks. a.	Us. a.	Rs. n.	Rs. a.	Rs. a.	Ks. a.	
1	Saltpetre, 240lbs. per acio, at Rs. 3-8-0 per 82fl5s	319	102	217	[illegible]	47	213	16	193	1,234	2,626	30 2	6 9	36 11	- 7 5	- 1 5	- 8 10	
2	Ditto ditto and boneũust, 3001b*. per acre, at 11 annns per mnund.	315	in	204	[illegible]	54	174	25	302	1,343	2,468	32 12	- 6 3	38 15	—10 10	+ 0 15	- 9 II	
3	Cowdung, 180 maunds per acre, at Bs. 3 per 100 muunda ...	289	104	185	66	56	178	18	217	1,258	2,288	30 11	5 10	30 5	—2 6	- 1 11	- 4 1	
4	Ditto ditto and bonedust, 360Ibs. at 11 Rnnas per 82flw	253	102	156	66	65	153	16	193	1,234	1,888	30 2	4 12	34 14	- 5 11	- 3 2	- 8 13	
5	Cowdimg, 180 maunds per acre, at Rs 8 per 100 maunds, and gypsum 240lbs per acre, at Rs. 1-14-0 per 82lbs.	295	98	199	65	48	207	10	121	1,162	2,408	28 5	6 0	34 5	- 7 8	- 3 11	- 11 3	
6	Sheepdung, 180 raaunds per acre at Ks. 3 per 100 maunds	266	102	164	66	02	161	16	193	1,234	1,984	30 2	4 15	35 1	- 2 6	- 2 15	- 5 5	
7	Ashes of 180 maunds dung per acre, at Rs. 3 per 100 maunds.	172	69	103	64	67	149	17	206	835	1,246	20 6	3 2	23 8	•2 8	—11 8	- 17 0	
8	Shcepdungr. 180 mannds, at Rs. 3 per 100 maunds, and bone-dust 36ofl)s per acre, at 11 nnuns por 82!bs.	227	90	137	65	66	152	4	48	1,089	1,658	26 9	4 2	30 11	—5 11	~7 5	- 13 0	
0	Saltpetre, 240lb« per acre, at Rs 3-8-0 per S-Ibs, and super-phosphate 240lb? per acre, at Rs. 4 8-0 per 112lbs.	258	99	159	65	62	161	13	157	1,193	1,924	29 3	4 10	34 0	- 37 0	- 4 0	- 21 0	
10	Sheepdung, 180 maunds, at RB 3 per 100 maunds, and gypsum, 240lbs. per acre, at Re. 1 per 82lbs	386	108	278	6G	39	257	22	266	1,307	3,364	31 14	8 7	40 5	- 7 8	+2 5	- 5 3	
11	Mo manure ... IM ... ... ,,	251	86	165	65	52	192	+	+	1,041	1,996	25 6	5 0	30 6	+3 0	- 7 10	—4 10	
12	Poudrettc, 180 mnunds pern ere, at Rs. 4 per 100 maunds ..	356	120	236	66	51	197	34	411	1,452	2,856	35 7	7 2	42 9	- 5 12	+ 4 9	—1 3	
13	Ashes of 180 maunds cowilung, at Rs. 3 per 100 maunds, and saltpetre 210ils per acre, at Rs 3-8 0 per S2tbs.	307	[illegible]	211	65	45	220	10	121	1,162	2,553	23 5	6 G	U 11	—12 13	- 3 5	- 16 2	

[illegible]ENT No. II.--DUFL[illegible] SERIES.

Column 1	2	3	4	5	6	7	8	9	10	11		12			13	14	15	16
Comparison of outturn [illegible]										Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.								
										Actual outturn per acre.		Value of outturn.						
Number of plots as per map of Farm.	Detail of special treatment with the rate of its cost.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Grain.	Straw.	Grain at Re. 1 per 41lbs.	Straw at Re. 1 per 400lbs.	Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 38.	Net profit or loss over or against the assumed income, Rs. 8.	Remarks.
	Quantity of manure applied per acre.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	
1	Saltpetre, 240lbs. per acre at Rs. 8-8-0 per 82lbs. ...	[illegible]	178	289	66	62	164	14	[illegible]	[illegible]	[illegible]	24 13	6 15	[illegible]	[illegible]	+ [illegible] 13	[illegible]	
2	Ditto ditto and bonedust 360lbs. per acre at annas 11 per 82lbs.	[illegible]	129	219	66	59	170	25	[illegible]	[illegible]	2,060	33 [illegible]	6 10	[illegible]	[illegible]	+ [illegible] 11	[illegible]	
3	Cowdung, 180 maunds per acre at Rs. 3 per 100 maunds ...	[illegible]	118	204	66	51	194	1	[illegible]	[illegible]	[illegible]	31 0	0 9	[illegible]	[illegible]	[illegible] 13	[illegible]	
4	Ditto ditto and bonedust 240lbs. per acre at 11 annas per 82lbs.	[illegible]	146	189	66	77	130	41	[illegible]	[illegible]	[illegible]	42 10	6 1	[illegible]	[illegible]	[illegible]	[illegible]	
5	Ditto ditto and gypsum 240lbs. per acre at Rs. 1-12-0 per 82lbs.	[illegible]	128	221	66	58	172	19	[illegible]	[illegible]	[illegible]	36 6	6 [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
6	Ashes of cowdung, 180 maunds at Rs. 3 per 100 maunds ...	[illegible]	69	130	66	53	188	[illegible]	[illegible]	[illegible]	[illegible]	26 6	[illegible]	[illegible]	[illegible]	[illegible] 11	[illegible]	
7	Sheepdung, 180 maunds per acre at Re. 1 per 100 maunds and bonedust 240lbs. per acre at 11 annas per 82lbs.	[illegible]	106	190	66	56	170	[illegible]	[illegible]	[illegible]	[illegible]	31 5	[illegible]	[illegible]	[illegible]	[illegible] 15	[illegible]	
8	Saltpetre, 240lbs. per acre at Rs. 8-8-0 per 82lbs. and superphosphate 240lbs. per acre at Rs. 4-8-0 per 112lbs.	[illegible]	132	291	66	49	220	[illegible]	[illegible]	[illegible]	[illegible]	34 0	[illegible]	[illegible]	[illegible]	+ [illegible] 13	[illegible]	
9	Sheepdung, 180 maunds at Rs. 3 per 100 maunds and gypsum 240lbs. per acre at Rs. 1-12-0 per 82lbs.	[illegible]	128	299	66	45	234	[illegible]	[illegible]	[illegible]	[illegible]	33 1	0 [illegible]	[illegible]	[illegible]	+ [illegible] 3	+1 11	
10	Unmanured ...	[illegible]	104	211	66	48	203	[illegible]	+	[illegible]	[illegible]	40 11	8 [illegible]	37 1	[illegible]	[illegible]	[illegible]	
11	Sheepdung, 180 maunds per acre at Rs. 3 per 100 maunds ...	[illegible]	144	326	66	44	226	[illegible]	424	[illegible]	[illegible]	43 [illegible]	[illegible]	53 [illegible]	[illegible]	[illegible]	[illegible]	
12	Poudrette ditto ditto ...	[illegible]	183	356	66	46	220	[illegible]	702	[illegible]	[illegible]	47 13	10 [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
13	Ashes of 180 maunds cowdung at Rs. 3 per 100 maunds and saltpetre 240lbs. per acre at Rs. 8-8-0 per 82lbs.	[illegible]	166	357	66	40	210	[illegible]	738	[illegible]	[illegible]	48 11	11 [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

STATEMENT No. III.—GREEN MANURE SERIES.

	Calculation of the result and comparison of outturn with the standard plot in the series.									*Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.*									
1	2	3	4	5	6	7	8	9	10	11		12			13	14	15	16
	Detail of special treatment with the rate of its cost.	Weight of unthreshed crop.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	*Actual outturn per acre.* Grain.	*Actual outturn per acre.* Straw.	*Value of outturn.* Grain at Re. 1 per 41 lbs.	*Value of outturn.* Straw at Re. 1 per m lbs.	*Value of outturn.* Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 20.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 25.	Net profit or loss over or against the assumed income.	Remarks.
	Quantity of manure applied per acre.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	
1	Old indigo refuse, 120 maunds at 1 Re. per 100 maunds per acre.	297	108	189	65	57	175	+35	+400	1,297	2,287	31 14	6 11	37 9	−1 12	−0 7	[illegible]	
2	Fresh ditto ditto ditto ...	328	120	208	66	58	173	+50	+695	1,469	2,617	85 7	6 6	51 12	−3 8	+1 12	[illegible]	
3	Indigo water, 3,600 cubic feet per acre at Re. 1 per 1,200 cubic feet.	221	61	160	63	38	262	−9	−109	732	1,968	15 0	4 13	23 13	[illegible] 0	−15 4	[illegible]	
4	Hemp water, 3,600 cubic feet per acre at Re. 1 per 1,200 cubic feet.	192	64	128	64	50	200	−6	−73	774	1,549	15 14	3 14	23 13	[illegible] 8	[illegible]	[illegible]	
5	No manure	227	70	157	64	44	227	+	+	847	1,816	20 10	4 13	25 8	[illegible] 0	[illegible]	[illegible]	
6	After hemp crop	160	53	107	65	50	202	−17	−208	641	1,296	15 10	3 4	18 14	[illegible] 0	−19	[illegible]	
7	Green manured with hemp 3-8-0 per acre	197	72	125	64	58	174	+2	+24	871	1,412	21 4	4 13	26 0	[illegible]	−13	[illegible]	
8	Green manured with indigo 8 per acre	240	105	144	64	43	231	+35	+423	1,270	2,964	31 0	7 7	38 7	[illegible] 1	+0	[illegible]	
9	After indigo crop	306	106	210	65	58	178	+36	+436	1,284	2,200	31 6	8 12	27 1	[illegible]	−0	[illegible]	
10	Green indigo ploughed as ... acre with 6 maunds gypsum at Rs. 2-13-0 per 82lbs. per	397	133	265	66	50	201	+63	760	1,597	3,209	38 15	8 0	46 15	[illegible]	+8	[illegible]	
11	Green hemp ploughed as ... acre with 6 maunds gypsum at Rs. 1-12-0 per 82lbs. per	120	109	190	66	94	174	39	472	1,318	2,298	32 2	6 12	37 15	−5 12	−0	[illegible] 18	
12	No manure	208	97	149	65	57	170	+	+	1,174	2,016	23 10	5 2	33 12	+8 0	−4 4	[illegible] 4	
13	Alternate with increase	241	3	246	+	1	7,934	...	...	36	2,330	0 14	7 9	8 1	+3 0	−29 15	[illegible] 15	

* Saving of the value of manure ... Rs. 3
Value of the crop of indigo sold ... " 20

[illegible] No. I [illegible]

1	2	3	4	5	6	7	8	9	10	11		12			13	14	15	16
	[illegible] of the result and comparison of outturn [illegible] in the series.									[illegible] of cost and income [illegible] the ordinary kind [illegible]								
										Actual outturn per acre.		Value of outturn.						
Number of plots as per map of Farm.	Detail of special treatment with the rate of its cost.	Weight of an threshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Grain.	Stra^.	Grain at Be. 1 per 4im3.	Straw at Be. 1 per 400B53.	Total.	Gain or los* per acre in the cost aeainst the cost of ordinary cultivation assumed to be Rs. 30.	Gain or loss per acre in the value of outturn ngainst ordinary cultivation assumed to be Ks. 38.	Net prof.t or loss over or against the assumed income, Bs. 3d.	Kemnrks.
	Quantity of manure [illegible] per acre.	Lbs.	Lbs.	[illegible]	[illegible]	[illegible]	[illegible]	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	
1	Brick-kiln refuse, 150 maunds at Re. 1 per 300 maunds per acre.	196	60	[illegible]	60	55	[illegible]	28	[illegible]	799	1,152	19 8	8 10	28 2	+1 4	—14 14	—13 10	
[illegible]	[illegible] per 100 [illegible]	[illegible]	63	80	63	79	[illegible]	28	[illegible]	[illegible]	[illegible]	18 9	[illegible]	[illegible]	[illegible] 4	—17 0	—[illegible] 12	
[illegible]	[illegible] per 1 [illegible]	[illegible]	84	90	64	47	[illegible]	27	[illegible]	[illegible]	[illegible]	18 14	[illegible]	[illegible]	— 0	—16 4	—18 4	
[illegible]	[illegible] Re. [illegible] per	[illegible]	86	156	64	56	[illegible]	48	593	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	— 11	—7 15	—9 10	
5	[illegible] of 120 maunds [illegible] per 100 [illegible] acre.	[illegible]	[illegible]	74	+	42	[illegible]	—5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible] saltpetre, 240 [illegible] per [illegible]	[illegible]	59	159	+	40	[illegible]	18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible] chloride, [illegible] per [illegible]	[illegible]	61	110	+	51	[illegible]	24	190	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible] manure	[illegible]	37	84	+	44	[illegible]	+	+	[illegible]	[illegible]	[illegible]	[illegible]	18 8	+	[illegible]	[illegible]	

No. V.—WATERING.

Number of plots as per map of farm.	Detail of each treatment with the rate of its cost.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Outturn per acre: Grain.	Outturn per acre: Straw.	Value of outturn: Grain at Re. 1 per [illegible]	Value of outturn: Straw at Re. 1 per [illegible]	Value of outturn: Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 38.	Net profit or loss over or against the assumed income, Rs. 63.	Remarks.
1	2	3	4	5	6	7	8	9	10	11		12			13	14	15	16
	Watering.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	
B.D.																		
1	[illegible] at Re. 1 [illegible] per each watering from canal ...	305	[illegible]	193	[illegible]	[illegible]	170	[illegible]	[illegible]	1,367	[illegible]	[illegible]	6 15	[illegible]	[illegible]	[illegible]	[illegible]	
2	[illegible] at Re. [illegible] per each watering ditto ...	237	103	131	[illegible]	[illegible]	170	48	[illegible]	1,248	[illegible]	[illegible]	6 9	[illegible]	−1 13	[illegible]	[illegible]	
3	[illegible] at Re. 1 1-0 per each ditto ...	[illegible]	88	154	[illegible]	67	176	[illegible]	[illegible]	1,608	[illegible]	[illegible]	4 11	20 11	[illegible] 0	[illegible]	[illegible]	
4	[illegible] at Re. 1-4-0 ditto ditto ...	219	[illegible]	130	[illegible]	[illegible]	174	18	[illegible]	[illegible]	[illegible]	[illegible]	1 3	27 [illegible]	+ [illegible]	[illegible]	[illegible]	
5	Ditto [illegible] at Re. 1-4-0 ditto ditto ...	172	[illegible]	160	[illegible]	58	173	1	[illegible]	762	[illegible]	[illegible]	3 8	21 [illegible]	+ [illegible]	[illegible]	−14 [illegible]	
6	Dry	174	[illegible]	132	[illegible]	[illegible]	191	+	+	780	1,355	[illegible]	9 8	21 [illegible]	+ [illegible]	[illegible]	−[illegible] 11	
B.A.																		
1	Three times watered from well at Re. 1 15-6 per each time ...	974	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,011	[illegible]	[illegible]	6 11	[illegible]	[illegible]	[illegible]	[illegible] 11	
2	Ditto from tank at Re. 1-4-6 per each watering.	190	[illegible]	138	[illegible]	[illegible]	[illegible]	+	+	[illegible]	[illegible]	[illegible]	[illegible] 0	[illegible]	[illegible]	[illegible]	−14 [illegible]	

STATEMENT No. VII.—GREEN MANURED DUPLICATE PLOTS

Number of plots as per map of Farm	Detail of special treatment with rate and cost.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Actual outturn per acre: Grain.	Actual outturn per acre: Straw.	Value of outturn: Grain at Re. 1 per [illegible] lbs.	Value of outturn: Straw at Re. 1 per 400 lbs.	Value of outturn: Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 38.	Net profit or loss over or against the assumed income, Rs. 38.	Remarks.
1	2	3	4	5	6	7	8	9	10	11		12			13	14	15	16
	Quantity of [illegible]	lbs.	lbs.	lbs.	[illegible]	[illegible]	lbs.	[illegible]	[illegible]	lbs.	lbs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
[illegible]	[illegible] manured with [illegible]	[illegible]	[illegible]	226	[illegible]	[illegible]	194	2	[illegible]	[illegible]	2,7[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+ [illegible]	+ [illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+	[illegible]	237	+	+	[illegible]	1,[illegible]94	[illegible]	[illegible]	[illegible] 11	+ [illegible]	[illegible]	[illegible]	
[illegible]	[illegible] manured with [illegible] Rs. [illegible] per acre	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,300	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+	+	910	[illegible]	[illegible]	[illegible]	[illegible]	+ [illegible]	[illegible]	[illegible]	
[illegible]	[illegible] per [illegible]	2,347	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+	[illegible]	[illegible]	3,093	[illegible]	[illegible]	[illegible]	[illegible]	+ [illegible]	+ [illegible]	
[illegible]	[illegible]	604	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+		[illegible]	1,389	[illegible]	[illegible]	[illegible]	+ [illegible]	[illegible]	[illegible]	

STATEMENT No. VIII.-GREEN MANURED DUPLICATE PLOTS RESULTS.

1	2	3	4	5	6	7	8	9	10	11		12			13	14	15	16
	Calculation of the result and comparison of outturn with the standard plot in the series.									*Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.*								
Number of plots as per map of farm.	*Detail* of special treatment with the rate of its cost.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of [illegible]	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	*Actual outturn per acre.* Grain.	[illegible]	*Value of outturn.* Grain at Rs. 1 per 41 lbs.	Straw at Rs. 1 per 400 lbs.	[illegible]	[illegible]	[illegible]	Net profit or loss over or against the unmanured [illegible]	Remarks.
	Quantity of manure applied per acre.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	
1	Fresh indigo refuse, 120 mds. and lime 6 mds. per acre at Re. 1 per 100 mds. and Rs. 20 per 100 maunds.	660	196	464	65	42	237	86	521	1,186	2,807	23 15	7 0	35 15	-3 8	-2 1	-5 9	
2	Fresh indigo refuse, 120 mds. at Re. 1 per 100 mds.	463	180	283	65	64	157	70	424	1,089	1,712	26 9	[illegible]	30 13	-1 12	-7 3	—8 15	
3	Old indigo refuse, 120 mds. and lime 6 mds. per acre at Re. 1 per 100 mds, and Rs. 20 per 100 mds.	442	148	294	65	50	199	38	230	895	1,779	21 14	4 7	[illegible]	-3 8	—11 11	-15 3	
4	Old indigo refuse, 120 mds. at Re. 1 per 100 mds.	442	166	276	65	60	166	56	[illegible]	1,004	1,670	24 8	4 3	28 11	-1 12	-9 5	—11 1	
5	No manure	369	110	259	65	42	235	+	+	665	1,567	16 4	3 15	20 3	+3 0	—17 13	-14 13	

STATEMENT No. IX.—PLOUGHING SERIES.

	Calculation of the result and comparison of outturn with the standard plot in the series.									*Comparison of cost and income wifh the ordinary kind of cultivaton in vogue in thin country.*								
1	2	3	4	5	6	7	8	9	10	11		12			13	14	15	16
Number of plots in Farm.	Detail of special treatment with the rate of its cost.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard.	Increase or decrease per acre.	*Actual outturn per acre.* Grain.	Straw.	*Value of outturn.* Grain at Rs. 1 per 41 lbs.	Straw at Rs. 1 per 400 lbs.	Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 30.	Gain or loss per acre in the value of outturn compared with ordinary ...	Net profit or loss over or against the assumed income, Rs. 88.	Remarks.
	Ploughing.	fife.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Ks. a.	Ks. a.	8s. a.	Bs. a.	Bs. a.	Bs. a.	
1	Ploughed 5" deep (four times), at annas 12 per each ploughing.	72	[illegible]	43	+	67	148		73	468	694	11 7	1 12	13 3	+5 12	-24 13	-19 1	
2	Ploughed (eight times) with country plough at 12 annas per each ploughing.	61	25	36	+	69	144	+	+	403	581	9 14	1 7	11 5	+3 4	-26 11	—23 7	
3	Ploughed (eight times) with country plough at 12 annas per each ploughing.	61	24	37	+	65	154	+	+	381	597	9 7	1 8	10 15	+3 4	-27 12	—23 13	
4	Ploughed 9" deep (four times) at 12 annas per each ploughing.	90	37	53	+	70	143	12	202	597	855	14 9	2 2	16 11	+3 4	-21 5	-18 1	
5	Ploughed 9" deep (four times) at 12 annas per each ploughing.	800	285	515	[illegible]	55	181	220	434	563	1,017	13 12	2 9	16 5	+3 4	-21 11	-18 7	
6	Ploughed 5" deep (four times) at 12 annas per each ploughing.	410	124	286	63	43	231	59	116	245	565	6 0	1 7	7 7	+5 12	—30 9	—24 13	
7	Ploughed (eight times) with country plough at 12 annas per each ploughing.	265	65	200	63	[illegible]	30S	×	×	128	395	3 2	1 0	4 2	+3 4	-33 14	-30 10	

[illegible] ENT [illegible] X.

Number of plots as per map of Farm.	Detail of special treatment with the [illegible]	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Actual outturn per acre. Grain.	Actual outturn per acre. Straw.	Value of outturn. Grain at Re. 1 per 41lbs.	Value of outturn. Straw at Re. 1 per 400lbs.	Value of outturn. Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be [illegible]	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 38.	Net profit or loss over or against the assumed income, Rs. 38.	Remarks
1	2	3	4	5	6	7	8	9	10	11		12			13	14	15	16
	Quantity of manure [illegible] per acre.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	
1	Mustard cake, 5 [illegible] per [illegible] 30 seers per acre	464	153	81	64	49	203	24	190	1,909	2,458	33 8	6 9	65 10	− 6 1	− 2 6	− 7 7	
2	[illegible] 10 man [illegible] ditto [illegible] to	471	[illegible]	[illegible]	66	54	185	38	[illegible]	1,304	2,418	31 13	6 1	37 14	−13 1	− 0 2	−14 3	
3	Co[illegible] 240 [illegible] 5 per 100 maunds [illegible] acre	[illegible]	[illegible]	320	64	58	172	67	[illegible]	1,576	2,589	36 14	6 8	42 4	− 8 0	+ 4 4	+ 1 4	
4	[illegible] ke-fed dung, 60 [illegible] per acre 5[illegible] per 100	[illegible]	176	272	[illegible]	64	154	47	370	1,301	2,149	30 16	5 0	39 5	+ 1 0	+ 1 5	+ 2 5	
5	Ditto ditto 1[illegible] ditto	464	166	275	67	68	147	59	467	1,496	2,781	36 4	5 7	41 11	− 1 0	+ 3 4	+ 1 4	
6	[illegible], 960 maunds at [illegible] maunds per acre	506	178	328	65	[illegible]	184	[illegible]	385	1,407	2,542	34 5	6 4	40 13	− [illegible] 0	+ 8 13	− 0 3	
7	No manure	591	129	262	66	46	203	+	+	1,019	2,070	24 14	5 3	30 1	+ [illegible] 0	− [illegible]	− 8 0	

No. XI.

Calculation of [illegible] — [illegible] comparison of outturn with [illegible] plot in the series. | [illegible] of the ordinary [illegible] of cultivation [illegible] this country.

Number of plots as per map of Farm.	Detail of manure applied, with the rate of its cost.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Actual outturn per acre. Grain.	Actual outturn per acre. Straw.	Value of outturn. Grain at Rs. 1 per 40 lbs.	Value of outturn. Straw at Rs. 1 per 400 lbs.	Value of outturn. Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 38.	Net profit or loss over or against the assumed income, Rs. 38.	Remarks.
1	2	3	4	5	6	7	8	9	10	11	11	12	12	12	13	14	15	16
	Manure applied per acre.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	
[illegible]	Cotton seed, [illegible] dung, 50 maunds per acre [illegible] Rs. 4 [illegible] 100 maunds.	[illegible]	133	[illegible]18	65	[illegible]	160	[illegible]	[illegible]	1,0[illegible]	1,886	23 10	[illegible] 8	29 1[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	Cotton seed [illegible], 100 maunds [illegible] Rs. 4 per 100 maunds.	[illegible]	139	[illegible]	6[illegible]	[illegible]	170	[illegible]	113	1,[illegible]	1,[illegible]	24 14	[illegible]	29 [illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible] at Rs. 2 per [illegible]	[illegible]	110	[illegible]	[illegible]	51	188	[illegible]	—[illegible]	[illegible]	1,[illegible]	21 [illegible]	[illegible] 1	26 4	[illegible]	[illegible] 12	[illegible]	
[illegible]	[illegible] maunds at [illegible] per	328	103	[illegible]	[illegible]	46	216	[illegible]	—67	[illegible]	1,702	19 14	[illegible]	24 4	[illegible]	[illegible]	[illegible]	
5	Prepared cotton seed, [illegible] Rs. 1 [illegible] per acre.	287	150	217	60	69	155	[illegible]	234	1,[illegible]	1,715	23 14	[illegible]	33 [illegible]	[illegible]	[illegible] 13	[illegible] 15	
4	[illegible], 200 maunds at Rs. 3 [illegible] 100 maunds	85	98	199	65	49	203	[illegible]	—197	[illegible]	1,573	13 14	3 15	[illegible] 1[illegible]	[illegible]	[illegible] 9	[illegible] 3	
7	[illegible] None	8	114	181	65	[illegible]	159	+	+	901	1,480	21 0	3 9	25 9	[illegible]	[illegible] 7	[illegible] 7	

STATEMKNT No. XIL

Calculation of the mult and comparison of outturn with the standard plot in the series.										Comparison of cost and income with the ordinary hind of cultivation in vogue in this country.								
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10	11		12			13	[illegible]	15	16
Number of plot [illegible]	Detail of special treatment with the rate of Its cost.	Weight of [illegible] sheaves.	Weight of [illegible]	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease [illegible] plots in [illegible]	Increase or decrease per acre.	Actual outturn per acre. Grain.	[illegible]	Value of outturn. [illegible]	[illegible]	Total.	[illegible]	[illegible]	[illegible]	Remarks.
	Quantity of manure applied per acre.	Tba.	lbs.	lbs.	lbs.	lbs.	B5S,	lbs.	lbs.	lbs.	lbs.	Us. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a	Rs. [illegible]	
		Mundia wheat.																
88	No manure	[illegible],591	[illegible]	1,765	66	47	214	[illegible]	617	[illegible]	[illegible]	29 8	6 7	35 15	+3 0	-2 1	+0 15	
		Muzaffarnagar wheat																
	No manure *•	340	107	239	65	45	223	[illegible]	[illegible]	592	1,322	14 7	3 4	17 11	+3 0	-10 5	-7 5	

REPORT

ON THE

CAWNPOEE EXPERIMENTAL STATION

FOB THE KHARIF SEASON OF 1887.

ALLAHABAD:

NORTH-WESTERN PROVINCES AND ODDH GOVERNMENT PRESS.

1888.

PART II.

Trial of machines and implements.

Sugar-mills.

(1) *The "Rája" sugar-mill.*—This is patented by Mr. J. Rogers of Cawnpore; was shown in several shows; and much admired by mill-owners. Its price is Rs. 120. On the 3rd of March it was tried on the farm in Mr. Rogers' presence with the following result:—

No. of trial.	Length of beam.	Traction in number of steers. Without cane.	Traction in number of steers. With cane.	Variety of cane crushed.	Weight of cane pressed.	Duration during which the mill worked.	Revolutions.	Weight of juice expressed.	Percentage of juice on the weight of cane crushed.	Weight of cane crushed per hour.
					Seers.	Mins.		S. c.		S. c.
1st ...	9' 3"	4	12	Dhaul,	55	65	113	23 5¼	42·4	50 12
2nd ...	9' 3"	4	12	Do.,	55	57	141	26 6¼	48·0	57 14
Average,	...	...	...	...	...	61	127	24 14	45·3	54 5

N.B.—The weight of juice given above is the net amount after deducting the weight of sugar particles held in the juice.

(2) *Nahan sugar-mill.*—Three of these—(1) 6-inch two roller; (2) 8-inch three roller, double squeeze; (3) 8-inch three roller, double feed—were shown in Moradabad, and on the 3rd of March were tried at the Cawnpore experimental station in presence of Mr. Jones, the patentee. No. (2) was shown at Muttra and Meerut and drew considerable attention of the sugarcane-planters. The following figures show the results:—

Description of mill.	Price.	Length of beam.	Traction in number of steers. Without cane.	Traction in number of steers. With cane.	Variety of cane crushed.	Weight of cane pressed.	Duration during which the mill worked.	Revolutions.	Weight of juice expressed.	Percentage of juice on the weight of cane crushed.	Weight of cane crushed per hour.
	Rs.					Seers.	Mts.		Seers.		S. c.
Nahan, 8-inch double feed three-roller mill.	90	10' 0"	½	14½	Dhaul.	55	39	109	26	47·27	84 9
Nahan 6-inch two-roller mill.	60	9' 2"	2	8	Do.	55	57	157	22	40	57 14

Sugar-refiner.

(3) *Centrifugal or sugar-refining-machine*, introduced by Messrs. Thomson and Mylne, of Behees, was tried again during the year. The results are as follows:—

Number of trial.	Quantity of rab worked.		Time occupied.		Quantity of refined sugar.		Remarks.
	Mds.	s.	Hour.	m.tes.	S.	c.	
1 ...	0	30	0	12	4	3	Very white and fine.
2 ...	0	23	0	10	1	4	Ditto.
3 ...	0	36	0	11	11	0	Yellowish colour.
4 ...	0	32	0	13	7	4	Ditto.
5 ...	0	31½	0	17	7	6	Whitish colour.
6 ...	0	19	0	19	6	2	Very yellow.
Total ...	4	11½	1	33	37	3	

No. II. OF 1888.

DEPARTMENT OF LAND RECORDS AND AGRICULTURE, N.-W. P. AND OUDH.

DATED CAWNPOEB, THE 23RD JUNE, 1888.

FROM

LIEUT.-COL. D. G. PITCHER,
OFFG. DIB. OF LAND RECORDS AND AGRICULTURE,
N.-W. PROVINCES AND OUDH,

To

THE CHIEF SECRETARY TO GOVERNMENT,
N.-W. PROVINCES AND OUDH.

SIR,

I HAVE the honor to submit, for the information of His Honor the Lieutenant-Governor and Chief Commissioner, the kharff report of the Cawnpore experimental station for the year 1887-88.

2. The season was again for the third year in succession most unfavourable for ordinary farming, and as experimental farming requires that for reliable results the season shall be at least au average one, it is not surprising to find that the results at Cawnpore were, on the whole, somewhat negative. The unfavourable nature of the past season has been brought home to us all as one of the causes operating to maintain Prices at so high a rate throughout the cold season.

3. Experiments were confined to plots of maize, indigo, cotton, and sugarcane. To maize and cotton various fertilizers were applied, the best of which proved to be woollen refuse followed by sheep's dung. Other experiments in early sowing gave somewhat negative results, and the same is reported of the regular series of standard manure plots, of application of gypsum and kainite and of sowing after the American fashion as compared with other methods. In all these the bad weather levelled distinctions.

4. Gypsum was applied to iadigo with some better results, indigo being, it may be remarked, leguminous. These experiments, which will be continued on a larger scale next year, may prove of great importance, should gypsum be found to possess any markedly good effect on the plant. Large deposits of gypsum are available at Klieora, in the Punjab, close to the North-Western Railway. Through the kindness of the Agents, East Indian Railway and North-West Railway, a considerable quantity was procured from thence, some of which has been distributed for experiment to indigo-growers. "Land plaster," as it is called in America, is there considered the most valuable application for all leguminous crops.

5. For sugarcane alone was tbe season favourable and tbe experiments there were more satisfactory. The cane grown was very fair mdeed, and the results proved so far tbat tbe metbod of cultivating ordinarily adopted here suits the conditions of climate, &c, far better than tbe West Indian plan of growing in lines. In tbe latter case tbe plan is designed for a climate where rain falls on most days of the year ; tbe canes must, therefore, be grown well apart to secure tbe full benefit of tbe falls. In India tbe water is delivered by artificial irrigation channels direct to the foot of the cane, and a close growth overhead minimises loss of moisture by evaporation in tbe intervals between irrigation. The two plans were tried some years back at tbe farm and tbe same result in favour of the native metbod obtained.

So, also, I must observe in regard to ratooning cotton tbat the me*its and demerits had previously been exhaustively experimented on. The most to be looked for in later experiments now is tbe improvement of seed by selection, and to tbis the Superintendent's attention will be directed.

The report closes with an account of various trials of implements tbe results of which speak for themselves.

6. I must apologise for tbe late appearance of tbe report. At is nominally due in December—an impossible date for any year in which cotton or sugarcane is grown. This year tbe operations connected with tbose two crops were not concluded until towards the end of March, when the Assistant Director bas his hands too full of agricultural show work and tbe rabi harvest to be able to expedite his report. I venture, then, to take this opportunity of suggesting that tbe Government of India be moved to consent to a separate kharif report being discontinued and to one annual report being submitted for the station by the date now fixed for tbe submission of tbe rabi report.

1 have tbe honor to be,

SIB,

Your most obedient servant,

D. G. PITCHER, LT.-COI..,

Offg Director-

REPORT

OF THE

CAWNPORE EXPERIMENTAL STATION,

FOR THE KHARIF SEASON OF 1887.

PART I.

Experiments on Crops.

BESIDES the experiments on the usual kharif crops, indigo and sugarcane were included this season. The milling of sugarcane went on up to the 5th, and cotton-picking up to the 15th of March : hence delay in submission of this report.

I., *Determination of the effect of various fertilizers on maize.* — From statement I it will be seen that woollen refuse (shoddy) has this year again taken the leading place and has given 1,670lb. per acre more grain than the unmanured plot, leaving a profit of Rs. 11-2-0 over and above the usual profit per acre.

Sheep dung and pigs' dropping too have given a profitable yield, but saltpetre has shown uncommonly bad result: it may be said that in too wet a season, as of the last kharif, it is of no avail.

II., *Determination of the effect of early and late sowing on maize.* — Against early sowing the plot sown in ordinary time has produced 76lb. per acre more grain *vide* statement No. II. ; the difference is, however, not much and not worth taking into consideration. The loss, as shown by the statement, may be attributed to the bad season which at Cawnpore had been throughout unfavourable for the crop. The other experiments on maize, such as sowing on flat and ridges after the American way, and those connected with gypsum and kainite started this year and various kinds of dungs which are tried in duplicate series every year, were so much injured by the heavy and continuous rain that they hardly gave any yield worth noting.

III., *Determination of the quality and yield of different varieties of foreign cotton from acclimatized seed.*—Cotton of two varieties, (1) Louisiana and (2) Egyptian, was tried under the same treatment ; each was sown in two series, (1) before and (2) after rain. For the seed sown before rain the fields were prepared and till monsoon time protected by irrigation. Statement III shows result. The produce of early-sown plots was greater than those sown late. In either case the variety called Egyptian has proved to be better for our soil and climate than the other. The proportion of lint to the total weight of seed-cotton is also higher in this variety.

From a financial point of view the result was very poor, which is no doubt due to bad season : heavy rain is always injurious to a cotton crop.

IV., *Determination of the effect of gypsum and kainite on cotton and comparison of the yield of American against country variety.*—In two plots country cotton and in other two with the same treatment New Orleans was sown. Statement IV gives details. In both cases the yield with gypsum and kainite has been greater than otherwise. The produce of New Orleans was 145lb. clean cotton per acre and of country cotton 121lb.

The financial condition of this experiment is also not favourable.

'P., *Experiments with Haniin cotton.*—The points aimed at in those experiments were :—

(*a*) For how many years the plants will continue to bear.

{!») Whether the yield is equ.il to the annually-sown crop or not,

(cj Whether there is any change of colour in the produce of the annual an'l perennial plants.

(*d*) Whether ratooning makes any difference.

For last three years this experiment has been kept up.

With regard to (o), it is sufficiently proved that Nankin cotton plant is perenn ial and will staud and yield for several years. If kept long it thrives a good deal, becomes more busby, and bears more pods. But compared with the fresh-sown cotton, S greater number of pods do not yield fine cotton. Experiment has also shown that longer the plant is kept the smaller the seed becomes ; thus the percentage of clean cotton ou seed increases.

With regard to *(b),* owing to the unfairness of season, nothing can decidedly b« said- One of the two plots sown this year yielded per acre as much as 172ft. cleaned cottoo, and the other only 40ft., while the produce of the two plots sown three years »g" wa* 85It>. per acre in each case. Details are given in statements V and VI •pp» ded to this report.

With regard to *(e)* and (tf), there did not appear any difference between the coloar of the produce of the two kinds of plants, nor was there any difference between the results of ratooned and unratooned plants.

By summing up the result of the last three years' experiments, it mny be saiJ that there is no dfence between the quantity of the produce and quality of its colour, from , the *Hnual a«<* Perennial pknts : so there is a deal of saving in cost by keep^S tne plants for several years h> field, if fue land is not suitable to bear an extra crop-

VL, E,,rhj and late sowing i» t/te case of yankin w«on._The statement N°- VI wiU show the results of the two kinds of sowing. Early sown plot has given far Urg" yield than the other, and the percentage of cotton ou seed is also better.

It is a recognised fact that early sowing of all kharif crops, especially cotton, B. adJtageous.

VII, Determimition of the t$eet of gypsum on ind!ao.-'£he following figore9 show the result:—

No. of plot and area.	Special treatment.	Cost of special treatment.	Weight of green crop cut.	Actual outturn per acre.	Value of the outturn per acre at Rs. 1 per 30 lb.	Increase of outturn. In weight.	Increase of outturn. In money after deducting the cost of manure.
			lb	lb	Rs. a. p.		Rs. a. p.
(1) 7,380 square yards.	Gypsum applied as manure, 3 cwt. per acre.	Rs. 3 per acre	31,780	14,487	47 7 0	1,527	9 4 0
(2) 6,400 square yards.	No manure ...	...	17,128	12,960	45 3 0	...	...

Gypsum was not expected to produce its full effect in the first year: still it is satisfactory to see that it has left , Det profit rf E9· 2-4-0 per acre.

VIII. Drill versus *broadcast.*—The following fable gives the reaults of indigo sown In the two ways :—

No. and area of plots.	Special treatment.	Cost of the special treatment per acre.	[illegible]	[illegible]	[illegible]	Increase.	
						[illegible]	[illegible]
			lb.	lb.	Us.	lbs.	lbs.
(1) 522 square yards.	Seed sown with drill.	No noticeable difference of the cost between the two ways of sowing.	5,507	7,507	24 7 O	5,462	17 13 0
(2) 4,658 square yards.	Seed sown broadcast.		2,045	2,045	G 10 0	...	...

Equal quantity of seed was sown in both cases (8Jtb). There is no doubt that almost half of the seed sown broadcast, owing to its being deposited unevenly and too deep in the field is lost, and fails to germinate : still I must say the difference in the present instance is rather abnormal.

IX. Experiments with Sugarcane..—This experiment may be classed into :—

(«) Comparison of the foreign against the ordinary varieties of the district.

(6) Determination of the merits of sowing canes in lines as done in the French sugar-growing settlements, against the ordinary method followed in the country.

Statement VII shows the details.

Foreign seed was obtained from the best sugarcane-growing districts—(I) Sh6hjuhānpur, (2) Kauth (Moradabad), (3) Beheea (Shahabad).

v t . . _ • +„,_ -lot, AH the plots were made side by side on one

JSach varietv was sown in two piow- v ->

Piece of land and received similar treatment in every respect.

The two plots of Sh&hjahānpur seed were attacked by parasite and one of then* was almost entirely destroyed, although every possible effort was made to saye it A · H mi er · j ; - · copper was applied, the attacked and injured — mixture of kerosine-oil and sulphate oi t^ri ir .» m canes were dug out with roots and thro** away, an eitra d.gging and watering were given : but all to no effect.

^ T . ,. ,., wfcer but did not come up to the mark. - This

The other two varieties did bettei, r

adapt itself to its new home and might A ;r«*² affected during the transit or that it did not

proves that either the vitality of seed was sr* »

which will be decided by future trials- d bctter in the next year or so—a question

· r AlinfrV fashion gave much better results. Thera

was In every case sowing after country of the oiir made from plants raised ia

the -, i j/r • *\~ f h i d f lt raised ia

no perceptible difference m the

two ways.

PART II-

Trial of machines and implements.

Sugar-mills.

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No. of trial.	Length of beam.	Tension in number of stones. Without cane.	With cane.	Variety of cane crushed.	Weight of cane pressed.	Duration during which the mill worked.	Revolutions.	Weight of juice expressed.	Percentage of juice on the weight of cane crushed.	Weight of cane crushed per hour.
					Seers.	Ming.		S. c.		S. c.
1st ...	0'3"	4	12	Dbaul,	55	G5	113	23 5	42-4	50 12
2nd ,,	9' 3"	4	12	Do.,	55	57	141	26 6*	48 0	57 1*
Average,	...	...	...	...	...	61	127	24 14	453	54 5

N.B.—The weight of juice given above is the net amount after deducting the weight of megas particles in the juice.

(2) *Baton* «wj«w^miB.—Three of these—(1) 6-inch two roller; (2) 8-inch three roller, double squeeze; (3) 8-inch ihree Ioiler, double feed—were shown in Moradabad, and on the 3rd of March were tried at the Cawnpore experimental station m presence of Mr. Jones, the patentee. No. (2) was shown at Muttra and Meerut and drew considerable attention of the sugarcane-planters. The following fig™** sbo* the results :—

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	Rs.					Seers.	Mts.		Seers.		S. c.
Kahan, 8-ich double feed three-roller mill.	30	10' 0"	4	14½	Dhaul,	45	30	108	26	47·27	84 9
Kahan 6-inch two-roller mill.	00	9' 3"	2	8	Do.	56	67	137	18	40	37 14

Sugar-refiner.

(3) *Centrifugal or sugar-rejining-mackine,* introduced by Messrs. Thomson^ Mylne, of Beheea, was tried again during the year. The results are as follows :—

Number of trial.	Quantity of ráb worked.		Time occupied.		Quantity of refined sugar.		Remarks-
	Mds.	s.	Hour,	mins.	S.	c.	
1 ...	0	30	0	13	4	9	Very white and fine-
2 ...	0	23	0	10	1	4	Ditto.
3 ...	0	36	0	21	11	0	Yellowish colour.
4 ...	0	32	0	13	7	4	Ditto.
5 ...	0	31*	0	17	7	6	Whitish colour.
6 ...	0	19	0	19	6	1	Very yellow.
Total ...	4	11½	1	43	37	3	

1R87 • two of the Beheea men were sent for and ... made in February, 18«; <-of ... at ^ployed to make it. The machine ... WM the various agricultural shows ... did not come> we had to ordered from Messrs. Th«m«« «ndMy ... standing loilg in wait till May, when the ^ ^ J ^ m ,ery fine> and this accounU for the per- the molasses, perhaps got broken or beoaro j. cei»t8ge ot refined sugar ou *treacle* being so ve.y low.

In many of the shows during ... last February and March it was worked with great success. At Moradabad a maH, ... khuwha brought his own rab and worked it himself; the rab was of coarse of first-rate quality, ... much more sugar by this machine than by the * * * P^ess.

The machine is . great thing ... for capitalists, but it requires rab of an especial kind, which though not at all difficult ... , j ... this country.

(4) *W»».'.',.-The work of ... the flour-mills was tested again this year. The trial was made on the 5tb of April last. ... giyea fa each mill (three) under trial. The result stands thus^ Flour-mills.

Name of the mill.	Quantity of grain given.	Labour applied.	Time occupied in the work.	Produce. Flour.	Bran.	Loss.
	Seers.		Hrs. mins.	S. c.	Chks.	Chks.
1. R. Hunt's "The Colonist" ...	5	6 men	0 49	4 9	6	1
2. Ditto "The Little Wonder."	5	2 women	1 8	4 7	8	1
3- Ali Husain's flour-mill ...	5	4 men	0 15	4 .9	6	1
4. Native chakki ...	5	2 women	1 15	4 8	6	2

Kos. 1 and 2 have steel grinding plates, which soon get heated to such an extent as to spoil the qoality of the flour. The grinding ... they grind, and ^ grinding of the plates are very fine and get choked ... worked ... good any more wheat: the machine thus canno- a few minutes.

The mill No. 3 is really a nat.v* **J mill but the stones are placed vertically, and are fed by a hopper placed at the top of the ... simply ... tya fiy.wheel without any complicated ... made at a rafjl at Moradabad, after watchiog)vhere many offers for its purchase were ... price of Rs. its work for several days, took it for its fi*a P

(5) *Barrakar Waterlift, 5 feet long,* ... made of *cast-iron*.—In 45 minutes a tank of 500 cubic feet was filled by this pump. ... does f«ir work for the price, but being of cast iron is very heavy. Was shown in several shows, but none sola ... y. Waterlift and pump.

(6) 2*. « fitavfa.." ^ - ... This is a force pump forcing water to 30 feet, Us price i8 Bs. 98 and is worked by ... t o men. It was shown at Meerut and was purchased by a zemindar.

...—This is patented by Mr. J. L. Houert, an Amencan gentleman, res.d.ng m B ... It resembles a *Noria*, consists of ten Wkets fastened between two endl.s, ... which latter are worked by means of four grooved wheels, arranged on a wooden ... middle of the frame ... trough * w * rece'.es water from the backets. The length of chain and number of b... ets are varied according to depih of water. The dista... between the two buckets the lift tried on the'farm was 6* feet, the total length of chain on one side 31* fed. height of stand 3 feet, and the capacity of a bucket 22 cubic feet.

In one honr and 30 minutes it filled a tank of -250 cubic feet, or lifted !««•«* cubic feet per hour; on au average it raised 13 backets in a minute, and thus there was a loss of nearly 4 per cent. in tne qu·intity of ,aterraised by u^age, fc.

The lift was set to work on the 2ht March *nd kept on working till the 4th of AH ! the results qnoted above were recorded on the last day.

©i&in separator.

(8) *Grain ,,parotor* 6y *Hmdand Lund, Pr»tn.-toh* machine was ruu by p°*er at 000 revolutions per minute. The sieves supplied with tlie machine prove to be of too large a raesh, and nearly ,he whofc of the bari,.y, as aiso the small peas (kasab"), contamed ,n the wheat was delivered with the clean sample.

d ^Ti," 6TM 8 of * SmaUer lne8b were then firted to the machine with the result be buik of the Wl «y a^ small peas were separated fro.n wheat,

la my opinion the machine «ill give satisfactory result if it is used to clean **the** *dm* of wheat that ordinarily c«,mes illto the market containing, say, 5 to *1 V** centof foreign grain and irapurities.

int. tfae.

(9) The following threshers were tried against thre.hing by bullocks :-

(1) May Furth'g hand thresher.

(2) Ben Heed's thresher.

(3) Shearer Brothers' hand and foot thresher.

No. (1, was worked by hand, the other two were worked conjointly by bullock power. Jl^nMtoarBn^ the Mowirjg table:

Number	Name of machine	[illegible]	Outturn. [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Total cost	[illegible]	Cost per hundred ... of clean grain
		[illegible]	M. s. ch.	[illegible]	S. ch.	H. m.	[illegible]		Ks. a. p.	A.P-	Bs. a. p.
I	May Fnrth's hand thresher.	10	3 16 0	620 0	4 0	1 30	[illegible]	...	0 3 0	OWi	5 7 6
II	Ben Seed's and Shearer Brothen' tlueshen.	20	6 30 12	12 37 0	12 4	1 2 0	[illegible]	[illegible]	0 11 0	X n	? 0 [illegible]
tn	Country way of threshing by bullock..	10	a 31J 0	5 30 0	1i 0	19 30	[illegible]	[illegible]	1 3 6	•4 104	30 7 [illegible]

Cost in ,he above iable [illegible] wear and tear, wages of **wdined ioreman, oil, *&c***

The work done by machine No. I. was no doubt the cheapest of all; but the [illegible] on e,am«,at,on was found to contain . lar<re portion of unthreshed entire ears which had to be beaten out by sticka.

[illegible]

A set of the butter-making apparatus has lately been received from BD«1«J-We cream separator, which was worked both at the farm and at the shows, see.ns to be very efficent m iu work. Prom pnre fresh milk it turned oot more tlian 20 per cent. of cream. The-entire apparatus w,l| however, be given a thorough trial next cold weather and its retults embodied in th;nest report.

WE MUHAMMAD HUSA1N, M.B.A.0.,

Amaant Direct-

[illegible] 4, including that the j B 5 m [illegible]

STATEMENT No. 1.

Maize.

No. of plots as per map of farm.	Quantity of manure applied per acre.	Comparison of the crop and [illegible] plot in the series: Value of manure.	Weight of unthreshed cobs.	Weight of grain.	Weight of stalks.	Percentage of grain over stalks.	Percentage of stalks over grain.	Increase or decrease over standing plot in the series (No. 8).	Increase or decrease per acre.	Comparison of cost and income with the ordinary kind of cultivation: Outturn per acre: Grain.	Stalk.	Value of outturn: Grain at Re. 1 per [illegible] lb.	Stalk at Re. 1 per [illegible] lb.	Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 16-8-0.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 20.	Net profit or loss over or against the assumed income Rs. 20.
		Rs. a. p.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a.	Rs. a. p.	Rs. a.	Rs. a.	Rs. a. p.	Rs. a.
1	Woollen refuse [illegible] maunds, and lime, 12 maunds ...	[illegible]	225	[illegible]	756	30	504	+189	[illegible]	1,815	9,148	[illegible]	[illegible]	87 7	[illegible]	+1[illegible]	+11 2
2	Sheep dung, 100 maunds	[illegible]	[illegible]	[illegible]	609	20	508	+ 89	1,085	[illegible]	8,147	[illegible]	[illegible]	24 15	[illegible]	+ 4 [illegible]	+ [illegible] 11½
3	Cow dung, 120 maunds	[illegible]	[illegible]	[illegible]	190	19	[illegible]	+ 18	167	[illegible]	1,978	[illegible]	[illegible]	[illegible]	[illegible]	−13 12	[illegible]
4	Poudrette, 120 maunds	[illegible]	[illegible]	[illegible]	460	23	[illegible]	[illegible]	762	[illegible]	4,696	[illegible]	[illegible]	[illegible]	[illegible]	−1 4	[illegible]
5	Horse dung, 120 maunds	[illegible]	75	[illegible]	330	15	[illegible]	+ 39	460	405	8,145	11 14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	Pigs' dropping, 120 maunds	[illegible]	[illegible]	[illegible]	[illegible]	20	[illegible]	+ 88	1,065	1,210	6,171	23 13	[illegible]	[illegible]	[illegible]	+ [illegible]	+ 7½
7	Saltpetre, 240 lb.	[illegible]	[illegible]	[illegible]	200	19	521	+ 26	315	409	2,480	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] 13
8	No manure	...	[illegible]	[illegible]	70	17	583	...	...	145	847	[illegible]	[illegible]	[illegible]	...	[illegible]	[illegible]

Area [illegible] 400 square yards.

STATEMENT No. II.

Maize,

[illegible] of plots as per map of farm.	Quantity of manure applied per acre.	CALCULATION OF THE BESULT AND COJIPABISON OF OUTTUBN WITH THE STANDABD PLOT IN THE BEBIES *(I.E.,* CEOP SOW* AFTBB BAIN).									COMPABISON OF COST AND INCOME WITH THE OBDINABY KIND OF CULTIVATION IN VOGUE IN THIS COUNTBY,							
											Outturn per acre.		*Value of outturn.*					
		Value of manure.	Weight of unthreshed cobs.	Weight of grain.	Weight of stalks.	Weight of grain per bushel.	Percentage of grain over stalks.	Percentage of stalks over grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Grain.	Stalk.	Grain at Rs. 1 per 61 lb.	Stalk at Rs. 1 per [illegible]	*I*	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 1[illegible] 2	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 5[illegible]	Net profit or loss per acre against the assumed [illegible] Rs. 80.
		B*. a.	ft.	lb.	lb.	ft.	lb.	lb.	lb.	lb.	ft..	ft.	Bs. a.	Bs. a.	Bs. a.	*Ha. A.*	Rs. a.	Bs. a.
38	Horse *dung,* 200 maunds per acre (crop sown before rain).	6 0	738	603	3,228	61	19	511	...	...	734	3,751	14 6	0 12	15 2	- 6 0	—4 14	- 10 14
41	Horse dung, 200 maunds per acre (crop sown after rain).	6 0	714	615	3,010	61	20	494	...	+ 76	810	4,004	15 14	0 13	16 11	- 6 0	- 3 6	- 9 6

AVCA { No. 38, 4,105 beware yards.
{ ,, 11, 3,075 ditto.

STATEMENT No. III.

Cotton—Louisiana and Egyptian.

Quantity of manure applied per acre.	Variety of cotton.	Value of manure.	Treatment.	COMPARATIVE STATEMENT OF THE RESULTS AND OUTTURNS WITH THE OTHERS IN THE SERIES (A). Weight of uncleaned cotton.	Weight of cleaned cotton.	Weight of seed.	Percentage of cotton over seed.	Percentage of seed over cotton.	COMPARISON OF COST AND INCOME WITH THE ORDINARY KIND OF CULTIVATION AS VOGUE IN THIS COUNTRY. Actual outturn per acre. Cotton.	Seed.	Value of outturn. Cotton at Re. 1 per 5 lb.	Seed at Re. 1 per 60 lb.	Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 31.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 45.	Net profit or loss over or against the assumed income Rs. 45.
		Rs.		lb.	lb.	lb.	P.	P.	lb.	lb.	Rs. a.	Rs. a.	Rs. a.	Rs.	Rs. a.	Rs. a.
A.																
Farmyard manure 200 maunds and gypsum 2 cwt.	Louisiana	4	Sown before [illegible]	38	10	28	46	[illegible]	121	[illegible]	24 [illegible]	4 7	28 10	-4	-16 6	-30 [illegible]
	Ditto	4		24	8	16	50	[illegible]	97	[illegible]	19 [illegible]	3 4	23 0	-4	-22 8	[illegible]
	Egyptian	4		37	12	25	48	[illegible]	146	302	29 [illegible]	5 1	34 [illegible]	-4	-10 15	[illegible]
B.																
Farmyard manure 200 maunds and gypsum 2 cwt.	Louisiana	4	Sown after	39	[illegible]	[illegible]	46	[illegible]	121	265	24 [illegible]	4 7	28 [illegible]	-4	-16 0	[illegible]
	Ditto	4		20	[illegible]	[illegible]	43	[illegible]	73	169	14 [illegible]	2 [illegible]	17 [illegible]	-4	-27 0	-31 0
	Egyptian	4		33	[illegible]	[illegible]	46	120	121	265	24 [illegible]	4 7	28 [illegible]	-4	-16 0	-20 6

Area of each plot 400 square yards.

		Rs.	a.	p.
Value of extra 50 maunds farmyard manure	...	1		0
Ditto gypsum 2 cwt.	...	[illegible]		0
Total	...	[illegible]		0

STATEMENT No. IV.

Cotton—Country [illegible] Orleans.

Number of plots as per map of farm.	Quantity of manure applied per acre.	Variety of cotton.	Weight of uncleaned cotton.	Weight of cleaned cotton.	Weight of seed.	Percentage of cotton over seed.	Percentage of seed over cotton.	Outturn per acre: Cotton.	Outturn per acre: Seed.	Value of outturn: Cotton at Re. 1 per 5 lb.	Value of outturn: Seed at Re. 1 per 60 lb.	Value of outturn: Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 31.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 45.	Net profit or loss over or against the assumed income Rs. 45.
			lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a.	Rs. p.	Rs. a.	Rs. p.	Rs. a.	Rs. p.
A—1	Fa[illegible] manure, 200 maunds, Rs. 4	Co[illegible]tton ...	20	6	14	43	233	73	169	[illegible] 10	[illegible] 13	17 7	[illegible] 00	—37 9	—20 [illegible]
A—2	Farm [illegible] manure, [illegible] [illegible]hite, 1 cwt. each, Rs. 0 ...	Ditto ...	32	10	[illegible]	[illegible]	220	121	[illegible]	[illegible] 8	4 7	28 10	— 0	—16 6	—20 6
[illegible]	Farmyard manure, 200 maunds, Rs. 4.	New Orleans ...	21	8	10	[illegible]	[illegible]	57	131	10 6	8 4	[illegible] 10	— 00	—32 0	—33 14
[illegible]	Far[illegible] manure, gypsum and Cabhite, 1 cwt. each, Rs. 0 ...	Ditto ...	[illegible]	12	[illegible]	53	132	142	278	[illegible] 0	4 10	[illegible]	— 0	—11 0	—[illegible]6 0

* Note.—[illegible] of 50 [illegible] [illegible] manure and 1 cwt. [illegible] [illegible]bhite. Acre of [illegible] 400 square yards.

(oi)

STATEMENT No. V.

Cotton—Nankin, sown in 1885.

Quantity [illegible] applied per acre.	Value of manure.		Calculation of the result and comparison of outturn with the standard plot in the series (B). Weight of uncleaned cotton.	Weight of cleaned cotton.	Weight of seed.	Percentage of cotton over seed.	Percentage of seed over cotton.	Comparison of cost and income with the ordinary kind of cultivation in vogue in this country. Outturn per acre. Cotton.	Seed.	Value of outturn. Cotton at Rs. 1 per 5 lb.	Seed at Rs. 1 per 60 lb.	Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 31.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 45.	Net profit or loss over or against the assumed income, Rs. 45.
A.			lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a. p.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.
Manured with farmyard manure, 200 maunds, per acre.	Rs. 8 [illegible] mds.	Ratooned portion ...	52	14	38	37	271	85	229	17 0	3 13	20 13	+7 14	[illegible]	[illegible] 15
B.															
Manured with farmyard manure, 200 maunds, per acre.	Rs. 8 [illegible]	[illegible] portion,	51	14	38	37	271	85	229	17 0	3 13	20 13	+[illegible]	—24 13	—16 15

Area of each plot 600 square yards.

			Rs. a. p.
Note.—(1)	Saving by no ploughing	...	1 10 0
(2)	" " seed	...	0 4 0
(3)	" " weeding	...	7 8 0
	Total	...	[illegible] 6 0

		Rs. a. p.
Extra charge.—Value of extra manure, [illegible] mds.	...	[illegible] 8 0
*Net gain	...	[illegible] 14 0
	...	[illegible] 8 0

([illegible])

STATEMENT No. VI.

Cotton— [illegible] 1887.

Quantity of manure applied per acre.	Special treatment.	Calculation of the results and comparison of outturn with the standard plot in the season (B): Weight of uncleaned cotton.	Weight of cleaned cotton.	Weight of seed.	Percentage of cotton over seed.	Percentage of seed over cotton.	Comparison of cost and [illegible] with the ordinary [illegible] of cultivation in this country: Outturn per acre: Cotton.	Outturn per acre: Seed.	Value of outturn: Cotton at Re. 1 per 5 lb.	Value of outturn: Seed at Re. 1 per 60 lb.	Value of outturn: Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 31*	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 45.	Net profit or loss over or against the assumed income Rs. 45.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.
A. Farmyard manure, 200 maunds	Nankin cotton sown before rain.	184	49	120	35	279	172	490	34 0	8 0	[illegible] 0	[illegible]	[illegible] 5	[illegible] 8
B. Farmyard manure, 200 maunds	Nankin cotton sown after rain.	40	10	30	33	300	40	120	[illegible] 0	[illegible] 0	10 0	[illegible]	[illegible] 0	-36 8

*Note.—Value of [illegible] area of [illegible] [illegible] cart yards of farmyard manure applied, [illegible].

STA[illegible] No. VII.

[illegible]

Treatment.	Area in square yards.	Weight of cane.	Weight of juice.	Weight of rab or gur.	Percentage of juice over cane.	Percentage of rab over juice.	Increase or decrease over indigenous way of sowing.	Increase or decrease per acre.	Outturn per acre. Juice.	Outturn per acre. Rab.	Value of outturn. Gur at Rs. 1 per 22 ft.	Value of outturn. Total.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 82.	Net profit or loss over or against the assumed income Rs. 82.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a.	Rs. a.	Rs. a.	Rs. a.
Shikhya upper seed (Ek[illegible]n).														
(1) Sown in lines	900	978	474	110	[illegible]	23·82	887	1,98[illegible]	2,549	648	20 6	20 6	[illegible]	[illegible]
(2) After indigenous [illegible]	900	1,962	906	252	[illegible]	27·61	814	1,08[illegible]	4,878	1,[illegible]	61 0	61 0	[illegible]	[illegible]
Bahera [illegible] or Dhaul).														
(1) [illegible] lines	900	2,740	1,404	250	[illegible]	17·81	237	1,226	7,[illegible]50	1,[illegible]	61 1	61 1	—20 15	—20 15
(2) [illegible] indigenous w[illegible]	900	5,007	2,010	316	[illegible]	13·59	260	1,315	13,409	1,600	77 4	77 4	— 4 12	— 4 12
[illegible]														
(1) [illegible] in lines	900	3,096	1,498	204	[illegible]	20·63	103	1,040	7,880	1,531	71 14	71 14	—10 2	—10 2
(2) after indigenous wa[illegible] sowing	900	4,059	1,570	420	[illegible]	21·71	137	737	10,020	2,307	104 14	104 14	+22 14	+22 14
Indigenous seed (Mi[illegible]).														
(1) S[illegible] lines	900	5,450	2,088	457	[illegible]	16·8	79	414	16,060	2,630	[illegible] 9	110 9	+27 9	+27 9
(2) Indigenous way of sowing	900	6,090	2,358	560	[illegible]	19·7	...	...	16,477	3,014	[illegible] 6	128 6	+46 6	+46 6

6. *Temporary experiments.*—Determination of the value of mustard and cotton-cake used as manure against dung obtained from cattle fed on the same cakes. The outturn obtained from plots manured with cake was higher than that given by plots treated with the dung of cattle fed on cake, but from point of economy the latter proved the better. As in the last year, the results from mustard cake were better than those from cotton-seed cake, *vide* statements Nos. VII and VIII.

7. *Determination of duration for which the effects of certain manures last.*—They were applied in 188S and withheld since that year. Statement No. IX shows the results. As expected, the plot manured with saltpetre is more exhausted than the plot to which the cowdung or poadrette was applied ; still the results obtained from the former are not worse than from the plot to which no manure was applied.

8. *Competitive trial of Busar and Mundia wheat.*—The seed of each variety was sown in two plots ; in one sowing was done in the native way behind the plough, and in the other by a drill. Mundia, I should note, is the variety mostly grown in Cawnpore district, while the other was the produce raised last year from seed received from Bengal. Busar wheat matured early and in the plot sown after the native fashion its produce exceeded that of Mundia by 200lb, but in the plot sown by drill it fell short by 30lb. of the outturn which the plot of Mundia similarly sown gave.

9. *Smithi wheat.*—In appearance this variety resembles the trans-Jumna wheat; its grains are long and transparent with a somewhat reddish tinge, and its ears have a double row of grain like English barley. It matured over a week after the M * * t.rnagar variety and required one more watering; the outturn was just as good as that of Mundia, *vide* statement No. X.

10. *English wheat.*—A few ounces of wheat were received from Messrs. PrMCb-Kauer and Co. The seed took long time to germinate: up till February the plants were only an inch high and looked more like a grass growing in tufts. At last stalks appeared and bore ears ; the grain ripened a month after all the Indian varieties were gathered but it [illegible] The experiment confirmed that English wheat will not succeed in the lower Doab.

11. *Catch crop.*—In a field of oats, when [illegible] lucerne seed was drilled in which germinated well, but its plants were, of course, kept down by oats. Its addition did not affect the [illegible] was rather more than the produce obtained from a neighbouring field to which lucerne was not added. The crop of lucerne was kept for seed and added Rs. 12 to the profit. [illegible] of catch crops can be recommended in [illegible] barley.

12. *Effect of gypsum on leguminous crops.*—Gypsum was applied to a field of peas and gram ; its effect on the former was not much, but it increased the produce of the [illegible]. The following statement shows the result :-

Number of plot.	Crops.	Manure and quantity per acre.	Outturn per acre.		Increase due to gypsum.	
			Grain.	Straw.	Grain.	Straw.
			lb.		lb.	lb.
1	Peas ...	Farmyard manure 100 maunds, gypsum 3 cwt,	1,672	1,608	62	29
2	Ditto ...	Farmyard manure 100 maunds ...	1,610	1,698	...	...
3	Gram ...	Farmyard manure 100 maunds, gypsum 3 cwt,	1,611	6SC	163	59
4	Ditto ...	Farmyard manure 100 maunds ...	1,408	537	...	...

13. [illegible] the following varieties of barley were sown at the station [illegible] ascertaining their value in the English market:—

1. Green.
2. Chocolate color .
3. White huskless.

It was intended to grow a sufficiently large quantity, on which a definite opinion could be procured ; but more than a handfol of their seed could not be procured, whioSi have produced the following quantities :—

1. Green, 210H).
2. Chocolate, *4'2tb.*
3. White huskless, 95H».

No. 3 so much resembles wheat that it would rather bo well not to encourage its cultivation, as otherwise there is a fear *of* its being added to wheat for purposes of adulteration. Chocolate barley would perhaps, from its color, find a good market in England for malting purposes.

14. *Effect of certain manure on potato**—The following statement shows the results of this experiment: it will he Been that 10 maniids of castor cake with 3 cwts. of gypsum gave nearly as good result as 500 maunds of farmyard manure or 200 >'iauiids of poudrette, with **54ft. of** iron sulphate. This is, however, the first year in whicb Uia experiment has been tried, and the results require to be confirmed for future trials :—

Comber of plot.	Manure nnij qusotitv per net*.	Outturn per acre.	IncrcaK over the last pint.
		lbs.	Eb
1	I'oudroLto 200 mniitids, rolpjl»t» rf irnn i *»t- -.. ...	4,373	—114
2	Woollen rofasc 200 maunds and gjpso 3 ewta ...	3.0SO	—1,707
3	Pdndrette 300 raaunik and kaniti! 5 owta. p* «!» ...	3,«K)	— 1,3B7
4	Castor-oil cake 10 mannds and g.Vjisuu 3 tn ta " ...	4.S40	+ 53
5	i-'urmj^rd nianuwaml poudrettc 500 irn ...	-1.7S7	...

15. *Alanffold Wu-rzeL*—Berkshire Yellow Globe and Sutlon'a Golden Tankard were sown in a fielii **measuring** half an sere and produced u total crop of **110** maunds. The cattle at the statiou took to them kindly this year.

16. *Ensilage,*—A largo pit was filled with cAari.and the common grasses of **the** rainy season. It was opened in May ami proved sound ; the ensilagu was freely eaten by eattle,

MIR E0HAMHAD HUSAJN, M.R.A.C.,

*AtsUianl Director**

STATEMENT No. I.—STANDARD SERIES.

Number of plots according to the map of Farm.	Detail of manure.	1. Value of manure per acre.	2. Weight of unthreshed sheaves.	3. Weight of grain.	4. Weight of straw.	5. Weight of grain per bushel.	6. Percentage of grain on straw.	7. Percentage of straw on grain.	8. Increase or decrease over unmanured plot.	9. Increase or decrease per acre.	10. Actual outturn per acre: Grain.	10. Actual outturn per acre: Straw.	11. Value of outturn: Grain @ Re. 1 per 41lb.	11. Value of outturn: Straw @ Re. 1 per 400lb.	11. Value of outturn: Total.	12. Gain or loss per acre in cost against the cost of ordinary cultivation, assumed to be Rs. 10.	13. Gain or loss per acre in the value of outturn against ordinary cultivation, assumed to be Rs. 30.	14. Net profit or loss over or against the assumed income, Rs. 30.	15. Remarks.
		Rs. a. p.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
1	Saltpetre 240lb. per acre	10 5 0	344 0	90 0	248 0	66 0	38·7	258·3	+10	+133	1,161	3,001	28 5 0	7 8 0	35 13 0	−7 8 0	−2 3 0	−9 8 0	
2	Ditto bonedust 360lb. per acre	13 10 0	341 0	110 0	231 0	66 0	47·6	210·0	+30	+363	1,331	2,795	32 7 0	7 0 0	39 7 0	−10 10 0	+1 7 0	−9 3 0	
3	Cow-dung 180 maunds per acre	5 6 0	375 0	102 0	273 0	66 0	37·7	265·0	+23	+277	1,245	3,303	30 6 0	8 4 0	38 10 0	−2 6 0	+0 10 0	−1 12 0	
4	Ditto and bonedust 360lb. per acre	8 11 0	369 0	109 0	260 0	65 0	41·9	238·5	+29	+351	1,310	3,025	32 4 0	7 9 0	39 13 0	−5 11 0	+1 13 0	−3 14 0	
5	Ditto and gypsum 240lb. ditto	10 8 0	370 0	100 0	270 0	65 0	37·0	270·0	+20	+242	1,210	3,267	29 8 0	8 3 0	37 11 0	−7 8 0	−0 5 0	−7 13 0	
6	Sheep-dung 180 maunds ditto	6 6 0	330 0	119 0	210 0	66 0	56·7	176·5	+39	+472	1,440	2,541	35 12 0	6 6 0	42 2 0	−2 6 0	+4 2 0	+1 12 0	
7	Ashes of 180 maunds dung	6 8 0	257 0	67 0	190 0	66 0	35·3	283·6	−13	−157	811	2,299	19 12 0	5 12 0	25 8 0	−2 8 0	−12 8 0	−15 0 0	
8	Sheep-dung 180 maunds and bonedust 300lb.	8 11 0	353 0	79 0	274 0	65 0	28·8	346·8	−1	−17	956	3,315	23 5 0	8 5 0	31 10 0	−5 11 0	−6 6 0	−12 1 0	
9	Saltpetre 240lb. and bone-super 240lb.	20 0 0	323 0	92 0	231 0	65 0	39·8	251·1	+12	+145	1,113	2,791	27 2 0	7 0 0	34 2 0	−17 0 0	−3 14 0	−20 3 0	
10	Sheep-dung 180 maunds and gypsum 240lb.	10 8 0	313 0	118 0	195 0	66 0	60·5	165·2	+38	+460	1,428	2,359	34 12 0	5 14 0	40 10 0	−7 8 0	+2 10 0	−4 14 0	
11	No manure	...	207 0	80 0	127 0	65 0	62·9	158·7	...	...	968	1,537	23 10 0	3 15 0	27 9 0	+3 0 0	−10 9 0	−4 7 0	
12	Poudrette 180 maunds per acre	8 13 0	238 0	105 0	133 0	63 0	78·9	126·7	+25 8	+309	1,277	1,609	31 2 0	4 0 0	35 2 0	−5 12 0	−2 14 0	−8 10 0	
13	Ashes of 180 maunds dung and saltpetre	16 13 0	371 0	158 0	213 0	66 0	74·2	134·8	+78 0	+944	1,912	2,577	46 10 0	6 7 0	53 1 0	−12 13 0	+15 0 0	+2 3 0	

Area of each plot 400 square yards.

No. 1299o OF 1888.

DEPARTMENT OF LAND RECORDS AND AGRICULTURE, N.-W. P. AND OUDH.

DEPAKIm

DATED CAWNFORE, THE 9TH OCTOBBB, 1888.

FROM

LIEUT.-COLONEL D. G. PITCHER,

OFFQ. DIR. OF LAND RECORDS AND AGRICULTURE,

N.-W. PROVINCES AND OUDH.

To

THE CHIEF SECRETARY TO GOVERNMENT,

N.-W. PROVINCES AND OUDH.

SIR,

I HAVE the honor to submit, for the information of His Honor the Lieutenant-Goyernor and Chief Commissioner, the Annual Report of Mir Muhammad Husain, Assistant Director, on the Cawnpore Experimental Farm for the rabi season of 1888.

2. The report states that while the season was favourable, the average outturn was low owing to the inclusion therein of every kind of experimental plot; as this affords no real clue to the general effect of the season, the Assistant Director will be a&ked to give in future a second average for plots under ordinary cultivation, from which some idea can be got as to the produce realized by cultivators generally.

3. The experiments are described in the usual detail as permanent and temporary, and disclose no results of such particular novelty as to call for comment. The good effects of deep ploughing, green soiling, of gypsum when applied to leguminous crops and of the good value to be obtained in the shape of manure for many materials now neglected of the people, have all been demonstrated before, but constant repetition is needed to keep the memory of these facts green. There are some experiments, however, of former years that have been discontinued which may, I think, be revived with advantage, such as growing for statistics of produce sample fields of all the main rabi crops, the cultivation of wheat on strips, with alternate strips of fallow, the pedigreeing of wheat, experiments with fodder grasses, *Sec.* I have given suggestions in this direction against next year's operations, the report on which will, as approved in G. O. No. -2%- 1-2, dated 20th July, 1888, combine the results of both harvests.

I have the honor to be,

SIR,

Your most obedient servant,

D. G. PITCHER, LIEUT.-COL.,

Offg. Director.

STATEMENT No. III.—GREEN MANUKE SERIES.

Number of plot according to the map of Farm.	Delail o£ fertilizer	CALCULATION OF THE BJ>SFJ,T AND COWrAIUSOX OF OUTTURN WITH US1TANU11EJ) TLOT IT TUB BEUIE3.									COMPARISON OF COST AND INCOME WITH THE ORDINARY KIND OF CULTIVATION IN VOGUE IN THIS COUNTRY.								
		1	2	3	4	5	6	7	8	9	10		11			12	13	14	15
		Value of the fertilizer in Cawnpore Farm.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Actual outturn per acre. Grain.	Straw.	Valve of outturn Grain @ Rs. 1 per 41lb.	Straw @ Rs. 1 per 400lb.	Total.	Gain or loss per acre in cost against the cost of ordinary cultivation, assumed to be Rs. 10.	Gain or loss per acre in the value of outturn against ordinary cultivation, assumed to be Rs. 28.	Net profit or loss over or against the assumed income, Rs. 18.	Remarks.
		Rs. a. p.	lb.	lb. oz.	lb.	lb.	lb.	lb.	lb. oz.	lb.	lb.	lb.	Rs. a. p.	Rs. a. p.	Es. s. p.	Ea. a. p.	Us. *a.* *p.*	Rs. a. p.	
1	Okl indigo refuso 120 mnunds per acre.	4 12 0	204	114 0	230	65	49·7	245·0	+49 0	+520	1,379	3,388	33 10 0	8 8 0	42 2 0	-1 12 0	+4 2 0	+2 6 0	
2	Fresh ditto 120 mtrands and lime 6 inminda.	6 8 0	300	123 0	245	66	50·2	199·1	+58 0	+702	1,488	2,064	36 5 0	7 7 0	43 12 0	-3 8 0	+5 12 0	+2 4 0	
3	Indigo water 3,000 culjic feet ...	27 0 0	216	71 8	143	65	50·0	200·0	+6 8	+79	863	1,730	21 2 0	4 5 0	25 7 0	-24 0 0	-12 9 0	-36 9 0	
4	Hemp water ditto	15 8 0	161	56 0	104	...	53·8	185·7	-9 0	-108	678	1,258	16 9 0	S 2 0	19 IX 0	-15 8 0	-18 5 0	-33 13 0	
5	No manure	...	183	65 0	116	...	56·0	178·4	...	...	780	1,379	19 3 0	3 7 O!	23 10 0	+3 0 0	-12 6 0	-12 6 0	
C	Green indigo n]owli<sl in ...	2 12 0	235	76 0	159	65	47·8	209·2	+11 0	+134	920	1,924	22 1 0	4 13 0	20 11 0	+0 4 0	-11 2 0	-10 1t 0	
7	**Wheat sown** aftur indigo ...	1 8 0	360	1H 0	232	66	45·2	221·6	+49 0	+593	1,370	2,040	33 10 0	7 10 0	41 4 0	+1 8 0	+3 ; 0	+4 12 0	
8	Indigo crop ploughed and 6 maunds gypsum.	13 7 0	183	61 0	120	...	40·5	247·1	-14 0	-169	617	1,525	15 1 0	3 13 0	18 14 0	-10 7 0	-ID 5 0	-20 9 0	
9	Hemp and gypsum as above ...	13 12 0	208	72 0	136	64	52·0	188·0	+7 0	+85	871	1,640	21 4 0	4 2 0	25 G 0	-10 IS 0	-12 10 0	-23 G 0	
10	Wlicsit niter Wcrn	...	234	82 0	152	66	53·0	185·4	+7 0	+206	902	1,800	24 3 0	4 10 0	28 13 0	+3 0 0	-9 3 0	-6 3 C	
11	Wheat loiK-n after hemp ...	...	250	86 0	173	66	49·7	201·2	+ 201 0	+25B1	1,04,1	2,080	23 6 0	5 4 0	30 10 0	+3 0 0	-7 G 0	-3 6 0	
12	Hemp plongVici -wlitn -1 £oct hi(;n ...	3 4 0	273	75 0	150	66	37·7	266·9	+10 0	+121	807	2,408	22 1 0	6 0 Oi	28 1 0.	-0 -1 C	-9 15 0	-9 5 0	

EEPOUT

ON THE

CAWNPORE EXPERIMENTAL STATION

FOR THE RABI SEASON OF 1888.

THB season has been generally very favourable, still the average outturn at tho station was very low. This is partly due to the continued cultivation of wheat in the same plots year after year without rotation or change in manure and partly to strong winds in February, just when many of the fields were watered which laid the plants.

2. The experiments conducted during the season may be classed as usual into (a) permanent, (6) temporary. The scheme of the permanent experiments have been fully described in previous reports.

The appended tubular statement Nos. I and II confirm the result heretofore generally obtained, *viz.*:—

(1)—That saltpetre applied either alone or combined with some other fertilizer benefits the straw more than it benefits the grain.

(2)—The percentage of grain on straw in unmanured plot is higher than in manured plot.

(3)—The most economical manure for wheat is farmyard manure.

(4)—By alternating wheat with maize its outturn is much increased.

3. *Green-oiling.*—The results of these plots are shown in statements III, IV, •nd V, and may be summarized as follows :—•

(IV—Following wheat after indigo is more economical than ploughing the indigo as manure.

(2)—Ploughing in a green crop of hemp is a most economical way of enriching the land, and is most to be recommended for fields where farmyard manure cannot be applied with profit either owing to long distance or scarcity of manure, *vide* statement No. IV.

(3)-Indigo refuse with lime is more effective than the refuse alone, *vide* statement No. V«

In connection with these experiments, I should note that cost of indigo refuse and indigo water, as entered in the statements, is much higher than what their cost would have been had there been an indigo factory close to the station.

4. *Miscellaneous manures.—Among* these are included a number of things which we ordinarily reckoned as mere waste, and for which people in towns and in villages have to spend money simply to get rid of them. Road scrapings have this year given better results, and so also the composts and the ashes of weeds. Statement VI shows result* and proves that an application of any of them is bettor than giving no manure.

5. *Ploughing.*—The experiment was conducted on the same plots in which it was tried in previous years : the result as last year is in favor of moderately deep ploughing. The fields ploughed 9 inches deep gave no better result than those ploughed with the country plough.

6. *Temporary experiments.*—Determination of the value of mustard and cotton cake used as manure against dung obtained from cattle fed on the same cakes, The outturn obtained from plots manured with cake was higher than that given by plots treated with the dung of cattle fed on cake, but from point of economy the latter proved the better. As in the last year, the results from mustard cake were better than those from cotton-seed cake, *vide* statements Nos. VII and VIII.

7. *Determination of duration for which the effects of certain manurt* last*—They were applied in 1886 and withheld since that year. Statement No. IX shows the results. As expected, the plot manured with saltpetre is more exhausted than the plot to which the cowdung or poudrette was applied ; still the results obtained iron* the former are not worse than from the plot to which no manure was applied.

8. *Competitive trial of Buxar and Mundia wheat.*—The seed of each variety was sown in two plots: in one sowing was done in the native way behind the plough, and in the other by a drill. Mundia, I should note, is the variety mostly grown in Ca*n-pore district, while the other was the produce raised last year from seed received from Bengal. Buxar wheat matured early and in the plot sown after the native fashion its produce exceeded that of Mundia by 200ft, but in the plot sown by drill it fell short by 350ft. of the outturn which the plot of Mundia similarly sown gave.

9. *Simlhi wheat.*—*In* appearance this variety resembles the trans-Jumna wheat: its grains are long and transparent with a somewhat reddish tinge, and its ears have a double row of grain like English barley. It matured over a week after the Muz*-farnagar variety and required one more watering *i* the outturn was just as good as that of Mundia, *vide* statement No-. X.

10. *English wheat.*—A few ounces of wheat were received from Messrs. Prase)-kauer and Co. The seed took longer time to germinate: up till February the plants were only an inch high and looked more like a grass growing in tufts. At last sta** appeared and bore ears ; the grain ripened a month after all the Indian varieties were gathered in, but it was very thin. The experiment confirmed that English wheat will not succeed in the lower Doab.

11. *Catch crop.*—*In* a field of oats, when the plants were some four inches hi*li> lucerne seed was drilled in which germinated well, but its plants were, of cour.so, kept down by oats. Its addition did not affect the yield of oats, which was rather more than the produce obtained from a neighbouring field to which lucerne was not added. The crop of lucerne was kept fo? seed and added Rs. 12 to the profit. Where water is available this system of catch-cropping can be safely recommended m fields of barley.

12. *Effect of gypsum on leguminous crops.*—Gypsum was applied to a field of peas and gram ; its effect on the former was not much, but it increased the produce of the latter by 113ft. per acre. The following statement shows the result z—

Number of plot.	Crops.	Manure and quantity pep acre.	Outturn per acre.		*Increase due to gypsum.*	
			Grain.	Straw.	Grain.	Straw.
			lb.	lb.	lb.	lb.
1	Peas ...	Farmyard manure 100 maunds, gyp" sum 3 cwts.	1,873	1,608	33	20
2	Ditto ...	Farmyard manure 100 maunds ...	1,840	1,588	...	...
3	Gram ...	Farmyard manure 50 maunds, gyp9''111 3 cwts.	1,611	556	113	50
4	Ditto ...	Farmyard manure 100 yards ...	1,498	507	...	...

13. *Bar*%>-With a view of ascertaining their • value in the English market the following varieties of barley were sown at the station:-

1. Green.
2. Chocolate color .
3. White huskies*

It was intended to grow a sufficiently large quantity, on which a definite opinion could be procured ; but more than a handful of their seed could not be procured, which has produced the following quantities :—

1. Green, 210tt>.
2. Chocolate, 421b.
3. White huskless, 951b.

l^o. 3 so much resembles wheat that it would rather be well not to encourage its cultivation, as otherwise there is a fear of its being added to wheat for purposes of adulteration. Chocolate barley would perhaps, from its color, find a good market in Eng- alnd for malting purposes.

14. *Effect of certain manure on potatoes.*—*The following statement shows the result of this experiment : it will be seen that 10 maunds of castor cake with 3 cwts. of gypsum gave nearly as good result as 500 maunds of farmyard manure or 200 maunds of poudrette, with 541b. of iron sulphate. This is, however, the first year in ^hich the experiment has been tried, and the results require to be confirmed for future trials :—

dumber of plot.	Manure and quantity per ncre.	Outturn per acre.	Increase over the last plot.
		lbs.	lbs.
1	Poudrette 200 maunds, sulphate of iron * cwt	4,373	—414
2	Woollen refuse 200 maunds and gyp3um 3 cwts. ...	3,080	—1,707
3	Poudrette 200 maunds and kanite 5 cwts. per acre ...	3,400	—1,387
4	Castor-oil cake 10 maunds and gypsum 3 cwts.	4,840	+ 53
5	Farmyard manure and poudrette 500 maunds	4,787	...

15. *Mangold WurzeL*__Berkshire Yellow Globe and Sutton's Golden Tankard xvere sown in a field measuring half an acre and produced a total crop of 110 Maunds. The cattle at the station took to them kindly this year.

16. *Ensilage.*__A large pit was filled with *chari* and the common grasses of the rainy season. It was opened in May and proved sound ; the ensilage was freely «aien by cattle.

MIR MOHAMMAD HCJSAIN, M.R.A.C.,
Assistant Director.

[illegible] No. I.— [illegible]

Number of plots according to the map of farm.	Detail of manure.	CALCULATION OF THE RESULT AND COMPARISON OF OUTTURN WITH THE UNMANURED PLOT IN THE SERIES. 1. Value of manure per acre.	2. Weight of unthreshed sheaves.	3. Weight of grain.	4. Weight of straw.	5. Weight of grain per bushel.	6. Percentage of grain on straw.	7. Percentage of straw on grain.	8. Increase or decrease over unmanured plot.	9. Increase or decrease per acre.	COMPARISON OF COST AND INCOME WITH THE [illegible] KIND OF CULTIVATION IN VOGUE IN THIS COUNTRY. 10. Actual outturn per acre. Grain.	10. Straw.	11. Value of outturn. Grain @ Re. 1 per 41lb.	11. Straw @ Re. 1 per 400lb.	11. Total.	12. Gain or loss per acre in cost against the cost of ordinary cultivation, assumed to be Rs. 30.	13. Gain or loss per acre in the value of outturn against ordinary cultivation, assumed to be Rs. 38.	14. Net profit or loss over or against the assumed income, Rs. 38.	15. Remarks.
		Rs. a. p.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
1	Saltpetre 240lb. per acre ...	10 [illegible] 0	344	[illegible]	348	58	58·7	[illegible]	+46	+183	1,101	3,001	[illegible] 5 0	[illegible]	35 [illegible]	−7 6 0	−2 [illegible]	−9 [illegible] 0	
2	Ditto bonedust 240lb. per acre ...	[illegible]	[illegible]	[illegible]	331	63	47·6	[illegible]	+80	+388	1,391	2,785	43 7 0	[illegible]	50 7 0	[illegible]	+1 7 0	−9 3 0	
3	Cow-dung 180 maunds per acre ...	[illegible]	376	[illegible]	378	63	37·7	265·0	+23	+5	1,246	6,600	30 6 0	[illegible]	38 10 0	[illegible]	[illegible]	[illegible] 12 0	
4	Ditto and bonedust 240lb. per acre	[illegible]	360	[illegible]	360	65	[illegible]	323·4	+28	+351	[illegible]	3,035	[illegible]	7 9 0	39 1[illegible] 0	−5 [illegible]	[illegible]	3 14 0	
5	Ditto and gypsum 240lb. ditto ...	10 [illegible] 0	[illegible]	100	370	65	[illegible]	370·0	+30	+248	[illegible]	8,307	30 6 0	8 8 0	37 11 0	−7 [illegible]	[illegible]	−7 1[illegible] 0	
6	Sheep-dung 180 maunds ditto ...	5 5 0	330	110	340	68	[illegible]	178·6	+30	+473	1,440	2,641	35 13 0	5 6 0	43 3 0	−3 6 0	+4 [illegible]	+1 13 0	
7	Ashes of 180 maunds dung ...	6 [illegible] 0	337	67	330	64	35·3	288·6	−13	−157	671	2,399	19 12 0	6 12 0	26 [illegible]	−3 [illegible]	−12 [illegible]	[illegible]	
8	Sheep-dung 180 maunds and bone-dust 240lb.	6 11 0	353	78	374	65	38·6	345·8	[illegible]	−17	856	3,015	23 5 0	8 6 0	31 10 0	[illegible]	[illegible]	[illegible]	
9	Saltpetre 240lb. and bone-super 240.	20 0 0	329	93	331	65	39·5	251·1	[illegible]	+145	1,110	2,721	27 2 0	7 0 0	34 [illegible] 0	[illegible]	[illegible]	−20 3 0	
10	Sheep-dung 180 maunds and gypsum.	10 8 0	313	118	305	66	60·5	165·9	[illegible]	+460	1,425	[illegible]	34 13 0	5 1[illegible] 0	40 [illegible]	[illegible]	[illegible]	−4 14 0	
11	No manure	...	307	[illegible]	327	65	[illegible]	158·7	...	...	962	1,567	25 10 0	3 15 0	27 9 0	[illegible]	−1 [illegible]	−4 7 0	
12	Poudrette 180 maunds per acre ...	[illegible]	[illegible]	[illegible]	332	63	[illegible]	135·1	+25 8	+300	1,377	[illegible]	31 9 0	4 0 0	35 9 0	[illegible]	−3 14 0	[illegible]	
13	Ashes of 180 maunds dung and saltpetre.	[illegible]	[illegible]	[illegible]	[illegible]	63	74·2	134·8	+70 0	+344	1,015	[illegible]	46 [illegible]	6 7 0	[illegible] 1 0	[illegible]	+15 0 0	[illegible]	

Area [illegible] 400 square [illegible].

STATEMENT No. JI—*DUPLICATE* SERIES.

Number of plots on farm	Detail of manures	CALCULATION OF THE *RESULT AND* COMPARISON OF OUTTURN WITH THE UNMANURED PLOT IN THE SERIES. 1. Value of manure per acre	2. [illegible] threshed	3. [illegible] of grain	4. Weight of straw	5. Weight of grain per bushel	6. Percentage of grain on straw	7. Percentage of straw on grain	8. Increase or decrease over unmanured plot in the series	9. Increase or decrease per acre	COMPARISON OF COST AND INCOME WITH THE ORDINARY KIND OF CULTIVATION IN VOGUE IN THIS COUNTRY. 10. *Actual outturn per acre.* Grain	10. Straw	11. *Value of outturn.* Grain @ Rs. 1 per [illegible]	11. [illegible]	11. Total	12. Gain or loss per acre [illegible]	13. Gain or loss per acre [illegible]	14. Net profit [illegible]	15. Remarks
		Rs. a. p.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb.	lb.	lb.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
X	Salpetre 240%. per acre ...	10 5 0	1483 0	136 0	349 0	6G 0	39 0	!57 0	+ 61 0	+739	1,646	4,223	40 2 0	•10 9 0	50 11 0	-7 5 0	+ 12 11 0	+ 5 6 0	
2	Ditto bone-dust 3G0ft. ...	13 1 0	S52 0	207 0	345 0	GG 0	60 0	1G7 0	+ 132 0	+1,598	[illegible]	[illegible]	61 2 0	10 7 0	71 9 0	—10 10 0	+ 33 9 0	+ 22 15 0	
3	Cowdung 180 maunds ...	5 G 0	282 0	101 0	181 0	66 0	56 0	170 9	+ 26 0	+315	1,222	2,190	29 12 0	15 8 0	34 10 0	-2 6 0	-3 6 0	-5 12 0	
4	Ditto and bonedust 3601b. ...	8 11 0	224 0	82 0	132 0	66 0	62 0	161 0	+ 7 0	+85	992	1,597	24 3 0	14 0 0	28 3 0	-5 11 0	-9 13 0	-15 8 6	
5	Ditto and gypsum 2401b, ...	10 8 0	211 0	75 0	136 0	66 0	55	181 0	+	+	907	1,646	22 2 0	4 2 0	26 4 0	-7 8 0	-11 12 0	-19 4 0	
6	Ashes 180 maunds of dung ...	5 8 0	365 0	124 0	>U0 0	65 0	52	194 0	+ 49 0	+ 593	1,500	2,904	36 9 0	7 4 0	43 13 0	-2 8 0	+ 5 13 0	+ 3 5 0	
7	Sheepdung and bonedust [illegible] ...	8 11 0	332 0	123 0	259 0	66 0	47	211 0	+ 48 0	+581	1,488	3,134	36 5 0	7 13 0	44 2 0	-5 11 0	+ 6 2 0	+ 0 7 0	
8	Saltpetre 2409). bone supcrpbospato 2401b.	20 0 0	386 0	166 8	219 0	66 0	76	131 3	+ 91 0	+1,108	2,015	2,650	49 2 0	6 10 0	55 12 0	—17 0 0	+ 17 12 0	+ 0 12 0	
9	Shcepdung 180 maunds and gypsum 2401b.	10 8 0	198 0	ff 0	121 0	66 0	63	157 1	+ 2 0	+25	932	1,464	22 12 0	3 11 0	26 7 0	-7 8 0	-11 9 0	-18 1 0	
10	Sheepdung 180 maunds ...	5 6 0	511 0	102 0	400 0	66 0	25	392 1	+ 27 0	+327	1,234	4,840	30 2 0	12 2 0	42 4 0	+ 2 6 0	+ 4 4 0	+ 1 14 0	
11	No manure ...	...	223 0	75 0	147 0	66 0	51	196 0	+	+	907	1,779	22 2 0	4 7 0	26 9 0	+ 3 0 0	-11 7 0	—14 7 0	
12	Poudrette 180 maunds ...	8 12 0	335 0	108 0	227 0	6G 0	[illegible]	210 2	+ 33 0	+ 400	1,307	2,747	31 14 0	6 4 0	3s 2 0	+ 5 12 0	+ 0 2 0	—5 10 0	
13	Askes of 180 maunds dung and saltpetre [illegible]	15 13 0	253 0	82 8	171 0	66 0	[illegible]	206 5	+ 7 8	+ 91	998	2,0C9	24 5 0	5 2 0	29 7 0	-12 13 0	-8 9 0	—21 6 0	

Area of **each** plot 400 square yards.

STATEMENT No. III.—GREEN MANURE SERIES.

S	Detail of fertilizer.	CALCULATION OF THE RESULT AND COMPARISON OF OUTTUBN WITH UNMANUBED PLOT IT THE 6EBIES.									COMPAEISON OF COST AND INCOME WITH THE OBDINAUY KIND OF CULTIVATION IN TOGUB IN THIS COrXTUY.								
		1	2	3	4	5	6	7	8	9	10		11			12	13	14	15
											Actual outturn per acre.		Value of outturn.						
		Value of the fertilizer in Chumparun Farm.	Weight of unthreshed sheaves.	... of grain.	W... of straw.	Weight of grain per bushel.	Percentage of grain on sheaves.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Grain.	I	n	Straw @ Re. 1 per 400 lb.	Total.	Gain or loss per acre in cost against the cost of ordinary cultivation, assumed to be Rs. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation, assumed to be Rs. 28.	Net profit or loss over or against the preceding...	Remarks.
		Bs. a. p.	ft.	ft. 02.	ft.	lb.	lb.	lb.	lb. oz.	ft.	lb.	ft.	Bs. a. p.	Bs. a. p.	Bs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
1	Old indigo refuse 120 maunds per acre.	4 12 0	394	114 0	280	65	40-7	2456	+49 0	+ 593	1,379	3,388	33 10 0	8 8 0	42 2 0	−1 12 0	+4 2 0	+2 6 0	
2	Fresh ditto 120 maunds and lime 6 maunds.	6 8 0	3GS	123 0	2i5	60	50-2	1991	+58 0	+ 702	1,488	2,964	36 5 0	7 7 0	43 12 0	−3 8 0	+5 12 0	+2 4 0	
3	Indigo water 3,600 cuUc feet ...	37 0 0	21G	71 8	143	66	50-0	2000	+6 8	+79	865	1,730	21 2 0	4 5 0	25 7 0	−34 0 0	−12 9 0	−46 0 0	
4	Hemp water ditto	18 8 0	161	56 0	m	...	538	185-7	- 9 0	-108	678	1,258	16 9 0	3 2 0	19 11 0	−10 8 0	−18 5 0	−30 13 0	
5	No manure.,. ...	...	181	65 0	116	...	560	178-4	...	...	78G	1*379	19 3 0	3 7 0	22 10 0	+3 0 0	−15 6 0	−12 6 0	
6	Green indigo ploughed in ...	2 12 0	235	76 0	159	66	47'8	[illegible]	+ 11 0	+ 134	920	1,924	22 1 0	4 13 0	26 14 0	+0 4 0	−11 2 0	−10 14 0	
7	Wheat sown after indigo ...	1 8 0	366	114 0	252	66	45'2	211-6	+49 0	+ 593	1,379	3,049	33 10 0	7 10 0	41 4 0	+1 8 0	+3 4 0	+4 12 0	
8	Indigo crop ploughed and 6 inannds gypsum.	13 7 0	188	61 0	126	...	40-5	247T	-14 0	-169	617	1,525	15 1 0	3 13 0	18 14 0	−10 7 0	−19 2 0	−20 9 0	
9	Hemp and gypsum as above ...	13 12 0	208	72 0	136	64	62-9	188-9	+7 0	+ 85	871	1,640	21 4 0	4 2 0	25 6 0	-10 12 0	−12 10 0	−23 0 0	
10	Wheat after lucern	...	234	82 0	162	66	53-9	185'4	+7 0	+ 206	992	1,839	24 3 0	4 10 0	28 13 0	+3 0 0	−9 3 0	−6 3 0	
11	Wheat sown after hemp ...	...	259	86 0	173	66	49-7	201-21	+ 201 0	+2551	1,0411	2,093	25 6 0	5 4 0	30 10 0	+3 0 0	−7 0 0	−3 0 0	
12	Hemp ploughed when 4 feet high ...	S 4 0	275	75 0	199	68	37'7	265-31	+10 0	+ 1211	9071	2,4081	22 1 0	6 0 0	28 1 0	-0 4 0	−9 14 0	−0 0 0	

STATEMENT No. IV.

Number.	Detail of fertilizer.	CALCULATION OF THE RESULT AND COMPARISON OF OUTTURN WITH THE UNMANURED PLOT IN THE SERIES. 1. Cost of the fertilizer in Cawnpore Farm.	2. Weight of unthreshed sheaves.	3. Weight of grain.	4. Weight of straw.	5. Weight of grain per bushel.	6. Percentage of grain on straw.	7. Percentage of straw on grain.	8. Increase or decrease over standard plot in the series.	9. Increase or decrease per acre.	COMPARISON OF COST AND INCOME WITH THE ORDINARY KIND OF CULTIVATION IN VOGUE IN THIS COUNTRY. 10. Actual outturn per acre. Grain.	10. Straw.	11. Value of outturn. Grain @ Be. 1 per 41 lb.	11. Straw @ Be. 1 per 400 lb.	11. Total.	12. Gain or loss per acre in cost against the cost of ordinary cultivation, assumed to he Rs. 30.	13. Gain or loss per acre in the value of outturn against ordinary cultivation, assumed to he Rs. 38.	14. Net profit or loss over or against the assumed income, Rs. 38.	15. Remarks.
		Rs. a. p.	lb. oz.	lb. oz.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
1	Hemp ploughed	3 4 0	1,508½	343 14	1,148 0	65 8	44 ½	183 ½	...	...	1,385½	2,202½	31 5 0	5 11 0	37 0 0	−0 4 0	−1 0 0	— 4 0	
2	Unmanured	...	721½	220¼	463¼	60 0	50¾	204	−10	...	387	1,107	14 5 0	2 14 0	17 3 0	+8 0 0	−20 13 0	−17 13 0	

Note—Average area of the plots { (1) of 2,424 square yards. (2) of 1,815 ditto.

STATEMENT N[illegible]

Number of plots according to the map of Farm.	Detail of fertilizer.	1. Cost of the fertilizer in Cawnpore Farm.	2. Weight of unthreshed sheaves.	3. Weight of grain.	4. Weight of straw.	5. Weight of grain per bushel.	6. Percentage of grain on straw.	7. Percentage of straw on grain.	8. Increase or decrease over standard plot in the series.	9. Increase or decrease per acre.	10. [illegible] per acre. Grain.	10. Straw.	11. Value of [illegible]. Gain @ Re. 1 per 41ft.	11. Straw @ Re. 1 per 400lb.	11. Total.	12. Gain or loss per acre in cost against the cost of ordinary cultivation, assumed to be Rs. 30.	13. Gain or loss per acre in the value of outturn against ordinary cultivation, assumed to be Rs. 38.	14. Net profit or loss over or against the assumed income, Rs. 38.	15. Remarks.
		R. a. p.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
1	Fresh indigo refuse 180 maunds and lime 6 maunds.	[illegible] 8 0	341·0	111	222½	66	50·2	187·6	+55½	+312	717	1,3[illegible]	17 8 0	3 6 0	20 14 0	−8 8 0	−17 2 0	−20 10 0	
2	Ditto ditto alone ...	4 0 0	280·0	82·0	193·0	56	42·7	[illegible]	−1	−6	496	1,102	12 10 0	2 14 0	15 0 0	−1 12 0	−23 0 0	−24 12 0	
3	Old indigo refuse 180 maunds and lime 6 maunds.	6 8 0	448·0	[illegible]	290½	56	57·	[illegible]	+91½	+554	1,068	[illegible]	26 12 0	3 10 0	29 11 0	−8 8 0	−8 5 0	−11 5 0	
4	Ditto ditto alone ...	4 12 0	345·0	112·0	236·0	56	47·5	210·7	+29	+176	[illegible]	1,422	16 2 0	3 9 0	20 2 0	−1 12 0	−17 14 0	−19 10 0	
5	No manure	...	226·0	83·0	164·0	68	50·6	198·4	...	...	502	986	12 4 0	2 7 0	14 11 0	+8 0 0	−23 5 0	−20 6 0	

[illegible]NT No. VI.—M[illegible]LLAN[illegible] SERIES.

Number.	Detail of manure.	1. Value of manure per acre.	2. Weight of unthrealied sheaves.	3. Weight of grain.	4. Weight of straw.	5. Weight of grain per bushel.	6. Percentage of grain *on* straw.	7. Percentage of straw on grain.	8. Increase or decrease over standard plot in the series.	9. Increase or decrease per acre.	10. Actual outturn per acre. Grain.	10. Actual outturn per acre. Straw.	11. Value of outturn. Grain @ Be. 1 per41ib.	11. Value of outturn. Straw @ Be. 1 per 400ft.	11. Value of outturn. Totol.	12. Gain or loss per acre in cost against the cost of ordinary cultivation, assumed to be Bs. 30.	13. Gain or loss per acre in the value of outturn against ordinary cultivation, assumed to be Bs. 38.	14. Net profit or loss over or against the assumed income, Bs. 38.	15. Bemarks.
		Rs. a. p.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
1	Brick-kiln refuse 120 maunds per acre ...	1 13 0	160 0	50 0	1[illegible] 0	...	32·2	310·6	+10	+121	471	1,464	11 0 0	3 15 0	15 7 0	+1 [illegible]	−23 9 0	−21 5 0	
2	Silt 800 maunds per acre	0 12 0	1[illegible] 0	46 0	97 0	66	...	210·9	+7	+200	...	1,474	13 1[illegible] 0	2 15 0	10 11 0	+8 4 0	−21 6 0	−10 2 0	
3	Compost 800 maunds per acre ...	5 0 0	1[illegible] 0	[illegible]	138 0	+	[illegible]	280·0	+28½	+242	623	1,[illegible]	16 14 0	4 0 0	20 4 0	−8 [illegible]	−17 12 [illegible]	−20 12 0	
4	Road-scraping 800 maunds per acre ...	[illegible] 0	195 0	[illegible]	134 0	+	[illegible]	321·5	+31½	+881	728	[illegible]	17 14 0	4 1 0	21 15 0	−1 11 0	−16 1 [illegible]	17 12 0	
5	Ashes of 180 maunds weeds ...	[illegible] 0	1[illegible] 0	[illegible] 0	96 0	+	[illegible]	171·4	+37	+327	[illegible]	1,162	15 7 0	2 14 0	18 [illegible]	−1 [illegible]	−14 11 [illegible]	−19 11 0	
6	Ditto ditto salt petre 240lb. ...	[illegible]	1[illegible] 0	[illegible] 0	130 0	+	45·0	265·7	+15	+167	509	1,463	12 4 0	[illegible] 0	16 [illegible]	−1 3 0	−22 1 [illegible]	−[illegible] 3 0	
7	Ammonic chloride 240lb.	[illegible] 0	140 0	40 0	110 0	+	27·3	266·7	+1	+12	[illegible]	1,[illegible]	6 14 0	2 5 0	12 [illegible]	−41 0 [illegible]	−25 16 [illegible]	−56 16 0	
8	No manure	...	115 0	32 0	88 0	+	33·7	286·6	...	...	[illegible]	1,[illegible]	8 2	[illegible] 10 0	11 8 0	+3 [illegible]	−36 13 [illegible]	28 16 0	

[illegible] of each plot 400 square yards.

STATEMENT No. VII.

Detail of manure.	CALCULATION OF THE RESULT AND OUTTURN OF MANURED PLOT IN COMPARISON WITH THE UNMANURED PLOT OF THE SERIES.								COMPARISON OF COST AND INCOME WITH THE ORDINARY KIND OF CULTIVATION IN THIS COUNTRY.								
	1	2	3	4	5	6	7	8	9	10		11			12	13	14	15
										Actual outturn per acre.		Value of outturn.						
	Cost of manure on Cawnpore Farm.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bundle.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over unmanured plot.	Increase or decrease per acre.	Grain.	Straw.	Grain @ Re. 1 per 41lb.	Straw @ Re. 1 per 400lb.	Total.	Gain or loss per acre in cost against the cost of ordinary cultivation, assumed to be Rs. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation, assumed to be Rs. 38.	Net profit or loss over ordinary income, Rs. 38.	Remarks.
	Rs. a. p.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
Mustard cake 5 maunds per acre ...	6 1 0	437	129½	307½	64	42·1	237·6	+25½	+281	1,084	2,483	26 0 0	6 1 0	31 1 0	−6 1 0	−6 15 0	−12 0 0	
Ditto 10 maunds per acre ...	16 0 0	470	164	300	68	54·6	182·6	+70	+664	1,297	2,480	31 10 0	6 1 0	37 11 0	−16 1 0	+0 5 0	−15 0 0	
Plain cowdung 200 maunds per acre ...	5 0 0	400	123	317	66	35·4	282·1	+29	+290	973	2,744	23 13 0	6 14 0	30 10 0	−9 0 0	−7 5 0	−10 8 0	
Cake-fed dung 50 maunds per acre ...	3 0 0	377	109	268	65	41·4	190·8	+15	+110	863	1,645	21 0 0	4 2 0	25 2 0	+1 0 0	−12 14 0	−11 14 0	
Ditto 100 maunds ...	4 0 0	354	107	257	68	37·5	266·3	+13	+103	848	2,270	20 10 0	5 11 0	26 5 0	−1 0 0	−11 11 0	−12 11 0	
No manure	...	345	94	251	66	37·4	267·0	...	...	743	1,986	18 2 0	4 15 0	23 1 0	+3 0 0	−14 15 0	−14 15 0	

Area 612 square yards,

STATEMENT No. VIII.

Detail of manures.	1. Cost of the manure in Cawnpore Farm.	2. Weight of unthreshed sheaves.	3. Weight of grain.	4. Weight of straw.	5. Weight of grain per bushel.	6. Percentage of grain on straw.	7. Percentage of straw on grain.	8. Increase or decrease over unmanured plot.	9. Increase or decrease per acre.	10. Actual outturn per acre. Grain.	10. Actual outturn per acre. Straw.	11. Value of outturn. Grain @ Re. 1 per 41 lb.	11. Value of outturn. Straw @ Re. 1 per 400 lb.	11. Value of outturn. Total.	12. Gain or loss per acre in cost against the cost of ordinary cultivation, assumed to be Rs. 30.	13. Gain or loss per acre in the value of outturn against ordinary cultivation, assumed to be Rs. 38.	14. Net profit or loss over or against the assumed income, Rs. 38.	15. Remarks.
	Rs. a. p.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
[illegible] seed [illegible] maunds ...	0 0	200	108	[illegible]	65	71·0	[illegible]	+18	+108	[illegible]	1,202	20 15 0	3 0 0	[illegible] 13 0	0 0	−14 3 0	−13 3 [illegible]	
[illegible] seed [illegible] per acre ...	4 0 0	405	140	210	56	66·7	150·0	+51	+	1,[illegible]	1,2[illegible]	[illegible] 3 0	4 5 0	[illegible] 8 0	−1 0 0	−5 8 0	− [illegible] 0	
Plant cowdung 500 maunds [illegible] ...	5 0 0	370	118	215	[illegible]	52·0	1[illegible]	+[illegible]	+	50[illegible]	1,700	21 13 0	4 4 0	25 1 0	−8 0 0	−11 15 0	−1 [illegible] 0	
Powdered cotton seed [illegible] acre ...	[illegible] 15 0	306	108	203	[illegible]	50·7	197·0	+8	+84	[illegible]	1,606	19 14 0	4 0 0	23 14 0	−8 15 0	−14 2 0	−18 1 0	
Ditto [illegible] 10 [illegible] ...	18 1 0	340	150	190	66	61·7	103·3	+55	+485	1,[illegible]	2,201	23 15 0	5 1 0	24 11 0	−15 1 0	−[illegible] 0	−16 [illegible]	
No manure	...	251	95	1[illegible]	66	61·1	1[illegible]	...	...	761	1,471	18 5 0	4 11 0	23 0 0	+4 0 0	−16 0 0	−18 0 0	

[illegible] of each plot 512 square yards.

TABLE No. IX.

Detail of manure.	When applied.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over unmanured plot.	Increase or decrease per acre.	Actual outturn per acre: Grain.	Actual outturn per acre: Straw.	Value of outturn: Grain @ Rs. 1 per 41 lb.	Value of outturn: Straw @ Re. 1 per 400 lb.	Total.	Gain or loss per acre in cost against the cost of ordinary cultivation, assumed to be Rs. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation, assumed to be Rs. 38.	Net profit or loss over or against the assumed income, Rs. 38.	Remarks.
	1	2	3	4	5	6	7	8	9	10	10	11	11	11	12	13	14	15
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a. p.	Rs. a.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
Cowdung 200 maunds per acre	These manures were applied in Rabi, 1885-86.	250	100	150	60	[illegible]	150·0	+ 52	+ 831	1,310	1,916	28 8 0	4 9 0	34 1 0	+ 8 0 0	− 2 15 0	+ 0 15 0	
Poudrette 200 maunds		190	76	115	66	[illegible]	151·3	+ 27	+ 337	1,007	1,291	22 3 0	3 6 0	25 11 0	+ 8 0 0	−12 15 0	+ 9 15 0	
[illegible] cake 900 [illegible] acre		153	59	94	...	[illegible]	159·3	+ [illegible]	+ 136	714	1,137	17 7 0	2 13 0	20 4 0	+ 8 0 0	−17 12 0	+14 12 0	
[illegible] refuse [illegible]		165	63	102	...	[illegible]	168·8	+ [illegible]	+ 69	[illegible]	1,240	18 6 0	3 3 0	21 10 0	+ 8 0 0	−16 6 0	+13 6 0	
Cowdung and [illegible] 400 maunds ...		140	58	83	...	[illegible]	169·8	+ [illegible]	+ 111	[illegible]	1,118	17 2 0	3 13 0	18 15 0	+ 8 0 0	−18 1 0	+15 1 0	
Compost 400 [illegible] acre		170	58	112	...	[illegible]	193·1	+ [illegible]	+ 121	[illegible]	1,368	17 2 0	3 6 0	20 8 0	+ 8 0 0	−17 8 0	−14 8 0	
Green manure [illegible]		160	61	99	...	[illegible]	124·1	+ [illegible]	+ 66	[illegible]	[illegible]	15 1 0	3 0 0	18 1 0	+ 8 0 0	−19 15 0	−16 15 0	
Saltpetre 240 lb. [illegible]		150	52	98	...	[illegible]	188·5	+ 4	+ 49	[illegible]	[illegible]	15 5 0	2 15 0	18 4 0	+ 8 0 0	−[illegible] 12 0	−16 12 0	
[illegible] chloride		160	57	103	...	[illegible]	180·7	+ 2	+ 109	690	[illegible]	16 13 0	3 3 0	19 15 0	+ 8 0 0	−[illegible] 1 0	−16 1 0	
No manure		160	48	97	...	55·1	181·2	...	...	581	[illegible]	14 3 0	2 10 0	16 15 0	+ 8 0 0	−21 2 0	−18 8 0	

[illegible] plot 400 square yards.

STATEMENT X.

Varieties of wheat sown to compare their yield with country or Mundia wheat.	CAtCTTIATION OP THE EESFIT AND COMPARISON OF OUT-TURN WITH THE STANDARD PIOT IN THE SERIES.						COMPARISON OP COST AND INCOME WITH THE ORDINARY KIND OF CUXTITATION IN YOGVE INTHIB COUNTRY.									
	1	2	3	4	5	6	7		8			9	10	11	12
	Weight of unthreshed above.	Weight of grain.	[illegible]	[illegible] of grain per [illegible]	Percentage of grain on straw.	Percentage of straw on grain.	Actual outturn per acre*		Value of outturn.			[illegible]	[illegible]	[illegible]	Remarks.
							Grain.	Straw.	[illegible]	[illegible]	Total.				
	lb.	ft.	lb.	ft.	ft.	ft.	ft.	ft.	Es. a. p.	Ea. a. p.	Es. a. p.	Es. a. p.	Us. a. p.	Bs. a. p.	
Buxer wheat from acclamatized seed, (sown after country fashion)	1,029	•356	[illegible]	[illegible]	53	189	[illegible]	1,795	23 4 0	4 8 0	27 12 0	- 1 8 0	-10 4 0	-11 12 0	
Country or Mundia wheat sown as above..	2,049	554	1,490	[illegible]	37	[illegible]	739	1,987	18 0 0	4 IS 0	22 15 0	- 1 8 0	-15 1 0	-16 9 0	
Buzar wheat sown with drill,.,	1,392	440	952	[illegible]	46	216	1,173	2,539	28 10 0	6 6 0	35 0 0	- 1 8 0	-3 0 0	-4 8 0	Fell down.
Mundia wheat sown as above	22,749	1,144	1,605	...	71	140	1,525	2,140	37 3 0	5 6 0	42 9 0	- 1 8 0	+ 4 9 0	+3 1 0	
Sendhi wheat sown after country way	1,152	384	768	[illegible]	50	200	768	1,536	18 12 0	3 13 0	22 9 0	- 1 8 0	-15 7 0	-16 15 0	

• The difference in quantity is due to the difference in area of the plots in which the different wheats were sown thus—
(1) Buxar wheat plot of 1,S15 square yards,
<2) Mundia „ „ 3,630 „
(3) Sendhi „ „ 2,420

In class I the experiments Nos. 1, 2 and 3 of kharif and rabi are to determine—

(a) The length of time that wheat (a spring crop) and maize {a rainy season crop) can he groivn year after year on the same land without materia falling oS in yield by the aid of artificial manures,

(I) The relative effect on the plots thus continuously cultivated of different kinds! of manure.

(e) The effect of a judiciou&rotation of crops, as compared with a continu cropping of tlie land with wheat and maize alone.

Rabi experiment No. 3 is, moreover, to determine the mammal value of refuse not ordinarily used by Indian agriculturists.

Nos. 4, 5 and 6 in class I (rabi) are experiments with liemp and indigo utilized as manures.

Nos. 7 and 8 are experiments in ploughing and are of long standing. The effect of improved ploughs is compared with that of indigenous ones.

Class, II, temporary experiment, hha-rif season, Wo. l.—In* 1885 a gentleman from America, Mr. Housar, visited the farm and started this experiment. It will be continued for three or four years.

Not 2 and 4, early **and late** *sowing of maize 'and cotton.*—This is ft very important experiment and is very carefully demonstrated.

Nos. 0 **to** *10, sugarcane and indigo experiments.*—Were started in 1887 and wil continue for 5 years,

2fo. ***11,*** *the.* **mtetilaneout** *gram* **teriet experiment.—"Was** discontinued 3 years sg°, but was re-started last year.

Class II. Jlabi—These experiments were all started in 18S6 or 1887 and will I* kept on for ō years,

Nos. 1 and 3 are to determine the vitality and productiveness of different varieties of wheat and barley.

No. 2 is to-find out the advantages of getting a catch crop from a barley or an oat field.

Nos. 4 and 5 are to demonstrate the effect of gypsum on leguminous crops.

Nos. 6 find 7 are to indicate the comparative manurial value of mustard and cotto cakes ; (1) applied directly to tlie soil, and (2) **indirectly** as farmyard manure.

Nos. 8 and 9 are to ascertain the residual value of certain fertilizers.

No. 10, an experiment with potatoes on a regular systenij was started last)* and will be kept on for 5 years.

No. 11, kainit, was started last year and its effect is demonstrated chiefly on wb and potato.

No. 12, sheep folding, is a Tery common indigenous process and is the big method of farmintr kiinum \-n n>: •> •muwn m this country. It is being experimentally tneu t>" larm.

KHARIF SEASON EXPEEIMKNTS.

The rainy season of 1883 Was ^.^tionably unfavorable, particularly at 7 1 d C : 1 7 e Tbe -bSB *&£&* 5&-5S inches, the normal average be about 30 inches.

REPORT

ON THE

CAWNPOEE EXPEKIMENTAL STATION

FOB THE

KHARIF AND RABI SEASONS> 1888-89.

ALLAHABAD:

NORTH-WE&TEBN PROVINCES **AND** OUDH GOVERNMENT **PRESS.**

1889.

Kharif Statement VI.

(5) *Comparison of the yield of several varieties of cotton.*—The season was even worse for cotton than for maize, and the results were very disappointing. Fresh seed of 3 varieties of cotton, namely, (1) Jones' Improved, (2) S. B. Mexey, (3) Shine's Prolific, had been obtained direct from America and the acclimatized seed of other varieties was also sown. But the whole experiment was spoilt. However two points may be considered to have been demonstrated : *(a)* that acclimatized seed (as proved before) is better than fresh imported seed; *(b)* that the Garo Hills cotton resists wet seasoning. It gave a yield of 166lbs., the largest yield of all the varieties.

The second cotton experiment, in the comparative value of early and late sowings, was a failure. The late sown plot yielded nothing, and the yield of the other plot was extremely poor.

Kharif Statement VII.

(6) *Experiments with sugarcane.—The* first of these experiments was to determine the yield of 4 varieties of sugarcane. The seed for plots numbered (1) to (3) was obtained the year before last from the best sugar-growing districts, 1 Behia (Bengal), 2 Shahjahanpur, 3 Moradabad,

The season was favorable for this crop, but the cane grew so high that it was beaten down by rain and the outturn was spoilt to some extent. The plots were manured with poudrette, 400 maunds per acre. They were sown on the 1st of March in two ways: *(a)* according to the indigenous way of sowing, *(b)* in lines as sown in West India settlements. They were hand hoed three times and watered five times. The yield of juice was very good, but the plots in which the cane had been beaten down by the rain did not produce fine *rāb* or *gur*.

Besides the determination of the comparative yield, the experiment was also meant to illustrate the comparative merits of sowing in the West India system and according to the native method. The results, as exhibited in Statement VII, show that the indigenous variety of cane as well as the indigenous method of sowing proves to be more suitable for this country. The same result was obtained last year.

Kharif Statement VIII.

(7) Another experiment with sugarcane was the determination of the relative economy of what is known as *peri,* namely, a second crop of sugarcane from the same plants. Accordingly the roots of the sugarcane crop sown the year before last were kept in the field, which was top dressed with farmyard manure at 200 maunds per acre, was hand hoed twice and watered five times.

The total cost of maintaining the field is calculated at Rs. 33 per acre, namely, rent of land Rs. 10, manure Rs. 6, hoeing and watering Rs. 10, making gur Rs. 7, total Rs. 33. The total income per acre has been Rs. 53; the net profit is Rs. 20. There would therefore not seem to be much gain to a cultivator from this special form of cultivation known as *peri,*

Kharif Statement IX.

(8) *Experiments with indigo.*—As gypsum is a special manure for leguminous crops, and deposits of it have lately been discovered in several places in the province, particular attention has been directed for the last two years to ascertain its effect on indigo. Gypsum has been given gratis to several indigo planters for trial, and, so far as their opinions are known, they corroborate the result obtained on the farm.

The experimental plots sown with indigo and either manured or top dressed with gypsum were seriously affected by the heavy rains, but they gave heavier yield than the other plots to which gypsum was not applied.

Kharif Statement X.

(9) Statement X shows details of an experiment in early and late sowings of indigo, as well as of the [illegible] four plots were used, of which two were sown before and two after they had set in. The late sown crop utterly failed. [illegible] plots was poor : but of these two, the one treated with gypsum gave the best results.

Kharif Statement XI.

(10) *Miscellaneous experiments.*—In [illegible] of 400 square yards, millet and other minor [illegible] experiment is to test the comparative value of the [illegible] in these Provinces. Owing to the season, the outturn of these plots was generally poor.

REPORT

ON THE

CAWNPORE EXPERIMENTAL STATION

FOR THE KHARIP AND RABI SEASONS, 3888-89.

INTRODUCTORY.

THIS is tlie first year that, by the consent of the Government, the two reports on the kharif and rabi seasons, which used to be issued separately, are combined in one volume.

It seems desirable in this first combined report to preface the details of the experiments with a short descriptive account of the Farm, specifying the areas under the different experimental crops and the character of the experiments in progrees.

The Cawnpore Farm was started in 1874 and is consequently about 15 years old. Its area, as also the character of the experiments conducted in the early days of its history, have been subject to considerable cliange. Some of the experiments at present carried on date from 1874. Others, such as the green soiling series, the rabi and kharif manuring series, the ploughing and irrigation series, date their existence in their present form from the year 1884-85 : before that the plots under treatment tad been subject to some extent to addition or alteration.

Experiments on the Cawnpore Farm are conducted in two places: (1) in a group of fields called "The Farm" (proper), consisting of 89 bighas and 9 biswas; (2) in the old public garden, called "The Company Bágh," in which about 12 acres of land has been cleared for growing cereals.

The chief points aimed at by the experiments now conducted are—

(*a*) To estimate the value and utility of improved methods of farming compared with indigenous methods.

(*b*) To form an idea, by weighment of crops, of the character of the season in point of outturn, and thereby obtain independent data for checking the agricultural forecasts of harvest yield obtained from the several districts of the province.

(*c*) To produce pedigree seed for distribution in the country.

A brief description of the experiments now in progress for one or other of the above objects will now be given, but first it may be said that such experiments naturally fall into two groups, according as they are "permanent" (that is, continued year after year with the same plots of land), or are temporary both in respect of term and in respect of the areas under treatment. With this explanation the subjoined list of experiments will be found sufficiently intelligible.

CLASS I.-LIST OF PERMANENT EXPERIMENTS.

Serial number.	Number according to khasra.	Number of plots in the series.	Name of experiment or of series.	Area.	Date of starting.	Bemarks.	Serial number.	Number according to khasra.	Number of plots in the series.	Name of experiment or of series*	Area.	Date of starting.	Remark*.
			KHAEJfF SEASON EXPEBIMEXTg.							BABI SEASON EXPEBUIENTS.			
			Maize.										
1	...	13	Kharif standard ...	Each plot 400 sq. yds.	1884.		1	...	13	Babi standard ...	Each plot 400 sq. yds.	1884.	
2	...	13	*Do.* duplicate ...	*Do.* ...	...		2	...	13	Do. duplicate ...	Do. ...	...	
S	...	[illegible]	N. plots	*Bo.* ...	...		3	...	8	Miscellaneous... ...	Do. ,,	...	
							4	...	13	Green soiling, No. I ...	Do. ...	...	
							5	31+33	13	Ditto, ,, II ...	4 big. 6 bis.	...	
							6	32	6	Ditto, ,, III ...	Each plot 400 sq. yds.	...	
							7	Ito4	4	Ploughing series ,, I ...	300 sq. yds.	...	
							8	...	[illegible]	Ditto, ,, II ...	3 bigs. ...	...	

CLASS II.—LIST OP PERIODICAL OR TEMPORARY EXPERIMENTS.

			Maize.	B. Bis.									
1	28	4	Sowing after American fashion.	2 0	1885	This experiment is for five years.	1	Change-able.	[illegible]	Comparison of five varieties of wheat.	Different ...	1888	
2	35	2	Sowing after American fashion, early and late sowing.	1 9	1886	Ditto.	2	Do. ...	4	Catch crops ...	Ditto ...	1887	
			Cotton.										
3	...	8	Different varieties of cotton.	...	1888	Thisexperimentisfor five yeais. As the fields are changing, the aiea and khasra numhers cannot he given.	3	Do. ...	4	Comparison of four varieties of barley.	Ditto ...	...	This experiment is for five years.

4	*X*	*2*	Early and late sowing of four varieties of cotton.	X	1886	*Ditto.*
6	*X*	6	Effects of certain manures on cotton.	X	1888	**Ditto.**
	.		*Sugarcane.*			
6	X	8	**Aftermath *(prij* series,..**	X	From 1887.	**This experimentis for** S years. Being changeable, thearea and khasra numbers cannot be given.
7	X	8	**Sowing series ,,,**	X	Do. ...	Ditto.
8	X	8	**Four varieties series ...**	x	**Do. ,,,**	**Ditto.**
			Indigo.			
9	X	2	Late and early sowing ,,,	X	**Do. ...**	**Ditto.**
10	X	3	Effect of gypsum on. indigo.	X	Do. ...	**Ditto.**
11	X	40	**Miscellaneous grain series,**	X	1888...	**This experiment is** again started for 5 **years from last year**

4	**Do. ...**	2	Effect of gypsum on leguminous crops (gram).	Ditto ...	1887 ...	**1**
5	**Do.** ...	...	**Ditto (peas) ..**	Ditto ...	**1887 ...**	
6	**10&11**	6	**Mustard cake used as manure,**	1J bighag...	**1886...**	**This experiment is** for 5 years, and the fields arc not changed.
7	**27**	6	**Cotton cake used as manure,**	1} ditto...	MI	**Ditto.**
8		6	**Residuary values of certain** manures.	Each plot 200 square yards.	**1887 ...**	**Ditto.**
9	**37**	10	**Ditto ditto ...**	**2 Wghas...**	**1886 ...**	**Ditto.**
10	28	6	Effect of certain manures on potato.	**U ditto ...**	**1888...**	**Ditto.**
11		2	Effect of kainit and woollen refuse on wheat.	III	**1889 ..**	Tliis experiment is for 5 years. Field is changeable.
12	35	2	Sheep folding	**ljbfghas...**	**1886..**	**Ditto.**
13	26	2	Jethro Tull system of sowing.	**li ditto ...**	**1889 ..**	**Be-started from 1889.**

In class I the experiments Nos. 1, 2 and 3 of kharif and rabi are to determine—

(a) The length of time that wheat (a spring crop) and maize (a rainy season crop) can be grown year after year on the same land without material falling off in yield by the aid of artificial manures.

(b) The relative effect on the plots thus continuously cultivated of different kinds of manure.

(c) The effect of a judicious rotation of crops, as compared with a continued cropping of the land with wheat and maize alone.

Rabi experiment No. 3 is, moreover, to determine the manurial value of refuse not ordinarily used by Indian agriculturists.

Nos. 4, 5 and 6 in class I (rabi) are experiments with hemp and indigo utilized as manures.

Nos. 7 and 8 are experiments in ploughing and are of long standing. The success of improved ploughs is compared with that of indigenous ones.

***Class II, temporary experiments, Kharif season, No. 1.*—In 1885 a** gentleman from America, Mr. Housar, visited the farm and started this experiment. It will be continued for three or four years.

***Nos 2 and 4, early and late sowing of maize and cotton.*—This is a very important** experiment and is very carefully demonstrated.

***Nos. 6 to 10, sugarcane and indigo experiments.*—Were started in 1887 and will** continue for 5 years.

***No. 11, the miscellaneous grain series experiment.*—Was discontinued 3 years ago,** but was re-started last year.

Class II. Rabi.—These experiments were all started in 1886 or 1887 and will be kept on for 5 years.

Nos. 1 and 3 are to determine the vitality and productiveness of different varieties of wheat and barley.

No. 2 is to find out the advantages of getting a catch crop from a barley or an oat field.

Nos. 4 and 5 are to demonstrate the effect of gypsum on leguminous crops.

Nos. 6 and 7 are to indicate the comparative manurial value of mustard and cotton cakes: (1) applied directly to the soil, and (2) indirectly as farmyard manure.

Nos. 8 and 9 are to ascertain the residual value of certain fertilizers.

No. 10, an experiment with potatoes on a regular system, was started last year and will be kept on for 5 years.

No. 11, kainit, was started last year, and its effect is demonstrated chiefly on wheat and potato.

No. 12, sheep folding, is a very common indigenous process and is the best method of farming known in this country. It is being experimentally tried on farm.

KHARIF SEASON EXPERIMENTS.

The rainy season of 1888 was unquestionably unfavorable, particularly at and around Cawnpore The rainfall aggregated 56'56 inches, the normal average being about 30 inches.

The following statement shows the exceptional heaviness of the rainfall:—

Rainfall at Cawnpore as given in the Government Gazette.		Inches.	Rainfall registered at the Cawnpore Farm.		Inches.
May,	1888	007	May,	1888	13
June,	,,	2 36	June,	,,	05
July,	,,	2398	July,	,,	26 8
August,	,,	22 37	August,	,,	201
September,	,,	4 52	September,	,,	22
January,	1889	.143	January,	1889	13
February,	,,	183	February,	,,	23
		56 56			54 5

The excessive and continuous rains of July and August ruined the kharif crops. The seed for the most part failed to germinate, though many fields were re-sown more than once, and where it geminated at all the want of sun and heat injured the vitality of the plants. The native agriculturists had resort to the device of sowing other kinds of crops when their first crop was destroyed. But on an experimental farm this device is inadmissible; hence we suffered great loss.

(1) *Experiments with maize, kharif standard and duplicate series.*—This experiment is to determine the effect of ordinary and artificial manures on maize. There are 2 series, each of 13 plots; the standard plots are kept under maize year after year while the duplicate plots are alternated with wheat. Each plot is treated with the same kind of manure year after year. During the year under review these plots were sown on the 14th of July, the treatment being the same as in previous years, *viz.,* ploughing twice, weeding twice. Kharif Statements I and II

Soon after the sowing the heavy and continuous rain of July destroyed the seed, as nearly all plots remained under water for weeks. Every effort was made to drain the soil, but with no effect. In the beginning of August seed was sown again, but it was too late for a good result.

The standard series gave no yield at all, but the duplicate was slightly better.

For the last two years these series have been complete failures.

(2) *Another series of miscellaneous manure experiments consists of 8 plots (termed the "N... natural manure series)*.—These were sown early in July, being flushed once; ploughing and weeding were done three times. These too were seriously affected by the rain, except the plot manured with woollen refuse. It is worth noticing here that woollen refuse again has proved this year to be the best fertilizer for maize. This is the only plot which has given a continuously good yield for several years past. Kharif statement III.

(3) *American method of sowing maize.*—Statement No. IV compares the result of sowing maize in the American way, *i.e.,* on ridges 1, 2 and 3 feet apart, with that obtained by the country fashion of sowing. The plots were sown on the 14th of July and, being on high land, escaped injury from the excessive rain. Ploughing and weeding were done twice. No manure was applied. The result this year confirms that of previous years,—that the native method of sowing gives a heavier outturn. This experiment is for 5 years only, which period will expire after next season. Kharif Statement IV.

(4) *Early and late sowing of maize.*—Two plots, each measuring nearly half an acre, were employed for this experiment. Kharif Statement V.

One of the plots was sown on the 15th of May. The field was once flushed for sowing and was twice watered. The other plot was sown on the 27th of June, after rain. This experiment has always hitherto shown that early sowing is better, and the same result has been obtained this year. The cost of watering, Rs. 5-7-0 per acre, has, however, to be taken into account. Against this may be set the higher prices which a cultivator can obtain for an early crop of maize.

Kharif Statement VI.

(5) *Comparison of the yield of several varieties of* cotton.—The season was even worse for cotton than for maize, and the results were very disappointing. Fresh seed of 3 varieties of cotton, namely, (1) Jones' Improved, (2) S. B. ... of other Prolific, had been obtained direct from America and the acclimatized seed ... points varieties was also sown. But the whole experiment was spoilt. However ... may be considered to have been demonstrated : *(a)* that acclimatized seed ... before) is better than fresh imported seed; *(V* that the Garo Hills cotton res seasoning. It gave a yield of 166fts., the largest yield of all the varieties.

The second cotton experiment, in'the comparative value of early and late so... plot was a failure. The late sown plot yielded nothing, and tJie yield of the otnei extremely poor.

Kharif Statement VII.

(6) *Experiments with sugarcane.-Uhe* first of these experiments was to de... the yield of 4 varieties of sugarcane. The seed for plots numbered (1) ... Bengal), obtained the year before last from the best sugar-growing districts, 1 Benia (2 Shâhjahânpur, 3 Moradabad,

The season was favorable for this crop, but the cane grew so high that it ^^*iteH* down by rain and the outturn was spoilt to some extent. The plots were ... ways: with poudrette, 400 maunds per acre. They were sown on the lst of March in W... India *(a)* according to the indigenous way of sowing, *(bj* in lines as sown in West yield of settlements. They were hand hoed three times and watered five times. The the rain juice was very good, but the plots in which the cane had oeen beaten down by did not produce fine *rdh* or *gur.*

Besides the determination of the comparative yield, the experiment was a lso meant to illustrate the comparative merits of sowing in the West India system and according to the native method. The results, as exhibited in Statement VII, show that the indigenous variety of cane as well as the indigenous method of sowing proves more suitable for this country. The same result was obtained last year.

Kharif Statement VIII.

(7) Another experiment with sugarcane was the determination of the relative economy of what is known as *peri,* namely, a second crop of sugarcane from the plants. Accordingly the roots of the sugarcane crop sown the year before las... kept in the field, which was top dressed with farmyard manure at 200 maunds p... acre^ was hand hoed twice and watered five times.

The total cost of maintaining the field is calculated at Rs. 33 per acre, name*j* rent of land Rs. 10, manure Rs. 6, hoeing and watering Rs. 10, making gur Rs. ... total Rs 33. The total income per acre has been Rs. 53; the net profit is Rs. *M-* There would therefore not seem to be much gain to a cultivator from this special form of cultivation known as *peri.*

Kharif Statement IX,

(8) *Experiment toith indigo.—As* gypsum is a special manure for leguminous crops, and deposits of it have lately been discovered in several places in the province, particular attention has been directed for the last two years to ascertain its effect on indigo. It has been given gratis to several indigo planters for trial, and, so far as their op... are known, they corroborate the result obtained on the farm.

The experimental plots sown with indigo and either manured or top dressed with gypsum were seriously affected by the heavy rains, but they gave heavier yield than the other plots to which gypsum was not[1] applied.

Kharif Statement X.

(9) Statement X gives details of an experiment in early and late sowings of indigo, as well as of the manurial value of gypsum against farmyard manure, For plots were used, of which two were sown before the rains and two after they had set in. The late sown crop utterly failed, and the yield from the other two plots was poor : ... of these two, that treated with gypsum gave the best result*.

Kharif Statement XI-

(10) *Miscellaneous experiments.—In* a series of 17 plots, each of 400 square yards, millet and other rain crops were sown. The object of this experiment is to test the comparative value of the ordinary rain crops cultivated in these Provinces. Owing to the season, the outturn of these plots was generally poor.

RABI SEASON EXPERIMENTS.

The rabi season experiments are chiefly restricted to wheat. Potato, barley, peas and gram have lately been added to the list. These occupy but a very limited area of wheat. The variety known in this Province as "Muzaffarnagar" (soft white) is, for the most part, sown; next to it in quantity is the beardless indigenous variety, called "Mundia," and on a much smaller scale Sindhi, Adelaide and Buxar.

In all, 21 acres were under wheat, of which area 15'5 acres were under different experiments, while 5"5 acres were sown for seed.

The average outturn per acre has been 13 maunds, ranging from 21 maunds or 29 bushels to 7*75 maunds or 10 bushels per acre. The fair average per acre in this country is 16 maunds or about 22 bushels, and in England about 22 maunds or 30 bushels. The season was very unfavorable for wheat, as the abnormal rain in February and March greatly injured what at one time promised to be a good crop. Kust was generated, and the grain proved to be small and discolored. The Muzaffarnagar variety of soft white wheat suffered least: the beardless variety called *mundia* proved to be most liable to be affected by rust.

The following is the detail of the experiments :—

(1) *Tie standard and duplicate series.*—This experiment is to determine *(a)* the effect of certain manures on wheat, *(b)* the advantages of rotation, *(c)* how long wheat can be grown year after year on the same land, and which manure best returns to the soil what the plant withdraws. Rabi Statements I andj II.

The two series are of 13 plots each, every plot measuring 400 square yards. Each plot receives a particular kind of manure year after year, save one, which is always unxnanured. The treatment of the duplicate plots in point of manure is precisely the same as that of the corresponding plots in the standard series ; but the latter are cropped with wheat year after year, while the former are alternated with wheat and maize.

In this season, as usual, Muzaffarnagar wheat at the rate of 60 seers per acre was sown on the 13th of October. Other treatments were as follows : ploughing three times, weeding once, watering three times.

The standard plots germinated very well, but were bitten by frost to a certain extent, while the duplicate ones suffered more. This is an exceptional year, as the outturn of several of the duplicate plots was less than the standard ones. As a rule, it has been better. On the whole, the outturn of these series in this season was better than that of many other series. Poudrette in both series gave a good outturn.

(2) *Green manure series.*—This also consists of 13 plots, each of 400 square yards. The experiment is to determine the manurial value of vegetable substances in various forms. It shows that indigo and hemp, like clover in Europe, prepare the land for wheat. If ploughed in, they act as manure; while if removed as a crop, they still improve the ensuing crop of wheat. Our experiments have also shown that more profit is derived from cropping the indigo or hemp and th^Q sowing wheat than from ploughing the former in—without realizing the outturn. Rabi Statement III.

The plots in these series were sown with Muzaffarnagar wheat at 60 seers per acre on the 25th of October, the other treatments being the same as described above.

Indigo refuse lias given better results than the indigo crop which was ploughed in. Both kinds of indigo refuse and also green soiling with hemp have given good outturn of grain. The plots manured with indigo and hemp water and the unmanured plots yielded little grain. The cost of indigo and hemp water at the farm is very high, owing to the distance of cartage. These fertilizers can only be economically used in close proximity to indigo and hemp factories.

(3) Rabi Statement IV contains the results of a further experiment in green soiling. Separate fields were manured with green indigo and hemp. The indigo series consists of six plots, each of 800 square yards. Four of them are green soiled, as detailed Rabi Statement IT

in the statement, and two are kept unmanured. The hemp series consists of 13 plots of different acres, all of them being of two acres. In seven of these, hemp is ploughed in and six are kept unmanured. The result shows the advantages of manuring. In spite of the cost of fertilizers, the income per acre is comparatively much larger than from the unmanured land. In this instance too it has been proved that indigo refuse mixed with lime is very effective.

Kabi Statement V.

(4) This experiment is to determine the effect of certain rubbish which ordinarily has no place in the list of manures known to the Indian agriculturists. The experiment, as usual, shows that the manured plots in many cases have given more yield than the unmanured one; that saltpetre is effective; that ammonia chloride has again failed, and that without the application of some good and rich fertilizers the plots in this series are gradually losing their fertility. The last one is the important point to be observed.

These plots were sown on the 24th October with Muzaffarnagar wheat, other treatments being exactly the same as in the other experiments.

Kabi Statement VI.

(5) This experiment is to determine the effect of shallow and deep ploughing, of rather the effect of ploughing with lie country plough and with improved pW>s- The experiment is carried on in two different places. In one place there are four plots and in the other three. They are respectively of 300 and 2,450 square yards each. Muzaffarnagar wheat was sown in them on the 24th October and 5th November, and they were subject to the same treatment as all other series. The three plots, this year, were manured with woollen refuse at 120 maunds per acre.

The result is again in favor of deep ploughing.' Ploughing nine inches deep has given more yield than five inch ploughing. It may be noted that hitherto no manure was given to these series •. consequently the produce had been reduced considerably. This year three plots were manured, and consequently the yield has greatly increased all round j yet the effect of deep ploughing is still perceptible in the comparative outturn of the several fields.

All the foregoing rabi experiments may be termed permanent or unchangeable. They have not been varied in the least for the last five years, and some date back to the opening of the Farm. No time for their duration is fixed. No other crop of any W»* is grown in the fields set apart for these series, and the treatment will remain m»U respects in future precisely as it is at present.

The next mentioned experiments are temporary or for a fixed period: most of them are for five years. In these,, sometimes necessarily, little changes occur, and the fields are also changeable.

Eabi Statement VII.

(6) *Experiment with cotton, seed and mustard cake, as mil as with the dung of cattle fed on the same* rf»/.—Thai is to ascertain (1) the comparative manurial value of («) cotton seed and mustard cake against the same stuff fed dungs, (J) of rich farm yard manure against plain dung; (2) to what extent good feeding of live stock is a S*m to a farmer ^ &,, shape of obtaining ^ and rich miLrmIei (3) whether nitrogen may be more economically added to the soil by directly manuring the fields with irogenous substances existing in cattle food or by converting them into dung. The iatments of the season were ploughing three times Muzaffarnagar wheat seed sown the plT™ *" aCle on thC 25th october, once and watering' three times, Al acre. ThT Feviou8ly ....d with common manure, at the rate of 100 maunds per seed T7 71dd brtb gKdn atld ^raw was from a plot treated with dead cotton compared U A T manures applied clearly 8een m the iaaiwA IfTw* 1\ S* of the ™^«red plots. Yet the largest net profit was on one of the latter plofc, This expwiment which fa ... wag commenced in 1885-86.

Babi Statement VIII.

(7) This experiment is to demonstrate for how long the residue of a fertilizer remains ... The ^tement shows the residual effect of the artificial manures which had been a™.r J u Deen applied to the plots for four consecutive years up to 1S8&. Since then no manure of ... been given. Senes J3 in the statement in question

indicates the residual result of ordinary and artificial manures of nearly all kinds that are in use on the Farm. These were applied in the year 1886-86. The result again is in favor of ordinary farmyard manure.

(8) *Hzjperiment wit A Jcahiit.*—Kainit is a potassic-manure, good for grasses and for wheat. Rabi Statement IX.

This is the first year that it has been tried on the Farm. It was applied along with green hemp to one plot, with farmyard manure to three plots, and with woollen refuse to four plots.

Muzaffarnagar wheat was sown in all of the plots on the 22nd and 23rd October. All the treatments were the same as usual. Kainit when combined with woollen refuse has given the largest yield : I may say largest of all the fields in the farm. With farmyard manure it has given very good results too, and with green manure also has not been bad. As this is the first year, nothing can be definitely decided about its value; but the experiment will continue for four years more, and it will be fully tested.

(9) This experiment \fas made to observe the effect of grazing down and nibbling wheat, in order to check too luxuriant growth of straw. Muzaffarnagar wheat was sown at 60iTjs. per acre on the 4th of November (late in season). The land had maize in kharff in it, and after taking the maize crop it was prepared for rabi and was manured by folding sheep in it. Only two waterings and one weeding were given. A very fair yield in grain and a distinctly good outturn of straw were obtained from the portions grazed down and nibbled by the sickle : on the portion left intact the yield of grain was about the same, while that of straw was considerably less. Rabi Statement X.

(10) In this experiment the Jethro Tull or Lois Weeden system of sowing on raised up strips of land was compared with the ordinary method of sowing. The Jethro Tull system of sowing is that in a field strips of land of equal width are marked out and six inches depth of earth from one strip is thrown upon the other, so that one strip is thus raised one foot higher than the other. On these raised up strips wheat is sown inline. In a piece of land of 1,936 square yards 21 strips were made,—11 raised, 10 depressed. In six of the latter strips a leguminous crop was sown. Rabi Statement XI.

Muzaffarnagar wheat was sown on the 29th of October. The statement shows that wheat sown in the indigenous way has given a better crop than that sown on the strip*, and if the cost of making the latter be taken in calculation, the Tull system *oi* sowing is evidently useless in India.

(11) In this experiment the productive power and vitality of four varieties of wheat compared with the indigenous variety (Mundia) were tested. In five plots of 400 square yards each, the different kinds of wheats were sown side by side: 60 seers of seed per acre of each kind were sown. All had one kind of treatment throughout the season. Of course the bad season and heavy rain had different effects on them. In this series the country Mundia wheat has given the largest crop. Generally on the farm the yield of Muzaffarnagar was found best, as on other plots the country variety proved to be more susceptible to fungoid disease. Buxar wheat did worst of all. Rabi Statement XII.

(12) This experiment was with three special varieties of huskless barley and was made with a view of ascertaining their value in the English market. These varieties have been propagated on the Farm from a very small quantity of seed. However, this year we were able to send three maunds of the chocolate colored variety to Kew for opinion. None of the varieties yielded as much either in grain or straw as the common country barley, a plot of which was sown for comparison. Rabi Statement XIII.

(13) In this experiment the value of gypsum mixed with farmyard manure on leguminous crops was tried. Both with gram aid peas it gave a larger outturn than farm manure alone, but not enough to cover the extra cost. Rabi Statement XIV.

(14) The last experiment to be mentioned was one to ascertain the effect of special manures on potato. The field, after being manured and well prepared according to Rabi Statement X\.

the indigenous method, was divided into five plots of 726 square yards each. To four of these special manures were applied, as shown in the statement. These were then sown with the variety of potato locally called here white or *Madrasi.* The seed was obtained from Farukhabad and was sown on the 19th of October, at the rate of 8 maunds per acre. The plot manured with kainit from the beginning did badly. In growth the plants did not reach the usual height, and frost seemed to have affected them, as the leaves shrivelled and became yellow.

The experiment is for five years, and this is the second trial. The treatments were ploughing four times; weeding, hoeing and earthening up ridges four times.

The crop was dug and removed from the field on different dates from 16th to 27th February. Poudrette with sulphate of iron gave the largest yield, and next to it came woollen refuse with gypsum. The latter produced potatoes of the largest size and best quality: had not a part of this plot been spoilt, its yield would have been the highest. Last year castor oil cake gave the best result.

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KHARIF STATEMENT No. I'—STANDARD SERIES MANVRE EXPERIMENT WITH MAIZE.

Quantity of manure applied per acre.	Value of manure.	Calculation of the result and comparison of outturn with the unmanured plot in the series. 1]Kuraber of plot as per map of Farm.	2 Weight of un-thrcshed cobs.	3 Weight of grain.	4 Weight of stalks.	5]?ercent-agc of grain on btalks.	6 Percent-age of stalks on grain.	7][ncrease or de-crease against unman-ned plot.	8 Increase or de-case per acre.	Comparison of cost and income with the ordinary kind of cultivation in vogue in this country. 9 Actual outturn per acre. Grain.	9 Stalks.	10 Value of outturn. Grain at Be. 1 per 41lK.	10 Stalks at Be. 1 per 410tt.	10 Total.	11 Gain or loss per acre in the cost against the cost of ordinary cultivation, assumed to be Bs. 10-8.	12 Gain or loss per acre in the value of outturn against that of ordinary cultivation assumed to be Bs. 20.	13 Net profit or loss over or against the assumed income, Bs. 20.
	Bs. a. p		fts.	as.	lbs.	lbs.	lbs.	fcs.	fts.	lbs.	lbs.	Bs. a. p.	Bs. a. p.	Bs. a. p	Bs. a. p.	Bs. a. p.	Bs. a. p
1. Cow dung 180 maunds, and bone dust 36011b.	8 10 0	1	6	4	21	19	525	+ 4	+48	48	254	1 3 0	0 10 3	1^3 3	8 10 9	—18 2 9	—26 13 G
2. *Cow* dung 180 maunds, and gypsum 240lbs.	10 8 0	2	...	...	13	...	...	...	...	...	157	...	*0 6 2*	*0 6 2*	10 8 0	- 1 9 9 10	- 3 0 1 10
3. Cow dung 180 maunds	5 6 0	3	...	...	10	...	...	...	...	...	121	...	0 5 0	0 5 0	5 6 0	—19 11 0	- 2 5 1 0
4. Ashes of 180 mauudsof cow dung.	15 8 0	4	3	2	U	14	700	+ 2	+ 24	24	169	0 9 6	0 6 9	1 0 3	15 8 0	—18 15 9	—34 7 9
5 Saltpetre 240fts.	10 5 0	5	3	2	16	12	800	+ 2	+ 24	24	194	0 9 6	0 7 9	1 1 3	10 5 0	- 1 8 14 9	—29 3 9
6. Saltpetre and bone superphos-patc 2-lolbs.	20 0 0	6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7. Sheep dung 180 maunds and Lone dubt 3G0fts.	8 0 0	7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8. Ashes of 180 maunds dung ard saltpetre 2401l>s.	15 13 0	8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9. Poudjette 180 maunds	8 12 0	9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10 Sheep dung 180 maunds	5 6 0	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11. Saltpetre 2101bs. and bone dust 300lbs.	13 9 0	11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12. Sheep dung 180 maunds and gypsum 2 M)lbs.	10 8 0	12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13. No manure	..	13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Area of each ylot is 400 square yards,

KHABFF STATEMENT No. II.—KHARIF DUPLICATE SERIES MANURE EXPERIMENT WITH MAIZE.

Quantity of manure applied per acre.	Value of manure.	Calculation of result and comparison of outturn with the unmanured plot.								Comparison oiP cost with the ordinary kind of cultivation in vogue in this country.							
		Number of plot as per map of Farm.	Weight of threshed cobs.	Weight of grain.	Weight of stalks.	Percentage of giain on stalk.	Percentage of stalk ou grain.	Increase or decrease against unmannred plot.	Increase or decrease per acre.	Aetna] outturn.		Value of outturn.			Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 10-8-0.	Gain or loss per acre in the value of outturn against that of ordinary cultivation assumed to be Rs. 20.	Net profit or loss over or against the assumed income, Rs. 20.
										Grain.	Stalk.	Grain @ lie. 1 per	Stalk @ He. 1 per 4101bs.	Total			
	Rs. a. p		lbs.	ibF.	lbs.	Its.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p	Rs. a. p	Rs. a. p	Rs. a. p	Rs. a. p	Rs. a. p
1. Sheep dung 180 maunds	5 6 0	1	15	10	45	22	450	[illegible]	-242	121	544	2 15 0	1 5 0	4 4 0	-5 6 (	-15 12 0	-21 2 0
2. Poudrette 180 „	8 12 0	2	30	20	58	31	290	-10	-121	242	702	5 14 0	1 11 0	7 9 0	-8 12 (	-12 7 0	-21 3 0
3. Ashes of 180 maunds of cow dung and saltpetre 24Ofts.	15 13 0	3	35	22	51	43	232	-8	-97	2GG	617	6 8 C	1 8 0	8 0 C	-15 13 0	-12 0 0	-27 13 0
4. Saltpetre 2401bs	10 5 0	4	...	...	12	...	...	...	...	...	145	...	J0 6 0	0 6 (	-10 5 0	-19 10 0	-29 15 0
5. Saltpetre 240ftsand bone dust3609)9...	13 10 0	5	...	...	20	...	...	...	...	...	242	...	0 9 0	0 9 C	-13 10 G	-19 7 0	-33 1 0
6. Cow dung 180 maunds	5 6 0	G	15	10	34	29	340	-20	-242	121	411	2 15 0	1 0 0	3 15 (	-5 6 0	-16 1 0	-21 7 0
7. Ditto and bone dust 360ft>3,	8 10 0	7	45	30	47	64	157	...	...	363	568	8 14 (	1 G 0	10 4 0	-8 10 0	-9 12 0	-18 6 0
8. Ditto and gypsum 2401bs...	10 8 0	8	55	35	58	GO	166	+ 5	+ G0	423	702	10 5 0	1 11 0	12 0 C	-10 8 0	-8 0 0	-18 8 0
9. Ashes of 100 maunds of dung ...	5 8 0	9	...	...	15	...	...	...	...	...	181	...	0 7 0	0 7 0	-5 8 0	-19 9 0	-25 1 0
10. Sheep dung 180 maunds and bone dust obUiDS.	8 10 0	10	...	...	22	-	...	...	...	...	26G	...	0 10 C	0 10 0	-8 10 0	-19 G 0	-28 0 0
11. Saltpetre 2-iOfts and bone superphospate [illegible]	20 0 0	11	...	•	17	...	...	...	...	...	206	...	0 8 <	0 8 0	-20 0 0	-19 8 0	-39 8 0
12. Sheep dung and gypsum 240fbs. ...	10 8 0	12	35	22	45	49	205	-3	97	266	544	6 8 0	1 5 C	7 13 0	-10 8 0	-12 3 0	-22 11 0
13. No manure	...	13	45	30	55	55	183	...	...	363	6G5	8 14 (	1 10 C	10 8 0	..	-9 8 C	-9 8 0

Area of each plot \a 400 square yaids.

KHARYF STATEMENT No. III.—MISCELLANEOUS MANURE EXPERIMENT WITH MAIZE ("N" SERIES).

Quantity of manure applied per acre.	Value of manure.	Calculation of the result and comparison of outturn with the unmanured plot in the series.								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.							
		1	2	3	4	5	6	7	8	9		10			11	12	13
		Number of plot as per map of Farm.	Weight of unthreshed cobs.	Weight of grain.	Weight of stalk.	Percentage of grain on stalk.	Percentage of stalk on grain.	Increase or decrease against unmanured plot.	Increase or decrease per acre.	Actual outturn per acre. Grain.	Actual outturn per acre. Stalk.	Value of outturn. Grain @Be. 1 per 41tls.	Value of outturn. Stalk @Ke. 1 pcr410lbs.	Value of outturn. Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 15.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Bs. 20.	Net profit or loss over or against the assumed income, Bs. 20.
	Bs. a. p.		lbs.	lbs.	fts.	ibs.	lbs.	ibs.	lbs.	lbs.	lbs.	Bs. a. p	Bs. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. p.
1. Woollen refuse 120 maunds and lime 12 maunds.	6 5 0	1	223	112	246	46	220	112	1,355	1,355	2,976	33 1 0	7 4 0	40 5 0	6 5 0	+ 20 5 0	+ 14 0 0
2. Sheep dung 120 maunds	3 9 9	2	2	li	16	9	1,066	H	18	18	194	0 7 0	0 8 0	0 15 0	3 9 9	-19 1 0	-22 10 9
3. Cow dung 120 ,, ..	3 9 6	3	2	li	19	8	1,266	li	18	18	230	0 7 0	0 9 0	1 0 0	3 9 6	-19 0 0	-22 9 6
4. Poudrette 120 ,, ...	5 13 6	4	3	1	25	4	2,500	1	12	12	302	0 5 0	0 12 0	1 1 0	5 13 6	-18 15 0	-24 12 6
5. Horse dung 120 ,, ...	3 9 6	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6. Pigs'dropping 120 ,, ...	3 9 6	6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7. Saltpetre 240 lbs....	10 5 0	7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8. No manure	...	8	...	...	...	...	...	...	...	...	...	...			...	...	...

Area of each plot is 400 square yards.

KHARIF STATEMENT No. IV.-SOWING EXPERIMENT (MAIZE SOWN AFTER AMERICAN FASHION).

Detail of experiment.	Calculation of the result and comparison of outturn with the plot sown after country way.								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.												
	1	2	3	4	5	6	7	8	9		10									11		
	Number of plot as per map of Farm.	Weight of unthreshed cobb.	Weight of grain.	Weight of stalk.	Percentage of grain on stalk.	Percentage of stalk on grain.	Increase or decrease against unmanured. plot.	Increase or decrease per acre.	Actual outturn.		Value of outturn.									Gain or loss per acre in the outturn against that of ordinary cultivation, assumed to be Rs. 20.		
									Grain.	Stalk.	Grain @ Re. 1 per 41 lbs.			Stalk @ Re. 1 per 410 lbs.			Total.					
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs.	a.	p.	Rs.	a.	p.	Rs.	a.	p.	Rs.	a.	p.
Maize sown in ridges :—																						
1 foot apart	1	215	150	320	46	210	+25	+ 100	600	1,316	14	10	0	3	3	0	17	13	0	-2	3	0
2 feet apart	2	143	104	107	53	180	*-21*	-84	416	788	10	2	0	1	15	0	12	1	0	-7	15	0
3 feet apart	3	105	75	170	44	227	-50	-200	300	680	7	5	0	1	11	0	0	0	0	-11	0	0
After country fashion ...		220	125	200	-	230	...		500	1,196.	12	3	0	2	15	0	15	2	0	-4	11	0

Area of each plot is 1,210 square yards.

KHARIF STATEMENT No. V.—EXPERIMENT IN EAELY AND LATE MAIZE SOWING.

Detail of experiment	Calculation of the result and comparison of outturn with the plot sown after country way.								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.					
	1	2	3	4	5	6	7	8	9		10			11
	Number of plot as per map of Farm.	Weight of unthrcsheil cobs.	'height of grain.	Weight of stalks.	Percentage of grain on stalk.	Percentage of stalk on grain.	Increase or decrease against un-ln{inured plots.	Increase or decrease per acre.	Actual outturn per aero. Grain.	Actual outturn per aero. Stalk.	Value of outturn. Grain at Re. 1 per 41fts.	Value of outturn. Stalk at Be. 1 per 41011)8.	Value of outturn. Total.	Gain or loss per acre in outturn against that of ordinary cultivation assumed to be Us. 20.
		lbs.	its.	its.	ibs.	ibs.	lbs.	fts.	ibs.	ibs.	Us. a. p.	Ks. a. p.	Rs. a. p.	Rs. a. p.
Sown (early) on tho 15th of May ...	1	1,G50	550	1,156	48	210	+ 70	151	1,183	2,487	29 14 *0*	6 1 0	34 15 0	+ 14 15 0
Sown (late) on the 27th of Jane ...	2	1,470	*480*	1,098	44	*229*	...	...	1,033	2,362	25 3 0	5 12 0	30 15 0	+ 10 13 0

Area of each plot is 2,250 square yards.

KHARIF STATEMENT No. VI.-EXPERIMENT WITH DIFFERENT VARIETIES OF IMPORTED COTTON SEED.

	Actual outturn and comparison of outturn with plot No. 1 in each series.										Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.				
	1	2	3	4	5	6	7	8	9		10			11
									Actual outturn per acre.		Value of outturn.			
	Number of plot as per map of Farm.	Weight of uncleaned cotton.	Weight of cleaned cotton.	Weight of seed.	Percentage of cotton on seed.	Percentage of seed on cotton.	Difference.	Difference per acre.	Cotton.	Seed.	Cotton @ Bs. 1 per Gibs.	Seed @ Bs. 1 per Gllbs.	Total.	Gain or loss per acre in outturn against that of ordinary cultivation assumed to be Bs. 45.
		lbs.	lbs.	lbs.	lbs.	Us.	lbs.	lbs.	lbs.	lbs.	Bs. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. p.
A. 1 Heengan Ghat ..	1	25	8	17	47	212	...	...	111	235	18 8 0	3 14 0	22 6 0	-22 10 0
2 Upland Georgcon,	2	34	10	24	42	240	+ 2	28	138	332	23 0 0	5 7 0	28 7 0	-16 9 0
3 Tree cotton ..	3	27	8	19	42	237	...	...	111	263	18 8 0	4 5 0	22 13 0	-22 3 0
4 Louisiana ..	4	26	7	19	37	271	- 1	11	97	263	16 3 0	4 5 0	20 8 0	-24 8 0
5 GarroHill ..	5	30	12	18	67	150	+ 4	55	166	249	27 11 0	4 1 0	31 12 0	-13 4 0
6 Hybrid ..	6	21	6	15	40	250	- 2	28	83	207	13 13 0	3 6 0	17 3 0	-27 13 0
7 Sealsland ..	7	24	7	17	41	243	- 1	14	97	235	16 3 0	3 11 0	20 1 0	-24 15 0
8 Egyptian ..	8	23	7	16	44	229	- 1	14	97	221	16 3 0	3 10 0	19 13 0	-25 3 0
B. 1 Jones' Improved,	9	3	1	2	50	200	- 7	97	24	48	4 0 0	0 13 0	4 13 0	-40 3 0
2 S.B.Mexey(Texas),	10	3	1	2	50	200	- 7	97	24	[illegible]	4 0 0	0 13 0	4 13 0	-40 3 0
3 Shines' Prolific,	11	3	1	2	50	200	- 7	97	24	[illegible]	4 0 0	0 13 0	4 13 0	-40 3 0

Area of each plot up to plot No. 8 is 350 square yards, and after that 200 square yards.

KUARIF STATEMENT NO. W.-EXPERIMENT IN EABLF AND LATE COTTON SOWING.

Detail of experiment.	Calculation of the result and comparison of outturn with the plot sown after rain.								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.					
	1	2	3	4	5	6	7	8	9		10			11
	Number of plot as per map of the Farm.	Weight of unclcaned cotton.	Weight of cleaned cotton.	Weight of seed.	Percentage of cotton on seed.	Percentage of seed on cotton.	Difference.	Difference per acre.	Actual outturn per acre.		Value of outturn.			Gain or loss per aero in outturn against that of ordinary cultivation assumed to bo Its. 45.
									Cotton. >	Seed.	Cotton @ Re. 1 per Gibs.	Seed @ Ee. 1 per Gllbs.	Total.	
	19	lbs.		fts.	Tbfl.	ftfl.			Us.	11)S.	Bs. a. p.	Ra. a. p.	Us. a. p.	Rs. a. p.
Sown before rain „•	1	16	5	11	45	220	••	...	81	177	13 8 0	2 14 0	16 6 0	-28 10 0
Sown after vain ...	2						*X*W.							

Area of each plot is 300 square yards.

KHAR1F STATEMENT No. VII.—EXPERIMENT (1) IN THE YIELD OF DIFFERENT VARIETIES OF SUGARCANE, AND (2) IN NATIVE AND WEST INDIAN METHODS OF PLANTING.

Detail of experiment.	Calculation of the result and comparison of outturn with the standard plot in the series (the last plot).								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.				
	Area in square yards.	Weight of cane in lbs.	Weight of juice in lbs.	Weight of rab or gur in lbs.	Percentage of juice over rab.	Percentage of rab over juice.	Increase or decrease over indigenous way of sowing.	Increase or decrease per acre.	Outturn per acre*		Value of outturn.		Gain or loss per acre in the outturn against that of ordinary cultivation assumed to be Rs. 80.
									Juice.	Gur.	Gur @ Re. 1 per 22lbs.	Total.	
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Sehea seed (Montju or Lhaul),													
(1) Sown in lines	605	1,580	772	152	509	20	-52	-416	6,184	1,216	55 4 0	55 4 0	-24 12 0
(2) After indigenous way of sowing ...	605	1,862	940	177	531	19	-57	-456	7,520	1,416	64 6 0	64 6 0	-15 10 0
Shahjahanpur seed (Dekehan).													
(1) Sown in lines	605	2,179	1,070	210	510	20	+6	+48	8,560	1,680	76 6 0	76 6 0	-3 10 0
(2) After indigenous way of sowing ...	605	2,250	1,144	230	502	20	-4	-32	9,232	1,840	83 10 0	83 10 0	+3 10 0
Moradabad seed (Jjarankho).													
(1) Sown in lines	605	1,841	928	180	516	19	-24	-192	7,424	1,440	65 7 0	65 7 0	-14 9 0
(2) After indigenous way of sowing ...	605	2,276	1,151	225	512	20	-9	-72	9,208	1,800	81 13 0	81 13 0	+1 13 0
Country Matna.													
(1) Sown in lines	605	2,084	1,037	204	503	20	-30	-240	8,216	1,632	74 3 0	74 3 0	-5 13 0
(2) After indigenous way of sowing ...	605	2,168	1,212	234	501	20	...	...	[illegible]	1,872	85 1 0	85 1 0	+5 1 0

KHARIF STATEMENT *No.* VIII.—EXPERIMENT *TO DETERMINE* THE ECONOMIC VALUE OF *PERI* (SECOND YEAR CANE-STOCKS).

Detail of experiment	Calculation of the result and comparison of outturn with the standard plot in the series (the last plot).								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.						
	Area in square yards.	Weight of cane in lbs.	Weight of juice in lbs.	Weight of rab or gur in lbs.	Percentage of juice over rab.	Percentage of rab over juice.	Increase or decrease over indigenous way of sowing.	Increase or decrease per acre.	Outturn per acre. Juice.	Outturn per acre. Rab.	Value of outturn. Gur at Re. 1 per 22 lbs.	Value of outturn. Total.	Total cost per acre of maintaining the peri (aftermath) crop.	Total cost per acre of raising a new crop.	Net gain per acre in the cost of cultivation.
	sq. yds.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Peri of Moradabad seed (Saretha).															
1. Sown in lines...	900	2,591	1,209	229	528	19	+ 15	+ 81	6,502	1,232	56 0 0	56 0 0			
2. Native method of sowing ...	900	2,773	1,314	250	526	19	- 8	- 43	7,066	1,344	61 1 0	61 1 0			
Bekea seed (Mongu or Dhaul).															
1. Sown in lines...	900	1,290	640	115	557	18	- 99	- 532	3,442	618	28 1 0	28 1 0	33 0 0	56 0 0	23 0 0
2. Native method of sowing ...	900	1,036	829	162	512	20	- 96	- 516	4,458	871	39 9 0	39 9 0			
Indigenous seed (Matna).															
1. Sown in lines...	900	2,200	1,171	214	547	18	- 41	- 237	6,297	1,151	52 5 0	52 5 0			
2. Native method of sowing ...	900	2,755	1,379	258	534	19	...	...	7,416	1,387	63 1 0	63 1 0			

KIIARfF STATEMENT Xo. IX.—DETERMINATION OF THE EFFECT OF GYPSUM ON INDIGO.

Number of plot ami arta.	Special treatment.	Cost of special treatment.	Weight of green crop sold.	Actual outturn per acre.	Value of outturn per acre at Re. 1 per 307 lbs.	Increase or decrease against the uninanurcd plot. In weight.	Increase or decrease against the uninanurcd plot. In money after deducting the cost of nuiiuire.
		Ks. a. p.	lbs.	fibs.	Bs. a. p	lbs.	Bs. a. p.
1. 1,600 square yards	Gypsum applied as manure 3 cut. and ploughed in as manure. *	3 0 0	2,542	7,G90	25 0 0	+ 1,737	+ 3 0 0
2. 3.000	†Top dressed with gypsum 'when plant G inches high,.,	3 0 0	2,214	*6,607*	22 0 0	+ 741	
3. 1,000	\o manure	...		5,053	10 0 0	...	...

KHAHIF STATEMENT No. X.—EXPERIMENT (1) IN EAltLY AND LATE INDIGO SOWING, (2) WITH GYPSUM AS A MANURE.

yuniher of plot and area.	When sown.	Cost of the special treatment ; or acre.	Weight of green crop sold.	Outturn per acre.	Value per aciv at 307 Its. per rupee.
		Rs. ti. p.	lbs.	lbs.	Its. a. p
(1) 1,815 square yards	Before rain	*J 2 0	67G	1,803	5 11 0
(2) 1,813	After rain	...	*%	...	...
(1) 1,815	Before rain ... Ml ...	t3 10 0	022	2,450	8 0 0
(2) 1,815	After rain	...	...	...	...

* Cost of "watering and. of fnmynrd manure @ 200 mawnds per acre.

\ Ditto and of gypsviva 1 cwt. \K:X SWMC.

KHARIF STATEMENT No. XL—EXPERIMENT IN OUTTURN OF MISCELLANEOUS KHARIF CROPS.

Detail of experiment.	1	2	3	4	5	6	7		8			9
	Area of each plot.	Weight of unthreshed crop.	Weight of grain.	Weight of stalk.	Percentage of grain on stalk.	Percentage of stalk on grain.	Actual outturn per acre.		Value of outturn.			Gain or loss per acre in outturn against that of ordinary cultivation assumed to be Rs. 20.
							Grain.	Stalk.	Grain @ Re. 1 per 41 lbs.	Stalk @ Re. 1 per 410 lbs.	Total.	
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1. *Cotton* and arhar	...	...	...	...	...	...	...	...	...	...	...	...
2. Jowar for chari	400 sq. yds.	512	...	512	...	...	...	6,195	...	15 2 0	15 2 0	- 4 14 0
3. Urd	„	41	6	35	17	583	73	423	1 12 0	1 1 0	2 13 0	- 17 3 0
4. Moong	„	50	10	40	25	400	121	484	2 15 0	1 3 0	4 2 0	- 15 [illegible] 0
5. Moth	„	146	66	80	82	121	799	968	19 8 0	2 6 0	21 11 0	+ 1 14 0
6. Lotto	„	125	[illegible]0	99	26	381	315	1,198	7 11 0	2 15 0	10 10 0	- [illegible] 0
7. Bajra and arhar	„	22[illegible]	8	218	1	2,725	97	2,638	2 6 0	6 7 0	8 13 0	- 1[illegible] 3 0
8. Bajra alone	„	331	10	324	3	3,240	121	3,920	2 15 0	9 9 0	12 8 0	- 7 [illegible] 0
9. Jowar alone	„	523	35	488	7	1,394	423	5,905	10 5 0	14 0 0	24 11 0	+ [illegible] 11 0
10. Jowar and arhar	„	447	30	417	7[illegible]	1,390	363	5,046	8 14 0	12 5 0	21 3 0	+ 1 3 0
11. Til	„	57	7	50	14	711	85	605	2 1 0	1 8 0	3 9 0	- 10 7 0
12. Arhar	„	126	3[illegible]	90	40	250	436	1,089	10 10 0	2 10 0	13 4 0	- 6 12 0
13. Hemp	„	136	21	112	21	467	290	1,355	7 1 0	3 5 0	10 6 0	- 9 10 0
14. Kodon	„	77	17	60	28	353	206	7[illegible]6	5 0 0	1 12 0	6 12 0	- 13 4 0
15. Mirwa	„	...	...	...	...	...	...	...	...	...	...	...
16. Kurthi	„	[illegible]	112	102	88	1[illegible]	1,718	1,960	11 14 0	4 12 0	4[illegible] 10 0	+ 26 10 0
17. distorted	...	...	...	...	...	...	...	...	...	...	...	...

BAB1 STATEMENT No. I.—STANDARD SERIES, MANURE EXPERIMENT WITH WHEAT.

Calculation of the result and comparison of outturn with standard plot (No. 11) in the series.								Couiparisou of cost and income with the ordinary kind of cultivation irL vogue in this country.							
1	2	3	4	5	6	7	8	9		10			11	12	13
Detail of special treatment with the rate of its cost.	Weight of un-thrcshed sheaves.	Weight of grain.	Weight of straw.	Percentage of grain on straw.	Percentage of straw on grain.	incrctLs or decrease over standard plot in the strict.	Increase or decrease per acre.	Actual outturn per acre.		Value of outturn.			Gain or loss per acre in the cost against the jost of ordinary cultivation assumed to be Bs. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Bs. 38.	Net profit or loss over or against the assumed income, Bs. 38
								Grain.	Straw.	Grain at He. 1 per 41fts.	Straw at Ke. 1 per 4001b*.	Total.			
	lbs.	lbs.	lbs.	fibs.	lbs.	lbs.	Is.	lbs.	fts.	Rs. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. P.
1 Saltpetre 240fts. per acre at Us. 3-8-0 pr 82fts.,	286	94	192	49	204	+ 21	+ 252	1,137	2,323	35 8 0	11 10 0	47 2 0	- 7 6 0	+ 9 2 0	+ 1 13 0
2 Saltpetre 2401bs. per acre and bone dust 3G0lbs. per acre at 11 annas per 82fl>s.	323	100	223	45	223	+ 27	H-127	1,210	2,698	39 11 (	13 8 0	53 3 0	-10 10 0	+ 15 3 0	+ 4 9 0
3 Cow dung 180 mar.nds per acre at Es. 3 per 100 maunds.	275	81	194	42	239	+ 8	+ 97	980	2,347	[illegible]0 10 0	11 12 0	12 6 0	- 2 6 0	+ 4 6 0	+ 2 0 0
4 Cow dung 180 maunds per acre and bane dust 360&S. per aero at 11 annas per 821ba.	310	102	208	49	201.	+ 29	+ 351	1,234	2,517	[illegible]9 9 0	12 9 0	[illegible]L 2 C	- 5 11 0	+ 13 2 2	+ 7 7 0
5 Cow dung 180 maunds per acre and gypsum 2!Ofts. per aero at Be. 1-12-0 per 822)3.	304	97	207	47	213	+ 24	+ 290	1,174	2,505	36 11 C	12 8 0	[illegible]9 3 0	- 7 8 P	+ 11 3 0	+ 3 11 0
6 Ashes of 180 maunds of cow dung at Bs. 3 per 100 maunds.	209	69	140	49	203	- 4	- 48	835	1,694	[illegible]6 1 C	8 8 0	34 9 0	- 2 6 0	- 3 7 0	- 5 13 0
7 Sheep dung 180 maunds per acre at Bs. 3 per 100 maunds and bone-dust 360fl>s. per acre at 11 annas per S2fbs.	278	80	198	40	247	+ 7	+ 85	968	2,396	30 4 0	12 0 0	42 4 (	- 2 8 0	+ 4 4 0	+ 1 12 0
8 Saltpetre 2401bs. per acre at Ra. 3-8-0 per 82fts. and bone superphosphate 240fts. per acre at Da A Q n HAII 1 1 9H'a Ks> 4ro-u per nzius.	193	61	132	46	216	- 12	- 145	738	1,597	[illegible]3 1 0	8 0 0	[illegible]1 1 0	- 5 11 0	- 6 15 0	- 12 10 0
9 Sheep dung 180 maunds at Bs. 3 per 100 maunds and gypsum 2401bs. per acre at Be. 1-12-0 per 82tbs.	315	104	211	49	23	+ 31	+ 375	1,258	2,553	[illegible]9 5 0	12 12 0	[illegible]2 1 ('	—17 0 0	+ 14 1 O	- 2 15 0
10 Sheep dung 180 mauntU at Bs. 3 per 100 mauids.	237	84	153	55	182	+ 11	+ 133	1,016	1,851	31 12 0	9 4 0	[illegible]L 0 C	- 7 8 0	+ 3 0 0	- 4 8 0
11 No manure	267	73	191	37	266	...	...	883	2,347	27 9 0	11 12 C	[illegible]9 5 0	+ 3 0 0	+ 1 5 0	+ 4 5 0
12 Poudrette 180 maunds per acre at Bs. 4 per 100 maunds.	322	102	220	4C	216	+ 29	+ 351	1,234	2,662	38 9 0	13 6 0	[illegible]1 14 C	- 5 12 0	+ 13 14 O	+ 8 2 0
13 Ashes of 180 miuinds of cow dxmg at B*. 3 per 100 mauuda ard saltpetre 2401bs per acre at Bs. 3-S-O pet S*Hbs.	203	70	133	53	190	- 3	- 36	847	1,609	26 7 0	8 1 G	[illegible]4 8 (	- 12 13 0	- 3 8 0	- 16 5 0

[illegible] each plot 400 square yard*.

RABI STATEMENT No. II.—DUPLICATE SERIES; MANURE EXPERIMENT WITH WHEAT.

Calculation of the result and comparison of outturn with standard plot (No. 11) in the series.									Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.							
1	2	3	4	5	6	7	8	9	10		11			12	13	14
Serial number.	Detail of special treatment with the rate of its cost.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Actual outturn per acre. Grain.	Actual outturn per acre. Straw.	Value of outturn. Grain at Be. 1 per 41lbs.	Value of outturn. Straw at Be. 1 per 400tbs.	Value of outturn. Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Bs. 30.	Gain or loss peMcre in the value of outturn against ordinary cultivation assumed to be Bs. 38.	Net profit or loss over or against the assumed income, Bs. 38.
		fbs.	lbs.	fbs.	ft.	lbs.	lbs.	lbs.	fts.	lbs.	Us. a. p.	Ba. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. p.
1	Saltpetre 240fbs. per acre at Bs. 3-8-0 per 82fts. ...	248	71	177	40	249	+ 20	+ 242	859	2,142	26 13 0	10 11 0	38 8 0	- 7 5 0	+ 0 8 0	- 6 13 0
2	Ditto ditto and bone dust 360fts. per acre at 11 annas per 82fos.	212	70	142	49	203	+ 19	+ 230	847	1,718	25 13 0	8 9 0	34 6 0	- 10 10 0	- 3 10 0	- 14 4 0
3	Cow dung 180 maunds per acre at Bs. 3 per 100 maunds...	253	82	171	48	209	+ 31	+ 375	992	2,069	31 0 0	10 6 0	41 6 0	- 2 6 0	+ 3 6 0	+ 1 0 0
4	Ditto ditto and bone dust 360&s. per acre at 11 annas per 82S)s.	230	72	158	46	219	+ 21	+ 254	871	1,912	27 0 0	9 9 0	36 9 0	- 5 11 0	- 1 7 0	- 7 2 0
5	Cow dung 180 maunds per acre and gypsum 240fts. per acre at Be. 1-12-0 per 82fos.	267	78	189	41	242	+ 28	+ 330	944	[illegible]	29 8 0	11 6 0	40 14 0	- 7 8 0	+ 2 14 0	- 4 10 0
6	Ashes of 180 maunds of cow dung at Bs. 3 per 100 maunds,	218	67	151	44	225	+ 16	+ 194	611	1,827	25 5 0	9 2 0	34 7 0	- 2 8 0	- 3 9 0	- 0 1 0
7	Sheep dung 180 maunds per acre at Bs. 3 per 100 maunds and bone dust 360fes. per acre at 11 annas per 82fts.	273	83	190	44	229	+ 32	+ 387	1,004	2,299	31 6 0	11 8 0	42 14 0	- 5 11 0	+ 4 14 0	- 0 13 0
8	Saltpetre 240fts. per acre at Bs. 3-8-0 per 82ibs. and bone superphosphate 240fba. per acre at Bs. 4-8-0 per 112fcs.	212	66	i46	45	221	+ 15	+ 181	799	1,767	24 15 0	8 13 0	33 12 0	- 17 0 0	- 4 4 0	- 21 4 0
9	Sheep dung 180 maunds at Bs. 3 per 100 maunds and gypsum 240fos. per acre at Be. 1-12-0 per 82ft>s.	391	131	260	50	198	+ 81	+ 980	1,585	3,146	49 8 0	15 12 0	65 4 0	- 7 8 0	+ 3 0 0	- 4 8 0
10	Sheep dung 180 maunds at Bs. 3 per 100 maunds ...	283	[illegible]	190	79	204	+ 42	+ 508	1,125	[illegible]	25 2 0	11 8 0	36 10 0	+ 2 6 0	- 1 6 0	+ 1 0 0
11	No manure ...	154	61	103	50	202	...	...	617	1,210	19 4 0	6 4 0	25 8 0	+ 3 0 0	[illegible]	- 9 8 0
12	Poutette 180 maunds per acre at Bs. 4 per 100 maunds ...	414	136	278	49	204	+ 85	+ 1,028	1,646	3,30-1	51 7 0	16 13 0	68 4 0	- 5 12 0	+ 30 4 0	+ 24 8 0
13	AsheTOE 180 maunds of cow dung at Bs. 3 per 100 maunds and saltpetre 240fbs. per acre at Bs. 3-8-0 per 82lbs	229	72	157	46	218	+ 21	+ 254	871	1,900	27 3 0	9 8 0	36 11 0	- 12 13 0		- 14 2 0

Area of each plot 400 square yards.

RABI STATEMENT No. III.-GREEN MANURES (WHEAT) SERIES.

	Calculation of the result unfl comparison of outturn with the standard plot (No. 12) in the dories.							Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.							
	[	2	3	4	5	6	7	8		9			10	11	12
	Weight of un-[illegible] -heaves.	Weight of grain.	Weight of straw.	Percent-age of grain on straw.	Percent-age of [illegible] on grain.	Increase of decrease over stan-dard plot in the series.	Increase or decrease per acre.	Actual outturn per aciv.		Value of [illegible]			Gain or loss per acre in the cost against the cost of ordina-ry cultivation assumed to be Bs. 30.	Gain or loss per acre in the value of out-turn against ordinary cul-tivation assumed to be Bs. 38.	Net profit or loss over or against the assumed income, Bs. 38.
								Grain,	Straw.	drain at I.V. 1 per ;:21bs.	Straw at Be. 1 per 2ooibs.	Total.			
	lbs.	lbs.	lbs.	Us.	Us.	[illegible]	lbs.		Us	a. p.	Bs. a. p.	[illegible] a. p.	Bs. a. p.	Bs. a. p.	Us. a. p.
1. Old indigo refuse 120 maunds at lie. 1 per 100 maunds per acre.	320	107	213	50	199	+ 53	+ 641	1,205	2,57;	iJ 7 0	12 11 0	[illegible]	- 1 12 0	+ 15 5 0	+ 14 9 0
2. Fresh indigo refuse 120 maunds at lie. 1 per 100 maundy and lime 6 maunds,	322	•118	204	58	173	+ 64	+ 774	1,128	2,468	U 1 0 0	12 5 0	[illegible] 15 0	- 3 8 0	+ 18 15 0	+ 15 7 0
3. Indigo water 3,600 cubic feet per acre at Be. 1 per 1,200 cubic feet.	107	60	137	44	228	+ 6	+ 73	726	1,658	22 11 0	8 5 0	31 0 0	-34 0 0	- 7 0 0	-41 0 0
4. Hemp water 3,600 cubic feet per acre at Be. 1 per 1,200 cubic feet.	100	Cl	120	47	212	+ 7	+ 85	738	1,561	23 1 0	7 13 0	30 14 0	-15 8 0	- 8 0 0	-23 8 0
5. No manure	167	51	113	43	200	...	...	653	1,307	20 6 0	6 13 0	27 3 0	+ 3 0 0	-10 13 0	- 7 13 0
6. After hemp crop	223	73	150	40	205	+ 26	+ 315	883	1,815	27 9 0	9 1 0	33 10 0	+ 3 0 0	- 2 6 0	- 5 6 0
7. Green manure with hemp at Bs. 3-8-0 per acre.	248	85	163	52	102	+ 38	+ 460	1,028	1,552	32 2 0	7 12 0	39 14 0	+ 0 4 0	+ 1 14 0	+ 1 10 0
8. Green manure with indigo at Bs. 8 per acre.	206	59	147	40	240	+ 12	+ U5	714	1,779	22 6 4	8 14 0	31 4 0	- 0 4 0	[illegible] 12 0	- 8 0 0
9. After indigo crop	232	60	163	42	236	4 22	+ 266	835	1,972	26 1 0	9 14 0	35 15 0	+ 1 8 0	- 2 1 0	- 3 9 0
10. Green indigo ploughed as manure at Re. M2-C per 82lbs. per acre with 6 maunds gypsum.	203	63	140	45	222	+ 16	+ 194	762	1,694	23 13 0	8 8 0	32 5 0	-10 7 0	- 5 11 0	-10 2 0
11. Green hemp ploughed as manure at Re. 1-12-0 per 82fts. per acre with 6 maunds gypsuin.	214	69	145	49	210	+ 22	+ 266	835	1,754	26 1 0	8 12 0	34 13 0	-10 12 0	- 3 3 0	-13 15 0
12. 15o manure	I69	47	112	42	238	...	...	569	1,355	17 12 0	6 12 0	21 8 0	+ 3 0 0	-13 8 0	-16 8 0
13. Alternate witti lucerne	227	75	152	49	[illegible]	+ 28	+ 339	907	629	28 5 0	[illegible] 2 0	31 7 0	+ 3 0 0	- 6 9 0	- 9 9 0

Area of each plot is 400 senate yards.

. RATH-STATEMENT No. IV.—GREEN MANURE EXPERIMENT WITH WHEAT.

		Calculation of the result and comparison of outturn with the standard plot Ncs. 5 and 2 respectively in A and B in the series.								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.							
		1	2	3	4	5	6	7	8	9		10			11	12	13
		Number of plots as per map of Farm.	Weight of-un-threshod sheaves.	Weight of grain.	Weight of straw.	Percent-age of grain on straw.	Percent-age of straw on grain.	Increase or decrease over stan-dard plot in the series (Nos. 5 and 2.)	Increase or decrease per acre.	Actual outturn per acre.		Value of outturn.			Gain or loss per acre in the cost against the cost of or-dinary cul-tivation as-sumed to be Rs. 30.	Gain or loss per acre in the value of outturn against or-dinary cul-tivation as-sumed to be Rs. 38.	Net profit or loss over or against the assumed income, Rs. 38.
										Grain,	Straw.	Grain at Re. 1 per 32fts.	Straw at Re. 1 per 2001b3.	Total,			
			fts.	ft*.	lbs.	fts.	fts.	fts.	fts.	fts.	fts.	Rs. a. p	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p	Rs. a. p
	Fresh indigo refuse 120 mannds and lime 6 maunds per acre at Re. 1 per 100 maunds and Rs. 20 per 100 maunds, respectively.	* 1	CCO	181	479	38	265	+ 96	+ 581	1,095	2,898	34 3 0	14 8 0	48 11 0	- 3 8 0	+ 10 11 0	+ 7 3 0
	Fresh icdigo refuse 120 maunds at Re. 1 per 100 maunds.	2	444	117	327	30	279	+ 32	+ 194	708	1,97S	22 2 0	9 14 0	32 0 0	- 1 12 0	-C 0 0	- 7 12 0
A.	Old indigo refuse 120 maunds and lime 6 maunds per acre at Re. 1 per 100 maundb and Rs. 20 per 100 roaunds, respectively.	3	543	154	389	40	253	+ 69	+ 417	931	2,353	29 1 0	11 12 0	40 13 0	- 3 8 0	+ 2 13 0	- 0 11 C
	Old indigo refuse 120 maunds at Re. 1 per 100 maunds.	4	4G2	135	327	[illegible]	242	+ 50	+ 302	817	1,978	25 9 0	9 14 0	35 7 0	- 1 12 0	- 2 9 0	- 4 5 C
	No manure (average of 2 plots) ...	5	305	85	220	39	259	...	...	514	1,331	16 1 C	6 10 0	22 11 C	+ 3 0 0	-15 5 0	-18 5 C
	Hemp ploughed in (average of 7† plots)	1	475	128	347	37	271	+ 61	+ 338	814	2,207	25 7 C	]1 1 0	36 8 ()	- 0 4 ()	- 1 8 0	- 1 12 C
	No manure (average 6 plots) ...	2	239	67	172	39	257	...	...	447	1,010	13 15 u	5 1 0	19 0 ()	+3 0 ()	-19 0 0	-16 0 C

Area of each plot 800 square yards.

† The area of the plots is different, but the average of a manured plot is 761 square yards and of an unmanured one is 726 square yards.

WHEAT.

EABI STATEMENT NO. V.-MISCELLANEOUS MANURES SERIES.

	Calculation of the resalt and comparison of outturn with the standard plot Ko. 8 in the series.								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.							
	1	2	3	4	5	6	7	8	S)		10			11	12	13
	Number of plots as per map of Farm.	Weight of un-thrcslttd sheaves.	Weight of grain.	Weight of straw.	Percen'-ago of grain on straw.	Percent-age of straw on grain.	Increase or decrease over stan-dard plot (No. 8) in the series.	Increase or deCHAAC per acre.	Actual outturn per acre.		Value of outturn.			Gain or loss per acre in the cost against the cost of ordinary cul-tivation as-sumed to be Bs. 30.	Gain or loss per acre in the value of out-turn against ordinary cul-tivation as-sumed to be Bs. 38.	Net profit or loss over or against the assumed in-come, Bs. 38.
									Grain	Straw	Grain at Be. 1 per 32Ibs.	Straw at Be. 1 per 2001b.	Total.			
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	By. a. p.	Bs. a. p.	Rs, a. p.	Bs. a. p.	Bs. a. p.	Bs. a. p.
Brick kiln refuse 120 maunda at Be. 1-12-0 per acre.	1	170	53	117	45	221	+ 4	+ 43	641	1,416	20 0 0	7 1 0	27 1 0	+ 1 4 0	- 10 15 0	- 12 3 0
Silt 300 maunds at annas 4 per 100 maunds per acre.	2	18G	57	129	44	226	+ 8	+97	690	1,661	21 8 0	7 9 0	29 1 0	+ 2 4 0	- 8 15 0	- 11 3 0
Compost 200 maunds at Bs. 3 per-100 maunda per acre.	3	221	69	152	45	220	+ 20	+ 242	835	1,839	26 1 0	9 2 0	35 3 0	- 3 0 0	- 2 13 0	- 5 13 0
Boad scrapings 300 maunds=Bi. 4-11-0 per acre.	4	201	61	140	44	230	+ 12	+ 145	738	1,094	23 1 0	8 8 0	31 9 0	- 1 11 0	- 6 7 0	- 8 2 0
Ashes of 120 maunds weeds=Bs. 4 per acre.	5	151	4C	105	44	228	- 3	- 36	557	1,270	17 6 0	6 6 0	23 12 0	- 1 0 0	- 14 4 0	- 15 4 0
Ashes of saltpetre 240fbi.=Es. 3-8-0 per acre.	*6*	281	85	196	43	231	+ 36	+ 436	1,028	2,372	32 2 0	11 14 0	14 0 O	- 11 3 0	+ 6 0 0	- 5 3 0
Ammonia chloride 24Ofts.=Bs. 15 per acre.	[illegible]	163	46	n,	[illegible]	*m*	- 3	- 36	557	1,416	17 6 0	7 1 0	» . .	- 41 0 0	- 13 9 0	- 54 9 0
No manure ...	8	175	40	126	[illegible]	257	•••	«•	593	1,561	18 8 0	7 9 0	26 1 0	+ 3 0 0	- 11 15 0	- 14 16 0

Area of each plot 400 pquftre yard*.

RABI STATEMENT No. VI—PLOUGHING EXPERIMENT WITH WHEAT.

	Ploughing series.	Calculation of the result and comparison of the outturn with standard plot Nos. 4 and 7 in the series A and B.								Comparison of cost and income with ordinary kind of cultivation in vogue in this country.							
		1	2	3	4	5	6	7	8	9		10			11	12	13
		Number of plots as per map of Farm.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Actual outturn per acre. Grain.	Actual outturn per acre. Straw.	Value of outturn. Grain at Re. 1 per [illegible] lbs.	Value of outturn. Straw at Re. 1 per 400lbs.	Value of outturn. Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs.30.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 38.	Net profit or loss over or against the assumed income, Rs. 38.
			lbs.	lbs.	lbs.	lbs.	Hi	to.	tbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
A.	Ploughed 5" deep (four times) at annas 12 per ploughing.	1	153	51	102	50	200	+ 7	+ 113	823	1,646	25 11 0	8 4 0	33 15 0	+ 1 8 0	- 4 - 1 0	- 2 9 0
	Ploughed 3" deep (six times) with country plough at 12 annas per ploughing.	2	132	44	88	50	200	...	...	710	1,420	22 3 0	7 2 0	29 5 0	...	- 8 11 0	- 8 11 0
	Ploughed 9" deep (four times) at 12 annas per ploughing.	3	179	61	118	52	193	-15	+ 242	984	1,904	30 12 0	9 8 0	40 4 0	+ 3 0 0	+ 2 4 0	+ 5 4 0
	Ploughed 3" deep (eight times) with country plough at 12 annas per ploughing.	4	139	46	93	49	215	...	...	742	1,500	23 3 0	7 8 0	30 11 0	...	- 7 5 0	- 7 5 0
B.	Ploughed 9" deep (four times (at 12 annas per ploughing.	5	1,505	367	1,138	32	310	- 3	- 6	725	2,248	22 10 0	11 4 0	33 14 0	+ 3 0 0	- 4 2 0	- 1 2 0
	Ploughed 6" deep (four times) at 12 annas per ploughing.	6	1,501	426	1,075	40	252	- 56	- 111	842	2,124	26 5 0	10 10 0	36 15 0	+ 3 0 0	- 1 1 0	+ 1 15 0
	Ploughed 3" deep (eight times) with country plough at 12 annas per ploughing.	7	1,500	370	1,130	33	305	...	...	731	2,237	22 13 0	11 3 0	34 0 0	...	- 4 0 0	- 4 0 0

The difference of the cost of ploughing for eight times at annas 12 each time = Rs. 6, is shown in column 12.

Area of each plot (Nos. 1 to 4) 300 square yards.

„ „ (Nos. 5 to 7) 2,450 „ „

EABI STATEMENT No. VII.—MANURE EXPERIMENT WITH COTTON SEED CAKE AND COW DUNG (WHEAT SOWN).

	Detail of special manures applied.	Calculation of the result and comparison of outturn with the standard plot Nos. 6 and 6 in the series A and B.								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.							
		1	2	3	4	5	6	7	8	9		10			11	12	13
		Number of plots as per map of Farm.	Weight of un-threshed sheaves.	Weight of grain.	Weight of straw.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Actual outturn per acre. Grain.	Actual outturn per acre. Straw.	Value of outturn. Grain at Be. 1 per 32 lbs.	Value of outturn. Straw at Bic. 1 per 200 lbs.	Value of outturn. Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to bells. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to he Bs. 38.	Net profit or loss over or against the assumed income, Bs. 38.
			ILs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Bs. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. p.	Bd. a. p.	Bs. a. p.
A.	Cotton seed fed dung, *50* maiuids per acre at Its. 4 per 100 maunds.	1	422	124	298	42	240	- 14	- I11	981	2,367	30 10 0	11 13 0	42 7 0	+ 1 0 0	+ 4 7 0	+ 5 7 0
	Ditto ditto 100 maunds per acre at Bs. 4 per 100 maunds.	2	417	132	285	4G	216	- G	- 47	1,044	2,254	32 10 0	11 4 0	44 5 0	- 1 0 0	+ 6 5 0	+ 5 5 0
	Cow dung 200 inauuds at Us. 3 per 100 maunds per acre.	3	530	148	391	38	2C4	+ 10	+ 79	1,170	3,109	36 9 0	15 9 0	5? 2 0	- 3 0 0	+ 14 2 0	+ 11 2 0
	Perished cotton seed 5 maunds at lie. 1 per 30 seers per acre.-	4	498	140	358	39	256	+ 2	+ 16	1,107	2,831	34 9 0	14 9 0	49 2 0	- 3 15, 0	+ 11 2 0	+ 7 3 0
	Ditto ditto 10 maunds at Re. 1 per 30 seers per acre.	5	56G	1G2	404	40	249	+ 24	+ 190	1,281	3,260	40 0 0	16 5 0	56 5 0	- 10 14 0	+ 18 5 0	+ 7 7 0
	No special manure	6	530	138	392	[illegible]	284	...	...	1,091	3,103	34 1 0	15 8 0	49 9 0	+ 3 0 0	+ 11 9 0	+ 14 9 0
B.	Mustard cake 5 maunds per acre at Be. 1 per 30 seers.	1	501.	154	350	44	227	+ 33	+ 220	1,027	2,333	32 1 0	11 11 0	43 12 0	- 5 1 0	+ 5 12 0	+ 0 11 0
	Ditto 10 maunds per acre at Be. 1 per 30 seers.	2	G33	189	444	43	235	+ 68	+ 453	1,260	2,960	39 6 0	14 13 0	54 3 0	- 13 1 0	+ 1G 3 0	+ 3 2 0
	Plain cow dung 200 maunds per acre at Bs. 3 per 100 maunds.	3	G01	183	418	44	229	+ 62	+ 413	1,220	2,787	38 2 0	13 15 0	52 1 0	- 3 0 0	+ 14 1 0	+ 11 1 0
	Cake fed dung 50 maunds per acre at Bs. 4 per 100 maunds.	4	523	134	3S9	34	290	+ 13	+ 87	893	2,593	27 14 0	12 15 0	40 13 0	+ 1 0 0	+ 2 13 0	+ 3 13 0
	Ditto 100 maunds per acre at Bs. 4 per 100 maunds.	5	461	122	342	36	280	+ 1	+ 7	813	2,280	25 6 0	11 3 C	36 9 0	- 1 0 0	- 1 7 0	- 0 7 0
	No special manure	6	4G7	121	346	35	[illegible]	...	...	807	2,307	25 3 0	li 9 [illegible]	36 12 [illegible]	+ 3 0 0	- 1 4 0	+ 1 12 0

A.* Area of each plot 612 square yards.
B. Ditto 72ti ditto.

RABI STATEMENT No. VIII.—EXPERIMENT AS TO THE RESIDVAL VALVE OF VARIOVS MANVRES (WHEAT SOWN).

		Calculation of the result and comparison of outturn with the standard plot No. 6 and 10 in the series A and B.								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.				
		1	2	3	4	5	6	7	8	9		10		
										Actual outturn per acre.		Value of outturn.		
		Number of plots as per map of Farm.	Weight of unthrebhed sheaves.	Veight of grain.	Veight of btraw.	Percentage of grain on btraw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Grain.	Straw.	Grain at Re. 1 per [illegible]	Straw at Re. 1 per [illegible]	Total.
			lbs.	fliS.	fts.	lbs.	lbs.	lbs.	fiiS.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.
A'	Calcic superphosphate lSOfbs, ammonic chloride 131'fts., potassic sulphate 9Olbs., calcic sulphate 96£bs«j per acre.	1	89	27	62	44	229	+ 2	+ 48	653	1,500	20 6 0	7 8 0	27 14 0
	Ditto except calcic superphosphate	2	79	24	55	44	229	- 1	- 21	581	1,331	18 2 0	6 10 0	24 12 t)
	Ditto except ammonic chloride	3	84	26	58	45	223	+ 1	- 24	629	1,40-1	19 10 0	7 2 0	26 12 0
	Ditto except potassic bulphatc	4	84	28	56	50	200	+ 3	+ 73	678	1,355	21 3 0	6 12 0	27 15 0
	Ditto except calcic sulphate ...	5	G5	21	44	48	210	- 4	-97	508	1,065	15 14 0	5 5 0	21 3 0
	No manure	G	82	25	57	44	228	...	...	605	1,379	18 14 0	6 14 0	25 12 0
B*	Cowdung	1	321	85	236	36	278	+ 13	+157	1,028	2,856	32 2 0	14 4 0	46 6 0
	Poudrette	2	235	70	165	42	236	- 2	- 21	817	1,996	2G 7 0	10 0 0	36 7 0
	Mustard cake	3	212	64	148	43	231	- 8	- 97	774	1,791	21 3 0	8 15 0	33 2 Of
	Woollen refuse	4	21G	66	160	35	286	- 16	- 194	678	1,936	21 3 0	9 11 0	33 14 0
	Cow dung and hone dust	5	215	59	156	38	264	- 13	- 157	714	1,8S8	22 5 0	9 7 0	31 12 0
	Compost	6	209	57	152	38	2G7	- 15	- 181	600	1,839	21 9 0	9 3 0	30 12 0
	Indigo ploughed	7	179	55	124	44	225	- 17	-20(5	665	1,500	20 12 0	7 8 0	28 4 0
	Salt pure	8	20G	59	147	40	249	- 13	- 157	714	1,779	22* 5 0	8 14 0	31 3 0
	Ammonic	9	210	58	152	38	262	- 14	- 169	702	1,839	21 12 0	9 3 0	30 15 0
	No manure	10	239	72	167	43	232	...	...	871	2,021	27 3 0	10 2 0	37 5 0

A. Each plot is of 200 square yards.
B. Ditto G05 ditto.

BABI STATEMENT No. IX.—EXPERIMENT WITH KAINIT ON WHEAT.

	Calculation of the result and comparison of outturn with the standard plot No. 5 in (he series.								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.							
	1	"I	3	4	0	(5	7	8	9		10			11	12	13
									Actual outturn per acre.		Value of outturn.					
	Number of plots as per map of Farm.	Weight of un-tlireshed sheaves.	Weight of grain.	Weight of straw.	Percent-age of grain on straw.	Percent-age of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease ljer acre.	Grain.	Straw.	Grain @ Be. 1 per 32lbs.	Straw @ Ee. 1 per 200 lbs.	Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to bi Bs. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Bs. 38.	Net profit or loss over or against the assum-ed income, Bs. 38.
		lbs.	tls.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Bs. a. p.	Rs. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. K	Bs. a. p.
Kainit 3 cwt. per acre and green hemp ploughed.	1	281	88	193	46	219	+ 26	+ 315	1,065	2,335	33 4 C	11 11 0	44 15. 0	—8 8 0	+ 6 1 5 ^	- 1 %.Q
JJeup ploughed	2	242	80	K.2	49	202	+ 18	+ 218	968	1,960	30 4 0	9 13 0	40 1 0	—0 4 0	+ 2 1 0	+ 1 13 0
Farmyard manure *200 mds.* and kainit 3 cwt. per acre.	3	683	231	452	51	196	+ 169	+ *1,230*	1,681	3,290	52 9 0	16 7 0	49 0 0	-] 1 4 0	+ 31 0 0	+ 19 12 0
Woollen refuse *200 mds.* and Jciinit 3 cwt. per acre.	4	779	*219*	530	47	213	+ 187	f 1,361	1,812	3,857	56 10 0	19 5 0	75 15 0	- 1 1 4 0	+ 37 15 0	+ *26* 11 0
No manure	5	240	62	178	35	287	...	...	750	2,154	23 7 0	10 12 0	34 3 0	+ 3 0 0	- 3 13 0	- 0 13 0

1—400 square yards. • 2—400 square yards. 3—665 square yards. 4—665 square yards. 5—400 square yards.

RABI STATEMENT No. X.

	Calculation of the result and comparison of outturn with the standard plot in the series.								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.				
	1	2	3	4	5	6	7	8	9		10		
									Actual outturn per acre.		Value of outturn.		
	Number of plots as per map of Farm.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or de-crease over standard plot in the series.	Increase or decrease per acre.	Grain.	Straw.	Grain at Be. 1 per 32lbs.	Straw at Be. 1 per 200lbs.	Total.
		fts.	lbs.	lbs.	lbs.	lbs.	fcs.	fts.	as.	lbs.	Bs. a. p.	Bs. a. p.	Bs. a. p.
Grazed by sheep when one foot high	1	180	42	138	30	329	—1	- 24	1,016	3,340	31 12 0	16 11 0	48 7 0
KibWcd by sickle ditto	2	186	45	141	32	313	+ 2	+ 48	1,089	3,412	34. 0 0	17 1 0	51 1 0
Left as it was ,, ... M,	3	155	43	112	38	260	...	...	1,041	2,710	32 8 0	13 9 0	46 1 0

Each plot 200 square yatda.

RABI STATEMENT No. XI.—EXPERIMENT IN METHODS OF SOWING (WHEAT).

	Calculation of the result and comparison of outturn with the standard plot No. 2 in the series.							Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.							
	1	2	3	4	5	6	7	8	9		10			11	12	13
	Number of plots per map of Farm.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Actual outturn per acre. Grain.	Actual outturn per acre. Straw.	Value of outturn. Grain at Re. 1 per 41lbs.	Value of outturn. Straw at Re. 1 per 400lbs.	Value of outturn. Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 38.	Net profit or loss over or against the assumed income, Rs. 38.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Elf* ") Sown after Jethro)	1	570	215	355	61	165	—206	-515	537	887	16 12 0	4 7 0	21 3 0	-45 2 0	-16 3 0	-61 5 0
		65	40	25	...	...	...	...	...	...	1 0 0	0 4 0	1 4 0			
		40	...	...	...	...	...	...	...	...	...	1 0 0	1 0 0			
												Total ..	23 7 0			
Sown after country fashion ...	2	1,439	421	1,018	41	242	...	...	1,052	2,545	33 14 0	12 12 0	45 10 0	...	+ 7 10 0	...

* Cost of making strips per acre. (1) Making strips 43,560 cubic feet at Re. 1 per 1,000 cubic feet Rs. 43-8-0. (2) Labor of making lines and sowing Re. 1-10-0.

RABI STATEMENT No. XII.—EXPERIMENT WITH DIFFERENT VARIETIES OF WHEAT.

	Calculation of the result and comparison of outturn with the standard plot No. 5 in the series.								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.				
	1	2	3	4	5	6	7	8	9		10		
	Number of plot as per map of Farm.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Actual outturn per acre. Grain.	Actual outturn per acre. Straw.	Value of outturn. Grain @ Re. 1 per 41lbs.	Value of outturn. Straw @ Re. 1 per 400lbs.	Value of outturn. Total.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Adelaide ...	1	305	72	233	31	324	+ 7	+ 85	871	2,819	27 3 0	14 2 0	41 5 0
Muzaffarnagar	2	254	89	165	54	185	- 10	- 121	1,070	1,996	33 7 0	10 0 0	43 7 0
Sindhi ...	3	328	70	258	27	369	+ 9	+ 109	847	3,122	26 7 0	15 10 0	42 1 0
Muxar ...	4	215	58	157	37	271	+ 21	+ 254	702	1,900	21 15 0	9 8 0	31 7 0
Mundia ...	5	348	79	269	29	341	...	...	956	3,255	29 14 0	16 4 0	46 2 0

RABI STATEMENT No. XIII.-EXPERIMENT WITH BARLEY.

Number of plot.	Crojfe.	Weight of unthrcshed sheaves.	Weight of grain.	Weight of straw.	Percentage of grain on straw.	Percentage of straw on grain.	Outturn per acre.	
							Grain.	Straw.
		lbs.	lb*.	lbs.	lbs.	lbs.	lbs.	lbs.
1	*Chocolate* colored barley	1,060	343	712	49	205	1,547	3,164
2	White huskless barley	476	178	298	60	167	1,780	2,980
3	Green ditto	523	164	359	46	219	1,312	2,872
4	Country barljy	1,205	395	810	49	205	1,974	4,050

RABI STATEMENT No. X1V.-EXPEUIMENT WITH GYPSUM APPLIED TO PEAS AND GRAM.

Number of plot.	Crop*.	Manure and quantity per aero.	Outturn per acre.		Increase due to gypsum.	
			Grain.	Straw.	Grain.	Straw.
			lbs.	lbs.	lbs.	lbtf
1	Peas	Farmyard manure 100 maunds, gypsum 3 cwt. P. A.	1,703	1,542		484
2	Do.	Ditto 100 maunds per acre	1,673	1,058		
3	Gram	Ditto 50 maunds, gypsum 3 cwt. P. A.	1,680	745		89
4	Do.	Ditto 100 maunds per acre	1,508	G56		

EABI STATEMENT No. XV.—EXPERIMENT WITH POTATOES.

Number of plot.	Manure and quantity per acre.	Actual outturn.	Increase or decrease over standard plot No. 5 in the series.	Increase or decrease per acre.	Actual outturn per acre.	Potatoes at Be. 1 per 99fts.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Bs. 82.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Bs. 200.	Net profit or loss over or against the assumed income, Bs. 200.
		lbs.	fts.	lbs.	lbs.	Bs. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. p.
1	Poudrette 200 mds. at Bs. 4 per 100 mds. and sulphate of iron i cwt. at Bs. 6-2-0 per cwt.	1,742	+ 748	+4,987	11,613	117 5 0	+ 6 15 0	-82 11 0	-75 12 0
2	"Woollen refuse 200 mds. at Ks. 3 per 100 mds. and gypsum 3 cwt. at Bs. 2-6-0 per cwt.	1,640	+ 640	+ 4,307	+ 10,933	110 7 0	+4 14 0	-89 9 0	-84 11 0
3	Poudrette 200 mds. at Bs. 4 per 100 mds. and kainit 5 cwt. at Bs. 2-12-0 per cwt.	920	- 74	—493	6,133	61 15 0	- 3 12 0	-138 1 0	-141 13 0
4	Castor oil cake 10 mds. at Be. 1-1-0 per md. and gypsum 3 cwt. at Bs. 2-6-0 per cwt.	1,285	+ 291	+ 1,940	8,567	66 9 0	+0 4 0	-113 7 0	-113 3 0
5	Sown after country fashion	994	MI	HI	6,626	£6 15 0	+	-143 1 0	-143 1 0

The objects of this experiment have heen already stated. Each of the plots, save the unmanured one, receives a special kind of manure year after year. At the time of sowing they were ploughed twice with the **improved** plough five inches deep, and twice with the country plough. Maize seed, six seers per acre, was sown hehind the country plough. They were weeded twice and ridged up once. Sowing took place on the 13th of June,

The plants in **NOB.** 2, 4, 8 and 10 of the standard series were somewhat injured by rain. In Nos. 7 and 9 the plants were very vigorous and the cohs were plump a»d full of seed.

The subjoined statements Nos. I and II contain the result and show the difference of the produce of the several plots, which is chiefly due to the effect of different fertilizers.

Of the standard series plots *{viz.,* in which maize is sown **without** any alternation) poudrette, sheepdung, sheepdung mixed with honedust and with gypsum, and pla"> cowdung have given good results. Asa good crop of **maize (say 1,600** lbs. to the acre) is worth Us. 40 exclusive of the value of the stalks, it **repays a** liberal **expenditure** on manure.

Of the duplicate series plots (statementNo.il) ashes of cowdung **with saltpett?** have been hest of all. The yield of many plots in this **series** lias teen less **than** that of the corresponding plots in the standard series. This is due to their **enjoying** n° rest> as the maize is sown two months after **the** wheat crop has been taken.

KHAafF STATEMENT No. *I.-Standord serie*-Man«re experiment* ***mti*** *maize.*

Ifum-bac or pioi per fsiriu map.	Hanaro applied per acre.	Vftlun of manure.	Produce per acre.				Increase or decrease over unmanned plot.			
			Grain.		Stalks.		In grain,		In stalks-	
			Average for previous 4 yoaw.	This year.	Average for previous 4 years.	This year.	Average for previous 4 jsaa.	This year.	Average ror previous 4 years.	This year.
		Ba. a. p.	fts.	as.	lbs.	lbs.	lbs.	ill.	B)9.	lbs.
K-10	Sheepdang ISO mannas ...	S 6 0	780	U98	4,459	9,8G2	+ 163	+ 920	-427	+5,015
K- 0	Poudrette 180 mannda ...	7 3 0	1,036	1,912	3,943	8,204	+ 430	+ 1,(534	-913	+3,937
K-8	Ashes of 180 maunds of cowdung and saltpetre 3 maunds.	14 6 0	1,222	1,102	6,019	9,535	+ GIC	+ 834	+ 1,733	+5,28»
K-5	Saltpetre 3 mauuds	O 0 0	852	**1,041**	4,745	5,870	+ 216	+ 7C3	-141	+ 1.G33
K-11	Ditto ditto and bonedust 41 maunds.	19 11 0	936	1,271	5.G90	10,570	+ **829**	t + 993	+ 810	+a3?s
K-3	Cowdung 180 tnsunda	5 G 0	1,031	1,500	3,537	7,917	+ 425	+ 1.L'^J	-1,310	+3,870
K-1	Ditto ditto and bonedust 4V maunds.	IS 1 0	1,082	UIO	4,447	8,470	+ 476	+ P32	-439	+4.S39
K-a	Ditto ditto and gypsum 3 lAaunds.	10 10 C	1,170	1,150	4.419	7,187	+ 564	+ 873	-407	+ 2,9W
K- 4	Ashes of 180 maunds of cowdung ,,,	s e t	E-tO	895	8,708	7,817	-CG	+ C17	-1,178	+3,537
K-7	Sheepdung 180 maunds and bonedust 4^ maund&.	16 1 (	933	1,827	6,500	8,180	+ ^7	+1,549	+ GS3	+3,93*
K-G	Saltpotre 3 maunds and bone-superphosphate 3 mauuds.	30 O (	875	1.24G	4,069	1,403	+ 2G9	+ OCS	-81''	-2,544
K-12	Sheepdung 180 mannda and gypsum 3 maunda-	10 10 0	846	1,700	4,702	6,304	+ 240	+1,428	-181	+ 2,057
K-13	Ko manure ,,. ... ***	...	60a	278	4,830	4,247	...	...	...	...

REPORT

ON THE

CAWNPORE EXPERIMENTAL STATION

FOB TUB

XHARIF AND BABI SEASONS, 1889-90.

ALLAHABAD:

WRTU-WESTERN PKOVINCJ3S AND OUDH GOVEENMBNT FRESfl.

1890.

Kharif Statement III.—This experiment is termed "miscellaneous," and has been carried on from 1881, in a series of eight plots each measuring 4,00 square yards.

These plots were sown with the usual quantity of seed, 6 seers per acre, on the 12th of June. Ploughing and weeding was done as in No. I experiment.

The plants in Nos. 1, 2, 3 and 5 of this series grew too luxuriantly and were afterwards beaten down by heavy rain. Some damage was also done by wild pigs. No. 1, as usual, gave the best results. The tendency of saltpetre to increase stalk rather than seed is noticeable.

Kharif Statement No. III.—*Miscellaneous manure experiment with maize.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre.				Increase or decrease over unmanured plot.			
			Grain.		Stalks.		In grain.		In stalks.	
			Average for previous 5 years.	This year.	Average for previous 5 years.	This year.	Average for previous 5 years.	This year.	Average for previous five years.	This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
N. 1	Woollen refuse 120 maunds ...	6 0 0	1,594	2,226	6,706	8,966	+936	+1,258	+3,596	+2,129
N. 2	Sheepdung 120 " ...	3 10 0	983	1,573	4,594	7,901	+325	+605	+1,484	+1,064
N. 3	Cowdung 120 " ...	3 10 0	697	1,488	3,433	9,704	+39	+520	+323	+2,867
N. 4	Poudrette 120 " ...	4 13 0	1,067	1,694	4,744	9,922	+409	+726	+1,634	+3,085
N. 5	Horsedung 120 " ...	3 10 0	1,002	1,331	4,957	9,741	+344	+363	+1,847	+2,904
N. 6	Pigdung 120 " ...	3 10 0	1,103	1,150	5,570	9,051	+445	+182	+2,460	+2,214
N. 7	Saltpetre, 3 " ...	9 0 0	954	1,355	4,405	9,898	+296	+387	+1,295	+3,061
N. 8	No manure ...	...	658	968	3,110	6,837	...	...	...	...

Kharif Statement IV.—This experiment is for five years, which term has expired this year. Its object is to determine the comparative result of sowing maize on ridges after the American fashion at the distance of one, two and three feet.

All the plots of this series were kept under the same treatment throughout the season, i.e., were all ploughed, sown, and weeded on the same days. They were sown on the 10th of June. The number of ploughing and weeding was the same as in the foregoing cases.

The cobs in plots Nos. 1, 2 and 3 were very stout and good.

This year the plots sown on ridges have produced more than the plot sown by ordinary method, but this is contrary to the results generally obtained in previous years. The plots Nos. 1 and 4 were beaten down by the rain and suffered to a certain extent.

Kharif Statement No. IV.—*Maize sown after American fashion.*

Number of plot per farm map.	Mode of sowing.	Produce per acre.				Increase or decrease over ordinary cultivated crop.			
		Grain.		Stalks.		In grain.		In stalk.	
		Average for previous 4 years.	This year.	Average for previous 4 years.	This year.	Average for previous 4 years.	This year.	Average for previous 4 years.	This year.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
[illegible]	One foot apart	1,018	2,300	3,800	10,400	−540	+660	−471	−752
[illegible]	Two feet apart	740	2,108	3,265	8,664	−818	+468	−1,006	−2,488
[illegible]	Three ditto	554	1,876	1,910	5,784	−1,004	+236	−2,361	−5,368
[illegible]	After country fashion	1,558	1,640	4,271	11,152	...	...	...	...

No. 1432F.

DEPT. OF LAND RECORDS AND AGRI., N.-W. P. AND OUDH.

Dated Cawnpore, the 15th November **1890.**

FROM

T. *W.* HOLDERNESS, ESQ., C.S.,

Dir., DEPT. OF LAND RECORDS AND AGRI., N.-W. P. AND OUDH,

To

THE CHIEF SECRETARY TO GOVERNMENT,

N.-W. PROVINCES AND OUDH.

SIR,

I HAVE the honour to submit the Report on the Government Experimental Farm at Cawnpore for the year ending the 30th June last. The report has been drawn up under my supervision by the Assistant Director, who has been in charge of the farm throughout the year.

2. The statements exhibiting the results of the several experiments have been recast, with the object both of simplifying them and of comparing for each field the averages of past years with the outturn for the year under report. This has considerably delayed the present report, as the averages had to be carefully worked out and checked.

3. Dr. Voelcker visited the farm on several occasions, and expressed his approval of the method of management and the mode of recording results. It is essential on an experimental station that there should be no doubt as to the exact yield of each field year by year, or as to its method of treatment. I am therefore pleased to know that in Dr. Voelcker's opinion the method of obtaining results and of recording them followed on the Cawnpore Farm meets the requirements of scientific accuracy. It is of the highest importance to obtain an exact register of what land in India will produce on the average of a number of years under unchanged conditions. This information is being gradually collected on the Cawnpore Farm, and it will become more valuable as the observations increase in number.

4. The yield of unmanured land in a series of years is one of the most interesting points on which information is being collected. There are a good many such plots on the farm. I give in the margin the average outturn of wheat per acre of all plots which have been without manure and under wheat for the past six years. Some of these plots the yield is possibly still affected by manure applied before the land was placed under the present series of experiments, and may be expected to decrease in future years. Taking a bushel of wheat at 6 libs., the general yield of unmanured land of the kind found on the Cawnpore Farm—a loam of average fertility cropped year after year and carefully watered and tilled—may be put at 10 to 13 bushels an acre. The American average for all the States of the Union is about 12 bushels. The English average

			lbs.	
Page 11,	average for six years,	...	950	
" 12,	ditto	...	933	
" 13,	ditto	...	956	
" 13,	ditto	...	916	
" 14,	ditto	...	630	(average of 2 plots).
" 11,	ditto	...	596	(ditto 6 do.)
" 14,	ditto	...	614	
" 15,	ditto	...	586	(ditto 4 do.)

is 30 bushels. The Cawnpore experiments conclusively show that 5 to 10 bushels can be easily added to the average yield by the application of Rs. 5 worth of farmyard manure or even by green-soiling with hemp at the cost of Rs. 3-8-0 per acre. This is putting the increase at a minimum. The six years' average yield of the plot manured with farmyard manure only in the "Rabi duplicate series" is 27 bushels, and of the plot manured with *poudrette* 28 bushels. Thus we get the American average on our unmanured land and approximate to the English average on our manured. I am afraid that the American average is not unfrequent in many districts of these Provinces, especially in those where canals enable the cultivator to subject the soil to » systematic process of exhaustion.

5. As regards the comparative value of manures, the experience of the Cawnpore Farm is not favourable to artificial or extraordinary fertilizers. Bones, bone-Buperphosphate, gypsum, kainit, &c., are considerably more costly in this country than the common kinds of manure, and so far as they have been tried they have not given commensurate results. Green-soiling with indigo or hemp might, however, be more commonly adopted by the Indian agriculturist than at present. The cost of sowing hemp and ploughing it in when green is put at Rs. 3-8-0 an acre. But this is chiefly made up of hire of labour and bullocks, and the cultivator can find both without actual expenditure of money. In districts where indigo is not a staple crop, the fields destined for wheat (unmixed) are almost invariably left fallow in the preceding kharff. To sow these with hemp instead of fallowing them would, according to the CawnpoJI Farm Experiments, make the wheat crop heavier.

6. Most of the produce of the farm is sold to the public for seed, the seed-grain bang carefully cleaned and selected. Dr. Voelcker was of opinion that this branch should be developed, and some of the minor experiments abandoned. I am considering how effect can best be given to this suggestion. The demand for good wheat, cotton, barley, and maize seed is increasing, and in endeavouring to meet it the farm can be of practical utility,

I have the honour to be,

Sis,

Tour most obedient servant,

T. W. HOLDERNESS,

Director.

REPORT

ON THE

CAWNPORE AGRICULTURAL STATION,

FOR THE KHiRIF AND RABI SEASONS OF 1889-90.

Alteration in the form of the tabular statements.

THE tabular statements showing the results of the several experiments have been altered this year at the suggestion of Dr. Voelcker. They were unnecessarily elaborate and cumbersome. In the present series averages of past years have been given where possible.

Character of the year.

The year under review lias been very favorable in this district (Cawnpore) for both kharif and rabi crops. The rains were all that could be wished, and the supply of canal water for irrigation has also been regular throughout the year.

All the experiments during the year under report were virtually the same as in the last years. There is hardly room for new ones. The existing experiments are considered by Dr. Voelcker fully sufficient, if not too numerous.

The chief and important experiments are—

In kharif with maize.

In rabi with wheat, indigo, sugarcane. Potatoes have lately been added.

Summary of experiments.

The experiments may be thus classed :—

(a) " Permanent" (i.e., carried on year after year on the same plot of land and with the same kind of treatment) a detailed account of which will follow.

(b) " Temporary " in respect of duration and of land used.

The " permanent" experiments are carried on with the view to determine—

(1) Whether wheat and maize can be grown year after year on the same land by the aid of manure, deep ploughing, &c.

(2) Whether to obtain a good crop rotation is really indispensable.

(3) For how long and to what extent, without the application of manure, the soil remains capable of nourishing plant life.

(4) What constituent in soil or in a manure is more essential for the above crops, (maize and wheat) and needs to be provided artificially in case of its absence or scarcity.

(5) Whether deep ploughing and watering are enough for obtaining a good crop, or whether manure is indispensable.

The "temporary" experiments are conducted with the view to ascertain (1) the value of certain fertilizers; (2) of imported and acclimatized seeds; (3) of deep and shallow ploughing, methods of sowing, &c, &c.

Both the " permanent" and " temporary" experiments further enable us—

(a) to ascertain the value and utility of improved methods compared with the country way of farming;

(b) to form an idea of the character of the season from the result obtained on the farm.

KHARIF SEASON EXPERIMENTS.

KHARIF STATEMENTS I AND II.—*Experiments with maize.*—This experiment is carried on in a series of 26 plots. In 13 of these plots maize is sown year after year without any change of treatment, while the other 13 plots are alternated with maize aud wheat.

on [illegible] of this experiment [illegible] been already stated. Each of the plots, save the unmanured one, receives a special kind of manure year after year. At the time of sowing they were ploughed twice with the improved plough five inches deep, and twice [illegible] maize [illegible] was [illegible] behind the country [illegible] were [illegible] twice and [illegible] once. Sowing took place on the 13th of June.

The plants in Nos. 2, [illegible] 8 and 10 [illegible] rain. In Nos. 7 and 9 the plants [illegible] were somewhat [illegible] were very vigorous [illegible] the cobs were plump and full of seed.

The subjoined statements [illegible] and II contain the result and show the difference of the produce of the several plots, which is chiefly due to the effect of different fertilizers.

Of the standard series plots ([illegible] in which maize is sown without alternation) poudrette, sheepdung, sheepdung [illegible] and plain cowdung have given good results. As a good crop of maize (say 1,600 lbs. to the acre) is worth Rs. 40 [illegible] of [illegible] the [illegible] a liberal expenditure [illegible] manure.

Of the duplicate series plots (statement No. II) ashes of cowdung with saltpetre have been best of all. The yield of many plots in this series has been less than that of the corresponding plots in the standard series. This is due to their enjoying no rest, as the maize is sown two months after the wheat crop has been taken.

KHARIF STATEMENT No. I.—Standard series [illegible] experiment with maize.

Number of plot per former map.	Manure applied per acre.	Value of manure.	Produce per acre. Grain. Average for previous 4 years.	Produce per acre. Grain. This year.	Produce per acre. Stalks. Average for previous 4 years.	Produce per acre. Stalks. This year.	Increase or decrease over unmanured plot. In grain. Average for previous 4 years.	Increase or decrease over unmanured plot. In grain. This year.	Increase or decrease over unmanured plot. In stalks. Average for previous 4 years.	Increase or decrease over unmanured plot. In stalks. This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
K-15	Sheepdung 180 maunds ...	5 6 0	788	1,169	4,459	9,862	+162	+920	−437	+5,615
K-2	Poudrette 180 maunds ...	7 8 0	1,066	1,012	5,043	8,204	+430	+1,034	−248	+3,467
K-3	Ashes of 180 maunds of cowdung and saltpetre 3 maunds	14 6 0	1,298	1,165	6,019	9,405	+610	+894	+1,733	+5,285
K-6	Saltpetre 3 maunds	9 0 0	883	1,041	4,145	5,870	+245	+783	−141	+1,613
K-11	Ditto ditto and bonedust 4½ maunds	19 11 0	936	1,271	5,486	10,676	+329	+993	+610	+5,409
K-5	Cowdung 180 maunds	5 6 0	1,061	1,400	3,837	7,017	+426	+1,232	−1,040	+3,670
K-1	Ditto ditto and bonedust 4½ maunds	10 1 0	1,048	1,210	4,447	8,470	+470	+932	−420	+4,539
K-3	Ditto ditto and gypsum 3 maunds	10 10 0	1,170	1,150	4,419	7,187	+561	+872	−457	+2,940
K-4	Ashes of 180 maunds of cowdung ...	5 6 0	640	895	3,706	7,817	−66	+617	−1,178	+3,647
K-7	Sheepdung 180 maunds and bonedust 4½ maunds	18 1 0	846	1,827	5,500	8,150	+397	+1,549	+433	+4,033
K-8	Saltpetre 3 maunds and bone-superphosphate 3 maunds	30 0 0	875	1,348	4,009	1,408	+202	+908	−817	−2,844
K-12	Sheepdung 180 maunds and gypsum 3 maunds	10 10 0	848	1,700	4,703	6,304	+240	+1,428	−183	+2,057
K-13	No manure	...	608	278	4,950	4,247	...	...	...	...

Kharif STATEMENT NO, II.—Kharif duplicate series—Manure experiment with maize.

Number of plot per farm map.	Manure applied per acre.	Value of manure.	Produce per acre. Grain. Average for previous four years.	Produce per acre. Grain. This year.	Produce per acre. Stalks. Average for previous four years.	Produce per acre. Stalks. This year.	Increase or decrease over unmanured plot. In grain. Average for previous four years.	Increase or decrease over unmanured plot. In grain. This year.	Increase or decrease over unmanured plot. In stalks. Average for previous four years.	Increase or decrease over unmanured plot. In stalks. This year.	Remarks.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
Alb-1	Sheepdung 180 maunds	5 6 0	715	1,270	3,648	8,325	+ 382	+ 968	+ 999	+ 3,836	The rotation on these plots is as follows. They were under maize in June-September 1887. They then lay fallow till October 1888, when they were put under wheat, which was reaped in April 1889. They were then put under maize in June 1889, of which the result is given in the accompanying report. They will now lie fallow till October 1890, when they will again be sown with wheat. Thus maize follows wheat after an interval of only two months, between the reaping of the maize and the next wheat sowing a fallowing of 13 months ensues.
Alb-2	Foudrette 180 maunds	7 3 0	997	1,379	3,564	7,163	+ 666	+ 1,077	+ 915	+ 2,674	
Alb-3	Ashes of cowdung 180 maunds and saltpetre 3 maunds	14 6 0	743	1,815	4,083	6,183	+ 412	+ 1,513	+ 1,434	+1,694	
Alb-4	Saltpetre 3 maunds	9 0 0	627	1,077	3,362	6,691	+ 296	+ 775	+ 703	+ 2,202	
Alb-5	Saltpetre 3 maunds and bonedust 4½ maunds,	19 11 0	791	1,040	3,268	7,554	+ 460	+ 738	+ 619	+ 3,065	
Alb. 6	Cowdung 180 maunds	5 6 0	743	1,573	4,030	6,800	+ 412	+1,271	+ 1,381	+ 2,311	
Alb-7	Cowdung 180 maunds and bonedust 4½ maunds.	16 X 0	806	1,331	4,160	7,926	+475	+ 1,029	+ 1,511	+ 3,437	
Alb-8	Cowdung 180 maunds and gypsum 3 maunds,	10 10 0	780	1,355	4,053	7,623	+ 449	+ 1,053	+ 1,395	+ 3,134	Another point to be noticed is that in those years in which these plots are under wheat, they appear as the "rabi duplicate series." The 13 plots shown in the present report in the rabi duplicate series will appear in the report for next year (1890-91) as the kharif duplicate series.
Alb-9	Ashes of cowdung 180 maunds ...	5 6 0	503	920	2,983	8,688	+ 172	+ 618	+ 334	+ 4,199	
Alb-10	Sheepdung 180 maunds and bonedust 4½ maunds.	16 1 0	717	1,343	3,485	9,716	+ 386	+ 1,041	+ 836	+ 5,227	
Alb-11	Saltpetre 3 maunds and bone-superphosphate 3 maunds.	30 0 0	711	1,222	3,302	1,779	+380	+ 920	+ 653	-2,710	
Alb-12	Sheepdung 180 maunds and gypsum 3 maunds.	10 10 0	565	1,452	3,718	10,477	+234	+ 1,150	+ 1,069	+ 5,988	
Alb-13	No manure	...	331	302	2,649	4,489	...	...	...	...	

KHARIF STATEMENT III.—This experiment is termed "miscellaneous," and has been carried on from 1881, in a series of eight plots each measuring 400 square yards.

These plots were sown with the usual quantity of seed, 6 seers per acre, on the 12th of June. Ploughing and weeding was done as in No. I experiment.

The plants in Nos. 1, 2, 3 and 5 of this series grew too luxuriantly and were afterwards beaten down by heavy rain. Some damage was also done by wild pig. No. 1, as usual, gave the best results. The tendency of saltpetre to increase stalk rather than seed is noticeable.

KHARIF STATEMENT NO. III.—*Miscellaneous manure experiment with maize.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre. Grain. Average for previous 5 years.	Grain. This year.	Stalks. Average for previous 5 years.	Stalks. This year.	Increase or decrease over unmanured plot, In grain. Average for previous 5 years.	In grain. This year.	In stalks. Average for previous five years.	In stalks. This year.
		R. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
K-1	Woollen refuse 120 maunds	6 0 0	1,594	2,226	6,706	8,966	+ 936	+ 1,258	+ 3,596	+ [illegible]
N-2	Sheepdung 120 "	3 10 0	983	1,573	4,594	7,901	+ 325	+ 605	+ 1,484	+ 1,0[illegible]
N-3	Cowdung 220 "	3 10 0	697	1,488	3,433	9,704	+ 39	+ 520	+ 323	+ 2,867
27-4	Toudrette 120 "	4 13 0	1,067	1,694	4,744	9,922	+ 409	+ 726	+ 1,634	+ 3,085
H-5	Horsedung 120 "	3 10 0	1,002	1,331	4,957	9,741	+ 344	+ 363	+ 1,847	+ 2,904
K-6	Pigdung 120 "	3 10 0	1,103	1,150	5,579	9,051	+ 445	+ 182	+ 2,469	+ 2,114
N-7	Saltpetre, 3 "	9 0 0	954	1,355	4,405	9,898	+ 296	+ 387	+ 1,295	+ 3,001
N-8	No manure ...	...	658	968	3,110	[illegible]	...	...	...	...

KHARIF STATEMENT IV.—This experiment is for five years, which term has expired this year. Its object is to determine the comparative result of sowing maize on ridges after the American fashion at the distance of one, two and three feet.

All the plots of this series were kept under the same treatment throughout the season, *viz.*, were all ploughed, sown, and weeded on the same days. They were sown on the 10th of June. The number of ploughing and weeding was the same as in the foregoing cases.

The cobs in plots Nos. 1, 2 and 3 were very stout and good.

This year the plots sown on ridges have produced more than the plot sown by ordinary method, but this is contrary to [illegible] results [illegible] previous years. The plots Nos. 1 and 4 [illegible] rain and suffered to a certain extent.

KHARIF STATEMENT NO. IV.—*Maize sown after American fashion.*

Number of plot per farm map.	Mode of sowing.	Produce per acre. Grain. Average for previous 4 years.	Grain. This year.	Stalks. Average for previous 4 years.	Stalks. This year.	Increase or decrease over ordinary cultivated crop. In grain. Average for previous 4 years.	In grain. This year.	In stalk. Average for previous 4 years.	In stalk. This year.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
[illegible]	One foot apart	1,009	2,300	3,600	10,400	− 540	+ 600	− 471	− 762
[illegible]	Two feet apart	740	2,108	2,357	8,654	− 918	+ 489	− 1,506	− 2,458
[illegible]	Three ditto	654	1,470	1,010	5,784	− 1,004	+ 180	− 2,301	− 5,388
[illegible]	After country fashion	1,553	1,040	4,571	11,153	...	...	...	...

KHAIUP STATEMENT V.—This experiment is to contiuue for five years, three of which have expired; as a rule, early sowing for all kharff crops is good. It has generally proved to be true on the farm.

Rainy season crops are often liable to damage. If cultivators can afford to maintain an early sown crop till the rain sets in, they are pretty sure to keep it free from damage. But one or two waterings are necessary.

In the season under review one plot was sown on the 18th of May and the other on the 6th of June.

Except in respect of early sowing and weeding, all the plots were subject to the same kind of treatment, being ploughed and weeded three times and sown with maize seed six seers per acre.

The early sown plot looked very healthy throughout the season. It was beaten down by rain, but, notwithstanding, its produce was best. The same result has always been obtained.

KHARLF STATEMENT NO. V.—*Experiment in early and late sowing of maize.*

Number of plot per farm map.	Mode of sowing.	Produce per acre.				Increase or decrease,			
		Grain.		Stalks.		In grain-		In stalks.	
		Average for previous 2 yenrs.	This year.	Average for previous 2 years.	This year.	Average for previous 2 years.	This year.	Average for previous 2 years.	This year.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
35B'	Sown early	958	2,882	3,119	7,090	+ 37	+ 929	- 64	+ 1,450
35Aa-c	Sown late	921	1,953	3,183	5,640	...	...	...	...

KHARI* STATEMENT VI.—This experiment is to determine the effect of certain manures on cotton, and is to be carried on for five years, two of which have passed. This series consists of six plots each of 400 square yards. All the plots were sown on the 14th June j the cotton picking began from the 26th of September; six seers of seed per acre were sown. Ploughing was done twice with the improved plough, and weeding three times.

'Plots Nos. 1, 3 and 4 were covered with water soon after sowing. Every possible care was taken to drain the water off, but the seed in the plots germinated very badly. At the time of flowering a heavy shower of rain came on and damaged the blossoms. Plots Nos. 3 and 4 suffered more from a fungoid disease (which has done great injury to cotton, especially to the country variety) than the other plots in the series.

Woollen refuse in this case also has beaten other manures. The silt from canal has come out next. All other kinds of manure have added more or less to the yield.

KHARIF STATEMENT NO. *VI.-Experime»t as to the efiect of certain manures on cotton.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre.			
			Cleaned cotton.		Seed.	
			Result of last year.	This year.	Result of last year.	This year.
		Ks. a. p.	lbs.	lbs.	lbs.	lbs.
Ab-1	Fresh silt from canal 500 maunds, ...	1 4 0	1G9	121	27S	194
Ab-2	Kainit 4 maunds and gypsum 4 maunds ...	12 8 0	181	97	315	169
Ab-3	Farm yard manure 180 maunds and gypsum 1 mannd 14½ seers.	7 12 0	218	73	3G3	133
Ab-4	Farm yard manure 180 maunds and kainit 1 maund 14½ seers.	8 3 0	230	97	375	157
Ab-5	Woollen refuse, 120 maunds	3 9 0	290	133	482	230
Ab-G	No manure	...	145	Gl	242	121

STATEMENT No. II.—*Duplicate series—Manure experiment with wheat.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre. Grain. Average for previous 5 years.	Produce per acre. Grain. This year.	Produce per acre. Straw. Average for previous 5 years.	Produce per acre. Straw. This year.	Increase or decrease over unmanured plot per acre. In grain. Average for previous 5 years.	In grain. This year.	In straw. Average for previous 5 years.	In straw. This year.	Remarks.
		Rs. a. p.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
Ale-1	Saltpetre 2 maunds	9 0 0	1,416	1,079	2,733	3,062	+431	−206	+ [illegible]	−702	The rotation is as follows:— October 1886 to March 1887 ... Wheat. June 1887 ... ... Maize. October 1887 to March 1888 ... Wheat. June 1888 ... ... Maize. October 1888 to March 1889 ... Wheat. When these fields are under maize they appear in the kharif experiments as "duplicate kharif series." The fields shown in the present report in the duplicate kharif series will be cropped in October 1889 with wheat and be shown as duplicate rabi series in next year's report.
Ale-2	Saltpetre 2 maunds and [illegible] maunds ...	19 11 0	1,736	2,239	3,011	4,162	+741	+303	+1[illegible]	+308	
Ale-3	[illegible]	2 6 0	1,394	2,850	2,432	5,764	+400	+260	+ [illegible]	+2,330	
Ale-4	[illegible]ung 180 maunds and [illegible] 4½ maunds ...	10 1 0	1,339	1,094	1,912	3,473	+354	−243	− [illegible]	−181	
Ale-5	[illegible] maunds [illegible] maunds ...	10 10 0	1,261	1,213	2,474	3,061	+266	−303	+ [illegible]	−209	
Ale-6	[illegible]	5 6 0	1,267	1,469	3,263	2,039	+222	−287	+1[illegible]	−1,016	
Ale-7	[illegible]	5 6 0	1,137	1,730	1,036	2,848	+172	−145	+ [illegible]	+194	
Ale-8	Sheep-dung [illegible] and bonedust 4½ maunds ...	16 1 0	1,462	1,021	2,339	3,279	+477	−234	+ [illegible]	−373	
Ale-9	Saltpetre 2 maunds and bone superphosphate 3 maunds,	20 0 0	1,180	1,367	2,501	2,935	+195	−309	+ [illegible]	−1,310	
Ale-10	Sheep-dung [illegible] and gypsum 3 maunds ...	10 10 0	1,365	1,327	2,643	2,856	+400	−333	[illegible]	−798	
Ale-11	No manure	...	985	1,670	1,902	3,654	...	...	...	...	
Ale-12	Poudrette	7 8 0	1,622	2,045	2,944	4,130	+637	+73	+1,052	+486	
Ale-13	Ashes [illegible] of cowdung and saltpetre 3 maunds.	14 6 0	1,405	1,428	2,655	2,650	+420	−446	+603	−1,004	

Area of each plot is 400 square yards.

RABI STATEMENT III,—This experiment contuta of 13 plots nam<il "*$rte* mantrt mietf* each plot is of WO wjuarc yards. The experiment is to •:• i-rmine the manurial value of hemp and indigo, which is applied to wheat in certain farms.

In 1889 all thaw plot* were icwn with Mnaaffamagar wheat nn the 15th of October, Umg ploughed tuiee witli the improved and twice with the country plough. TVy were weeded once and waterwl three time*.

The plot* No». 3, 4, 8 and 10 Itfing rather wet at the time of sowing, did not germinate well and w«re attacked by whiteanU ; No*. 1, 2 and 7 did well.

I mligo refu»e and indifro water are not alway* obtainable by cultivators. But gjeen hamp e little to *>wand plough in during tha pnoediag rain*, and reprweata MM I luapert form of manure which the cultivator can ofattta. It has the drawback that it pnreafal the field bearing a *dofatU* crop. But where a cultivator is unalilc to give hi» land farmyard manur.'. fa* Buaot lm]«> to (TOJI it twice as a regular thing, and by grwewoiling he can both rest it and improve it.

RAHI R No, III — <*iren*K«a«re *tenet.*

No. ••f ..:., C MB	H u m Applied JUT •«*.	V ||B| „f • .:-:T,	ProJtwi per ftcta. Offtli. jvlTIJlttl •ft fan*	Tliii J«M	SLrnr. \.rr»i.v for	Ttiii	tnr*nut* of il«n». uuuMHUTMI plot ppr iriv, In i^mib. for jew*	Ttil.	la itnir. •MVIMH i n]f«ftrt.	Thti
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Aft-U	AHMTMHV wllh t H M i		Mi	1,174		MM	-M	+ M	+ 7M	

RABI STITIMIVT IV.—Thi» i* to oonfirm lh<- n nf tie BMM in U» 'ongoing MMriBMit awl b «".- ,W> „f ^*W^T *^ th,n tbe plotj of tht ,•* noted MriM. Th*« ploU w«r* wwi, M Ml "A «i W* "I (k-l^W with U» ••me kind bf wheat (Muiaffamagar) at U« ~me raU A0 «o» per MM; they had t*en ploughed twkw wilh the improved awl counuy ploughs rwprctirrly. Weeding wa* done otm and watering twiee.

TlM> following tUtement *tUowt* that Uw onttnrn pw acre ii larger with indigo th*» withhemn. ««tCT«nmp«»aiil*»bl$_y$incr««U»«.y».U. Tb* hemp pbU at the tim. «f «wing had W- mouture thM U« 'oiigo f^U, hrtc* the ami » thro, germwaUdUU.

RABI STATEMENT No. IV—*Green manure experiment with wheat.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre.				Increase or decrease per acre over unmanured plot per acre.			
			Grain.		Straw.		In grain.		In straw.	
			Average for previous 5 years.	This year.	Average for previous 5 years.	This year.	Average for previous 5 years.	This year.	Average for previous 5 years.	This year.
		Rs. a. p.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
32A & L	Fresh indigo refuse 120 maunds and lime 6 maunds.	2 6 0	1,066	1,426	2,352	2,710	+437	+647	+864	+647
32B & K	Fresh indigo refuse 120 maunds ...	1 2 0	861	1,061	1,812	2,400	+232	+521	+433	+250
32C & J	Old indigo refuse 120 maunds and lime 6 maunds.	2 6 0	939	1,156	1,812	2,414	+210	+375	+433	+275
32D & I	Old indigo refuse 120 maunds ...	1 2 0	868	1,422	877	2,414	+239	+611	+298	+611
32E & H	No manure (average of two plots).	...	629	811	1,379	1,837	...	...	...	...
31A-D & 32A-C	Hemp ploughed in (average of seven plots).	3 8 0	1,131	1,123	2,239	3,302	+512	+636	+900	+1,484
31F-I & 33D-E	No manure (average of six plots) ...	...	619	484	1,236	908	...	...	...	...

RABI STATEMENT V.—This experiment is tried in a series of eight plots and is to determine the manurial value of certain things (mostly rubbish) not in the list of manures ordinarily used.

In this season these plots were sown on the 19th of October. Plots Nos. 4, 5 and 7 did not germinate well.

The statement shows (1) that all the manured plots have produced something more than the unmanured one in the series; (2) that compost and ashes of wood with saltpetre confirms the result obtained last year; (3) that the brick-kiln refuse and silt also have acted well.

RABI STATEMENT No. V—*Miscellaneous manure series.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre.				Increase or decrease over unmanured plot per acre.			
			Grain.		Straw.		In grain.		In straw.	
			Average for previous 5 years.	This year.	Average for previous 5 years.	This year.	Average for previous 5 years.	This year.	Average for previous 5 years.	This year.
		Rs. a. p.	Rs.	Rs.	Rs.	Rs.	Rs.	[illegible]	[illegible]	Rs.
M-1	Brick kiln refuse 130 maunds ...	1 12 0	826	1,113	1,654	2,069	+212	[illegible]	[illegible]	[illegible]
M-2	Silt 300 maunds ...	0 12 0	827	1,063	1,369	1,670	+211	[illegible]	[illegible]	[illegible]
M-3	Compost 200 maunds ...	6 0 0	874	1,210	1,677	2,166	+258	+400	[illegible]	[illegible]
M-4	Road scraping 300 maunds ...	4 11 0	962	980	1,847	1,735	+336	[illegible]	+203	[illegible]
M-5	Ashes of 120 maunds of weeds ...	4 0 0	741	641	1,304	1,133	+125	[illegible]	[illegible]	[illegible]
M-6	Ashes of 120 maunds of wood & 3 maunds saltpetre.	12 0 0	942	1,020	1,900	3,130	+327	[illegible]	[illegible]	+1,028
M-7	Ammonic chloride, 3 maunds ...	45 0 0	865	620	1,740	1,476	[illegible]	[illegible]	[illegible]	+336
M-8	No manure ...	...	616	605	1,414	1,102	...	...	...	...

Rabi Statement VI.—This experiment is to determine the advantages of deep ploughing with an improved plough against shallow ploughing with the country one.

This experiment also belongs to the list of permanent experiments and is conducted in two series, one containing four and the other three plots. These series are shown in the statement under the heads A and B, the plots in A series do not receive any manure, but to the B plots farmyard manure is applied at the rate of 200 maunds per acre. A plots were sown on the 19th, and B plots on the 20th of October.

Ploughing was done four times, nine and five inches deep respectively, with the improved plough; and six times, three inches deep, with country plough. Plots A were weeded twice and B plots only once. They were in both cases watered three times.

In the A plots series, Nos. 3 and [illegible] did not germinate well, and in series B plots 1 and 2 similarly suffered.

The statement shows that in all cases deep ploughing has given a better yield and that the plots with manure have produced more than the unmanured ones.

This result corroborates the facts found in previous years.

Rabi Statement No. VI.—*Ploughing experiment with wheat.*

Series	No. on farm map.	Treatment.	Cost of ploughing per acre.	Produce per acre. Grain. Average for previous 5 years.	Grain. This year.	Straw. Average for previous 5 years.	Straw. This year.	Increase or decrease per acre over the plots ploughed with country plough. Grain. Average for previous 5 years.	Grain. This year.	Straw. Average for previous 5 years.	Straw. This year.	Remarks.
			Rs. a. p.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
A.	Ad-1	Ploughed 9" deep 4 times with improved plough.	8 0 0	[illegible]	694	1,121	1,832	+23	+40	+43	+123	The A plots have not received any kind of manure since they were started. To this may be attributed the low outturn of past years. B plots have received manure since 1898.
	Ad-2	Ploughed 3" deep 6 times with country plough.	6 0 0	233	642	1,082	1,210	—	—	—	—	
	Ad-3	Ploughed 3" deep 8 times with country plough.	8 0 0	230	661	1,245	1,005	—	—	—	—	
	Ad-4	Ploughed 9" deep 4 times with improved plough.	8 0 0	210	920	[illegible]	1,7[illegible]	−23	+220	−204	+645	
B.	Ad-1/2	Ploughed 9" deep 4 times with improved plough.	8 0 0	580	1,419	1,222	2,734	+137	+284	+202	[illegible]	
	Ad-2/2	Ploughed 5" deep 4 times with improved plough.	8 0 0	494	1,616	1,014	2,870	+71	+480	+28	+349	
	Ad-3/2	Ploughed 3" deep 8 times with country plough.	8 0 0	423	1,134	986	2,521	—	—	—	—	

Bill SriTUaXf VII.—Thu etparimeat wa«f»r fivf rear*, whirh time has now expired. It u to ttewtaiii the value of mu*unl and cottoa cake OMn| aa manuiv Mtaioit the duiur obUised from cattle *ttJ* « tin- »«~» cakw.

Thta* pk>u www aown on the xtnd of Ortohw, briof pl«|rhed ft•W with Uw improved and twice with country plo«ga. Owing to dryaaat of the «aw>o three waUr-iagt were given, wtwling was done only one* *e the field* wen not fool.

In th•< tf HM plot Xo. 1 failed to germinal* well. '

The result ihowi that is all cam but two ibe manawd plot! bate yielded «•" than the unnunuml one* in tb* aoia* ami that *+k» IIIHIM to haw gi**n brttcr rw"[1] than the dung oUainod from cattle fad on the f"" cak*

RAM STATUUBfT So. VHV-afMf, uymvil *ai t*tm m*d,* Mi> tWimfa

-!v | Mi tin.	Kun aVmtpri wrim	Value of manure, per acre.	Onla. aaaaai tor paNMai 4 years.	mi	HM«. M 4^~	nt.	E	!•»•	taato*	jar.
				av^		a*			•fc	
r toe	Mustard cake 5 maunds	• no	1,000	i.m		UN	-m	• a*		
|al	Ditto 10	u a o	1J»O	uai		MM	-u	.4IT	-Ml	
A. 10A	Pkiaomd^MO . „.	0 0 0	UM	IJW	UN	MM	-«r		+ 101	•m
lie	Cake fed dung 50	t o o	IMI	I.U7	I.IOS		-41	»n	-U»	«Mt
UB	• Dm* ISO . . .	4 0 0	MM	M»	MR	UM	. 4-.	-a	...ii	
. HA	So m»nuf»	_.	WDM	•W		MM			..	
r IT. t	CaUos Wtd-M dwif » und.	S 0 0	UM	1JJ0	WM		•J«		«« •	
S7. t	Ditto Alto 100 „ ...	4 0 0	uta	14*u		UaT	•t*»	*1»	• tw	
17f I	ntfKtwIut too	• 0 0		IJO*		UN	*••)	• 1*7		• wo
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aii	Ditto ditto 10	u e o	UM	UU	UJtl	un				•«•
	No manure	...	uu	I.IW				•H	•*•	

H*ai 8TATBMI3T VIII,—Thw npvnmeat ii to aaeertaia for wfcat time»r for ho« »«iy yean the w»nlw of a ffrtjli^r mruin* avmilalia for wheat. The itatMwatKtow* U* iwidoal effect of the artificial *muttxnm* which had Wn apptad to UM plots for four «.o»«uli« 7«ra up to 18W; afUr that *pmt* DO nunai. of an* 1 « an/ atnd ha* l-*» given.

Ttti. exponent !• aftnUbM iittwa «n« of 10 pUu, A *uA* B A tarWwttf-t* of 0 pWU and B of 10. It - u, Wbtia« te «„ y—Vthe p ^ tJ'^ , fourth y***• [••owBoatbe

Tb« pl»u Si*. », 6 and «ol the A. and N.-. i and 7 of th» B did aotffrr niaate well, la the B series cowdung

RABI STATBSKXT NO. VIII.—*ExjaeriMtnt a$ to tie rtiiJuul talue of tarioui«vaintrei (wmnj.*

Kuml-T of plot jK-r form nup.	ll»nnr» i|>jil«xl per wra.	TahM cf •Bam |»r m	Frodtiee *per* acre. Grain. for previous ttn»	Thli yaw.	SU»w. AiMng* to previous three	This year.	Inm !«• M >1,'. nMI MM iiurwl jJul *[at *cn.* la irnin. AllTtCC for previous tiir I«an.	Thli j»r.	In MAW. Armgc for previous	Tliit jam
				It*.	la,	la.	la	It,	la,	Ih.
L	CulrJi- mpn^hnplMM *VVtU.*, tmmmilf clilorW' 19U It.. j..u«e wipUte Wtlk.. MU**" jilalr Wlb.|« icn.	...	no	Ml	1^14	i.r.4-..	• ID	t»4	+ 1SU	+ *w
L	All but calcic superphosphate	...	nil	h "1	1 KM 1 ,'*.!	1,1...	+ H	+ 79	—<Jj	r Hi
A. V3	Wtto uamouie cbluriil*	...	7»	Ml	MM	l.CII	...	• IW	+ 17	+ 228
-	Ditto potassic sulphate	...	87i	B71	MM	1.C21	(-141	• 1S7	+ 141	*SM
V5	Dttto oldttol^aU	...	TO	7<M	U1S	1,907	4 SI	-a	- »	• !S
L	DMHMMI ... .- ...	...	no	Tu	IJM	UM	...	...	...	...
V7A	OMAMI	...	1,250	858	MM	*um*	t-M	+ m	HIM	tj*»
37B	Poudrette	...	*m*	M	1,048	*\jm*	• »so	- K	• SIS	+ 8
we	Mustard cake	...	011	664	LNSU	*um*	f1M	-80	+ 430	-at
37D	VMlbn rrfow ,,. —	...	M	658	I.M8	ijs-i	• no	-88	. Ml	-M
B, STB	Cuv4nnc »nd Wv4wt	...	804	7ft*	1JW	1,160	4-eai	-40	• 57*	-160
wy	... ...	...	816	CIS	1,819	I4M	• 101	-M	• M	-M
*7(1	lDd«« i.U^W in	...	PIS	*tin*	tM	1.1S4	+ I9B	-130	+ M»	-136
JTII	iaka«ta	...	no	744	1,867	L07G	+ 258	...	. »41	+ 54
tn	Anwflsk eklotfaU	...	W	736	1,011	UM	+ 240	-a	+ 678	+ 88
372	V« aiaawn	...	722	*tu*	l.titt	UNO	...	...	...	...

R*a*in HrtTUiirr IX.—IWriainit itm <»f Ui* . effect of kmintt ..n « heat. It m »1>I^JM at tlw r»t« or fitur tnaui»i> to tin' a' n [a] «n;. green hemp plough h*l b, (4j with fantt yan) manure, and (r) wilii woollen n i use.

T1* «-.•.! in all plot* of *went** A gfrtmii*t»'d ami fcP; t on well. In B series pk4 No. t d*l uo(gwrtnitul* w.>]| •ml |>J>1 No. 1 wn injur.xl 4 little *[,y* wli ctments.

TJw iUUttk. nt No. IX gi r. the rrtull It ihowi that It* nit rith lxMnj* •»" (tiren tin: Ur.> est yield, UHI is ali cun ita j.rxJuw IUM 0mintnl UM uM^Kiiur- *1 I'l. A

RABI STATEMENT No. IX.—*Experiment with kainit on wheat.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre. Grain. Average for previous year.	Grain. This year.	Straw. Average for previous year.	Straw. This year.	Increase or decrease per acre over unmanured plot. In grain. Average for previous year.	In grain. This year.	In straw. Average for previous year.	In straw. This year.
		Rs. a. p.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
A.	[illegible] kainit 4 maunds.	11 8 0	1,088	1,839	2,835	3,267	—216	+689	—363	+1,307
B.	Only green hemp ploughed in ...	3 4 0	368	1,779	1,360	3,170	—713	+629	—1,230	+1,2[illegible]
C.	No manure	...	1,081	1,150	2,290	1,569	...	...	...	...
14a.	Farmyard manure 200 maunds and kainit 4 maunds.	14 4 0	1,312	1,402	2,857	2,502	+231	+252	+367	+541
14c	Woollen refuse 200 maunds and kainit 4 maunds.	14 4 0	750	1,227	2,154	2,002	—331	+77	—1,136	+442
14b	Farmyard manure 200 maunds alone ...	6 0 0	Nil.	1,463	Nil.	2,965	Nil.	+313	Nil.	+1,006
14d	Woollen refuse 200 maunds alone ...	6 0 0	—	1,436	—	3,019	—	+286	...	+169

RABI STATEMENT X.—This experiment is to contrast the produce of a field (a) grazed by sheep when the plants reach the height of one foot, and (b) of a field nibbled [illegible] with a sickle [illegible] left untouched.

The [illegible] of wheat [illegible] under [illegible] in all the plots. The statement No. X [illegible] the result, which [illegible] of the field left untouched.

Rabi Statement No. X.

Number of plot per farm map.	Treatment.	Produce per acre. Grain. Average for previous year.	Grain. This year.	Straw. Average for previous year.	Straw. This year.	Increase or decrease per acre over the plot C. In grain. Average for previous year.	In grain. This year.	In straw. Average for previous year.	In straw. This year.
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
25Aa	Grazed by sheep when [illegible] ...	[illegible]	1,[illegible]	3,[illegible]	3,[illegible]	—[illegible]	—[illegible]	[illegible]	—[illegible]
25Ab	Nibbled by sickle ditto	1,[illegible]	1,[illegible]	3,[illegible]	2,[illegible]	—[illegible]	[illegible]	+[illegible]	[illegible]
25Ac	Left untouched	1,[illegible]	1,[illegible]	[illegible]	3,[illegible]	...	...	...	...

RABI STATEMENT XI.—This is the experiment of [illegible] the Tull or Lois Weedon system. In this [illegible] bad.

In a piece of land of 1,930 square yards, 21 strips were made, 11 raised, 10 depressed. In the latter lucerne and peas were sown, which did not give any crop. The result is again in favour of the ordinary way of sowing.

This experiment will be tried no more.

Field Statement No. XI.

Number of plot per farm map.	Mode of sowing.	Produce per acre. Grain. Average for previous year.	Produce per acre. Grain. This year.	Produce per acre. Straw. Average for previous year.	Produce per acre. Straw. This year.	Increase or decrease per acre over the plot cultivated after country fashion. In grain. Average for previous year.	In grain. This year.	In straw. Average for previous year.	In straw. This year.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
26A	Sown after Jethro Tull system. { Wheat—on the raised strips ... ; Peas—on the depressed strips ... ; Lucerne— ditto ditto ... }	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—575	—1,658	—1,435
26C	Sown after country fashion	[illegible]	[illegible]	2,545	[illegible]	...	...	...	...

EXPERIMENT No. XII.—This experiment is to contrast the productive power and quality of five varieties of wheat compared with the indigenous variety grown in Cawnpore.

The varieties of the wheat sown were :—

(1) Muzaffarnagar.
(2) Adelaide.
(3) Buxar.
(4) Sindhi.
(5) Red nursery (English).

They were sown in six plots each of 7W square yards. All the plots received the same kind and the same amount of manure; and the same number of ploughings, weedings and waterings were given to each plot.

This year Muzaffarnagar wheat stands first in yield and Buxar comes next.

English wheat, though mixed with acclimatized seed grown on the farm for the last two years, has given the worst crop. [illegible] WM at the top of the list.

FIELD STATEMENT No. XII.—Experiment with different varieties of wheat.

Number of plot per farm map.	Variety of wheat.	Produce per acre. Grain. Average for previous year.	Grain. This year.	Straw. Average for previous year.	Straw. This year.	Increase or decrease per acre over the indigenous variety. In grain. Average for previous year.	In grain. This year.	In straw. Average for previous year.	In straw. This year.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
[illegible]	Muzaffarnagar wheat	1,070	2,273	1,200	2,582	+223	+1,220	—625	+71
[illegible]	Adelaide ditto	[illegible]	[illegible]	2,520	2,568	+24	+103	+208	+58
[illegible]	Buxar ditto	[illegible]	1,465	1,847	2,717	—22	+413	—774	+207
[illegible]	Sindhi ditto	...	1,007	2,329	2,850	—60	—45	—292	+340
[illegible]	Mundia (country) wheat	[illegible]	[illegible]	[illegible]	2,510	...	...	...	...
[illegible]	English red wheat	...	[illegible]	...	[illegible]	...	—204	...	—284

RABI STATEMENT [illegible] four varieties of barley. [illegible] [illegible]y.

Though the country [illegible] varieties fetch a higher price. The [illegible] colored [illegible] be popular in European markets.

RABI STATEMENT No. [illegible]—*Experiment with barley.*

Number of plot per farm map.	Variety of barley.	Produce per acre.			
		Grain.		Straw.	
		Average for previous 2 years.	This year.	Average for previous 2 years.	This year.
		[illegible]	[illegible]	[illegible]	lbs.
28A	Green huskless barley		1,110		1,930
[illegible]	Chocolate colored barley	1,027	[illegible]	[illegible]	[illegible]
[illegible]	White huskless barley (Basoli jau)	1,177	[illegible]	[illegible]	2,110
[illegible]	Country barley	1,374	1,540	[illegible]	1,775

[illegible] This experiment is to determine the effect of gypsum on [illegible] pease.

[illegible] a very bad year on [illegible] minous crops. The result obtained cannot be considered [illegible]ory. However, the statement shows that in both cases gypsum has done goo[illegible] to [illegible]ps.

RABI STATEMENT [illegible] IV.—*Experiment with gypsum applied to pease and gram.*

No. of plot per farm map.	Crop.	Manure applied per acre.	[illegible]	Produce per acre.		Increase or decrease due to gypsum.	
			[illegible]	Grain.	[illegible]	[illegible]	Straw.
			[illegible]				
[illegible]	[illegible] ...	Farmyard manure 100 maunds ...	[illegible]	1,068	1,256	...	...
[illegible]	Do. ...	Farmyard manure 50 maunds and [illegible]	[illegible]	[illegible]	[illegible]	+254	[illegible]
27C	[illegible] ...	[illegible] ...	[illegible]	847	817	...	...
[illegible]	[illegible] ...	Gypsum 4 maunds.	[illegible]	[illegible]	[illegible]	+63	

RABI STATEM[illegible] XV.—For the last three years potatoes [illegible] been added to the list of experiment[illegible] The experiment is to determine the effect of certain special manures for potato[illegible]

The field after being prepared according [illegible] method in vogue in this part of the country, was divided into five equal plots. [illegible] plots were manured with farmyard manure at the rate of 200 maunds per acre. In addition to this, to four of five plots in the series, four special manures were applied. All of them were sown with a variety of potato, called here "Madrasi." [illegible] obtained from Farrukh-abad. It was sown on the 7th of October.

The plots were ploughed twice with the improved plough and [illegible] with the country. They were watered [illegible] and ridged three times.

In plots Nos. 3 and 4 seed did not germinate well, the plants appeared after the first irrigation but did not thrive well. The crop in No. [illegible] very good both in quantity and quality.

The statement shows that woollen refuse has given the best result; last year poudrette with sulphate of iron came out first.

FARM STATEMENT NO. XV.—*Experiment with potatoes.*

Number of plot	Manure experimented	Value of manure	Produce per acre		Increase or decrease per acre over the plot sown after country fashion	
			[illegible]	Tubers	[illegible]	Tubers
		Rs. a. p.	lb.	lb.	lb.	lb.
[illegible]	Poudrette [illegible] maunds and sulphate of iron 27 [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Woollen refuse 100 [illegible]	11 0 0	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Poudrette 600 [illegible] maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Castor oil cake 10 maunds [illegible]	17 0 0	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Sown after country fashion	...	[illegible]	[illegible]	...	...

MIR MUHAMMAD HUSAIN, M. R. A. C., C.,
[illegible] Director, [illegible].

INDEX OF THE FARM MAP.

Number of the plot on the map.	Name of the plot.	Nature of present experiment on the plot.	Number of the experiment in this report.	Remarks.
1 to 7	Nil ...	No experiment	...	
A (13 plots)	Old standard No. 1.	[illegible] ...	Rabi IV ...	[illegible]
[illegible]	Nil ...	No experiment	...	
[illegible]	Nil ...	Ditto		
104 to 10[illegible] to 110	Nil ...	[illegible] yard manure.	[illegible]	[illegible]
119	Nil ...	No experiment	...	
[illegible]	Nil ...	Ditto	...	
[illegible]	Nil ...	[illegible] on cotton.	Kharif VI,	Ditto.
[illegible]	Nil ...	No experiment	...	
[illegible]	Nil ...	[illegible] on wheat ...	Rabi [illegible] ...	Ditto.
[illegible]	Nil ...	No experiment	...	
[illegible]	Nil ...	Miscellaneous manure series ...	Rabi V ...	Permanent.
[illegible] to 10[illegible]	Nil ...	No experiment	...	
A C (4 plots)	Nil ...	Ditto		
[illegible]	[illegible]	[illegible] ,,	[illegible] ...	[illegible]
[illegible]	Nil ...	No experiment	...	
[illegible]	[illegible]	Experiment in early and late cotton sowing.	[illegible]	[illegible]
[illegible]	[illegible] ...	[illegible]	Rabi VIII/A ...	Ditto.
[illegible]	Nil ...	No experiment	...	
[illegible]	Early sowing.	[illegible]	[illegible]	[illegible]
[illegible]	Nil ...	No experiment	...	
[illegible]	Nil ...	Ditto	...	
[illegible]	Nil ...	Ditto	...	
[illegible]	Nil ...	Ditto	...	
[illegible]	Nil ...	[illegible] sowing.	[illegible] IX/? ...	[illegible]
[illegible]	Kharif alternate series.	[illegible]	Kharif II,	[illegible]
[illegible]	Rabi standard series.	[illegible] ...	Rabi I ...	[illegible]
A B C	Nil ...	Experiment with kainit on wheat ...	Rabi IX/A ...	For 5 years.
[illegible]	Kharif standard series.	Manure experiment with maize ...	Kharif I ...	Permanent.
[illegible]	Rabi alternate Series.	[illegible] ditto [illegible] ...	Rabi II ...	Ditto.
[illegible]	Nil ...	No experiment	...	
[illegible]	Fallow [illegible] system.	Experiment in method of sowing (wheat.)	[illegible] ...	For 5 years.

Number of the plot as on the map.	Name of the plot.	Nature of present experiment on the plot.	Number of the tabular statement in the report.	Remarks.
26B1, 26B2, 26D1 and 26D2	Nil ...	Maize sown after American fashion ...	Kharif IV.	For 5 years.
27A to 27D	Nil ...	Experiment with gypsum applied to peas and gram	Rabi XIV.	Ditto.
27e1 to 27g2	Nil ...	Manure experiment with cotton seed and farm yard manure (wheat sown).	Rabi $\frac{VII}{B}$ ...	Ditto.
27h to 27j	Nil ...	No experiment	...	
28a to 28f	Nil ...	Ditto	...	
$\frac{Ad}{2}$1 to $\frac{Ad}{2}$8	Ploughing series No. II.	Ploughing experiment with wheat ...	Rabi $\frac{VI}{B}$ ...	Permanent.
P1 to P12	New green manure series.	Determination of the effect of gypsum on indigo.	Rabi X ...	For 5 years.
P13 to P18	Nil ...	No experiment	...	
29A to 29E and 29F2	Nil ...	Ditto	...	
29F1, 29G2, 29G1, 29H2 and 29H1	Nil ...	Experiment with potatoes ...	Rabi XII...	Ditto.
29I to 29K	Nil ...	No experiment	...	
30A to 30I	Nil ...	Ditto	...	
31A to 31D and 31F to 31I and 32A to 32E	Green soiling No. II.	Green manure experiment with wheat...	Rabi $\frac{XIV}{B}$ ...	Permanent.
32E and 31J	Nil ...	No experiment	...	
33A to 33L	Green soiling, No. III.	Green manure experiment with wheat...	Rabi $\frac{IV}{A}$ ...	Ditto.
34A and 34B	Nil ...	No experiment	...	
N1 to N8	N series ...	Miscellaneous manure experiment with maize.	Kharif III.	Ditto.
35Aa to 35Az	Nil ...	Experiment of feeding young wheat by sheep.	Rabi X ...	For 5 years.
35B	Nil ...	No experiment	...	
36a to 36h	Nil ...	Experiment to determine the economic value of poel (2nd year crop).	Kharif $\frac{IX}{B}$.	Ditto.
37A to 37J	Nil ...	Experiment as to the residual value of various manures (wheat sown).	Rabi $\frac{VIII}{B}$.	Ditto.
38A to 38D	Nil ...	Experiment with barley	Rabi XIII.	Ditto.
38E	Nil ...	No experiment	...	
39a to 39f	Nil ...	Experiment with different varieties of wheat.	Rabi XII.	Ditto.
40A and 40B	Nil ...	No experiment	...	
41Aa to 41Ah.	Nil ...	Experiment with different varieties of imported cotton seed.	Kharif VII.	Ditto.
41B	Nil ...	No experiment	...	
42A to 42E	Nil ...	Ditto	...	
$\frac{Ae}{A}$5 to $\frac{Ae}{A}$7, $\frac{Ae}{A}$8 to $\frac{Ae}{A}$9, $\frac{M\ T}{1}$ to $\frac{M\ T}{17}$ and F1 to F8.	Miscellaneous kharif series.	Experiment in culture of miscellaneous kharif crop.	Kharif XI.	

No. SB1A. OP 1801.

DEPT. OF LAND RECORDS AND AGRICULTURE, N.-W. P. AND OUDH.

DATED CAWXTOKE, THE I2TH ACQCBT 1891.

FROM

T. W. BOLD] ftNB88, Esq.,

DIKECTOK Of L*XD RECOBIM AXD AoirCfLTTlF,

NORTH-WESTERN PROVINCES AND Onm,

• u

THE CUP IF SEC MTAB1 TO QO\ BRNMSMT,

NORTH-WESTERS PaoviKrEs *xo Ocim.

S,t,

I have the honour to submit the report on the (Invrrnmenl Eiprrimental Farm «t Cawnpor* for the ywr ending the 30th Jane last. The i*port ha* heen drawn up under my •ajMrrMa t.y the .W-i-Unt Director, who haa Iwn in cbarn of the farm throughout the year.

2. Two a[i|wmli'<>« have htwn added to thn rnport thU JMT. Appendix A in report by Babu Lachhmi in IV§h»l lljrniih, my Pononal AacutMtit, on a imall expert-ment si farm which In- conduct* at Ca wnpon[1] at hi* own cxpenie. I In n jK-nmi'tiU arc very carefully conducted, and the retur n«of outturn and d>*t of eultiiKtion which ha Rivr* an) urul"uUrt!ly reliable. Appendis " ii« thort aoconnt of mm« fxperimrnta which I itaiVd thia rwir with the cbjwt of aaoerUining the Actual outturn of crops (frown in tfw nrijjhl^mrliood »f th* farm by »nlin»rj cultivator*.

3, The experiments on the farm \«ricJ little from tv»w> diwribad in formor yoan, Imt thr interesting feature in the jo*r ii the effwt which the very pec.liar tNMon of 1891 had on the different \,U unirr whc»t. The n>port »bow» that 0* crop* on unmanured or lightly manured .idtwore considerably above the av••r»tr while thoM on the best fields yielded less than u»ua1. Ttio aluinrmal rainfall and high windi of Feb ruarr ami March were destructive to •»*?> •*»a<ii«» »n«i b*»vy crop*, while Of Bffatac and ha •dm and crops were be *i*«l bjr the rain a"1 w*'* *M° t« iwov« from th# wind. Jndpntc fr»m the outturn of the farm (*•'*• *mm* fl«*r ll«t tl» ral.i uf 1891 w»iiif-rior to that of 1890 in the Cawnpore district. Th1? tf*11 wm FTMr ln nu»|(tV *nd the produce w««!(*». The average yield of wh»tthi.j-«iroathefarm w»i 1« mauM* or 21 hmktk ajfainrt I3 bushels in 1890.

4. I uuiaun an.) Kntfliih wh«U h»v. been tested *• y««' « »« former years, with the indigenous varieti-., »nd • again the superiority of selected Muzaffarnagar Mai hM »-«rt«l it-rif. Tito C»nadia n oats and barleys were disappointing. U it wu boptd Uial lh*y w.>uld, a* in ('«*: a, quickly • mature. t!,.t -i(«r raulu may ba "•"••ined next y«w fn.m jmrtUI y acclimatised seed. As a fodder crop the Canadian <wU aro likrh to prove uaM, »• Ihi «*»»* '• ver)' ·l>[>e »^ Hi

5. Tl»o tv«ulu wliiain^l in *" one of the ifr**!' wiil'il «nd indict rt-fu»e pl»l (rabi •Uletnenl. N . 11J ,n | | \) were remarkably good. With wheat at 3ft *Mf» tb rupee four of the plots in statement No. IV, which were treated with indigo r.'f»»<\ Mail gave a t,rt profit of over Rs. 60 the acre, rising in one case to Rs. 87 the acre. Till* shows value of a good wheat crop at present prices. In statement No. III green indigo ploughed in gave a net profit in wheat, and straw of Rs. 38 an acre. The results obtained,

i of the *man* exprniir« kind* of m»nun\ tnch M aaltpatn, Uine d ntt, awl bone ;.'**]i t«M «trilnng. The firrt two cannot he applied at a !«• cost than Rs. 10 the acre, and the third costs Rs. JO th* acre. To cover an outlay of Rs. . I'' an JDLTVWM of 1 mauuU of w!w*t per acre over the piwlaoe of unmam iral. In Kiinn few of oor plot* we can »how ttitf or a larger inrreaaf over a term of yean ; but this i» the excvptton.

6. Tli* farm U in good or.te, aDj ba, b«m carefully matiagad darinff the year by' th.. AafctaBt Director aad tbt Parm Overawr, Ali 1lu«in. It u fr^oently TM by samiitdin and othew, and th* pkraght, ptunpt, iUK»r mill*, and *wag»r* malcii macbinea uMdon it an not uafnqacatly Urfowed by th< neia^louring ctdtiraUn.

I lave the honour to I*,

Sn,

Your Boat obedient aerrant,

T. W. JIOLUtKNESS,

Director.

REPORT

ON THE

CAWXrORE EXPERIMENTAL STATION

FOR THE KHARIF AND RABI SEASONS OF 1890-91.

The KtiiKfr BKAHOX. *Ckararier of tit* MUHM.—TV rain* during the kharff season under report «epe quit* ai>nunn.i!, vst on the whole did not do any noticeable damage to any of the rr ops. At the begin. -tini: <'f tbe «<•»*>*n* t!)(. (,]) ^ unu.nmiiv heavy ami con tin you*, followed by a protracted break in Augiut anil SeptemW.

With :i .in.» exemption the kharif wperinwnU during tho aeaaon ware the name u •Otod itt tiw tart report, The term for •' yta«) ft»! be tkt —pf»trirt nf wwng maise ftftrr American faahion hiring expired, tb« exptrimont of cawini; an ized crop of maize •ml indigo *in»* tulwlit uted for it, tl « objact bang to dctermiii. the economy of mixe •1 vp.|.|.tn« M comjwim] with the remit of towing the tuno cropi wparat^ly.

The important »j>mmniU of thekharif Kaaon an (1) with Ruiie^B) with cotton, (3) with mjimnain-, and (i) with indigo.

The abore may t» thuir obund—

[*) * P«roa>ent" (*i.e.*, carri*d on y«r after year on ttw aame plot of land and with Uw mme Lin.l of treatment),

(*) "TomporaTy" in iwpect of duration and of land uwJ.

In tii.* toDowiaf paragraph* a detailed account „f the atmre np<<Hm«niU U gim>n. In tMordaac* with the wi»h «xprrta»l in the orders of 11 >vTnm-iil. on ih<« report of 1890 that the financial mttitl of i<at each experiment should be «bo«ni, a noU> ha« baan •ddad to each statement which . .11 «»lil« th« not return nf •>.ch plot to be •• n-ily >'»!-culated. It is, however, nvmaatry to remirk Utat tlw outturn *of* »]| kliuff i-Mp« rarw» largely with tW aondnnUof the wa»on, and that iM* <k«tnu>ta lacfalj frtm Itw an« tific value of kharil experime*M*, Thp ra]U»aU>r u abb to *rvplaor* »(liim*^,-,1 idasrS anp bj Ute aowittg or by »uUii(at«ng anstbar crop; Ut on an experimental farm tl. is possible.

Kharif STATfMrjrni No*. 1 a*» I'.— *faprrimntt wU* BMf,—Thii experiment w carried on in 2 *eries each of 13 plots. 1" ^'" first (or (awlanl MTIPD) mau is sown T«ar after *jmr.* In the duplicate ser«• tiiwe i> a rotation of nuixe and wbmt. Tb* experiment in th« >Uixlan) imrti i* to a»f*rtaiii tlip mull of growing UM aanw crop year after year on Utr wm» land with the ««"• Lit^l of manure or, u h one instance, *ttU no manure.. at all. In the duplicate series the object of the «i|>criment u pavtf] to verify the wr.lt of the tUmlard «•"••• »"J |»rlly la IMP if rotati-m of mB'f* wiLb a wheat crop improret (lie \wU, thr manure* being theaane tu Li&d and quantity.

Eaah of tU 13 pM« (in both series) » V « UI« uBraanurad one* reccivw » »pwial load of ttuuture year afkr j car.

KHARÍF STATEMENT No. I.—*Standard Series.—Manure experiment with maize.*

Number of plot per farm map.	Manure applied per acre.	Value of manure.	Produce per acre in pounds. Grain. Average for previous five years.	Grain. This year.	Stalks. Average for previous five years.	Stalks. This year.	Increase or decrease per acre over unmanured plot. In grain. Average for previous five years.	In grain. This year.	In stalks. Average for previous five years.	In stalks. This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
K. 10	Sheep dung, 180 maunds	5 6 0	760	980	5,735	8,131	+379	+109	+1,357	+2,807
K. 9	Poudrette, 180 maunds	7 3 0	1,060	1,549	6,232	7,596	+679	+678	+1,854	+2,032
K. 8	Ashes of 180 maunds of cow dung and saltpetre, 3 maunds	14 6 0	1,105	1,295	7,732	8,540	+724	+474	+3,374	+2,516
K. 5	Saltpetre, 3 maunds	9 0 0	711	1,186	4,647	7,704	+330	+315	+289	+2,380
K. 11	Ditto, ditto, and bone dust, 4½ maunds	10 11 0	811	1,065	7,219	7,502	+430	+194	+2,833	+2,178
K. 3	Cow dung, 180 maunds	5 6 0	911	1,053	3,980	8,518	+530	+182	−406	+3,194
K. 1	Ditto, ditto, and bone dust, 4½ maunds	16 1 0	927	1,488	4,990	8,027	+626	+617	+612	+2,703
K. 2	Ditto, ditto, and gypsum, 3 maunds	10 10 0	316	1,545	425	7,671	+202	+373	−3,953	+2,347
K. 4	Ashes of 180 maunds of cow dung	5 6 0	487	1,016	4,690	8,204	+106	+145	+9	+2,880
K. 7	Sheep dung, 180 maunds, and bone dust, 4½ maunds	10 1 0	1,080	1,679	6,088	8,482	+695	+799	+1,710	+3,128
K. 6	Saltpetre, 3 maunds, and bone superphosphate, 3 maunds	30 0 0	871	1,347	3,400	8,089	+520	+496	−1,018	+1,364
K. 12	Sheep dung, 180 maunds, and gypsum, 3 maunds	10 10 0	861	1,113	4,980	7,817	+610	+242	+502	+2,493
K. 13	No manure	—	381	871	4,378	5,324	—	—	—	—

NOTE.—The cost of cultivation may be taken at Rs. 10-8-0 per acre, including rent, seed, [illegible] &c., but exclusive of manure. The value of the produce at a reasonable estimate may be put at Re. 1 p[illegible] for fodder. According to this estimate the outturn of the unmanured plot this year [illegible] The average net profit, however, on this plot for the previous five years was [illegible] of Rs. 29-13-0, Rs. 33-2-0, and Rs. 5-0-0, and for the previous five years [illegible] ively.

Area of each plot, 400 square yards.

KHARÍF STATEMENT No. II.—*Kharíf duplicate* [illegible] *ater.*

Number of plot per farm map.	Manure applied per acre.	Value of manure.	Produce per acre. Grain. Average for previous five years.	Grain. This year.	Stalks. Average for previous five years.	Stalks. This year.	Increase or decrease per acre over unmanured plot. In grain. Average for previous five years.	In grain. This year.	In stalks. Average for previous five years.	In stalks. This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Alb. 1	Sheep dung, 180 maunds	5 6 0	741	1,561	4,708	8,273	+475	+750	+1,417	+3,108
Alb. 2	Poudrette, 180 maunds	7 3 0	910	1,936	3,537	9,244	+644	+1,125	+711	+3,088
Alb. 3	Ashes of 180 maunds, saltpetre, 3 maunds	14 6 0	513	938	4,258	7,372	+547	+127	+1,322	+2,808
Alb. 4	Saltpetre, 3 maunds	9 0 0	520	629	3,830	5,560	+254	−182	+958	+396
Alb. 5	Saltpetre, 3 maunds, and bone dust, 4½ maunds	10 11 0	553	774	3,002	9,466	+287	−37	+1,130	+4,302
Alb. 6	Cow dung, 180 maunds	5 6 0	741	653	4,180	6,640	+475	−158	+1,303	+1,656
Alb. 7	Cow dung, 180 maunds, and bone dust, 4½ maunds	16 1 0	747	1,113	4,363	7,908	+481	+302	+1,407	+2,734
Alb. 8	Cow dung, 180 maunds, and gypsum, 3 maunds	10 10 0	738	1,053	4,303	8,131	+472	+242	+1,417	+2,802
Alb. 9	Ashes of 180 maunds of cow dung	5 6 0	406	503	4,133	5,148	+140	−308	+1,203	−124
Alb. 10	Sheep dung, 180 maunds, and bone dust, 4½ maunds	16 1 0	606	1,234	4,613	8,579	+342	+423	+1,037	[illegible]
Alb. 11	Saltpetre, 3 maunds, bone superphosphate, 3 maunds	30 0 0	626	1,267	2,616	8,143	[illegible]	+251	−277	+2,879
Alb. 12	Sheep dung, 180 maunds, and gypsum, 3 maunds	10 10 0	630	1,488	5,140	8,730	[illegible]	+677	+2,214	+3,472
Alb. 13	No manure	—	266	811	2,896	5,334	—	—	—	—

NOTE.—The cost of cultivation may be taken at Rs. 10-8-0 per acre, including rent, seed, labour, [illegible] exclusive of manure. The value of the produce at a reasonable estimate may be put at Re. 1 per 40lbs. of grain and Re. [illegible] lbs. of stalks for fodder. According to this estimate, the outturn of the unmanured plot this year was worth Rs. 32-12-0 an acre, giving a net profit of Rs. 15-4-0. The average net profit, however, on this plot for the previous five years was nothing, rather a loss of Rs. 2. The net profit this year of Nos. 7 and 1 was Rs. 13 and Rs. 30-4-0, and for the previous 5 years Rs. 7-0-0 and [illegible] respectively.

Area of each plot, 400 square yards.

In tin- standard ttriet wed at the rate of »ii teen per acre m town on the 15th of June am! In Iha dnnlirain *tnritt* ffH ttm ISthof tho ouno month. In both CUM it was Jmiwii taliind ttx country |il>«i»rli, tlio pUits being plough)-'! twioa with tha improved plough a im-Ite* deep and twiea with tin- eoontry plough. The plot* were weeded once and the plant* iMrihi'iifil up one*. Tlu> teed in the plot* of the duplicate aerie* did not umiiinoTf wi'll uinl trenty, p heavy rain came on in tho emirw of MW-ing. Thin cau*il tin- \>*UU* t*> ivinain under water for *<veral day,* and prevented the sowing of the entire *Utidard seric« OB one day. In &• badly (jormin»t«l plots of tin. duplitmU) (wri" the MMI was spiin dibbled. Tlius the growth of the plants and therefore tiii'ir yield wu unequal.

In the seMon uaW ivport »!i«ep duny unl hone dn*t, prtnitretto, mitprtre, an-l bone •i»pwj>!i'«|ili:iti\ tvjvr du:iir»ul *gjf&n,* a-iU>« uf c,w .lin,' .ml «lt|M»tre hate given t!v In—I *jiM.* *TU'u* rwult ii, on th<* whole, confirmed by the duplicate *tenet* and *ie* al«» in accord with the rctulU of put yi*am.

Kharif SnTKiicyi No, HI.—Thw experiment is nimel "miKcllaneon*" and uate« back fn.m 188*. The aeriaa eonauti of 9 plots e*uh of the nae of MO iqwn yardi.

Tln««f pluU wrrc wwn on tha litli J«:i- with «x aeen of miise «eed per acre. Tt* number of |il«u<»tiitijp and weeding* *wm* tlio ume a* in the foregoing instance. The need in »MN«. 3 did not (^rmintU* evenly, and nnf<trtiin»t.'lv the name plot wu injured to aeerUin cutvrnt by wild ni^*. The seedlings r-fuie luw again prove trnebiiur former results ai it ha« ffivtit tho largest yield. In every year mai in al kind* of *mwn* too wet or too dry it. np U thi* time, h«u proT<vl lo ba good for the crop *U* which it haa lf<ea appU^l. maize especially it ha* a wonderful effect. Next to thi« come poudretU and aVtap duny.

Kharif STITKKBXT NO. III.—*3fitmtUn*om mannre trftrimnt with maize.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre.				Increase or decrease per acre over unmanured plot.			
			Grain.		Stalks.		In grain.		In stalks.	
			Average for previous five years.	This year.	Average for previous five years.	This year.	Average for previous five years.	This year.	Average for previous five years.	This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
N. 1	Lime, 15 maunds.	8 9 0	1,719	2,505	6,427	11,664	+989	+2,806	+2,887	+9,072
N. 2	Sheep-dung, 120 mds.	3 10 0	1,812	1,609	4,871	8,827	+384	+1,500	+1,331	+6,209
N. 3	Cow-dung, 120 ,,	3 10 0	769	1,174	3,570	7,706	+40	+1,065	+430	+3,179
N. 4	Poudrette,	4 12 0	1,094	1,732	3,062	8,107	+365	+1,633	+442	+5,118
N. 5	Horse-dung, 120 ,,	3 10 0	1,059	1,367	3,720	8,022	+331	+1,258	+2,180	+5,433
N. 6	Pig-dung, 120 ,,	3 10 0	1,162	902	6,312	7,328	+433	+893	+2,002	+5,010
N. 7	Saltpetre, 120 ,,	9 0 0	1,026	635	5,420	6,277	+303	+406	+1,680	+3,788
N. 8	No manure	—	—	729	207	3,549	2,960	—	—	—

NOTE.—The cost of cultivation may be taken at Rs. [illegible] per acre, including rent, seed, labour, &c., but exclusive of manure. [illegible] previous five years Rs. [illegible] respectively.

Area of each plot, 400 square yards.

Kharif Statement No. I \ _TUi» ciprritniMit w» for five years, which term h*. expired this year. It i« to detaftJ ine the effect of irrigation on the sowing of a maize crop. One plot •f 1,715 X{UM« v»rl» WH tuva on the 22nd of May and was maintained by means of four waterings, and the other plot of the same extent i orai aoflrn after the first shower on the 3rd of July. The seed and all other treatment, ptuuyhing, wtiediag, fcc, Were in both case* tin MUM- M BOW in UM lurfguu *$* |<angnpba.

Both plots [illegible] from flooding, [illegible] owing [illegible] of canal water the irrigated plot received insufficient watering. [illegible] poor [illegible] the experiment for the year was a failure. This experiment is an important one. It is therefore intended to keep it for five years more.

KHARÍF STATEMENT, NO. IV.—*Experiment in early and late sowing of maize.*

Number of plot per farm map.	Mode of sowing.	Produce per acre in pounds.				Increase or decrease.			
		Grain.		Stalks.		In grain.		In stalks.	
		Average for previous three years.	This year.	Average for previous three years.	This year.	Average for previous three years.	This year.	Average for previous three years.	This year.
33 B.	Sown early ...	1,650	572	5,101	7,000	+ 352	+ 121	+ 2,438	+ 1,876
33 A. C.	Sown late ...	1,263	436	6,063	5,124	—	—	—	—

NOTE.—The cost of cultivation in the second plot may be taken at Rs. 16-8-0 per acre, including rent, seed, labour, &c. In the first plot the irrigating charges add Rs. 6 the acre. The value of the produce at a reasonable estimate may be put at Re. 1 per 41lbs. of grain and Re. 1 per 410lbs. of stalk for fodder. According to this estimate the outturn of the late sown plot this year was worth Rs. 23-8-0 an acre, giving a net profit of Rs. 7. The average net profit, however, on this plot for the previous three years was Rs. 31-8-0. The net profit this year of the early sown crop was Rs. 8-8-0 and for the previous three years Rs. 38-12-0.

KHARÍF STATEMENT NO. V.—*Experiment with cotton.*—This experiment is to be conducted for five years, three of which have elapsed, including the season under review, and it is to determine the effect of certain manures on cotton. This series consists of 6 plots, each of 400 square yards. The plots were sown with six seers of seed per acre on the 12th of June, being ploughed twice with the improved plough and weeded three times. The cotton picking began from the 21st of September and ended on the 15th of March.

In 1889, though the plants grew very luxuriantly, the yield was not good, as the crop was attacked by grubs. This season yield was better.

Woollen refuse in this case too, has given good results. The mixture of kainit and gypsum has come out next.

KHARÍF STATEMENT NO. V.—*Experiment [illegible] to the effect of [illegible] cotton.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre.			
			Cleaned cotton.		Seed.	
			Average for previous two years.	This year.	Average for previous two years.	This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.
Ab. 1	Fresh silt from canal, 300 maunds ...	1 4 0	145	150	236	407
Ab. 2	Kainit, 4 maunds and gypsum, 4 maunds ...	12 8 0	120	204	242	403
Ab. 3	Farmyard manure, 150 maunds, and gypsum, 1 maund 14½ seers ...	7 12 0	146	218	248	436
Ab. 4	Farmyard kainit, 1 maund 14½ seers ...	8 3 9	164	230	256	403
Ab. 5	Woollen refuse, 120 maunds ...	3 2 0	212	263	320	523
Ab. 6	No manure ...	—	108	94	242	148

NOTE.—The cost of cultivation may be taken at Rs. 20-12-0 per acre, including rent, seed, labour, &c., but exclusive of manure. The value of the produce at a reasonable estimate may be put at Re. 1 per 6lbs. of clean cotton and Re. 1 per 61lbs. of seed. According to this estimate the outturn of the unmanured plot this year was worth Rs. 18-8-0 an acre, giving a net loss of Rs. 8-4. The average net loss, however, on this plot for the previous two years was Rs. 0-12-0. The net profit this year of Nos. 3 and 4 was Rs. 22-8-0 and Rs. 19-18 and for the previous two years Rs. 10-11-0 and a loss of Rs. 2-7-0 respectively.

Area of each plot, 400 square yards.

KHARÍF STATEMENT NO. VI.—*Experiments* [illegible] experiment with different varieties of imported cotton seed. This is the third year out of the

§n for whioh i\m .npflriment U tn continue. The seed of varieties No», 9 to 11 have been nvenily obtained direct from Amt'riea. Seed was sown on the 18th of Jane at the rate of sis seen per acre. Picking began from the 19tU of October and ended on the 15th of March. The freshly imported varieties flowered a few day< later i luti those which luid been acclimatised in thu province some yean ago.

Cat boa thmragfarat the dirtrirt suffered greatly tlii< yew from untimely ami deary rainfall and the attacks of grub*. The farm crop similarly suffered. The yield from acclimatised varieties (Nos. 1 to 8} his been better than the yield of the newly imported sane ties.

Ku&lir STATlinurr No. VI.—*Experiment vUk different wxridit* of imported cotton *etd.*

Number of plot per farm map.	Varieties of cotton seed.	Produce per acre.			
		Cleaned cotton.		Seed.	
		Average for previous two years.	This year.	Average for previous two years.	This year.
		lbs.	lbs.	lbs.	lbs.
41Aa(1)	Upland Georgian	130	103	300	229
41Ab(2)	Tree cotton	143	115	343	251
41Ac(3)	Louisiana	153	126	360	319
41Ad(4)	Garo Hills	146	91	296	137
41Ae(5)	Hybrid	175	105	347	203
41Af(6)	Sea Island	134	91	300	252
41Ag(7)	Egyptian	140	80	225	194
41Ah(8)	Hinganghât	140	100	239	251
19e(9)	S. B. Money (Texas)	102	40	184	100
19f(10)	Shines' Early Prolific	82	40	164	100
19g(11)	Jones, Improved	102	60	204	120
19h(12)	Country	150	60	320	80

NOTE.—The cost of cultivation may be taken at Rs. 31-4-0 per acre, including rent, seed, labour, &c., and manure (value Rs. 4-6-0). The value of the produce at a reasonable estimate may be put at Rs. 1 per 6lbs. of clean cotton and Rs. 1 per 6lbs. of seed. According to this estimate the outturn of the country seed plot this year was worth Rs. 11-4-0 an acre, giving a net loss of Rs. 20. The average net profit, however, on this plot for the previous two years was Rs. 4. The loss this year of the Nos. 2 and 7 was Rs. 5 and Rs. 8-0-0, and for the previous two years a net profit of Rs. 0-2-0 and a loss of Rs. 1-10-0 respectively.

Am»dmm\jm\m square yards.

Ku.ufr STITMDTT NO. VII.—-The «tultJ of the oarly and late sowing of cotton aw ahowtt in U»ie «ut«m«nt.

^Mpma^lwMtr^wiaAauwBiwloWMdfoBrjrtiBigo. Tn 4 plou Mad uf \ Tmnctie- *ot* ootto* wai «>«™ *ª «*'• 12tl> ''' ***Tf* ''^ ''»«»IW 4 plots eeed of :* eraa Tarieties waswwoonlhe ISth of June when the rain had eet in. *Piclaag* of all tbm plots U^»n from the SStli Decnpbtr and oontinntd till the l&th March. The late eown |'1''<« suffered *gNUij trota* heavy rain and from the attacks ot an

Th* esperimml eJcarly mUUishw that if irrigation is poanble, oottoo ihonW ho sown before the raBuamoanwDt of the rains. The plant* am rigomw. They do sufirr fwia U» *wm ot mat* tad *ifoMtllj* «oaf» Uw altacka of ias«ct*

KHARIF STATEMENT No. VII.—*Experiment with* [illegible]

Number of plot per farm map.	Variety of cotton sown.		Produce per acre. Cleaned cotton. Average of previous two years.	This year.	Seed. Average of previous two years.	This year.
			lbs.	lbs.	lbs.	lbs.
13a.	Sown before rain.	S. B. Meary (Texas) ...	170	200	310	260
13b.		Shines' Early Prolific ...	180	140	285	300
13c.		Jones Improved ...	155	190	245	220
13d.		Country ...	180	250	300	440
15a.	Sown after rain.	S. B. Meary (Texas) ...	150	40	325	100
15b.		Shines' Early Prolific ...	140	80	280	170
15c.		Jones, Improved ...	130	60	320	120
15d.		Country ...	130	60	320	80

KHARIF STATEMENT No. VIII.— [illegible] with respect [illegible] statement shows [illegible] of certain varieties of sugarcane.

The object of the experiment is (1) to determine the productive capacity of 4 varieties of cane, seed of which [illegible] three years ago from Behea, Shahjahanpur, and Moradabad; (2) to ascertain [illegible] in line as done in the West Indies has any advantage over the indigenous way of sowing.

The seed was planted on the 29th March. [illegible] which, as a rule, are thrown away by cultivators in [illegible] The field was ploughed four times with the improved plough, weeded and hand-hoed four times, watered five times. The Shahjahanpur variety gave the largest produce per acre, while the method of planting cane as done in these provinces yields a far larger produce than the method practised in the West Indies.

KHARIF STATEMENT No. VIIIA.— [illegible] (1) in the yield of different varieties of sugarcane; [illegible]

Number of plot per farm map.	Detail of experiment.	Produce per acre. Weight of cane per acre. Average for previous three years.	This year.	Weight of juice per acre. Average for previous three years.	This year.	Percentage of juice on cane.
	Behea seed (Mango or Dhaul).	lbs.	lbs.	lbs.	lbs.	
2021a	Sown in line ...	22,832	16,202	7,023	5,111	34
2021b	Sown in the indigenous way ...	20,144	21,480	10,404	11,227	53
	Shahjahanpur seed (Dhaul).					
2021c	Sown in line ...	7,202	17,298	4,128	10,148	59
2021d	Sown in the indigenous way ...	10,913	20,374	5,127	12,116	41
	Moradabad seed (Baraukha).					
2022a	Sown in line ...	11,926	7,002	7,012	2,323	48
2022b	Sown in the indigenous way ...	20,748	9,237	10,424	4,201	46
	Country seed (Matna).					
2022c	Sown in line ...	20,013	4,896	10,900	2,021	47
2022d	Sown in the indigenous way ...	23,387	5,268	12,011	2,179	64

KHARIF STATEMENT No. VIIIB.—This s[illegible] the result of a peri crop (ratooned cane stock kept a second year after [illegible]'s crop was taken).

This experiment is to be conducted for a period of two years, 3 of which have now elapsed. Its object is to determine the economic value of keeping the ratooned flocks of sugarcane a second year. When the last year's crop was off, the field was watered and ploughed once and then the stumps were [illegible]. On the 11th April it was topdressed with 200 maunds of [illegible] manure and hand-hoed. It was watered five times in the hot weather.

A comparison of the yield with those given in the preceding statement shows that this year the [illegible] crop in many cases has given better results than the first year's crop.

Kharif Statement No. VIII.—Experiment to determine the economic value of peri (second year cane stock).

Number of plot per farm map.	Details of treatment.	Weight of cane per acre. Average for last two years.	Weight of cane per acre. This year.	Weight of juice per acre. Average for last two years.	Weight of juice per acre. This year.
		lbs.	lbs.	lbs.	lbs.
	Peri of Rohtas seed (Mungo or Dhaul).				
24a	Sown in line	1,0[illegible]	14,211	8,481	7,[illegible]
24b	Sown in the [illegible] ...	10,116	20,8[illegible]	8,949	
	Shahjahanpur seed (Dobchan).				
24c	Sown in line	14,100	20,727	7,200	11,7[illegible]
24d	Sown in the [illegible] way ...	17,2[illegible]	22,034	[illegible]	12,8[illegible]
	Moradabad seed (Baraukha).				
24e	Sown in line	14,[illegible]	14,0[illegible]	[illegible]	7,8[illegible]
24f	Sown in the [illegible] way ...	1,6[illegible]	17,212	[illegible]	[illegible]
	Country seed (Matna).				
24g	Sown in line	9,816	17,011	[illegible]	8,421
24h	... ...	13,868	37,2[illegible]	7,1[illegible]	[illegible]

Kharif Statement No. IX.—Experiments with indigo.—This statement shows the results of applying gypsum to indigo. This experiment is to be carried on for [illegible] years: four years have already elapsed.

Three plots are kept under this experiment. To one of these plots no manure is applied. In the 2nd gypsum is ploughed in, while the third plot is topdressed with the same quantity of gypsum when the plants are four inches high. The seed was sown on the 21st of April, but owing to the deficiency of moisture in the soil it did not germinate evenly. The supply of canal water at this time proved very insufficient, and so the plants did not thrive as well as in previous years.

Gypsum has decidedly proved a good manure for indigo. This year again the plot in which it was ploughed in has given better results than the plot in which it was applied as a topdresser.

Kharif Statement No. X.—Distribution of the effect of gypsum on indigo.

Number of plot per farm map.		Treatment.	Average weight of green crop. Average of last two years.	Average weight of green crop. This year.	Increase or decrease over unmanured plot. Average of last two years.	Increase or decrease over unmanured plot. This year.
			lbs.	lbs.	lbs.	lbs.
P. 1	4	Gypsum applied 4 maunds per acre and ploughed in as manure, valued Rs. 3 ...	8,453	[illegible]	+ 7,822	+ 1,082
P. 5	8	Gypsum [illegible] topdressed when plants were 4 inches high ...	7,[illegible]	8,417	+ 6,417	+ 1,186
P. 9	12	Unmanured	573	4,271	—	—

Note.—The [illegible] acre, including rent, [illegible] for exclusion of manure. The value of the produce at a reasonable estimate may be put at Re. 1 per 100 lbs. of green crop. According to this estimate the outturn of the unmanured plot this year was worth Rs. [illegible] an acre, giving a loss of Rs. 4-12-0. The average loss, however, on this plot for the previous two years was Rs. 17. The loss this year of Nos. 4 and 8 was Rs. 2-4-0 and Rs. 3-12-0, and net profit for the previous two years Rs. 6 and Rs. 1-8-0 respectively.

Area of each plot, 1,000 square yards.

KHARIF EXPERIMENT No. X.—Experiment with [illegible] crops.—This experiment [illegible] food [illegible] commonly [illegible]. There are 18 plots in the series, each of which measures 100 square yards. This experiment is to continue five years, three of which have expired. All the plots were ploughed and weeded twice. They were sown in July. Owing to the heavy rain in July all the crops [illegible] much and the yield was poor.

KHARIF EXPERIMENT No. X.—Experiment [illegible]

Number of plot per farm map.	Crop.			Grain. This year.	Grain. Average of last two years.	Stalks. This year.	Stalks. Average of last two years.
				lb.	lb.	lb.	lb.
[illegible]	Cotton and arhar			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Jowar for chari			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Urd			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Mung			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Moth			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Lobia			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Jowar and arhar			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]

RABI SEASON EXPERIMENTS.

THE RABI SEASON.—*Character of the Season.*—At the beginning the season looked very promising. Ploughing and sowing on the whole [illegible] were done in good and opportune time. The seed germinated well in nearly all the fields, and everything looked excellent till the end of [illegible] the 23rd of January [illegible] heavy rain fell throughout the whole night, accompanied by high winds, which beat down the advanced plants. In February from 5th to 7th there was [illegible] frost, which also did great harm. [illegible] the late [illegible] the juice which was wanted to nourish, and [illegible] the grain, which [illegible] remained shrivelled and [illegible]. At this time a strong west wind kept on blowing for [illegible], which added to the effect of frost. The fields with high cultivation suffered more because their crop was beaten down. The [illegible] this year did better than [illegible].

In the season under report in the farm proper the area under wheat was 34 bighas 2½ biswas (about 17 acres) against 35 bighas 18 biswas (about 18 acres). The total produce this year was 81[illegible] maunds 4½ seers, the average per acre being only about 19 maunds or 1300lbs., ranging from 450 to 2,904lbs. The average outturn per acre last year was 17½ maunds.

This year the largest yield was obtained from the green soiling series (*vide* Statement No. [illegible]). One plot of this series, which is manured with old indigo refuse and lime, gave an outturn of 1,904lbs. or 36 [illegible] maunds per acre. This [illegible] the highest maximum yield obtained last year [illegible] 2,553lbs. per acre (Rabi Statement No. [illegible], plot No. 5, for 1889-90). Two more plots in the same series this year yielded 2,815 and [illegible]lbs. per acre respectively. The poorest outturn was obtained from Red Fern, a variety of Canadian wheat, received through the Government of India, being only [illegible]lbs. per acre. The seed, not being acclimatized, was naturally more susceptible to [illegible] in June.

The rabi [illegible] is chiefly confined to wheat: potato, barley, peas, and gram also occupy a limited, but a comparatively small, area. As stated in previous reports the experiments in this season are of two kinds, "permanent" and "temporary."

Statements Nos. I and II.—Permanent Wheat Experiment.—Of all the permanent experiments this is the oldest. It is conducted in two series called "standard" and "duplicate." Each of these series consists of 13 plots. In the "standard" series wheat is sown year after year without any rotation, while in the series called "duplicate" the plots are cropped one year with wheat and another year with maize, [illegible]. The corresponding plots in either series receive a special kind of manure year after year, and in every [illegible] all the plots receive the same treatment.

The object of this experiment is to observe (*a*) the effect of ordinary and artificial manures on wheat; (*b*) the utility of rotation; (*c*) how long wheat can be grown year after year on the same land without manure; and (*d*) which manure best returns to the soil what the plant removes.

As usual, Muzaffarnagar wheat seed was sown in the [illegible] plots, quantity being 120lbs. per acre. The standard series were sown on the 24th and the duplicate series on the [illegible]th October. They were harvested on the 8th and 9th of April respectively. All the plots were ploughed twice with the improved plough and twice with the [illegible] plough. They were [illegible] Still watered thrice. Statements Nos. I and II show that the outturn of many of the plots in the standard series is, as usual, less than the outturn of corresponding plots in the duplicate series. This year plot No. 10 in the duplicate series has given the largest yield, and plots [illegible] 5 and 9 rank next to it. Last year plot No. 3 had stood first. The advantage of rotation is obvious, and it [illegible] that the [illegible] of cow dung compared with the unburnt [illegible] very little value as manure for wheat.

Rabi Statement No. I.—*Standard Series.—Manure experiment with wheat.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre. Grain. Average for previous five years.	Grain. This year.	Straw. Average for previous five years.	Straw. This year.	Increase or decrease over unmanured plot per acre. In grain. Average for previous five years.	In grain. This year.	In straw. Average for previous five years.	In straw. This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
R. 1	Saltpetre, 3 maunds ...	9 0 0	1,376	1,440	2,339	2,450	+336	+219	+1,041	+330
R. 2	Saltpetre, 3 maunds, and bone dust, 4½ maunds ...	19 11 0	1,362	1,357	2,554	2,780	+345	+373	+767	+188
R. 3	Cow dung, 180 maunds ...	[illegible]	1,321	1,337	2,778	3,340	+279	+315	+801	+1,114
R. 4	Ditto and bone dust, 4½ maunds	16 1 0	1,068	1,742	2,653	3,541	+046	+520	+729	+1,319
R. 5	Ditto and gypsum, 3 maunds ...	19 10 0	1,286	1,757	2,786	3,207	+344	+543	+909	+1,041
R. 6	Sheep dung, 180 maunds ...	5 6 0	1,288	968	2,367	4,347	+346	−254	+490	[illegible]
R. 7	Ashes of 180 maunds of cow dung ...	5 6 0	972	1,367	2,043	2,821	−70	+145	+158	[illegible]
R. 8	Sheep dung, 180 maunds, and bone dust, 4½ maunds	16 1 0	1,159	1,718	[illegible]	[illegible]	+145	+436	+111	+961
R. 9	Saltpetre, 3 maunds, and bone superphosphate, 3 maunds ...	20 0 0	1,146	1,648	[illegible]	[illegible]	+104	+426	[illegible]	[illegible]
R. 10	Sheep dung, 180 maunds, and gypsum, 3 maunds	19 10 0	1,280	1,082	[illegible]	2,824	+247	+400	[illegible]	+328
R. 11	No manure ...	—	1,042	1,222	1,867	2,326	—	—	—	—
R. 12	Poudrette, 180 maunds ...	7 [illegible] 0	1,379	1,500	2,461	4,253	+337	+278	+374	+2,053
R. 13	Ashes of 180 maunds of cow dung and saltpetre, 3 maunds ...	[illegible]	1,240	1,494	[illegible]	2,583	+204	+182	+149	+722

NOTE.—The cost of cultivation may be taken at Rs. 27 per acre, including rent, seed, labour, &c., but exclusive of manure. The value of the produce at a reasonable estimate may be put at Re. 1 per 22lbs. of grain and Re. 1 per 240lbs. of straw for fodder. According to this estimate the culture of [illegible] plot this year was worth Rs. 47 an acre, giving a net profit of Rs. 20. [illegible] however, on this plot for the previous five years was only Rs. 12. The [illegible] profit this year of Nos. 5 and 4 was Rs. 20-[illegible] [illegible] Rs. 16-14-0 and Rs. 20-2-0 respectively.

[illegible] each plot, 400 square yards.

Rabi Statement No. II.—*Duplicate Series.—Manure experiment with wheat.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre. Grain. Average for previous five years.	Grain. This year.	Straw. Average for previous five years.	Straw. This year.	Increase or decrease over unmanured plot per acre. In grain. Average for previous five years.	In grain. This year.	In straw. Average for previous five years.	In straw. This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Alb. 1	Saltpetre, 3 maunds ...	9 0 0	1,401	1,019	3,548	3,329	+246	−279	+414	−220
Alb. 2	Saltpetre, 3 maunds, and bone dust, 4½ maunds ...	19 11 0	1,649	1,748	3,250	3,964	+494	+141	+898	+169
Alb. 3	Cow dung, 180 maunds ...	5 0 0	1,102	1,779	3,251	3,073	+ 7	+142	+823	+178
Alb. 4	Ditto, and bone dust, 4½ maunds ...	16 1 0	1,302	1,718	3,459	3,073	+207	+121	+27	+278
Alb. 5	Ditto, and gypsum, 3 maunds ...	19 10 0	1,384	1,700	2,503	3,479	+229	+105	+131	+478
Alb. 6	Sheep dung, 180 maunds ...	5 6 0	1,315	1,731	3,490	3,339	+205	+174	+43	−208
Alb. 7	Ashes of 180 maunds of cow dung ...	5 6 0	1,262	1,722	2,830	3,305	+130	+158	+219	−203
Alb. 8	Sheep dung, 180 maunds, and bone dust, 4½ maunds	16 1 0	1,474	2,010	3,867	3,448	+219	+473	+273	+423
Alb. 9	Saltpetre, 3 maunds, and bone superphosphate, 3 maunds ...	20 0 0	1,412	2,008	3,409	3,984	+237	+413	+30	+1,060
Alb. 10	Sheep dung, 180 maunds, and gypsum, 3 maunds	10 10 0	1,156	2,130	2,934	4,640	+282	+533	+402	+1,611
Alb. 11	No manure ...	—	1,151	1,337	2,492	2,730	—	—	—	—
Alb. 12	Poudrette, 180 maunds ...	7 [illegible] 0	1,152	1,373	3,328	3,119	− 3	+273	+1,030	+2,228
Alb. 13	Ashes of 180 maunds of cow dung, and saltpetre, 3 maunds ...	14 6 0	1,319	1,479	2,773	3,378	+158	+73	+241	+261

NOTE.—The cost of cultivation may be taken at Rs. 27 per acre, including rent, seed, labour, &c., but without manure. The value of the produce at a reasonable estimate may be put at Re. 1 per 22lbs. of grain and Re. 1 per 240lbs. of straw for fodder. According to this estimate the culture of the unmanured plot this year was worth Rs. 61 an acre, giving a net profit of Rs. 34. The average net profit, however, on this plot for the previous five years was only Rs. 18-12-0. The net profit this year of No. 6 was Rs. 36, and for the previous five years Rs. 23-0-0.

Area of each plot, 400 square yards.

RANI STATEMENT No. III.—This experiment is on "green manures." The series consists of 13 plots, each being 400 square yards in size. It is meant to indicate the manurial value of hemp and indigo which are applied to the plots in various forms. In the main crop all the plots were sown with Cawnpore wheat on the 23rd of October and were harvested on the 10th of April. The methods of ploughing, weeding, and watering were the same as used in the former experiment. The unmanured plot in this series (as well as in several others) this year has given a [illegible] yield. This is explained by the fact that in the present season the fields which were most advanced suffered most from wind and rain. The plots in which indigo was ploughed in green and those in which its refuse was applied have, as in previous years, given the largest yield.

RANI STATEMENT No. III.—Green Manure Series.

Number of plot.	Manure applied per acre.	Cost of manure per acre.	Produce per acre.				Increase or decrease over unmanured plot per acre.			
			Grain.		Straw.		In grain.		In straw.	
			Average for previous five years.	This year.	Average for previous five years.	This year.	Average for previous five years.	This year.	Average for previous five years.	This year.
		Rs. a. p.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
A 1	Old indigo refuse, 120 maunds	[illegible]	1,441	1,747	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+ 1,041
A 2	Fresh indigo refuse, 120 maunds, and lime, 6 maunds	[illegible]	[illegible]	1,742	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
A 3	Indigo water, 2,000 cubic feet	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
A 4	Hemp water, 2,000 cubic feet	[illegible]	731	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
A 5	No manure	...	[illegible]	[illegible]	[illegible]	[illegible]	...	...	...	...
A 6	Wheat sown after hemp crop had been taken ...	...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
A 7	Green hemp ploughed in...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
A 8	Green indigo ploughed in...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
A 9	Wheat sown after indigo crop	...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
A 10	Green indigo ploughed in and gypsum, 6 maunds...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
A 11	Green hemp ploughed in and gypsum, 6 maunds...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
A 12	No manure	...	[illegible]	[illegible]	[illegible]	[illegible]	...	...	...	...
A 13	Alternate with hemp ...	...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NOTE.—The cost of cultivation may be taken at Rs. 27 per acre, including rent, seed, labour, &c., but exclusive of manure. The value of produce at a reasonable estimate may be put at Re. 1 per [illegible] of grain and Re. 1 per [illegible] of straw for fodder. According to this estimate the outturn of the unmanured plot this year was worth Rs. [illegible] an acre, giving a net profit of Rs. [illegible]. The average net profit, however, on this plot for the previous five years was only Rs. [illegible]. The net profit this year of Nos. [illegible] was Rs. [illegible] and Rs. [illegible] and for the previous five years was Rs. [illegible] and Rs. [illegible] respectively.

RANI STATEMENT No. IV.—To confirm the results of the green manure experiment, two series of [illegible] plots were kept on the list of permanent experiments.

In one of these series fresh and old indigo refuse with and without lime are applied and their result contrasted with unmanured plots. In the other series 7 plots are manured with green hemp, the results of which are compared with the plots kept unmanured.

The following statement contains the results of both of these series. All the plots were sown on the 26th of October and were harvested on the 10th of April. The other treatment was the same as in other series. The plot manured with old indigo refuse and lime gave the maximum yield on the farm this year, namely 35 maunds, or 46 bushels, the acre.

RABI STATEMENT NO. IV.—*Green manure experiment with wheat No. 2.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre. Grain. Average for previous five years.	Grain. This year.	Straw. Average for previous five years.	Straw. This year.	Increase or decrease per acre over unmanured plot. In grain. Average for previous five years.	In grain. This year.	In straw. Average for previous five years.	In straw. This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
A. 32A & L	Fresh indigo refuse, 120 maunds, and lime, 6 maunds	2 6 0	1,065	2,013	2,334	5,334	+ 292	+ 1,236	+ 900	+ 2,700
A. 32B & K	Fresh indigo refuse, 120 maunds	1 8 0	929	2,465	1,532	5,316	+ 220	+ 1,078	+ 304	+ 2,752
A. 32C & G	Old indigo refuse, 120 maunds, and lime, 6 maunds	[illegible]	[illegible]	2,004	2,014	6,424	+ 230	+ 1,217	+ 540	+ 2,800
A. 32D & J	Old indigo refuse, 120 maunds	1 8 0	930	2,011	1,808	6,807	+ 257	+ 624	+ 200	+ 4,243
B. 32E & A	No manure	...	729	1,387	1,406	2,564	...	...	...	...
C. 31A & D	Hemp ploughed in	3 8 0	1,070	1,113	2,113	2,346	+ 490	+ 479	+ 546	+ 1,023
D. 31F & I	No manure	...	206	634	1,207	1,325	...	...	...	...

Note.—The cost [illegible] without manure. The value [illegible] for fodder. According [illegible] 23-12-0 and Rs. 25 an acre, [illegible] a loss of Rs. 2 respectively. The [illegible] on these plots for the previous 5 [illegible] Rs. 5-12-0 respectively. The net profit this year of the numbers 32 A & L and 32 C & G was Rs. 74 [illegible]

RABI STATEMENT NO. V.—The [illegible] the manurial value of certain things not commonly [illegible] by the people in this country. This series consists of eight plots. All the plots were [illegible] on the fifth of October and harvested on the [illegible] of April. Compost [illegible] strong fertilizers have [illegible] out better than the other manures [illegible] series.

RABI STATEMENT NO. V.—*Miscellaneous manure series.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre. Grain. Average for previous five years.	Grain. This year.	Straw. Average for previous five years.	Straw. This year.	Increase or decrease over unmanured plot per acre. In grain. Average for previous five years.	In grain. This year.	In straw. Average for previous five years.	In straw. This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
M. 1	Brick kiln refuse, 120 maunds	1 12 0	816	627	1,706	1,113	+ 252	— 73	+ 305	— 242
M. 2	Silt, 200 maunds	0 12 0	1,028	556	1,522	2,080	+ 457	+ 254	+ 184	+ 654
M. 3	Compost, 200 maunds	6 0 0	800	1,424	1,250	3,125	+ 233	+ 774	+ 400	+ 770
M. 4	Road scraping, 200 maunds	4 11 0	832	730	1,732	1,866	+ 231	+ 87	+ 415	+ 338
M. 5	Ashes of 120 maunds of woods	8 0 0	652	1,435	1,273	4,477	+ 92	+ 714	— 48	+ 3,112
M. 6	Ashes of 120 maunds of wood and 2 maunds saltpetre	12 0 0	805	702	1,551	1,718	+ 127	+ 60	+ 433	+ 363
M. 7	Ammonia chloride, 2 maunds	42 0 0	701	450	1,557	1,452	+ 140	— 242	+ 250	+ 97
M. 8	No manure	...	561	703	1,344	1,356	...	...	...	...

Note.—The cost of cultivation may be taken at Rs. 27 per acre, including seed, weed, labour, &c., but without manure. The value of the produce at a reasonable estimate may be put at Re. 1 per 32 maunds of grain and Re. 1 per 2,000 lbs. of straw for fodder. According to this estimate the outturn of the unmanured plot this year was worth Rs. 27-4-0 an acre, giving a net profit of Rs. 0-4-0. The average loss, however, on this plot for the previous five years was Rs. 4-4-0. The net profit this year of Nos. 3 and 5 was Rs. 22-12-0 and Rs. 11-4-0 and for the previous five years there was a profit of Re. 1 and a loss of Rs. 5-9-0 respectively.
Area of each plot 640 square yards.

RABI STATEMENT No. VI.—This experiment shows the effect of deep ploughing with an improved plough against ordinary ploughing with the country *plough*. This experiment is conducted in two series, one (A) containing four and the other (B) three plots. The plots in A series do not receive any manure, but to plots in B series farmyard manure is applied at the rate of 200 maunds per acre. All the plots were sown on the [illegible] of October and harvested on the [illegible]th of April. The manured plots suffered much from the rain of 23rd January. The deep ploughed plots, as in previous years, have given a better yield.

RABI STATEMENT No. VI.—*Ploughing experiment with wheat.*

Number of plot per farm map.	Treatment.	Cost of cultivation per acre.	Produce per acre. Grain. Average for previous five years.	Produce per acre. Grain. This year.	Produce per acre. Straw. Average for previous five years.	Produce per acre. Straw. This year.	Increase or decrease over the plots ploughed with country plough. In grain. Average for previous five years.	In grain. This year.	In straw. Average for previous five years.	In straw. This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
A. Ad. 1	Ploughed 5" deep 4 times with improved plough.	3 0 0	550	[illegible]	1,160	1,555	+ 28	+ 81	+ 10	+ 97
A. Ad. 2	Ploughed [illegible] (country plough).	4 [illegible] 0	[illegible]	[illegible]	[illegible]	[illegible]	—	—	—	—
A. Ad. 3	Ploughed 3" deep 8 times with country plough.	6 0 0	[illegible]	[illegible]	1,178	[illegible]	—	—	—	—
A. Ad. 4	Ploughed 3" deep 4 times with improved plough.	3 0 0	[illegible]	1,600	1,845	1,825	−110	+ 322	−53	[illegible]
B. Ad./2 — 1	Ploughed 5" deep 4 times with improved plough.	[illegible]	716	[illegible]	1,552	2,280	+ 152	[illegible]	[illegible]	[illegible]
B. Ad./2 — 2	Ploughed 3" deep 4 times with improved plough.	3 0 0	[illegible]	[illegible]	1,41[illegible]	2,028	+ 144	+ 30	+ 73	[illegible]
B. Ad./2 — 3	Ploughed 3" deep 8 times with country plough.	6 0 0	[illegible]	[illegible]	1,342	2,308	—	—	—	—

NOTE.—The cost of cultivation may be taken at Rs. 27 per acre, including rent, seed, labour &c., but without manure. The value of the produce at a reasonable estimate would be Re. 1 per [illegible] lbs. of grain and Re. 1 per [illegible] lbs. of straw for fodder. According to this estimate the outturn of the plot ploughed with country plough 3 inches deep (*i.e.*, plot $\frac{Ad.}{2}$—3) this year was worth Rs. [illegible] an acre, giving a net profit of Rs. [illegible]. The average net loss, however, on this plot for the previous five years was Rs. [illegible]. The net profit this year of the Nos. $\frac{Ad.}{2}$—2 and $\frac{Ad.}{2}$—1 was Rs. [illegible] and Rs. [illegible], but for the previous five years there was [illegible] Rs. [illegible] and Rs. [illegible] respectively.

Area of each plot [illegible] square yards.

Temporary experiments.—Temporary experiments are those which are conducted for a limited time.

RABI STATEMENT VII.—The first of these is to ascertain the [illegible] time for [illegible] the residual effect of fertilizing manures for the [illegible] crop. This experiment is conducted in two series of [illegible] plots. This experiment [illegible] years, which term has expired this year. All the plots were sown on the [illegible] of October and were harvested on the 18th of April.

The plot which had received cowdung has this year again given the largest yield.

RABI STATEMENT No. VII.—Experiment [illegible] of various manures on wheat.

Serial No. of plot on map.	Manure applied.	Value of manure per acre.	Produce per acre. Of grain. Average for previous four years.	This year.	Of straw. Average for four years.	This year.	Increase or decrease over unmanured plot. In grain. Average for previous four years.	This year.	In straw. Average for four years.	This year.
			lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
A. V1	Calcic superphosphate, 130 lbs., ammonic chloride, 130 lbs., potassic sulphate, 90 lbs., calcic sulphate, [illegible] lbs.	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	[illegible]	[illegible]
V2	All but calcic superphosphate	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
V3	Ditto ammonic chloride	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
V4	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
V5	Ditto calcic sulphate	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Unmanured	—	[illegible]	[illegible]	[illegible]	1,791	—	—	—	—
B. [illegible]	Cowdung	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]	—	—	—	[illegible]

NOTE.—The cost of cultivation may be taken at Rs. 27, including seed, weed, labour, &c., but without manure. The value of the produce at a reasonable estimate may be put at Re. 1 per 22 lbs. of grain and Re. 1 per 240 lbs. of straw for fodder. According to this estimate the outturns of the two unmanured plots, i.e., V6 and [illegible], this year was worth Rs. 33-12 and Rs. 35-12 an acre, giving a net profit of Rs. 1-14 and Rs. 9-12. The average net profit, however, on these plots for the previous four years was only Rs. 1-8 and Rs. 4-12 respectively. The net profit this year of Nos. V1, V4 and [illegible] and [illegible] was Rs. 14, Rs. 12-8, Rs. 23-12, and Rs. 15, and [illegible] were Rs. 6-8, Rs. 6-8, Rs. 16-8, and Rs. 8-12 respectively.

A.—Area of each plot of the series, 200 square yards.

B.— [illegible] do. do.

RABI STATEMENT VIII.—This experiment shows the effect of kainit on wheat. This experiment was tried in two series, in one of which kainit was applied with green hemp and in the other with farmyard manure and woollen refuse. The plots in the former series (A) were sown on the 22nd of October and harvested on the 7th of April, and those of the other series (B) sown on the 25th of October and harvested on the [illegible] of April.

This year in the first [illegible] manure [illegible] has given the largest yield, and in the other series (B) farmyard manure [illegible] applied by themselves [illegible] kainit.

Experiment No. VIII.—Experiment with manure on maize.

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre.				Increase or decrease over plot C.			
			Grain.		Straw.		Grain.		Straw.	
			Average for previous two years.	This year.	Average for previous two years.	This year.	Average for previous two years.	This year.	Average for previous two years.	This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
A	Green [illegible] ploughed in, for [illegible], 1 [illegible]	18 8 0	1,4[illegible]	[illegible]	[illegible]	1,7[illegible]	+[illegible]	[illegible]	+17[illegible]	[illegible]
B	[illegible] ploughed in,	3 4 0	1,00[illegible]	[illegible]	[illegible]	[illegible]	—373	—[illegible]	[illegible]	—435
C	Unmanured	...	1,[illegible]	1,0[illegible]	[illegible]	2,105	...	...	...	...
14a	[illegible]	[illegible] 4 0	[illegible]	[illegible]	[illegible]	[illegible]	...	...	...	...
14b	Woollen refuse, 200 maunds, and [illegible], 4 maunds	[illegible]	[illegible]	[illegible]	[illegible]	2,078	...	...	...	...
14c	[illegible] 300 maunds, alone,	[illegible]	[illegible]	1,7[illegible]	[illegible]	3,105	...	...	...	...
14d	Woollen refuse, 200 maunds ...	9 0 0	1,[illegible]	[illegible]	[illegible]	[illegible]	...	...	...	...

Note.—The cost of cultivation may be taken at Rs. [illegible] per acre, including rent, seed, labour, &c., but without [illegible]. The value of the produce at a reasonable estimate may be put at Re. 1 per [illegible] lbs. of grain, and [illegible] lbs. of straw for fodder. According to this estimate the outturn of the unmanured plot this year was worth Rs. [illegible], giving a net profit of Rs. [illegible]. The average net profit, however, on this plot for the previous two years was Rs. [illegible]. The net profit this year of Nos. [illegible] and [illegible] was Rs. [illegible] and Rs. [illegible], and for the previous two years Rs. [illegible] and Rs. [illegible] respectively.

Area of first 3 plots is [illegible] square [illegible].
Ditto 4 other ditto [illegible] ditto.

Experiment No. IX.—This experiment shows the effect on wheat (a) of grazing it by sheep, (b) of nibbling it with a sickle. The result is compared with a plot in which wheat was left to grow untouched, but which in other respects received a similar treatment. All plots were sown on the [illegible] October and harvested on the 9th April. As was expected in a year in which the rains lodged, the [illegible] were heavy with leaf, the plot in which the growth of leaf was not checked has yielded much less than the other two plots. Last year the result was in favour of the field left untouched [illegible].

Experiment No. IX.—Experiment with wheat (a) grazed by sheep when the [illegible] was about one foot, and (b) [illegible] at the same stage [illegible].

Number of plot per farm map.	[illegible]	Produce per acre.				Increase or decrease over plot C.			
		Grain.		Straw.		Grain.		Straw.	
		Average for previous two years.	This year.	Average for previous two years.	This year.	Average for previous two years.	This year.	Average for previous two years.	This year.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
[illegible]	Grazed by sheep when one foot high.	[illegible]	[illegible]	[illegible]	[illegible]	—[illegible]	+[illegible]	+[illegible]	[illegible]
[illegible]	Nibbled with a sickle ditto ...	[illegible]	[illegible]	[illegible]	[illegible]	...	+[illegible]	—[illegible]	+[illegible]
[illegible]	Untouched	[illegible]	[illegible]	[illegible]	[illegible]	...	...	...	...

Note.—The cost of cultivation may be taken at Rs. [illegible] per acre, including rent, seed, labour, and manure valued at [illegible]. The value of the produce at a reasonable estimate may be put at Re. 1 per [illegible] lbs. of grain and Re. 1 per [illegible] of straw for fodder. According to this estimate the outturn of the plot left untouched this year was worth Rs. [illegible] per acre, giving a net profit of Rs. [illegible]. The average net profit, however, on this plot for the previous two years was Rs. [illegible]. The net profit this year of Nos. [illegible] and [illegible] was Rs. [illegible] and Rs. [illegible], and for the previous two years Rs. [illegible] and Rs. [illegible] respectively.

Area of each plot is [illegible] square [illegible].

Rabi Statement No. X.—This statement compares the produce of [illegible] of wheat [illegible] which is commonly [illegible] neighbourhood of Cawnpore. Each variety was sown in a plot measuring 700 square yards. [illegible] to these plots, specially to the last one ( ), in which the water lodged for a time.

In respect of yield the Panjab red wheat has this year [illegible], and Muzaffarnagar white wheat ranked next.

Last year the latter had proved the best of the lot.

Rabi Statement No. X.—*Yield of different varieties of wheat.*

Number of plot per farm map.	Variety of wheat.	Produce per acre. Grain. Average for previous two years.	Grain. This year.	Straw. Average for previous two years.	Straw. This year.	Increase or decrease over the indigenous variety. In grain. Average for previous two years.	In grain. This year.	In straw. Average for previous two years.	In straw. This year.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
20a	Muzaffarnagar wheat	1,071	1,079	2,280	3,315	+247	+1,061	—458	+1,1[illegible]
20b	Adelaide ditto	1,013	1,411	2,050	3,260	+5	+819	—130	+1,4[illegible]
20c	Dunne ditto	1,095	1,614	2,306	3,333	+75	+1,012	—274	+[illegible]07
20d	Nadia ditto	947	1,356	2,800	3,402	—77	+214	+108	+1,[illegible]
20e	Mundia ditto	1,024	592	2,962	2,126	...	...	...	...
20f	Panjab red ditto	828	1,784	1,220	3,174	+140	+1,110	—1,030	+1,0[illegible]

Note.—The cost of cultivation may be taken at Rs. 30 per acre, including rent, [illegible] and manure valued at Rs. 5. The value of the produce at a reasonable estimate may be put at Re. 1 per 22 lbs. [illegible] and Re. 1 per 240 lbs. of straw for fodder. According to this estimate the outturn of the Mundia wheat this year was worth Rs. 27-[illegible] per acre, giving a loss of Rs. 2-14. The average net profit, however, [illegible] two years was Rs. 13. The net profit this year of Nos. 20f and 20a was Rs. 29-8-0 [illegible] two years Rs. 1-13 and Rs. 11-8 respectively.

Area of each plot is 700 square yards.

Rabi Statement No. XI.—*Experiment with barley.*—This statement shows the comparative yield of certain varieties of barley. The crop on all the plots was extremely poor.

Rabi Statement No. XI.—*Experiment with barley.*

Number of plot per farm map.	Variety of barley.	Produce per acre. Grain. Average for previous three years.	Grain. This year.	Straw. Average for previous three years.	Straw. This year.
28A	Green huskless barley	1,067	1,229	1,367	2,514
28B	Chocolate coloured barley	1,346	1,415	2,370	2,418
28C	White huskless coloured (Benali jau)	1,224	1,427	1,579	2,199
28D	Country ditto	1,063	1,064	2,012	2,023

Note.—The cost of cultivation may be taken at Rs. 23-13-0 per acre, including rent, seed, labour, &c., and manure, valued at Rs. 2-8-0. The value of produce at a reasonable estimate may be put at Re. 1 per 42 lbs. of grain and Re. 1 per 240 lbs. of straw for fodder. According to this estimate the outturn of the country barley this year was worth Rs. 34-3-0 an acre, giving a net profit of Rs. 10-6-0. The average net profit, however, on this plot for the previous three years was Rs. [illegible]. The net profit this year of Nos. 28A and 28C was Rs. 19-13-0 and Rs. 20-0-0, and the net profit for the previous three years was Rs. 10-13-0 and Rs. 14-7-0 respectively.

Area of each plot is 700 square yards.

RABI STATEMENT No. XII.—This statement shows the effect of gypsum on two principal leguminous crops of the rabi, viz., gram and peas. It will be seen from the statement that the effect of gypsum [illegible] on grain.

RABI STATEMENT No. XII.—[illegible]

Number of plot per farm map.	Crop.	Manure applied per acre.	Value of manure applied per acre.	Produce per acre.		Increase or decrease due to gypsum.	
				Grain.	Straw.	In grain.	In straw.
			Rs. a. p.	lbs.	lbs.	lbs.	lbs.
27A	Gram ...	Farmyard manure, 100 mds.	3 0 0	1,213	2,508	...	...
27B	Do. ...	Ditto, 50 mds., and gypsum 4 mds.	8 8 0	1,742	2,315	—127	—257
27C	Peas ...	Farmyard manure, 100 mds.	3 0 0	333	828	...	...
27D	Do. ...	Ditto, 50 mds., and gypsum 4 mds.	8 8 0	540	1,440	—127	—[illegible]

NOTE.—The cost of cultivation may be taken at Rs. 20 per acre, including rent, seed, and labour, &c., [illegible] value of produce at a reasonable estimate may be put at Re. 1 per 41 lbs. of grain and Re. 1 per 328 lbs. of straw for fodder. According to this estimate the outturn of the plot [illegible] manure, i.e., No. 27A (gram) and No. 27C (peas) this year was Rs. 33-3-0 and Rs. 10-0-0, giving a net profit of Rs. 13-3-0 and a loss of Rs. 13-10-0 respectively. [illegible] this year of Nos. 27B and 27D was Rs. 20-13-0 and a loss of Rs. 11 respectively.

Area of each plot is 450 square yards.

RABI STATEMENT No. XIII.—*Experiment with potatoes.*—This statement shows the effect [illegible] to potatoes.

This experiment has been carried on for the last four years. A pretty big field was divided into five equal parts, each of which was treated with a particular manure. The crop suffered much from blight and no conclusion can be drawn from the results of this year.

RABI STATEMENT No. XIII.—*Experiment with potatoes.*

Number of plot per farm map.	Manure applied.	Value of manure per acre.	Produce per acre.		Increase or decrease per acre over the plot sown after country fashion.	
			Average for previous three years.	This year.	Average for previous three years.	This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.
203A	Poudrette, 200 mds., and sulphate of iron, 27 seers.	20 15 0	5,924	13,479	+2,169	+947
203B	Woollen refuse, 200 mds., and gypsum, 4 mds.	13 0 0	5,502	13,757	+1,747	—775
203C	Poudrette, 200 mds., and kainit, 2½ mds.	21 7 0	6,496	14,868	—152	+354
203D	Castor oil cake, 10 mds., and gypsum 4 mds.	17 0 0	7,614	17,042	+959	+3,119
203E	Sown after country fashion ...	—	5,652	14,532	...	...

NOTE.—The cost of cultivation after the country fashion may be taken at Rs. 82 per acre, including rent, seed, labour, &c., and manure valued at Rs. 19-0-0. The value of produce at a reasonable estimate may be put at Re. 1 per 200 lbs. of potato. According to this estimate the outturn of the plot sown after country fashion this year was worth Rs. 145-2-0 an acre, giving a profit of Rs. 63-2-0. The average loss, however, on this plot for the previous three years was Rs. 13-7-0. The profit this year of Nos. 203D and 203A was Rs. 84-7-0 and Rs. 71-13-0, and loss for the [illegible] years was Rs. 4-14-0 and Rs. 0-4-0 respectively.

Miscellaneous experiments.—Under this head may be noticed the results of certain varieties of wheat, barley and oats obtained from Canada and of wheat from Messrs. Carter and Co.

The season under report was one decidedly [illegible] for the foreign varieties, which felt its severity even more than the indigenous varieties. They were sown in a [illegible] field, and every [illegible] care was taken in their culture, but with no effect.

The growth of [illegible] wheats received from Canada was very slow. All of them flowered more or less [illegible] No. I [illegible] hardest and matured [illegible]. No. II had strong and vigorous plants, but almost all of them were [illegible] by frost. No. III [illegible] well, but the plants in their growth were [illegible] by frost. No. IV [illegible] as badly as No. II. Nos. V and VI [illegible] flowered and came up to maturity a fortnight after No. I.

The [illegible] proved the same with the barleys. At the beginning they looked heavy crops, but all of them suffered much from frost. The grains which they yielded [illegible] than, and hence the proportion of grain to straw was very low. The [illegible] did not fare any better than the barley and wheat. The bulk of all the varieties looked wonderfully good and stout. They will [illegible] be tried next year.

Carter's [illegible] wheat [illegible] from Messrs. Carter and Co. arrived [illegible] late, but it was sown with very possible care on the farm and distributed to a few enterprising zamindars. The result was as indifferent as that of other English varieties [illegible] of wheat [illegible] with [illegible]. The small amount of grain which [illegible] secured will be tried next year, but it is very thin and light [illegible]:—

Statement of outturn of [illegible] grain.

Name of crop.	[illegible]	Area of [illegible]	Outturn of [illegible] pounds. Weight of grain.	[illegible]	Weight of straw.	[illegible]	[illegible]
(a) Canadian wheats—							
(1) [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(2) Red fern [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(3) [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(4) White Fife	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(5) Red Fife	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(6) [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(b) Canadian barley—							
(1) [illegible], six rowed	[illegible]	200 square yards	[illegible]	[illegible]	117	[illegible]	[illegible]
(2) Danish Chevalier, two rowed	[illegible]	250 do.	[illegible]	[illegible]	48	242	[illegible]
(3) Beardless, two rowed	[illegible]	200 do.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(4) [illegible]	[illegible]	400 do.	[illegible]	[illegible]	[illegible]	1,452	[illegible]
(c) Canadian oats—							
(1) [illegible] Chester	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(2) Canadian [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(3) [illegible] Prize	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(4) Welcome	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(5) Brown	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(6) White Egyptian	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

APPENDIX A.

Note containing results of experiments [illegible] *farm, for the year* 1890-91 [illegible]

Rotation Experiments.—The experimental [illegible] into 16 plots [illegible] acre. The soil [illegible] poor light loam. In 1885-86 it had a crop of [illegible] and was [illegible] 1882. Thus in 1887-88, when the present experiment commenced, all the plots [illegible] to have been equal [illegible] natural fertility was concerned.

The object of the experiment is to ascertain the most economical way of raising [illegible] by [illegible] it with various crops [illegible] application of manure.

For wheat all the plots were ploughed six times [illegible] with [illegible] at the rate of [illegible] per acre, and watered three times. None of the plots [illegible] manure was applied for wheat.

[illegible] following [illegible] in the past four years. The character of the season [illegible] so greatly in different years that [illegible] at present no safe conclusion can be drawn from [illegible]. But it may be noticed [illegible] the plot, or ten maunds [illegible] which is a very poor [illegible] of poor quality.

The experiment will be repeated [illegible] rest and [illegible] manuring each plot with [illegible] manure at the rate of [illegible] to the acre.

Number of plot.	Length of term of rotation.	First year. Crop.	First year. Outturn.	Second year. Crop.	Second year. Outturn.	Third year. Crop.	Third year. Outturn.	Fourth year. Crop.	Fourth year. Outturn.	The value of outturn of each plot in four years [illegible]	Total cost [illegible] in four years including [illegible] water rate.	Net profit per acre.
1	2	3	3	4	6	7	8	9	10	11	12	13
			Mds. s.		Mds. s.		Mds. s.		Mds. s.	Rs. a.	Rs. a.	Rs. a.
A—1	Annual.	Wheat	0 38	Wheat	0 35	Wheat	0 30	Wheat	0 26	11 0	10 0	3 7
		Urd	0 20	Urd	0 18	Urd	0 15	Urd	0 13			
A—2		Wheat	0 27	Wheat	0 30	Wheat	0 20	Wheat	0 19	14 10	13 0	4 1
		Hemp	0 26	Hemp	0 22	Hemp	0 20	Hemp	0 17			
A—3		Wheat	0 25	Wheat	0 29	Wheat	0 23	Wheat	0 17	14 8	12 12	4 6
		Indigo	12 20	Indigo	9 35	Indigo	11 0	Indigo	10 6			
A—4		Wheat	0 25	Wheat	0 27	Wheat	0 28	Wheat	0 20	18 9	18 10	12 5
		Cotton	0 8½	Hemp	0 23	Cotton	0 10	Hemp	0 10			
B—1	Biennial.			Wheat	0 30	—		Wheat	0 33	10 12	9 4	3 13
		Do.	0 8½	Urd	0 18	Cotton	0 10½	Urd	[illegible]			
B—2				Wheat	0 33	—		Wheat	[illegible]	9 0	9 0	0 13 (loss)
B—3		Maize†	1 3	Indigo	15 0	Maize	1 20	Indigo	13 0	27 8	15 8	29 3
		Potatoes	3 20	Wheat	1 2	Potatoes	4 10	Wheat	1 13			
B—4		Clover	0 1½	Do.	1 0	Clover	0 4	Do.	1 3	16 0	10 0	15 4
C—1	Triennial.	Cotton	0 8	Hemp	0 27	Indigo	12 0	—	—	*11 4	*7 7	12 11
				Barley	1 5	Wheat	0 35	—	—			
C—2		Do. †	0 14	Sugarcane	Sold standing for Rs. 4.	Do.	1 14	—	—	*10 0	*9 5	2 11
C—3		Maize†	1 11	Sugarcane	Ditto.	Indigo	17 0	—	—	*17 0	*12 7	[illegible]
		Potatoes	3 10	—		Wheat	1 3	—	—			
C—4		[illegible]	5 20	Maize	1 3	Do.	0 38	—	—	*12 13	*7 13	17 1
				Peas	0 27	—		—	—			
D—1	Quadrennial.	Cotton	0 8½	Maize	0 24	Jowar	0 20	Hemp	0 12	10 6	9 5	2 10
				Gram	[illegible]	Peas	0 12	Wheat	0 35			
D—2		Carrots†	8 10	Hemp	0 35	—	0 9	Indigo	13 0	13 4	9 15	13 4
				Barley	1 13	—		Wheat	1 5			
D—3		Maize†	0 38	Sugarcane	Sold standing for Rs. 4.	Bajra	0 24	Hemp	0 19	16 9	14 9	5 0
D—4		Potatoes	3 13	—		Peas	0 18	Wheat	0 35	14 12	9 14	[illegible]
		Turnips	3 10	Barley	1 7	Clover	0 4½	Do.	1 1			

* Figures for three years only. † Manured with [illegible] at 200 maunds per acre.

The figures of outturn given against wheat, urd and other grain crops represent the weight of grain. The outturn of straw of each plot was not weighed separately. For column 11, which includes value of straw, its weight has been taken at the following proportion to the weight of grain:—

	Straw.	Grain.
Wheat ...	2	1
Barley ...	1½	1
Urd ...	4	1
Peas ...	2	1
Gram ...	1½	1

The produce of cotton was not cleaned. It was sold as *kapás*, and the figures given in this table represent the weight of *kapás*.

2. *Farmyard mannrt \mm <ttku,*~Thii experiment wu condocUxl in 12 plotf, each nipantiriinj one-tenth of an acre. TV toil of tlw*e ploU u similar to, and their is hiitory up to lSSB-SJ tin) MUM U that of tin* ti.-;.| in wliwli tbo station . wu conducted. In l^s-7-S3 they liad a crop of barley, and aun< , n-MMit experiment. •

TV lbi*i'»jn-rirnptit U (1) to awertain the low in msnnrbl value of farm-yard ma mm- occatwioed)>y b i ruing, and the >wt.'iit I it can bo made up by ut addition of certain nitrogenous mineral manures, such, for instance, as saltpetre; (2) to see whether a cultivator is justified in burning his manure and using the ashes, or whether iic w.mU da tielter tu apply it unl>urut and raise *lalit* or *dkik* tree on a per* >f bu bolding for fuel.

All the plot* *$*e&* aix limr , *""» ultli .\[u»f* famagnr wb«t *tty* . 1 j nwnaj, j>« acre, and wu uooia ' Item wu WIT.;

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4. *Value of gypsum to leguminous crops.*—This experiment was tried on indigo. To conduct this experiment on a large *scale* and at the same time to minimize the effect of an uneven distribution of the natural fertility in different parts of the field, a uniform piece of land measuring 3,600 square yards was taken, and when quite ready for sowing it was portioned out in 36 beds each measuring 100 square yards. In 18 of these beds gypsum was applied at the rate of 3, 6, and 12 maunds to the acre; the other 18 beds were kept unmanured. The beds were so arranged that for every manured bed there was an adjoining unmanured bed for comparison. Gypsum was applied at the time of sowing the seed, seed and gypsum being both mixed up with the soil by a hand hoe. The following table shows the produce of each bed :—

	Outturn of beds in which gypsum was applied at the rate of 3 maunds per acre, and the outturn of the adjoining unmanured beds.				Outturn of beds in which gypsum was applied at the rate of 6 maunds per acre, and the outturn of the adjoining unmanured beds.				Outturn of beds in which gypsum was applied at the rate of 12 maunds per acre, and the outturn of the adjoining unmanured beds.			
	Manured.		Unmanured.		Manured.		Unmanured.		Manured.		Unmanured.	
	No. of bed.	Outturn.	No. of bed.	Outturn.	No. of bed.	Outturn.	No. of bed.	Outturn.	No. of bed.	Outturn.	No. of bed.	Outturn.
		Md. s.		Md. s.		Md. s.		Md. s.		Md. s.		Md. s.
	1	1 10	2	[illegible]	13	4 [illegible]	14	4 [illegible]	[illegible]	[illegible]	[illegible]	1 37
	3	[illegible] 31	4	[illegible]	[illegible]	4 [illegible]	[illegible]	4 [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	5	[illegible]	[illegible]	1 [illegible]	[illegible]	4 [illegible]	[illegible]	4 10	[illegible]	[illegible] 19	[illegible]	[illegible]
	7	[illegible]	[illegible]	[illegible]	[illegible]	4 [illegible]	[illegible]	4 31	[illegible]	[illegible]	[illegible]	[illegible]
	9	[illegible]	[illegible]	1 [illegible]	21	4 [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	11	[illegible]	12	[illegible] 11	23	4 [illegible]	24	4 31	[illegible]	[illegible]	30	[illegible]
Average outturn of manured and unmanured beds	...	[illegible]	...	1 0	...	[illegible]	...	4 [illegible]	...	1 [illegible]	...	[illegible]
Increase in outturn due to gypsum	...	[illegible]	...	...	...	0 [illegible]	...	...	...	0 14	...	...
		Rs. a. p.				Rs. a. p.				Rs. a. p.		
Value of increased outturn per acre	...	[illegible]	...	...	...	3 1 7	...	...	...	[illegible]	...	...
Cost of gypsum* per acre	...	...	1 1 [illegible]	...	...	...	[illegible] 1 0	...	...	...	4 [illegible] 0	...	...

* A consignment of [illegible] maunds of gypsum [illegible] Forests, Central Circle, cost Rs. [illegible] [illegible]

It will thus be seen that although gypsum has more or less beneficial effect on indigo and has increased the produce in every bed, yet the value of increased outturn does not cover the cost of gypsum unless it could be had in the plains at a cost of not more than 8 annas a maund and be applied sparingly at the rate of not more than three maunds an acre.

5. *Mixtures.*—The following mixtures of cotton and juar were tried during the past year ;—

I.—1. Cotton and arhar.

2. Do. castor.

3. Do. tilli.

4. Do. urd.

5. Cotton, arhar and tilli.

6. Do. do. [illegible]

7. Do. do. urd, tilli, castor, juar and arhar.

II.—1. Juar and arhar.

2. Do. arhar and til.

3. Do. do. do. lobia.

Each of these was sown in a plot measuring one-fourth of an acre, and there was one plot for pure cotton and another for pure jute in each series. Each plot in its respective series received the same treatment. The land on which these plots are made is poor outlying land, rented at Rs. 3 an acre. I am not aware of any manure being applied to this land for many years past, and it grows only rain crops. The object of this experiment was to determine the utility of sowing mixed crops, and to measure the quantity by which the outturn of the principal crop is diminished. The following table shows the outturn and the financial result of each plot:—

Number of plot.	Crop.	Outturn per acre. Grain.	Outturn per acre. Stalk.	Value of outturn per acre.	Cost (including rent) per acre.	Net profit per acre.
	Cotton Series.	Mds. s.	Mds. s.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1	Cotton	4 5	—	20 10 0	13 6 0	7 4 0
2	Cotton	2 10	—	21 2 9	13 7 6	7 11 3
	and Arhar	1 18	4 26			
3	Cotton	2 34	—	17 10 6	13 7 0	4 3 6
	and Castor seed	0 34	—			
4	Cotton	3 33	—	21 10 0	13 6 6	8 3 6
	and Til	0 18	—			
5	Cotton	3 34	—	23 14 6	13 7 0	10 7 6
	and Urd	1 3	4 30			
6	Cotton	3 4	—	18 13 0	13 8 0	5 5 0
	Arhar	1 9	2 13			
	and Til	0 3	—			
7	Cotton	3 11	—	21 4 0	13 8 6	7 11 6
	Arhar	1 4	4 3			
	and Urd	0 24	2 1			
8	Cotton	3 4	—	25 3 0	13 10 6	11 8 6
	Arhar	1 12	2 27			
	Urd	0 22	1 13			
	Castor	0 16	—			
	Jute	0 20	4 5			
	and San	0 16	—			
	Jute Series.					
1	Jute	7 6	48 0	24 8 0	12 7 3	12 0 9
2	Jute	5 20	34 0	24 0 0	12 10 0	11 6 6
	and Arhar	2 0	5 26			
3	Jute	6 12	30 0	27 6 0	12 11 0	14 11 0
	Til	0 15	—			
	and Arhar	1 30	5 8			
4	Jute	5 3	30 0	26 1 9	12 11 0	13 6 9
	Arhar	1 32	6 0			
	and Lobia	0 30	3 30			

Wheat.—4.—The following varieties of Canadian wheat were tried last year:—

1. Red Fife.
2. Red Fern.
3. White Fife.
4. Saxonka.
5. Judket.
6. Ladoga.

Only a few ounces of the seed of each variety were received. All the varieties were sown in a richly manured field in beds measuring one-ninetieth of an acre. Close to them on beds of an equal size were sown three Indian varieties for comparison. In each case the seed was dibbled by hand. The Canadian varieties matured a long time after the Indian varieties, and had to be watered from five to eight times, according to the time they took in maturing: the Indian varieties were watered only three times. All of them suffered much from the hot winds, which shrivelled up the grain when it was 'irroiDg;, The following ubl* show* the outturn of eaoli nrietjr. The produce Imi *beeu* carefully kvj.i imLodded in • W uf 4i(«*u for irial m tltu next ji-ar.

Variety of wheat.	Outturn per acre. Grain.		Straw.		Remarks.
	Mds.	s.	Mds.	s.	
Imported.					
Red Fife	5	30	24	0	
Red Fern	3	4	2[illegible]	0	
White Fife	2	10	17	0	
Saponka	8	28	26	20	
Jolbet	7	20	47	20	
Ladoga	7	12	46	20	
Indigenous.					
Muzaffarnagar	18	11	28	0	
Mundia	18	0	23	0	
Buzar	18	0	29	0	

L. P. BARMAN,

Persl. Asst. to Director, Land Records and Agriculture.

APPENDIX B.

tnlt oftfptrimeutt to atirtai tit pM ,./ trtip, in tkf* a«>J**eT*W *eftheferm.*

Thete esperimciiti tutve tins year been lUrkil to ascertain the yield of crop grown in the anghbourbood of the Government farm by ordinary cttltmttin following the ordinary OKOWKU of native buthaadry. They were carried not (>y the farm oixrxer. Syed Ali Hofaain.

1. *$*nu* [illegible] the TiHae* of Kakwleo two field* ww «U [illegible] '••*'" [illegible] WM on *)**k*»,* Uh , [illegible] ,' 1.1 TUakur *\'sx*i* Sinsjh. a cultivator, and «itiul«il al»ut half a furl'in [illegible] •• and paying a m» [illegible] •'" *m:* tliu other wa* in *mjgji,* J^ | [illegible] ,l,tt# Q^to LiJb, »o»e tw<> furLogx from hi* bottw aod rented at it«. fr-9-0 tbe bf|iha.

The owner* agrml to the npnriiaent* on the cowlltMa* ttiat the wh- [illegible] ni<-!ii wm 'lone on tbe tpot and at the tann'c espetup, anJ Uiat the outturn of * * • •bouU be rnulp orer to them.

Two Nahan sugar mill* of two n l l m an I on** Beh«m erapontinff shallow p»» wen» tent to tbe village by the farm, and five Luwa* of cmne in «wh fwld wa» carefully meawnxl off and cut daily as nu.utmj [illegible] Tb* «atw in both field* **• of the " matna " variety aad was uwn in the MM montb. Too , [illegible] each field, as gathered from the «iliiv»t'»r», is (riven below. TV Cawnpore Mgb» [illegible] i 2,450 etuare yards. TIw ««.« / N the railway nuund of [illegible]

The outturn of [illegible] ._

Field.	Total weight of 5 biswas cane. Mds.	Srs.	Total weight of juice extracted. Mds.	Srs.	Total weight of *gúr* made. Mds.	Srs. ch.	Produce per acre in pounds. Cane.	Juice.	Gúr.
Plot No. 1 [illegible]	35	13½	13	21½	3	9 7	[illegible]	[illegible]	[illegible]
Km i f w [illegible]	37	30	25	—	4	13 14	[illegible]	[illegible]	[illegible]

Thua the lew highly i [illegible] that |fet [illegible] -r aveng [illegible] , *n\fm.* [illegible] irrown front the stock, of tbe , [illegible] -a than th». t t o uutiuru of tlu» tlt-M was aa follow*:—

Cane.	Juice.	Gúr.
lbs.	lbs.	lbs.
n	»*	t. MM

TfemhtaUrrfp] [illegible] hajlnpr--. [illegible] rear* *>H his mi [illegible] eo pfa«Md with tJ, [illegible] htmi a mill and an [illegible] *jot* tromtb* Cam to work efi the r. [illegible]

t. Aal* *r/#ri»e*._SotB» MJaoTr [illegible] f ._. ^ a * L . fi____.—« aehieW. [illegible] bitwa of ea, I, ft-U . , . n a ^ a n d and marko 1 r»ttt UaallWM J|aJ rill- [illegible] •> tbeaw were m m i d to it., fa [illegible] _..,.UJ aft* [illegible]

rieM,	Crop.	Weight of unthrashed sheaves.	Outturn of each plot in pounds. Grain.	Straw.	Outturn per acre in pounds. Una.	=—
		Bm	ft*.	IW.	IW.	ft*-
IW 1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Do. 1	MM *	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Do. >	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Do. 4	[illegible]	[illegible]	[illegible]	MM	[illegible]	[illegible]
Do. 1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The produce of plot No. I was thrashed by bullocks after country fashion, while that of No. II with Mayfur the' Ilan LThnabar. It is noticeable that in the former case the weight of jjr»iu mi I etr:i w together was equal to that of theavc* thruhcd, whilo in the latter ca« it wat proved to bo somowhat lea*. This it probably owing to the fact that in thrashing by bullocks M tln^t from the ground 1 i» mixed with the llt'ia, while in that Uirafhcd witli marliino tainnte particles of straw .• wcl] ai diut arc Uown out.

In soiccting fields for this experiment endeavour wa* made to illustrate thi following caaet ;—

(1) Good toil with a good cultivator of fair meant and oircamitaneet.

(2) Good toil with an indifferent cultivator of poor meant and tirounntanj es.

(3) Common toil with a good cultivator el poor meana and circumstances.

(4) < omtnon toil with ordinary cultivator*.

Plot No. I it hold by * man of fair mean*. I[v- hi* seven relatives, who taatt him in the work. Hit fluid wat injured to wmc c. tent by high winds and frost, but th« Lett portion uf it wat M ected in T J « to g«t an idu of high rarrainjr ia thii load ity. T «Kl«clcd pdrtian give the high yield of -C nuun U ut 33 leishels the acre ; but ^10 average for the wliole (ie!. would not exceed i lit or SO maand*. Tliti WM U JTHKI a field at could bo found near the farm, The Instant jkld gn Uie ftu-tn WM 45 btuhela tie acre thit y< ar.

Plot No. II it of good wi),W tho cultivator it iall£,• rout, n;r hat heinffintest means. The outturn wat only S mauodt to the auro.

Hot No. Ill it IHd by a very hard working woman, bat the u alta^iur at th* meruy of her mabijaa aad oaonot g*t alvanoa* when tiu utiit tlu.n. Xi» outturn via 13 matinda the tan.

PloU No. IV and No. V an held by average: cultivator! in poor circumstances. Th* fwrm-r gaT« 13 rnaundt and the btWr 16| mauud* ihc acre.

It ia a fact worth noticing that, owin;r to the aoiraity of f >M»r even th« welUlo* do cultivator* cannot keep a aufflcieat number of cattle tettttirfarmi. T.i.u^i tin cultivation of fair moani oan afford money for the punghsM of muan, yet m i nt of carla and of farm roadf eUni in their wiy. Their crop* alt) tuff* very much from intufBcient irrigation. If Uw» a«aton i* fawurable, they mak.. » »aull pro6t \ otherwise ttwy are cxlrvmcly badly off.

Regarding UM ditp^aal uf th* crop by UtM* cultivator* the following I urJUlioo wa« collected ;—

The huW^r of plot No. I, wso u not in hit mthajan'* ; power, has thi* year tM hit whuat (tmng • of better i<t»lity) t« hit nuhajan at li. seers per tap* »ni hi, kept iy*'J and birr* for bit own UM.

Th9holdanofploUNo.II and Ul. M ng in debt to their mahajan, hm mtlj •»er nwHt of the proioc* to him, lowpuv • VvO" llOili quantity for their own use. The mahajan i yava lUrni cfwdtl for Uwir wlitat at tlw ntto of IT Man t!i# rjps*, tb« market rate bving lot Men.

The petty cultivators who are eith*f p«f««twn»t nxht or Unmrtn, moilly caltivate at an a«r*r*g<« a Ltgba of laud fov tltar own uae and aeldom M ll their produce. Xh« holders of plots IV a ;il V an cultiv*V>f» uf thu kind. [%•/ bava kept ih eir produce.

No. [illegible]

DEPT. OF LAND RECORDS AND AGRI., N.-W. P. AND OUDH.

Dated Cawnpore, the 10th September 1892.

From

J. O. MILLER, Esq.,

Director of Land Records and Agri., N.-W. P. and Oudh,

To

The Chief Secretary to Government,

N.-W. P. and Oudh.

Sir,

I have the honor to submit the Report on the Government Experimental Farm at Cawnpore for the year ending 30th June last.

2. The Farm is under the immediate supervision of the Assistant Director, and the programme of operations for the last year was drawn up by Mr. Mohammad Husain, who was in charge at the beginning of the season. On his deputation to Hyderabad the control [illegible] into the hands of Saiyad Mahammad Hadi, who retained it till April, when ill-health obliged him to go on leave. The report has, therefore, been drawn up by Babu Lachman Prasad, the Officiating Assistant Director, who, though he was not in actual charge during any part of the year in which agricultural operations were in progress, is well acquainted with the methods followed and with the results of the experiments, and is thoroughly qualified to report on them.

3. Tables have been added to the report to show the results of experiments conducted during the last ten years, and from them a better idea can be obtained of the values of the various manures that have been tried and of different methods of treatment and varieties of seed than is possible on a consideration merely of the trials of a single season. It would appear from them that chemical manures, and the more expensive manures generally, have not a very marked effect in increasing the outturn than the ordinary farmyard manures within the reach of the native agriculturist, and when the cost is taken into consideration the profits of the former are not unfrequently reduced to a minus quantity. The refuse of the woollen mill has been found to be a very valuable fertilizer, and next to that there is nothing better for ordinary crops than mixed farmyard manure. Recently some difference of opinion has arisen amongst the best authorities on the subject as to the loss of manurial elements caused by the native practice of using cow-dung as fuel, but the experience of the Farm is in favour of the view that the ashes have little value. The Assistant Director recommends the [illegible] to be tried, and he informs me that the value of saltpetre earths for manurial purposes is fully recognised by the native agriculturist. The sowing of wheat after indigo appears to be financially a most successful rotation of crops, and [illegible] with [illegible] has given excellent results in the last season, though it has not always proved so satisfactory.

4. That improved ploughs give better results than the native plough is now an established fact at the Farm; and the use of deep ploughs, where effective supervision is possible, as at the Stud Farm at Babugarh and the Botanical Gardens, Saharanpur, confirms the experience gained here. At the same time the use of the improved ploughs is [illegible] slowly. Cultivators in the neighbourhood of the Farm are glad to hire [illegible], and landlords [illegible] buy them [illegible] though

passive resistance to their introduction is offered by the native ploughman, who does not appreciate the [illegible] of [illegible].

5. Experiments with imported varieties of wheat have been satisfactory, one of the few exceptions being [illegible], which has given uniformly good outturns. [illegible] much [illegible] than the [illegible]. There is now a good demand for [illegible], to meet which a large quantity must be grown in future.

6. An Arab stallion was sent to the Farm in May 1891, but it has [illegible] as yet proved very successful. The system [illegible] of breaking the [illegible] into agricultural work has been adopted, and the health of the animal has much improved since he has been regularly used in the plough. No particular difficulty was [illegible] in training the horse to plough; but the pace at which he works makes the ploughman's task harder than in ordinary circumstances.

7. The Farm is in good order, and the [illegible] work of [illegible] and implements has recently been [illegible] so as to allow of more [illegible] by [illegible].

I have the honour to be,

Sir,

Your most obedient Servant,

J. O. [illegible],

Director.

REPORT

ON THE

CAWNPORE AGRICULTURAL EXPERIMENT STATION

FOR THE YEAR 1891-92.

Rainfall.—There was a good shower on the 25th of May 1891, but the regular rains did not commence till the [illegible] of July. From that date to the middle of August the showers were light and irregular. Subsequently they were exceptionally heavy and continuous till the end of September. From October to January there was hardly any rain. In February there were a few light showers. The following table shows the actual and normal rainfall and number of rainy days in each month from May to April :—

Month	Rainfall, In 1891-92.	Rainfall, Normal.	No. of rainy days, In 1891-92.	No. of rainy days, Normal.
May	·60	·12	1	1
June	·18	3·11	1	4
July	4·75	10·25	9	12
August	24·92	10·06	18	12
September	13·23	4·33	14	7
October	·05	1·22	1	2
November	—	—	—	—
December	—	·34	—	1
January	·22	·54	1	1
February	·90	·28	4	1
March	—	·25	—	1
April	...	·11	—	1

General character of the season.—The shower of May assisted the early ploughing operations, but the delay in the setting in of the regular rains greatly delayed the sowing of maize and cotton, with which most of the [illegible] in the [illegible] season are cultivated. The light rains of July proved very beneficial for weeding and ploughing the land for rabi crops, but the heavy rains of August and September did considerable damage to the standing crops. The average yield of maize and cotton was in consequence poor, on manured land the outturn was only 933 and 721 lbs. per acre respectively, as compared with 1,171 and 117 lbs. in the previous year.

The [illegible] of the winter rains was not much felt, as the land being protected by irrigation from the canal, a distributary of which runs past the Station. The supply of water was regular and sufficient. The showers of February, in the case of many fields, [illegible] one watering, which would otherwise have been given. There were some particularly cloudy days, and the crops did not suffer from rust, except in a few fields in low situations to the [illegible]. Up to the end of February the spring crop promised to be a remarkably good one, but in March high and hot winds set in unusually early and shrivelled up the grain. The result was a considerable falling-off both in the average and in the maximum outturn of the rabi crop as compared with other years. The following figures show the average and the maximum yield of wheat, per acre, in 1891-92 and the preceding two years :—

Year.	Average yield of wheat per acre.	Maximum yield of wheat per acre.
	lbs.	lbs.
1891-92	1,133	2,080
1890-91	1,800	2,004
1889-90	1,420	2,888

3. **Experiments.**—The experiments conducted during 1891-92 were directed to show the effects of—

(a) Different kinds of manure.
(b) Deep and shallow ploughing.
(c) Early and late sowing.
(d) Different methods of sowing.
(e) Restricting the growth of plants when running to leaf.
(f) Taking a second crop from the same land in the same year.
(g) Varieties of imported and indigenous crops.
(h) Cultivation of mixed crops.
(i) Rust, how to prevent it.

4. Experiments with manures.—The following experiments were made with manures:—
(1) To determine the effect of nitrogenous manures applied singly and combined with non-nitrogenous fertilizers on maize and wheat.
(2) To determine the effect of green manuring.
(3) To ascertain the comparative value of certain animal manures and of saltpetre on maize.
(4) To determine the effect [illegible] on leguminous [illegible]
(5) To determine the effect of certain miscellaneous manures on cotton, wheat and potatoes.

5. Manure experiment No. I.—This experiment was commenced in 1879-80; its original object was to ascertain the effect of nitrogenous and non-nitrogenous manures [illegible] in four years (1879-83) [illegible] non-nitrogenous [illegible] themselves; and in 1883 [illegible] manure was added to the plots, which had hitherto been treated with non-nitrogenous manures only, and the experiment assumed its present form, which may be regarded as an attempt to determine the effect of nitrogenous manures only, as compared with the same manures reinforced with a non-nitrogenous fertilizer.

6. **Treatment.**—The experiment is conducted in four series. Each series consists of thirteen plots of 400 square yards each. For every plot in one series there is a corresponding plot treated with like manure in the other three series.

Plots in series No. I are cropped every year with maize.
Ditto No. III ditto ditto wheat.
Ditto Nos. II and IV are cropped alternately with maize and wheat.

Thus in series I the plots bear a maize crop after a fallow of nine months; those in series No. III bear a wheat crop after a fallow of six months; while in series II and IV maize follows wheat after a fallow of three months, and wheat follows maize after a fallow of rather more than a year.

All the plots [illegible] waterings, and [illegible] tions for every [illegible] in the [illegible] time. The maize grown on these plots is of the variety [illegible] local variety, but comes to maturity [illegible] Cawnpore variety. The wheat is the soft white wheat of Muzaffarnagar. The plots in the several series received the following treatment during the year under report:—

No. of series.	Manure.	Ploughing.	Weeding.	Watering.	Seed and rate per acre.
I II III IV	[illegible]	[illegible]	2 2 2 2	Nil. Nil. [illegible] [illegible]	[illegible] Ditto. [illegible] Ditto.

7. **Outturn.**—The following table shows the outturn of maize and wheat of every plot during the present year, and the average outturn of each plot from 1881-82 to 1890-91:—

No. of plot.	Manure and rate per acre.	Grain or straw.	Outturn of maize per acre. 1891-92. Series I.	Series II.	Average of 1881-82 to 1890-91. Series I.	Series II.	Outturn of wheat per acre. 1891-92. Series III.	Series IV.	Average of 1881-82 to 1890-91. Series III.	Series IV.
1	2	3	4	5	6	7	8	9	10	11
			lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
	Nitrogenous manures.									
1	Saltpetre 140 lbs.	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible] 132 lbs.	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	Sheep-dung [illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	Poudrette [illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Nitro-mineral manures.									
5	Saltpetre [illegible] and bone-dust [illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	Saltpetre [illegible] and bone-superphosphate [illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	Cow-dung [illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	Cow-dung [illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	Sheep-dung [illegible] and bone-dust [illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	Sheep-dung 132 cwts. and gypsum [illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	Ashes 133 [illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	No manure	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

8. **Maize.**—The [illegible] rains of August and September affected the different plots very unequally. The [illegible] are situated on a slope, those at the head [illegible] therefore in some cases [illegible] an advantage over those lying lower down, while others had their manures washed away. This explains why the plots treated with poudrette and saltpetre in series I [illegible] the outturn [illegible] the unmanured plot, and the plot treated with sheep-dung [illegible] total outturn of only 472 lbs. per acre, [illegible] treated with [illegible] alone [illegible] 1,812 lbs. to the acre. No safe conclusion can therefore be drawn from the maize [illegible] 1891.

9. **Wheat.**—In series III the plot treated with [illegible] gave the highest yield [illegible] year, while in series IV the plot [illegible] gypsum heads the list, [illegible] addition of bone dust to cow-dung and sheep-dung [illegible] to have little or no effect, in other words [illegible] sheep-dung appear to be perfect in themselves so far as [illegible] requirements of wheat crop are concerned [illegible] do not require to be supplemented [illegible] manurial ingredients contained in bone dust [illegible] application of [illegible] saltpetre is of [illegible] benefit, but the increase [illegible] yields is almost altogether absorbed by the extra cost of its application.

The application of [illegible] with [illegible] owing, but it seems with [illegible] to have a marked effect on wheat. [illegible] are probably due to [illegible] of this highly nitrogenous manure [illegible] to its [illegible] no doubt aware of the loss [illegible] to stand long [illegible] in the [illegible] and this explains their practice [illegible] fold sheep in fields [illegible] before the time of sowing. [illegible] this is not possible it would [illegible] of great benefit to spread a handful of gypsum over this manure [illegible] the [illegible]

Cow-dung [illegible] all [illegible] for wheat, and this year [illegible] the plot [illegible] proved inferior to [illegible] unmanured plot. The [illegible] of saltpetre [illegible] the nitrogenous elements lost in burning, and it would be a good thing if cultivators, when they add [illegible] to the [illegible] ashes, were to mix with them a manure, a small quantity of crude nitre.

10. The following table shows the increase in the outturn of maize and wheat obtained by an application of the manures, noted in the first column, during the present and in previous years.

Manure	Crop	Increase per acre over the outturn of the unmanured plot — Maize (average of series I and II) — 1891-92	Maize — Average [illegible]	Wheat (average of series III and IV) — 1891-92	Wheat — Average of 1881-91, vide appendix I, page 18
Saltpetre	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cow-dung	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Grain / Straw	[illegible]	[illegible]	[illegible]	[illegible]
Poudrette	Grain / Straw	[illegible]	[illegible]	[illegible]	[illegible]
Saltpetre and bone dust	Grain / Straw	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Saltpetre and ashes of cow-dung	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cow-dung and bone dust	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cow-dung and gypsum	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ashes of cow-dung	Grain / Straw	[illegible]	[illegible]	[illegible]	[illegible]

11. Value of produce.—The [illegible] value of the increase [illegible] of each manure is shown in the following table [illegible]

Manure	Cost of manure	[illegible] — Maize — In 1891-92	Maize — 1881-82 to 1890-91	Wheat — In 1891-92	Wheat — [illegible]	[illegible] — Maize — In 1891-92	Maize — [illegible]	Wheat — In 1891-92	Wheat — [illegible]
Saltpetre	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cow-dung	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Poudrette	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Saltpetre and bone dust	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Saltpetre and superphosphate	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Saltpetre and ashes of cow-dung	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cow-dung and bone dust	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cow-dung and gypsum	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sheep-dung and gypsum	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ashes of cow-dung	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] the following [illegible], which [illegible] in [illegible] at the harvest time in [illegible]:—

						Per rupee.
Maize grain	...	...	...	...	...	50 lbs.
Wheat grain	...	...	...	...	...	30 lbs.
Wheat straw	...	...	...	...	...	[illegible]

The [illegible] milk [illegible] thrown into [illegible] or [illegible] [illegible].

[illegible] column [illegible] what [illegible] wine the [illegible] Station. [illegible]

12. Manure experiment No. II.—This experiment has been conducted regularly [illegible] 1883-84. To compare its results, grain manuring with hemp and indigo [illegible] on in two fields in another part of the Station at some distance from these plots. The [illegible] wheat, at [illegible] to the acre. The plots were ploughed five times, weeded twice, and watered three times.

The [illegible] of the present year's crop and the average produce of previous years are shown in the following table:—

Series.	Serial number.	Manured per acre.	Outturn [illegible] Grain.	Outturn [illegible] Straw.	[illegible] Grain.	[illegible] Straw.	[illegible] 1891-92. Grain.	[illegible] 1891-92. Straw.	[illegible] Average. Grain.	[illegible] Average. Straw.
			lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
I	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	2	Green indigo ploughed in	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	5	[illegible] water [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	6	Wheat sown after [illegible] crop	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	*8	Green hemp ploughed in	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	9	Hemp water [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	*10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	11	No manure	[illegible]	[illegible]	[illegible]	[illegible]	...	...	...	...
II	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	2	[illegible] maunds alone.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	3	Old indigo refuse 120 maunds and lime 6 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	4	Old indigo refuse 120 maunds alone	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	5	No manure	[illegible]	[illegible]	[illegible]	[illegible]	...	...	...	...
III	1	Green hemp ploughed in	[illegible]	[illegible]	...	...	[illegible]	[illegible]	...	...
	2	Green hemp ploughed in and farmyard manure 50 maunds.	[illegible]	[illegible]	...	...	[illegible]	[illegible]	...	...
	3	Farmyard manure 200 maunds	[illegible]	[illegible]	...	...	[illegible]	[illegible]	...	...
	4	No manure	[illegible]	[illegible]	...	...	...	...	...	...

13. The plot treated with [illegible] and lime gave the largest yield. It is followed by the plot in which green [illegible] with gypsum. In the case of both indigo and hemp the plots which were treated with gypsum gave a better yield than the plots in which [illegible] were ploughed in without gypsum. This is another instance of gypsum absorbing the volatile compounds of nitrogen and [illegible] available for the succeeding wheat crop. The indigo and hemp water [illegible] steeping vat close to the Station from which water could be [illegible] floating in it have time to settle down. For the sake of experiment it is brought in earthen jars a long

* The plot No. 8 was added in 1884-85 and No. 10 in 1885-86; in comparing their previous outturn with the outturn of the unmanured plot the average of the latter has been taken for [illegible] and [illegible] respectively.

way to the Station, and in the state in which it is supplied it is little better than [illegible] pure water.

14. The following table shows the financial result of each plot in the period of the two fields in which this experiment is conducted; the average result of the past years' produce is also noted for comparison.

Field.	Serial.	Manure.	Cost of manure.	Value of outturn. 1891-92.	Value of outturn. Average 1884—91.	Net increase per acre over the unmanured plot. 1891-92.	Net increase per acre over the unmanured plot. Average 1884—91.
			Rs.	Rs.	Rs.	Rs.	Rs.
I	1	Green indigo ploughed in and gypsum.	9·73	29·70	28·57	[illegible]	9·52
	2	Green indigo ploughed in ...		26·14	20·06	19·89	12·81
	3	Fresh indigo refuse and lime ...	4·0	[illegible]		23·29	
	4	Old indigo refuse ...	3·5	[illegible]	10·71	29·61	10·71
	5	Indigo water ...		[illegible]	[illegible]	[illegible]	
	6	Wheat [illegible] ...		24·17	11·32	44·17*	[illegible]
	7	Green [illegible] gypsum.	[illegible]	[illegible]	9·74	19·73	4·74
	8	Green hemp ploughed in ...	2·0	[illegible]	8·90	9·82	
	9	Hemp water	2·0		[illegible]	—2·73	[illegible]
	10	Wheat sown after hemp has been taken	—	[illegible]	—1·01	13·07†	[illegible]
II	1	Fresh indigo refuse and lime ...	4·0	[illegible]	[illegible]	17·50	20·47
	2	Fresh indigo refuse alone ...		[illegible]	[illegible]	18·52	14·86
	3	Old indigo refuse and lime ...	4·7	17·06	24·97	[illegible]	20·17
	4	Old indigo refuse alone ...		14·40	20·55	[illegible]	17·06
III	1	Green hemp ploughed in ...	[illegible]	22·48	22·51	[illegible]	20·11
	2	Green hemp ploughed in and farmyard manure.	4·0	20·51	—	[illegible]	—
	3	Farmyard manure ...	7·8	[illegible]	—	7·76	—

Financially the plot of which the indigo crop was cut and sold for dye furnished the best result; while [illegible] a green crop of hemp appears to be the cheapest form in which land can be manured. It is perhaps the most suitable manure for [illegible] field, in which cow-dung and other [illegible] a very good return, especially [illegible] gypsum is [illegible] ploughed in.

15. Manure Experiment No. III.—This experiment was started in 1884. There are eight plots, each plot is annually manured with the manure noted in the following table and sown with maize. During the year under report all the plots were ploughed twice and [illegible] while [illegible] furrows behind the [illegible] cultivation of the crop.

16. The outturn of every plot during the present year and the average outturn during the past 7 years is shown in the following table. [illegible] heads the list, and [illegible] next [illegible] next; saltpetre in the case of maize does not give any great increase.

Serial number.	Manure.	Outturn in 1891-92. Grain.	Outturn in 1891-92. Stalk.	Average outturn from 1884 to 1891. Grain.	Average outturn from 1884 to 1891. Stalk.	Increase of grain per acre over the unmanured plot. 1891-92.	Increase of grain per acre over the unmanured plot. Average 1884 to 1891.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1	Woollen refuse 120 maunds and lime 12 maunds.	1,464	5,266	1,601	8,081	478	1,273
2	Sheep-dung 120 maunds ...	1,358	5,082	1,347	6,289	222	719
3	Cow-dung 120 maunds ...	1,358	5,064	1,322	5,735	222	404
4	Poudrette 120 maunds ...	1,095	5,040	1,406	6,220	[illegible]	672
5	Horse-dung 120 maunds ...	992	4,866	1,118	6,202	256	249
6	Pigs' droppings 120 maunds ...	1,254	4,573	[illegible]	6,306	[illegible]	478
7	Saltpetre 2 maunds ...	982	4,578	968	6,040	[illegible]	348
8	No manure ...	736	4,557	628	5,244	—	—

* Including Rs. 20, net amount realized by sale of indigo.
† Including Rs. 15, net amount realized by sale of hemp.

17. The financial result of each manure is shown in the following table:—

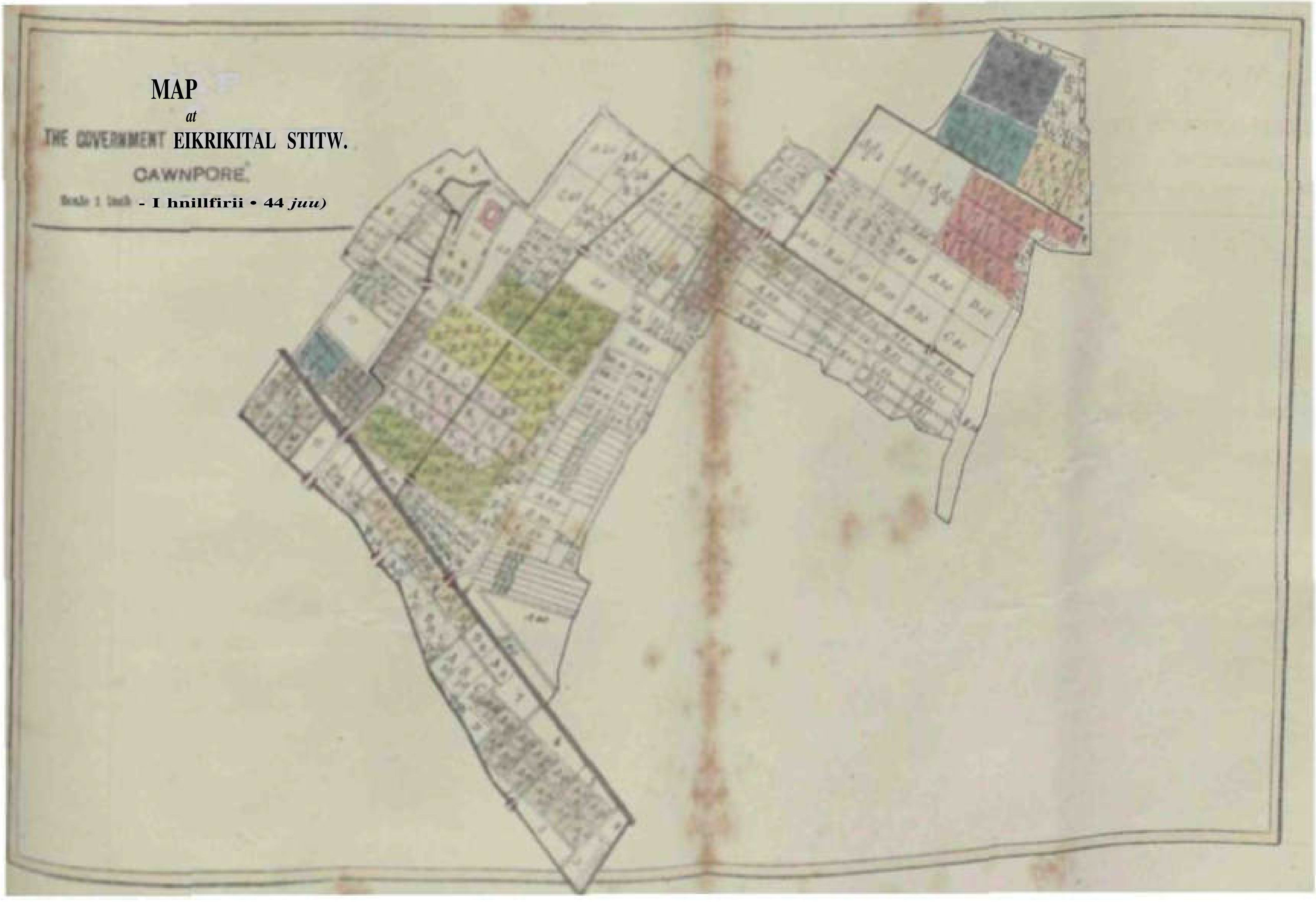
Manure.	Cost per acre.	Value of increased outturn. In 1901-02.	Value of increased outturn. Average 1898—01.	Net increase per acre over unmanured plot. In 1901-02.	Net increase per acre over unmanured plot. Average 1898—01.
	Rs.	Rs.	Rs.	Rs.	Rs.
Woollen rags, CiM and iln*	5·4	IS SO	»4H	814	[illegible]
Sheep dung ...	13	[illegible]	[illegible]	ta*	[illegible]
t-'flw -itunit	[illegible]	[illegible]	[illegible]	• 04	[illegible]
IWrtU*	[illegible]	[illegible]	17 W	11 IN	IE'U
Httm-4am ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1>. •totvltt|»	[illegible]	10 \e	[illegible]	[illegible]	[illegible]
KaUjeln-	0V	4 IE	[illegible]	- in	[illegible]

18. Manure Experiment No. IV.—To determine the effect of gypsum on leguminous crops it was applied as a manure to indigo and in combination with farmyard manure to gram and peas. The following statement shows the result of the present year's trial:—

Crop on which	Manure.	Outturn per acre in 1901-02.	Increase due to gypsum. In weight.	Increase due to gypsum. In value.
		Cwts.	Cwts.	
Indigo ...	Gypsum 240 lbs. ploughed in at the time of sowing.	PUnt.,, Iff		6-M
Ditto ...	Gypsum 240 lbs. applied as a top dressing when the plants were 6" high.	Do. ... 138	ft., ao	[illegible]
Ditto ...	No manure ...	Do. ... 10«		
Peas ...	Gypsum 110 lbs. and farmyard manure 20·5 cwts.	Grain ... 1,401 Straw ... 2,278	No increase.	
	Farmyard manure 20·5 cwts. ...	Grain ... 1,'JHC Straw ... 4.1 ui i		
Gram ...	Gypsum 110 lbs. and farmyard manure 20·5 cwts.	Grain ... [illegible] Straw ... 2,107	Ditto.	
	Farmyard manure 20·5 cwts. ...	Grain ... [illegible] Straw ... 2,374		

19. This is the fourth year in which the present experiment has been tried. In the case of indigo, gypsum this year gave an increase [illegible] Rs. 5 to [illegible]. 8 per acre, the plot in which it was applied as a top dressing giving a larger yield than the plot in which it was mixed up with the soil at the time of sowing. This confirms the results obtained in previous years in which the plot in which gypsum was mixed up with the soil gave better results than the other plot. The following are the figures of the past three years:—

	Outturn per acre. 1899-00.	Outturn per acre. 1900-01.	Outturn per acre. 1901-02.
	Cwts.	Cwts.	Cwts.
Field in which gypsum was mixed up with soil ...	[illegible]	[illegible]	[illegible]
Field in which gypsum was applied as a top dressing	[illegible]	[illegible]	[illegible]
No manure ...	[illegible]	[illegible]	[illegible]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It M that UoUUr«l which of UMtwo formof ipplying ejpram i* UM nun ulrma-tagonous. Bat the fact that an application of ffjpium ini-mun tlw weight of i>P> plants seems flu to b»v* bMn Mtffibmtljr Mabfrhfli' by experiinent* both at the Station awl elsewhere v, although the iaertmm which il «*_vt* in often not wry grmt. Tbt mral pl*w wh«aoe indigo plants of UMM pttmncM ami Bengal can hin a wippJy of it » Naini Tal. It vmy he of PDBV intern* to not« bvre the amount which a conagnrornt of thii miiwrml rrohrod in 1<*W had eoat m to HalJavmnt, which is UM newest nil**7 kUtion to UM Nairn Tal quarry: —

	Rs.	a.	p.
Cost of quarrying 212 maunds at Rs. 4 per 100 maunds ...	8	7	8
Carriage to HilUnal hf 1 maunds at Rs. 0-3-6 per maund ...	46	11	7
Bags and string ...	2	9	0
	»7	II	•

TV oonugnmoit bttng panl/ for ciptiiiMt, BO royalty vw cbuwcd.

At M^Mdf the experi tittnt with gran *nd pt kit thtt *^n U> «>J » that 8 am rain t, «5 cwta of fwmyinl raanttre d.J Mot giwM gmt v«W •• I cwt> af fanujanl nunur« appliad «nVly.

20. **Manure** experiment No. V.-TV Mowing **naasrw wm** experimented with ondtflhu lMaJ:-

IMM	Crop on which tried.
Group A.	
1 Brick kiln refuse	Wheat.
2 Silt	Wheat.
3 Compost	Wheat.
4 Road scrapping	Wheat.
5 Ashes of weeds	Wheat.
6 Ashes of weeds and saltpetre	Wheat.
7 Ammonic chloride	Wheat.
Group B.	
1 Green hemp ploughed in and kainit	Wheat.
2 Green hemp ploughed in	Wheat.
Group C.	
1 Farmyard manure and kainit	Wheat.
2 Woollen refuse and kainit	Wheat.
3 Farmyard manure alone	Wheat.
4 Woollen refuse	Wheat.
Group D.	
1 Fresh silt from canal	Cotton.
2 Kainit and gypsum	Cotton.
3 Farmyard manure and gypsum	Cotton.
4 Farmyard manure and kainit	Cotton.
5 Woollen refuse	Cotton.
Group E.	
1 Poudrette and sulphate of iron	Potatoes.
2 Woollen refuse and gypsum	Potatoes.
3 Poudrette and kainit	Potatoes.
4 Castor oil cake and gypsum	Potatoes.

TW trU with commenced in 1883-84. In the first two years the plots U which BOW nti . v* •till.., and road scrapping were treated with p#n«bal indiC" and since 1885-86 no alteration has been made either in the quality or quantity of th» MI ""••pptwd to each plot. The experiments with B, C, D, and E were started in 1888-89, and since then tiey have been regularly mnkl o^

6. The following table shows the produce of each plot in 1891-92 and previous years :—

Manures and their quantities per acre.	Crop cultivated.	Outturn per acre: 1891-92, Weight of cotton or grain	Outturn per acre: 1891-92, Weight of seed	Outturn per acre: Average of previous years, Weight of cotton or grain	Outturn per acre: Average of previous years, Weight of seed	Increase per acre compared with the unmanured plot in each case: 1891-92, Weight of cotton or grain	Increase: 1891-92, Weight of seed	Increase: Average of previous years, Weight of cotton or grain	Increase: Average of previous years, Weight of seed
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
A.—Brick kiln refuse, 88 cwts. ...	Wheat ...	[illegible]	1,370	[illegible]	[illegible]	—13	[illegible]	[illegible]	[illegible]
Silt [illegible] ...	...	774	1,321	[illegible]	1,253	64	[illegible]	177	217
Compost [illegible] ...	...	[illegible]	[illegible]	[illegible]	1,079	[illegible]	726	[illegible]	[illegible]
Road scraping 212 cwts. ...	...	[illegible]	1,532	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ashes of wood [illegible] ...	...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	181	[illegible]
Ashes [illegible] 240 lbs. ...	...	[illegible]	1,470	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ammonium chloride [illegible] ...	...	[illegible]	[illegible]	[illegible]	1,877	[illegible]	[illegible]	[illegible]	[illegible]
No [illegible] ...	...	[illegible]	[illegible]	[illegible]	[illegible]	...	...	...	...
B.—[illegible] kainit 3 cwts.	...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] ...	...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
No manure ...	...	1,077	[illegible]	[illegible]	[illegible]	...	...	...	...
C.—Superphosphate [illegible] kainit	...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—70†
Farmyard manure [illegible] ...	...	[illegible]	[illegible]	[illegible]	[illegible]	...	...	...	...
Woollen refuse 140 cwts. and [illegible] 3 cwts.	...	1,097	[illegible]	[illegible]	[illegible]	—202†	[illegible]	—68†	+127†
Woollen refuse 144 cwts. ...	...	2,088	[illegible]	[illegible]	[illegible]	...	...	...	...
D.—Fresh silt [illegible]	Cotton ...	149	[illegible]	[illegible]	[illegible]	[illegible]	84	47	73
Kainit 220 lbs and gypsum 220 cwts.	...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Farmyard manure 132 cwts. gypsum 110 lbs.	...	170	412	173	[illegible]	[illegible]	176	[illegible]	127
Farmyard manure 132 cwts. and kainit 120 lbs.	...	[illegible]	203	[illegible]	299	[illegible]	67	80	[illegible]
Woollen refuse 96 cwts.	...	228	[illegible]	[illegible]	[illegible]	80	[illegible]	[illegible]	[illegible]
No manure ...	...	129	[illegible]	[illegible]	[illegible]	...	...	...	...
E.—Poudrette 140 cwts. and sulphate of iron ½ cwts.	[illegible]	3,714	...	12,488	...	—1,100	...	2,330	...
Woollen refuse 140 cwts. and gypsum 3 cwts.	...	4,415	...	11,021	...	—455	...	2,016	...
Poudrette 140 cwts. and kainit 2 cwts.	...	4,809	...	10,137	...	—80	...	254	...
Castor-cake 300 lbs and gypsum 3 cwts.	...	4,544	...	[illegible]	...	—306	...	1,019	...
Cow-dung 145 cwts. ...	...	[illegible]	...	[illegible]	...	...	...	...	...

Group A.—The only manures which have given an outturn over 520 lbs, which is the lowest average for irrigated land of this district, are the ammonic chloride and compost. The [illegible] is very high [illegible] profit; the compost gives a net profit of over Rs. 11 compared with the unmanured plot. It seems that plots Nos. 1, 2 and 6 had enough of brick kiln refuse, silt and [illegible] in [illegible] whether of [illegible] or of dung have no great effect on [illegible].

*In comparing the outturn of the plots treated with compost and road scraping with the outturn of [illegible] the latter has been taken for the years 1885-86 to 1890-91.

†Compared with [illegible] with farmyard manure and woollen refuse respectively.

Groups B and C.—Kainit seems to have little effect on wheat; the same happened last year also. Like common salt it seems to retard the growth of the wheat plant and may perhaps be applied with advantage when the crop is too forward, but not otherwise.

Group D.—All the manures in this group more or less have an increase over the unmanured plot, but in the case of kainit and gypsum it is not possible to say what portion of the increase is due to them.

Group E.—Compared with past years' outturn on these plots, the outturn of the present year is very low. A [illegible] quantity of the [illegible] this year failed to germinate in the field, and the crop was very thin and irregular.

23. This experiment is conducted in two series, one consisting of 4 plots and the other of 3 plots. The experiment in the former was started in 1882-83 and in the latter one year after. Up to the year 1886-87 the plots were ploughed as follows and received no manure:—

Series.	Serial number of plot.	[illegible]	Number of ploughings.
I	1	Ploughed with Collin's plough, which in one ploughing turns up the soil to a depth of 9"	2
	2	Ploughed with Watt's or Kaisar Plough, which goes to a depth of 5"	2
	3	Ploughed with native plough ...	4
	4	Ditto ditto ...	4
II	1	Same as plot No. 1 of series I ...	2
	2	Ditto " 2 ditto ...	2
	3	Ditto " 3 ditto ...	4

Since 1886-87 the number of ploughings in each plot has been doubled, and the plots of series II manured [illegible] at the rate of [illegible] per acre, the plots of series I remaining unmanured as before [illegible] the plots are treated alike and all are sown with [illegible] wheat.

The following table gives the outturn of each plot of the two series:—

Series.	Serial number.	Description of ploughing.	Outturn per acre. 1891-92. Grain.	Straw.	Average since 1882-83 to 1890-91. Grain.	Straw.
			lbs.	lbs.	lbs.	lbs.
I	1	Four times with Collin's plough.	601	1,233	842	1,550
	2	Four times with Kaisar plough.	628	1,389	683	1,364
	3 & 4	Eight times with native plough.	573	1,198	520	1,076
II	1	Same as in No. 1 of series I ...	1,027	2,086	997	1,567
	2	Ditto " 2 ditto ...	1,021	2,179	905	1,743
	3	Ditto " 3 ditto ...	1,077	2,200	721	1,212

Taking the average of the two series, the outturn of the plot ploughed 9" deep in the present year differs by only 5 lbs from the outturn of the plot ploughed 5" deep, and the outturn of the deep ploughed plots is a little in excess of the outturn of the shallow ploughed plots, which means that for a crown rooted crop like wheat a ploughing of 5" depth is as good as one of 9" depth, and that four ploughings with an improved ploughs made at the Station have the same effect as ordinary ploughing with the native plough. Small bullocks and buffaloes of the value of Rs. 15 to Rs. 30 a pair [illegible] cultivators in the neighbourhood of the Station easily plough land to a depth of 5" with one of the ploughs made at the Station, and as the time taken to plough an acre of land with the improved plough must be the same or rather less than the time taken to plough an acre with a native plough, it is evident that ploughing with a Station plough [illegible] per acre, [illegible] the value of the plough itself.

21. Early and late sowing.—This experiment was conducted in two fields. In one maize was sown and in the other cotton. The early sown plots were sown between the 20th and 23rd May, and the late sown between 18th and 20th July. During the interval between the sowing of the early sown plots and the advent of the rains maize was irrigated twice and cotton three times, besides the watering which was required to prepare the land for sowing. The other treatment of the early and late sown fields was similar.

22. The following table shows the produce of the two fields.

Series.	Serial number.	Crop.	Time of sowing.	Produce per acre in 1901-02. Grain of maize and lint of cotton.	Produce per acre in 1901-02. Stalk of maize and seed of cotton.	Average produce per acre in 1896-97 to 1900-01. Grain of maize and lint of cotton.	Average produce per acre in 1896-97 to 1900-01. Stalk of maize and seed of cotton.
				lbs.	lbs.	lbs.	lbs.
I	1	Maize ...	May 20th	1,843	3,698	1,344	6,063
	2	...	July 18th	1,59[illegible]	3,070	1,063	4,252
II		Cotton—					
	1	Varadhi	May 23rd	220	295		
	2	Bani	May 23rd	115	281		
	3	Dharwari	May 23rd	192	447		
	4	Barodia	May 23rd	172	417		
	5	Louisiana	May 23rd	172	429		
	6	Tree	May 23rd	60	182		
	7	Country	May 23rd	172	345		
		Average	...	142	341	141	307
	1	Varadhi	July 20th	60	102		
	2	Bani	July 20th	30	62		
	3	Dharwari	July 20th	42	110		
	4	Barodia	July 20th	32	47		
	5	Louisiana	July 20th	27	45		
	6	Tree	July 20th	22	46		
	7	Country	July 20th	22	24		
		Average	...	31	64	70	164

23. The extra cost of irrigation before the rains of early sown plots, and the value of increased outturn obtained by sowing early, are stated below:—

Crop.	Extra cost of watering, including water dues, per acre.	Value of increased produce, per acre, in 1901-02.
	Rs.	Rs.
Maize ...	5·25	7·1
Cotton ...	6·5	22·6

In both cases the early sowing gives a margin over covering the cost of irrigation. In places where water is available, it will be advantageous to sow maize and cotton, especially the latter, a month or six weeks before the advent of the autumn rains. The plants thus get a start [illegible] by the time the rains commence, and are not choked up by weeds, which is very often the case when rains [illegible] heavy and continuous at their outlet. The adv[illegible] of cotton is recognized in the Meerut and Agra Divisions, w[illegible] one-fourth [illegible] total area under pure cotton is prepared by irrigation and sown before the rains.

27. Different methods of sowing sugarcane.—The experiment is to determine whether the method [illegible] followed in the West Indies [illegible] than that usually adopted in the [illegible] in two fi[illegible] sown with different varie[illegible] of [illegible]. Excepting the difference in [illegible] the treatment of the two [illegible] was exactly alike.

The following figures show the produce obtained by the two methods in 1887-88 to 1891-92.

Year.	Sown after the West Indian method.	Sown in the native way.
		lbs.
1891-92	[illegible]	2,740 (Chin).
1890-91	8,217 (Jwain)	7,453 (Jwain).
1889-90	7,502 (ditto)	11,279 (ditto).
1888-89	7,206 (ditto)	8,526 (ditto).
[illegible]	[illegible]	[illegible] (ditto).

The figures of this year do not show any noticeable difference between the two methods of sowing cane. The results of the preceding four years were invariably in favor of the native method.

28. Restricting [illegible] growth of plant when [illegible].—This experiment was tried [illegible] which was divided into three parts. In one part the plants were grazed by sheep when about a [illegible] high, in the other they were nibbled with a sickle, and in the third the crop was left untouched. The treatment of the three parts in every other respect was exactly [illegible]

The following table shows the outturn of the three parts :—

No.	Special treatment.		Outturn per acre. 1891-92.	1890-91.	1889-90.
			lbs.	lbs.	lbs.
1	Grazed by sheep	Grain	523	2,148	1,102
		Straw	2,049	8,200	3,270
2	Nibbled with a sickle	Grain	527	1,053	1,122
		Straw	3,211	2,545	2,983
3	Left untouched	Grain	546	661	1,149
		Straw	3,987	2,140	2,0[illegible]

29. The outturn of [illegible] year does not show any noticeable difference. [illegible] in favour of restricting the growth. As expected, the [illegible] vary with the character of the winter rains and of the crop. [illegible] the rains [illegible] the crop heavy, grazing or nibbling gives a higher yield, oth[illegible]. All that this experiment teaches, therefore, is that the operation [illegible] on a forward crop so long as the [illegible] yield.

30. [illegible] crop of [illegible] tried on sugarcane [illegible] of which [illegible] during the year with cane of four different varieties, and the [illegible] same four varieties planted in the preceding year.

The outturn of the two fields is shown below :—

Number.	Variety of cane.	Outturn per acre in gur. Of crop planted in 1891-92.	From stocks of crop planted in [illegible].
		lbs.	lbs.
1	[illegible]	2,018	3,280
2	[illegible]	2,078	[illegible]
3	[illegible]	2,834	[illegible]
3	[illegible]	3,235	[illegible]
	Average	[illegible]	3,121

31. The result of 1890-91 was decidedly in favour of the second year's growth. The same was the case in 1889-90, but in 1888-89 and [illegible] the outturn of freshly-planted cane exceeded [illegible] preceding year's growth. The outturn of the several years' cultivation is noted below :—

Year.	Outturn per acre. Of cane planted during the year.		Of cane planted in previous year.	
	Weight of juice.	Weight of gur.	Weight of juice.	Weight of gur.
	lbs.	lbs.	lbs.	lbs.
[illegible]	[illegible]	1,011	[illegible]	1,016
[illegible]	5,418	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

32. If the climatic differences of the two years be neglected and the produce of the first year's growth be compared with the produce of the second year's growth then the following results are obtained. The weight of gur shown in this table for 1889-90 and 1890-91 has been calculated from the weight of juice by adopting the proportion in which they stood in 1888-89.

Year in which cane was planted.	Produce in the first year.	Produce in the second year.
1887-88	1,340	1,016
1888-89	1,612	1,452
1889-90	1,529	1,351
1890-91	1,238	3,121
Average	[illegible]	[illegible]
Money value of average produce	Rs. [illegible]	[illegible]
Deduct additional cost of cultivation during the year the cane is planted*	Rs. 28·0	—
Net gain in retaining stocks for next year.	—	[illegible]

33. Varieties of seed.—Imported and indigenous varieties of the undermentioned crops were tried.

Kharif.	Rabi.
Cotton.	Barley.
Sugarcane.	Oats.
Maize.	Rye grass.
Rice.	Lathyrus.
Wheat.	Potatoes.

	Rs.
* Ploughing	10
Seed	8
Sowing	2
Two extra weedings and hoeings	8
	28

The following table shows the results of each variety. Some of these varieties were experimented with in the preceding two years; their figures for those years are quoted for comparison.

Crop.	Variety.	Outturn per acre. In 1891-92. lbs.		Outturn per acre. In previous years. lbs.	
		Fibre.	Seed.	Fibre.	Seed.
Cotton	Upland Georgian	84	131	119	272
	Louisiana	40	118	127	309
	S. B. Mealy	29	64	99	150
	Shine's Early Prolific	18	43	68	143
	Jone's Improved	20	23	98	172
	Sea Island	84	135	137	333
	Hybrid	55	139	128	305
	Egyptian	63	163	124	293
	Tree Cotton	92	181	125	287
	Garo Hills	108	186	130	231
	Hinganghat	64	135	117	274
	Varadi	85	198	—	—
	Bani	72	171	—	—
	Dharwari	113	279	—	—
	Baroda	102	237	—	—
	Cawnpore	97	184	126	279
		Gur.		Gur.	
Sugarcane	Dhaul (from Rohon)	3,022		1,524	
	Dikchan (from Saharanpur)	3,079		1,503	
	Barkukha (from Moradabad)	2,863		1,469	
	Matna (Cawnpore)	2,004		1,761	
		Grain.	Stalk.	Grain.	Stalk.
Juar	Alipur	871	—	—	—
Maize	American	Failed.			
	Jaunpur	1,707	3,379	—	—
Wheat	*Indian—*				
	Muzaffarnagar	1,334	3,123	1,087	2,658
	Mundia	408	2,351	1,159	2,323
	Dusee	813	2,055	1,147	2,361
	Red Punjabi	947	2,816	—	—
	Sindhi	629	2,311	974	2,050
	Australian and Canadian—				
	Adelaide	1,016	2,873	820	2,879
	Ladoga	310	473	587	1,404
	Red Fern	42	512	97	435
	Judkat	73	266	215	403
	White Fife	97	280	104	401
	Red Fife	342	1,052	139	505
	Saponika	47	212	140	654
Barley	*Indian—*				
	White huskless	820	1,700	1,008	2,447
	Chocolate	679	1,459	1,313	2,226
	Green	553	907	1,087	2,161
	Cawnpore (ordinary variety)	1,062	1,706	1,564	2,379
	Canadian—				
	Polar six rowed	300	1,056	620	2,431
	Danish Chevalier	150	732	242	1,162
	Beardless	300	1,840	1,120	2,408
	Swedish	624	1,844	1,463	2,309
Oats	*Canadian—*				
	Prize Cluster	240	1,128	320	3,142
	Canadian Triumph	246	1,053	787	2,237
	Brown's Prize	328	942	473	1,985
	Welcome	240	[illegible]	708	2,207
	Bonanza	252	913	787	2,358
	White Egyptian	300	895	847	2,428
Rye grass		8,330	5,736	—	—
Lathyrus		Failed.	—	—	—
English potatoes	Twenty varieties	Only one and in some cases two tubers of each variety were received. The tubers produced on the Station are very inferior to those imported. They have been carefully stored for trial in the next year.			

M. Mixed Crop— TV following mixed crop* were tried during the year. The field t in whk-b they were sown were treated in the native way.

1. mlijjo and tnaiM.
2. Juar and arhar.
3. Bijra and arliar.
4. Cotton, castor, til and urd.
6. Cotton, arhiir, til and uri.
6. Wheat and rape-teed.
7. Wheat ami safflowrr.

The following figure* *how the outturn of each crop in the above mixture*:—

Mixture.	Individual crop.		Oittuni f>r •en- lh«.		Outturn per acre lb.	
Kharif—						
Indigo-maize	Indigo	—	—	—	9,202	Green plant.
	Maize	—	train	42	1,906	Straw.
Juar-arhar	Juar	—	do.	682	8,571	do.
	Arhar	—	do.	696	1,670	do.
Bijra-arhar	Bijra	—	do.	93	1,498	do.
	Arhar	—	do.	210	73«	do.
Cotton, castor, til and urd.	Cotton	—	Fibre	30	69	Seed.
	Castor	—	Seed	432	—	
	Til	—	do.	32	—	
	Urd	—	Grain	81	403	Straw.
Cotton>. attar, Uu4w4	Cotton	—	Fibre	36	81	Seed.
	Arhar	—	Grain	1,396	4,110	Straw.
	Til	—	Seed	89	—	
	Urd	—	Grain	195	928	do.
Rabi—						
Wheat and rape-seed	Wheat	—	*>.	rr0	UM	la.
	Rape-seed	—	M	T7	—	
Wheat and safflower	Wheat	—	Onin	MI	tffl	do.
	Safflower	—	Flower	8	—	

35. Rn»t.—The o\.j«rt of the experiment, made wf mfold: (1) to decile rhrther the germ. <f nutt fungi are inherent in tU teed or float ia the air and ar* propagated I by aUwtpb«ri° condition. «uiubl* to tJmr growth; (*) to aaoerUin whether . (he ea«d with copper nlphate kilU the gerota enppOMd to be inberant in tli^ ^cdrimall .iuanUU« of rust-inf^t«I grain <f 7 rariotiea of wheat were wwii in ««all bhi, tad pots in duplicate. la one ert of tb«e, a«d waa aown after it waa eoalced in a aolution of copj^r .ulj.UU, a»d in the other eted WM M« without any |«Hmiiiarv trmtnmt The «*1 germin.U-1 trwly, ^ in Kthriaiy. wh« tbe winter rain, arrirtd; -iappea«d»allthab«Uand pots. Unfortunate-? the We and pot. all happoed be clcee to tbe canal dbtriUiUry, where another field of wheat wwn with uniafgeM WM al» atUcked with ru.t. Thu. the preaent year", esperimctit prorea that linir w.th «pp*r tylphKto • M preventive for rui • bul th* l»u«ti,)n wketh« th" germs of r Hi funpi are i»he«at b the te«d or «oat in the air atill remain, to l« decided by future ©xperiaenU.

36. The following appendices are attached to the present report :—

I.—V MAtetnent ooouiniog th« t results of all experimonU tried at tb« Station during the otearean IMl-Mto 1890-91, Ui a utle showing the character of rainfall thjumr.

II.—DUKnuM UlBtti»ti»ff the «wlt* of eoot of tbe principul rxjxmment tried lurtwg Uw Urt ten yrarv

III.—I nap ahswtaf the pocition of th* plob and fifldt in which eKparimnto are conducted.

CAWNPORE :
The i fi/i Jmtf 1892.

L. I*. HtKWl,
Offg. imd»at DirtttH.

APPENDIX I.

Table showing the character of rainfall at the Cawnpore Agricultural Experiment Station, during ten years 1881-82 to 1890-91.

Year	Autumn. (Kharif.)	Winter. (Rabi).
1881-82.	Excessive in the beginning and scanty towards the end.	Almost nil.
1882-83.	Fairly good.	Very abnormal; a fall of about three inches happened on a single day accompanied by high winds.
1883-84.	Late and scanty.	No rain.
1884-85.	Heavy and inopportune.	Almost nil.
1885-86.	Ditto	Very favorable.
1886-87.	Fair in the beginning, with a long break in the middle and a severe hailstorm at the end.	Favorable.
1887-88.	Heavy and continuous.	Favorable.
1888-89.	Very heavy, nearly double the normal fall.	Rather heavy, with continuance of cloudy weather.
1889-90.	Very favorable.	Late and partial.
1890-91.	Rather heavy in the beginning, with a pretty long break in the middle, but on the whole not very prejudicial.	Heavy and accompanied by high winds.

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Statement showing results of experiments tried at the Agricultural Experimental Station, Cawnpore, during the 10 years 1881-82 to 1890-91.

N.B.—Except [redacted] columns the treatment of every plot in each series in regard to ploughing, weeding, watering, manure and seed was exactly similar.

Class.	Experiment.	Crop on which tried.	Series.	Serial number.	Special treatment.	Outturn per acre in lbs. 1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	Average outturn per acre in lbs.	Increase per acre in lbs. over the unmanured plot, in the series.	Remarks.
						Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	
I.—Manure.	To determine the effect of nitrogenous and non-nitrogenous manures.	Wheat ...	III		*Nitrogenous manures.*													
				1	Saltpetre 240 lbs. per acre ...	1,742	1,079	1,355	1,654		1,234	1,161	1,137	1,646	1,480	1,423	420	[illegible]
				2	Cow-dung 132 cwts. ...	916	1,713	1,429	945		1,326	1,243	960	1,551	1,527	1,310	306	
				3	Sheep-dung 132 cwts. ...	—	—	—	892		1,234	1,430	1,016	1,730	968	1,336	[illegible]	
				4	Poudrette 132 cwts. ...	—	—	—	1,074		1,422	1,277	1,224	1,700	1,360	1,355	317	
					Nitrogenous and non-nitrogenous manures.													
				5	Saltpetre 240 lbs. and bone dust 300 lbs. per acre.	1,205	1,046	[illegible]	1,170		1,343	1,323	1,210	1,118	1,207	[illegible]	45	
				6	Saltpetre 240 lbs. and bone superphosphate 240 lbs. per acre.	—	—	[illegible]	[illegible]		1,190	1,112	[illegible]	1,582	1,048	[illegible]	[illegible]	
				7	Ditto 240 lbs. and ashes of 132 cwts. cowdung per acre.		—	[illegible]	[illegible]		1,102	1,012	[illegible]	1,343	1,404	[illegible]	[illegible]	
				8	Cow-dung 132 cwts. and bone-dust 300 lbs. per acre		1,394	[illegible]	1,016	1,899	1,234	1,319	[illegible]	1,767	1,742	1,207	413	
				9	Cow-dung 132 cwts. and gypsum 240 lbs. ...		1,712	[illegible]	997	1,607	1,162	1,210	[illegible]	1,222	1,707	[illegible]	372	
				10	Sheep-dung 132 cwts. and bone dust 300 lbs. ...		—	[illegible]	825	1,416	1,060	990	[illegible]	1,213	1,718	1,204	294	
				11	Ditto 132 cwts. and gypsum 240 lbs. ...		—	[illegible]	780	1,134	1,007	1,428	[illegible]	1,019	1,092	[illegible]	[illegible]	
					Non-nitrogenous manures.													
				12	Ashes of 132 cwts. cow-dung per acre ...	[illegible]	[illegible]	[illegible]	704	962	851	811	[illegible]	1,416	[illegible]	[illegible]	[illegible]	
				13	Bone dust 300 lbs. per acre ...	[illegible]	[illegible]	[illegible]	—	—	—	—	[illegible]	—	—	[illegible]	[illegible]	
				14	Bone superphosphate 240 lbs. per acre ...	[illegible]	[illegible]	[illegible]	—	—	—	—	[illegible]	—	—	[illegible]	[illegible]	
				15	Gypsum 240 lbs. per acre ...		[illegible]	[illegible]	—	—	—	—	[illegible]	—	—	[illegible]	[illegible]	
				16	No manure ...		[illegible]	[illegible]	[illegible]	[illegible]	1,043	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
		Do. ...	IV		*Nitrogenous manures.*													
				1	Saltpetre 240 lbs. per acre ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
				2	Cow-dung 132 cwts. ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
				3	Sheep-dung 132 cwts. ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
				4	Poudrette 132 cwts. ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
					Nitrogenous and non-nitrogenous manures.													
				5	Saltpetre 240 lbs. and bone dust 300 lbs. per acre.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
				6	Saltpetre 240 lbs. and bone superphosphate 240 lbs. per acre.	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
				7	Saltpetre 240 lbs. and ashes of 132 cwts. cow-dung per acre.	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
				8	Cow-dung 132 cwts. and bone dust 300 lbs. per acre.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
				9	Cow-dung 132 cwts. and gypsum 240 lbs. per acre	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
				10	Sheep-dung 132 cwts. and bone dust 300 lbs. ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
				11	Sheep-dung 132 cwts. and gypsum 240 lbs. per acre.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
					Non-nitrogenous manures.													
				12	Ashes of 132 cwts. cow-dung per acre ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
				13	Bone dust 300 lbs. per acre ...	[illegible]	[illegible]	—	—	—	—	—	—	—	—	[illegible]	[illegible]	
				14	Bone superphosphate 240 lbs. per acre ...	[illegible]	[illegible]	—	—	—	—	—	—	—	—	[illegible]	[illegible]	
				15	Gypsum 240 lbs. per acre ...	[illegible]	[illegible]	—	—	—	—	—	—	—	—	[illegible]	[illegible]	
				16	No manure ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		

Statement showing results of experiments tried at the Agricultural Experimental Station, Cawnpore, during the 10 years 1881-82 to 1890-91.

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Class.	Experiment.	Crop on which tried.	Series.	Serial number.	Special treatment.	1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	Average outturn per acre in lbs.	Increase per acre in lbs. over the unmanured plot in the series.
						Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.
I.—Manure.	Green soiling ...	Wheat ...	V	1–11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			VI	1–5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			VII	1–3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Experiment with certain combinations of selected manures to discover the deficiency of the farm soil lies.	Ditto ...	VIII	1–6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	To determine the effect of certain manurial [illegible] on maize.	Maize ...	IX	1–8	[illegible] ... No manure	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Crop destroyed.	[illegible]	[illegible]	[illegible]	[illegible]

Statement showing results of experiments tried at the Agricultural Experiment Station, Cawnpore, during the 10 years 1881-82 to 1890-91.

N.B.—Except the special treatment noted in column 6, the treatment of every plot in each series in regard to ploughing, weeding, watering, manure and seed was exactly similar.

Class.	Experiment.	Crop on which tried.	Series.	Serial number.	Special treatment.	Outturn per acre in lbs. 1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	Average outturn per acre in lbs.	Increase per acre in lbs. over the unmanured plot.	Remarks.
						Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	
I.—Manure	To determine the value of cotton seed and certain oil-cakes as manure and of the dung obtained from cattle fed on them against the dung obtained from cattle to whom no concentrated food is given.	Wheat	XA	1	Mustard cake 400 lbs. per acre	—	—	—	—	1,770	1,359	1,024	1,027	1,179	—	1,242	241	
				2	Ditto 800 lbs. "	—	—	—	—	1,391	1,304	1,207	1,260	1,321	—	[illegible]	327	
				3	Ditto 1,200 lbs. "	—	—	—	—	1,453	—	—	—	—	—	[illegible]	363	
				4	Cake fed dung 36 cwts. "	—	—	—	—	2,041	1,201	862	838	1,132	—	[illegible]	67	
				5	Ditto 72 cwts. "	—	—	—	—	1,394	1,480	840	812	947	—	[illegible]	214	
				6	Ditto 144 cwts. "	—	—	—	—	1,851	—	—	—	—	—	[illegible]	262	
				7	Cow-dung 144 cwts. per acre, obtained from cattle which had not received any cake, or other nutritious food.	—	—	—	—	998	1,438	779	1,230	1,242	—	[illegible]	172	
				8	No manure	—	—	—	—	1,468	1,013	742	807	914	—	1,002	—	
			XB	1	Cotton seed fed dung 36 cwts. per acre	—	—	—	—	1,140	1,052	824	961	1,130	—	1,031	−76	
				2	Ditto 72 cwts. "	—	—	—	—	1,118	1,079	1,155	1,044	1,240	—	1,134	87	
				3	Ditto 144 cwts. "	—	—	—	—	2,057	959	—	—	—	—	1,142	−104	
				4	Pickled cotton seed 400 lbs. "	—	—	—	—	1,470	814	812	1,107	1,270	—	[illegible]	−11	
				5	Ditto 800 lbs. "	—	—	—	—	2,722	1,393	1,186	1,053	1,212	—	[illegible]	410	
				6	Ditto 1,200 lbs. "	—	—	—	—	1,994	—	—	—	—	—	1,094	351	
				7	Cow-dung 144 cwts. per acre, obtained from cattle which had not received any cake or other nutritious food.	—	—	—	—	998	774	804	1,170	1,380	—	1,039	−69	
				8	No manure	—	—	—	—	1,032	902	751	1,083	1,160	—	—	—	
			XC	1	[illegible] 400 lbs. per acre	—	—	—	—	1,092	—	—	—	—	—	—	133	
				2	[illegible] 800 lbs. "	—	—	—	—	1,740	—	—	—	—	—	—	130	
				3	[illegible] 1,200 lbs. "	—	—	—	—	990	—	—	—	—	—	—	−335	
				4	[illegible] 36 cwts. "	—	—	—	—	1,802	—	—	—	—	—	—	−242	
				5	[illegible] 72 cwts. "	—	—	—	—	1,327	—	—	—	—	—	—	−12	
				6	[illegible] 144 cwts. "	—	—	—	—	998	—	—	—	—	—	—	−351	
				7	[illegible]	—	—	—	—	1,349	—	—	—	—	—	—	—	
	To determine the residual value of certain manures.	Ditto	XI	1	[illegible] 220 cwts. per acre	—	—	—	—	—	—	1,319	[illegible]	826	1,313			
				2	[illegible] 140 cwts. "	—	—	—	—	—	—	987	847	699	980			
				3	[illegible] 220 cwts. "	—	—	—	—	—	—	714	774	664	909			
				4	[illegible] flour 50 cwts. "	—	—	—	—	—	—	730	678	650	937			
				5	[illegible] and bone dust 14½ cwts. per acre	—	—	—	—	—	—	702	714	704	860			
				6	[illegible] 220 cwts. per acre	—	—	—	—	—	—	702	690	649	946			
				7	[illegible] used with residual	—	—	—	—	—	—	617	662	632	768			
				8	[illegible] 240 lbs. per acre	—	—	—	—	—	—	689	714	744	1,022			
				9	[illegible] chloride 240 lbs. per acre	—	—	—	—	—	—	690	702	730	979			
				10	No manure	—	—	—	—	—	—	683	671	744	886			
			XII	1	Calcic superphosphate 190 lbs., ammonia chloride 190 lbs., potassic sulphate 9[illegible] lbs., and calcic sulphate 95 lbs. per acre.	—	—	—	—	—	—	—	653	908	947			
				2	All except calcic superphosphate	—	—	—	—	—	—	—	881	823	906			
				3	Ditto ammonia chloride	—	—	—	—	—	—	—	820	843	1,041			
				4	Ditto potassic sulphate	—	—	—	—	1,099	—	—	658	871	1,019			
				5	Ditto calcic sulphate	—	—	—	—	714	—	—	646	598	659			
				6	No manure	—	—	—	—	693	—	—	666	744	942			

Statement showing results of experiments tried at the Agricultural Experiment Station, Cawnpore, [illegible] 10 years [illegible] to 1890-91.

N.B.—Except the special treatment noted in column 6, the treatment of every plot in each series in regard to ploughing, [illegible] watering, [illegible] was exactly similar.

Class.	Experiment.	Crop on which tried.	Series.	Serial number.	Special treatment.	Outturn per acre in lbs. 1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	Average outturn per acre in lbs.	Increase per acre in lbs. over the unmanured plot.	Remarks.
I.—Manure.	To determine the effect of kainit applied with other manures.	Cotton ...	XIII	1	Fresh silt from canal 260 cwts. per acre.	—	—	—	—	—	—	—	Fibre. 159	Fibre. 121	Fibre. [illegible]	[illegible]	Fibre. 47	
				2	Kainit 220 lbs. and gypsum 220 lbs. per acre.	—	—	—	—	—	—	—	191	97	[illegible]	[illegible]	[illegible]	
				3	Farmyard manure 122 cwts. and gypsum 110 lbs. per acre.	—	—	—	—	—	—	—	[illegible]	73	[illegible]	[illegible]	[illegible]	
				4	Ditto ditto and kainit 110 lbs. per acre.	—	—	—	—	—	—	—	[illegible]	87	[illegible]	[illegible]	[illegible]	
				5	Woollen refuse 88 cwts. per acre ...	—	—	—	—	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
				6	No manure ...	—	—	—	—	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
		Wheat ...	XIV	1	Kainit, 3 cwts. per acre and green hemp ploughed in.	—	—	—	—	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
				2	Hemp ploughed in ...	—	—	—	—	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
				3	Farmyard manure 140 cwts. and kainit 3 cwts. per acre.	—	—	—	—	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
				4	Farmyard manure 140 cwts. per acre ...	—	—	—	—	—	—	—	[illegible]	[illegible]	1,793	[illegible]	[illegible]	
				5	Woollen refuse 140 cwts. and kainit 3 cwts. per acre.	—	—	—	—	—	—	—	[illegible]	[illegible]	1,408	[illegible]	[illegible]	
				6	Woollen refuse 140 cwts. per acre ...	—	—	—	—	—	—	—	[illegible]	[illegible]	1,604	1,503	[illegible]	
				7	No manure ...	—	—	—	—	—	—	—	[illegible]	[illegible]	1,041	990	[illegible]	
	To determine the effect of gypsum on leguminous crops.	Indigo ...	XVA	1	Gypsum 240 lbs. per acre, applied at the time of sowing.	—	—	—	—	—	—	Plant. 14,487	[illegible]	Plant. [illegible]	[illegible]	Plant. 10,629	[illegible]	On the average of three years' figures.
				2	Gypsum 240 lbs. per acre applied as a top-dressing when the plants were 6 inches high.	—	—	—	—	—	—	—	6,602	[illegible]	5,457	8,020	[illegible]	
				3	No manure ...	—	—	—	—	—	—	12,300	5,352	[illegible]	4,271	8,000	—	
		Peas ...	XVB	1	Farmyard manure 80·5 cwts. and gypsum 8 cwts. per acre.	—	—	—	—	—	—	—	Grain. 1,703	[illegible]	Grain. 549	Grain. 804	—	
				2	Ditto 73 cwts. only per acre.	—	—	—	—	—	—	—	1,673	[illegible]	892	747	—	
		Grass ...	XVC	1	Farmyard manure 80·5 cwts. and gypsum 8 cwts. per acre.	—	—	—	—	—	—	—	1,080	[illegible]	1,743	1,545	—	
				2	Ditto 73 cwts. only per acre.	—	—	—	—	—	—	—	1,309	[illegible]	1,216	1,304	[illegible]	
	Miscellaneous ...	Wheat ...	XVI	1	[illegible] refuse 68 cwts. per acre ...	—	—	Grain. 2,508	Grain. 1,176	Grain. 1,053	[illegible]	Grain. 472	Grain. 641	[illegible]	Grain. 629	Grain. 1,030	Grain. 301	
				2	[illegible] cwts. per acre ...	—	—	1,322	1,059	1,065	[illegible]	508	690	[illegible]	966	946	177	
				3	[illegible] 140 cwts. per acre ...	—	—	—	—	908	[illegible]	404	831	[illegible]	1,476	909	404	
				4	[illegible] 212 cwts. per acre ...	—	—	—	—	908	[illegible]	732	739	[illegible]	799	876	267	
				5	[illegible] 132 cwts. weeds per acre ...	—	—	1,750	1,083	1,001	[illegible]	678	537	[illegible]	1,414	940	[illegible]	
				6	[illegible] 132 cwts. weeds and saltpetre [illegible] per acre.	—	—	2,184	1,303	1,240	[illegible]	809	1,028	[illegible]	782	1,096	[illegible]	
				7	Ammonic chloride 240 lbs. per acre ...	—	—	2,055	1,448	1,219	739	[illegible]	537	[illegible]	480	927	[illegible]	
				8	No manure ...	—	—	1,652	880	838	448	[illegible]	333	[illegible]	702	729	[illegible]	
		Potatoes ...	XVII	1	Poudrette 140 cwts. and sulphate of iron 4 cwts. per acre.	—	—	—	—	—	—	—	Bulbs. 11,613	[illegible]	Bulbs. 15,379	Bulbs. 12,409	2,500	Increase over the plot treated with cow-dung.
				2	Woollen refuse 140 cwts. and gypsum 8 cwts. per acre.	—	—	—	—	—	—	—	10,383	[illegible]	13,737	11,921	2,018	
				3	Poudrette 140 cwts. and kainit 3 cwts. per acre.	—	—	—	—	—	—	—	[illegible]	[illegible]	14,862	10,137	234	
				4	Castor cake 800 lbs. and gypsum 8 cwts. per acre.	—	—	—	—	—	—	—	[illegible]	[illegible]	[illegible]	11,822	1,919	
				5	Cow-dung 140 cwts. per acre ...	—	—	—	—	—	—	—	6,630	[illegible]	[illegible]	9,903	—	

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						Fibre.	Fibre.	Fibre.	Fibre.	Fibre.	[illegible]					Fibre.	Fibre.	
II.—Ploughing.	To determine the effect of deep and shallow ploughing.	Cotton	I	1	Ploughed with the native plough	177	98	130	40	220	[illegible]	—	—	—	—	111	—	
				2	Ditto with Watt's or Kaiser Plough, which goes to a depth of 5"; the number of ploughings being only half that of plot I.	188	112	141	45	220	[illegible]	—	—	—	—	133	11	Increase compared with the plot ploughed with the native plough.
				3	Ploughed with Collin's Plough, which goes to a depth of 9"; the number of ploughings being only half that of plot I.	—	106	130	61	210	[illegible]	—	—	—	—	117	10	
			II	1	Ploughed with the native plough	—	—	59	81	218	[illegible]	—	—	—	—	88		
				2	Ploughed with Watt's or Kaiser Plough, which goes to a depth of 5"; the number of ploughings being only half that of plot I.	—	—	106	33	229	[illegible]	—	—	—	—	98	[illegible]	Ditto.
				3	Ploughed with Collin's Plough, which goes to a depth of 9"; the number of ploughings being only half that of plot I.	—	—	113	37	224	[illegible]	—	—	—	—	103	[illegible]	
							Grain.	Grain.	Grain.	Grain.	[illegible]		Grain.		Grain.	Grain.		
	Ditto	Wheat	III	1	Ploughed with the native plough	—	590	407	554	413	[illegible]	—	729	[illegible]	708	450	[illegible]	
				2	Ploughed with Watt's or Kaiser Plough, which goes to a depth of 5"; the number of ploughings being only half that of plot I.	—	771	670	850	210	403	—	833	[illegible]	807	602	104	Ditto.
				3	Ploughed with Collin's Plough, which goes to a depth of 9"; the number of ploughings being only half that of plot I.	—	1,096	1,236	723	226	207	—	964	[illegible]	1,059	943	294	
			IV	1	Ploughed with the native plough	—	—	735	437	585	129	—	731	1,134	1,002	721	—	
				2	Ploughed with Watt's or Kaiser Plough, which goes to a depth of 5"; the number of ploughings being only half that of plot I.	—	—	1,066	540	615	243	—	842	1,018	1,506	895	[illegible]	Ditto.
				3	Ploughed with Collin's Plough, which goes to a depth of 9"; the number of ploughings being only half that of plot I.	—	—	1,304	736	419	309	—	723	1,416	1,303	927	[illegible]	
						Fibre.	Fibre.									Fibre.		
	To determine the effect of early and late ploughing.	Cotton	V	1	Early ploughed	252	165	—	—	—	—	—	—	—	—	208	[illegible]	
				2	Late ploughed	133	140	—	—	—	—	—	—	—	—	135		
						Grain.	Grain.	Grain.	Grain.	[illegible]						Grain.		
III.—Irrigation.	To determine the relative merits of canal and well water.	Wheat	IA	1	Irrigated from well	1,313	1,391	804	1,039	[illegible]	[illegible]	—	—	—	—	1,004	[illegible]	
				2	Ditto canal	1,309	1,227	720	641		[illegible]	—	—	—	—	904		
			IB	1	Ditto well	—	—	1,824	1,205	[illegible]	[illegible]	—	—	—	—	1,335	131	Ditto.
				2	Ditto canal	—	—	1,279	916		—	—	—	—	—	1,104	—	
	To ascertain the effect of irrigation in increasing the outturn.		II	1	Ditto once	696	413	769	269		762	—	—	—	—	607	[illegible]	
				2	Ditto twice	513	491	612	462		969	—	—	—	—	713	[illegible]	
				3	Ditto thrice	901	631	[illegible]	591	[illegible]	1,065	—	—	—	—	[illegible]	[illegible]	Increase over the unirrigated plot.
				4	Ditto four times	1,104	698	[illegible]	1,016	[illegible]	1,346	—	—	—	—	[illegible]	[illegible]	
				5	Ditto five	1,209	—	1,258	1,135	[illegible]	1,307	—	—	—	—	[illegible]	[illegible]	
				6	Unirrigated	813	480	630	909	[illegible]	740	—	—	—	—	[illegible]	[illegible]	

Class.	Experiment.	Crop on which tried.	Series.	Serial number.	Particulars.	Outturn per acre in lbs.										Average outturn per acre in lbs.	Increase per acre in lbs.	Remarks.
						[illegible]	[illegible]	1883-84.	[illegible]	1885-86.	1886-87.	1887-88.	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]	[illegible]	I.	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ditto	[illegible]	[illegible]	III. A.	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	On the plot sown broadcast.
		Cotton (Egyptian)	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ditto	[illegible]	[illegible]	IV.	1	Sown behind plough in the native way.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	V.	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Ditto.
[illegible]	[illegible]	Wheat	VI.	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ditto	Sowing in raised beds	Ditto	VII.	1	Ordinary way	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Ditto.
Ditto	To determine the merits of sowing on ridges	Carrots	VIII A.	1	Sown on ridges	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Ditto.
				2	Ditto flat ground	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Ditto.
				2	Ditto flat ground	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Indian turnips	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Ditto.
				2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Statement showing results of experiments tried at the Agricultural Experimental Station, Cawnpore, during the 10 years 1881-82 to 1890-91.

Class.	Experiment.	Crop on which tried.	Series.	Serial number.	Variety.	Outturn per acre in lbs. 1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	Average outturn per acre in lbs.	Increase per acre in lbs. over the local variety.	Remarks.
V.—Seed	To determine the relative merits of the different varieties of seed.	Cotton	I.	1	[illegible]	Fibre. 181	Fibre. 130	—	—	Fibre. —	—	—	Fibre. —	Fibre. —	—	Fibre. 120	Fibre. −12	[illegible]
				2	[illegible]	113	—	—	—	—	—	—	125	160	—	119	16	
				3	[illegible]	—	—	—	—	—	—	—	97	134	—	127	23	
				4	[illegible]	—	—	—	—	—	—	—	—	—	—	[illegible]	−8	
				5	[illegible]	—	—	—	—	—	—	—	24	150	—	89	−19	
				6	[illegible]	—	—	—	—	—	—	—	24	142	—	65	−20	
				7	[illegible]	—	—	—	—	—	—	—	24	180	—	59	−19	
				8	[illegible]	—	—	—	—	—	—	—	27	104	—	127	20	
				9	[illegible]	—	—	—	—	—	—	—	63	152	—	119	16	
				10	[illegible]	—	—	—	—	80	—	100	27	134	—	124	17	
				11	[illegible]	—	—	—	—	—	—	—	—	—	—	92	8	
				12	Tree Cotton	—	—	—	—	—	—	—	111	146	—	125	18	
				13	Garo Hills	—	—	—	—	—	—	—	160	134	—	120	42	
				14	Hinganghat	308	—	—	—	—	—	—	111	152	—	117	−17	
				15	[illegible]	161	—	—	—	—	—	—	—	—	—	101	−21	
				16	Cawnpore	252	179	67	—	—	—	97	—	130	—	130	—	
		Sugar-cane	II.	1	[illegible] (from Behar)	—	—	—	—	—	—	Juice. 10,524	—	—	Juice. —	Juice. 8,437	Juice. −1,005	
				2	[illegible] (from Shahjahanpur)	—	—	—	—	—	—	—	—	—	—	8,362	−1,080	
				3	[illegible] (from Moradabad)	—	—	—	—	—	—	—	—	—	8,515	7,787	−1,655	
				4	[illegible] Cawnpore)	—	—	—	—	—	—	13,779	—	—	6,080	9,442	—	
		Maize	III.	1	[illegible]	—	—	—	—	—	—	—	—	—	—	Grain. 3,053	Grain. 2,184	
				2	[illegible]	—	—	—	—	—	—	—	—	—	—	2,042	973	
				3	[illegible]	—	—	—	—	—	—	—	—	—	—	1,059	—	
		Wheat	IVA.	1	[illegible]	Grain. 1,757	Grain. [illegible]	Grain. —	—	Grain. [illegible]	Grain. —	—	2,372	—	—	Grain. 1,007	Grain. 436	
				2	[illegible]	—	—	—	—	—	—	—	1,052	—	—	1,110	—	
				3	[illegible]	—	—	—	—	—	—	—	—	—	—	1,422	233	
				4	[illegible]	—	—	—	—	—	—	—	—	—	—	379	−511	
				5	[illegible]	—	—	—	—	—	1,363	—	1,465	—	—	1,147	−42	
				6	[illegible]	—	—	—	—	—	—	—	1,007	—	—	974	−213	
					[illegible]													
			IVB.	1	[illegible], Rough chaff	314	472	—	—	—	—	—	—	—	—	298	−806	
				2	English, Red bearded	293	—	—	—	—	—	—	—	458	—	370	−419	
				3	Adelaide (Australian wheat)	—	—	—	452	—	—	—	871	1,114	—	820	−303	
					Canadian wheats.													
			IVC.	1	Ladoga	—	—	—	—	—	—	—	—	—	591	591	−608	
				2	Red Fern	—	—	—	—	—	—	—	—	—	97	97	−1,009	
				3	Fultz	—	—	—	—	—	—	—	—	—	515	515	[illegible]	
				4	White Fife	—	—	—	—	—	—	—	—	—	194	194	[illegible]	
				5	Red Fife	—	—	—	—	—	—	—	—	—	[illegible]	[illegible]	−1,016	
				6	Saxonka	—	—	—	—	—	—	—	—	—	140	140	−1,044	

Statement showing results of experiments tried at the Agricultural Experimental Station, Cawnpore, during the 10 years 1881-82 to 1890-91.

Class.	Experiment.	Crop on which tried.	Series.	Serial number.	Variety.	Outturn per acre in lbs. 1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	Average outturn per acre in lbs.	Increase per acre in lbs. over the local variety.	Remarks.
						Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	lb.	Grain.	
					Indian barleys.													
V.—Seed.	To determine the relative merits of different varieties of seed.	Barley	V.A.	1	Cawnpore barley, the ordinary variety of the North-Western Provinces.	1,201	2,018	2,465	2,168	1,277	—	1,074	1,074	1,349	—	[illegible]	—	
				2	Bussil, naked or huskless barley of Kumaon	820	1,121	1,760	787	538	—	374	1,780	1,302	—	[illegible]	—871	
				3	Chocolate coloured barley	—	—	—	—	1,109	—	507	1,547	1,094	—	[illegible]	—558	
				4	[illegible]	—	—	—	—	—	—	540	1,313	1,110	—	[illegible]	—879	
					[illegible] barleys.													
			V.B.	1	Gold[illegible]	1,000	[illegible]	1,711	1,072	—	—	—	—	—	—	1,253	[illegible]	
				2	[illegible]	805	[illegible]	1,460	407	—	—	—	—	—	—	526	[illegible]	
				3	[illegible]	741	[illegible]	1,246	609	—	—	—	—	—	—	927	[illegible]	
				4	[illegible]	—	[illegible]	—	1,670	—	—	—	—	—	—	1,670	—	
					[illegible] barleys.													
			V.C.	1	[illegible]	—	—	—	—	—	—	—	—	—	629	629	[illegible]	
				2	[illegible]	—	—	—	—	—	—	—	—	—	242	242	[illegible]	
				3	[illegible]	—	—	—	—	—	—	—	—	—	1,125	1,125	[illegible]	
				4	[illegible]	—	—	—	—	—	—	—	—	—	1,452	1,452	[illegible]	
	Ditto	[illegible]	VI	1	[illegible]	602	[illegible]	—	—	—	—	—	—	—	—	630	[illegible]	
				2	[illegible]	1,249	[illegible]	—	—	—	—	—	—	—	—	870	[illegible]	
				3	[illegible]	1,802	[illegible]	—	—	—	—	—	—	—	—	1,412	—	
					Cape and English oats.													
	Ditto	Oats	VII A.	1	Cape oats	1,700	[illegible]	[illegible]	2,140	1,033	—	—	—	—	—	[illegible]	—	
				2	English, black Tartary	97	[illegible]	—	—	—	—	—	—	—	—	[illegible]	—	
				3	English, [illegible]	209	[illegible]	—	—	—	—	—	—	—	—	[illegible]	—	
				4	English, [illegible]	102	—	—	—	—	—	—	—	—	—	[illegible]	—	
					Cereal [illegible]													
			VII B.	1	[illegible] Chevalier	—	—	—	—	—	—	—	—	—	[illegible]	530	—	
				2	[illegible]	—	—	—	—	—	—	—	—	—	[illegible]	787	—	
				3	[illegible]	—	—	—	—	—	—	—	—	—	[illegible]	473	—	
				4	[illegible]	—	—	—	—	—	—	—	—	—	[illegible]	709	—	
				5	[illegible]	—	—	—	—	—	—	—	—	—	[illegible]	787	—	
				6	White [illegible]	—	—	—	—	—	—	—	—	—	[illegible]	847	—	
								Seed.	Seed.							Seed.	Seed.	
	Ditto	Linseed	VIII	1	Red, as [illegible] the N.-W. P.	—	[illegible]	—	—	—	—	—	—	—	[illegible]	536	—	
				2	White va[illegible]	—	[illegible]	625	—	—	—	—	—	—	—	473	—17	
				3	Riga linseed	—	—	775	—	—	—	—	—	—	—	773	423	
		Rapeseed	IX	1	Ordinary Cawnpore [illegible]	—	—	—	531	—	—	—	—	—	—	[illegible]	—	
				2	German rapeseed	—	—	—	489	—	—	—	—	—	—	[illegible]	—98	
									Root.								Root.	
		Carrot	X	1	Belgian	—	—	—	76 cwts.	—	—	—	—	—	—	[illegible]	—	
				2	Country	—	—	—	221 cwts.	—	—	—	—	—	—	[illegible]	—135 cwts.	
		Mangold	XI	1	English, golden tankard	—	—	—	69 cwts.	204 cwts.	—	—	—	—	—	[illegible]	—	
		Turnips	XII	1	Dallas	—	—	—	63 cwts.	—	—	—	—	—	—	[illegible]	—	

Statement showing results of experiments tried at the [illegible] Experiment Station, Cawnpore, during the 10 years 1881-82 to 1890-91.

Class.	Experiment.	Treatment.	Series.	Serial number.	Crops.			Outturn per acre in lbs. 1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	Average outturn per acre in lbs.	Remarks.
									Grain.	Grain.	[illegible]	[illegible]			Grain.	Grain.	Grain.	Grain.	
VI.—Indigenous crops.	To determine the outturn of indigenous crops.	Cultivated in the native way.	I.		1. [illegible]														
				1	W[illegible] ([illegible]tivum)	—	—	—	[illegible]	1,564	[illegible]	—	—	—	—	—	—	975	
				2	Ba[illegible] ([illegible] vulgare)	—	—	—	—	1,408	[illegible]	—	—	—	—	—	—	1,453	
				3	Rice (Oryza [illegible])	—	—	—	—	—	[illegible]	—	—	—	—	—	—		
				4	Maize (Zea [illegible])	—	—	—	[illegible]	1,236	[illegible]	[illegible]	—	—	—	960	962	1,032	
				5	Juar (Sorghum vulgare)	—	—	—	—	—	[illegible]	[illegible]	—	—	425	1,027	600	561	
				6	Bajra (Penicillaria typhoidea)	—	—	—	—	—	[illegible]	[illegible]	—	—	121	461	121	233	
				7	Mandua ([illegible] coracana)	—	—	—	—	—	[illegible]	[illegible]	—	—	—	656	495	342	
				8	Kodon ([illegible] scrobiculatum)	—	—	—	—	—	[illegible]	[illegible]	—	—	296	233	323	228	
				9	Sawan ([illegible] frumentaceum)	—	—	—	—	—	[illegible]	[illegible]	—	—	—	—	—	390	
				10	Kakun ([illegible] italica) ...	—	—	—	—	—	[illegible]	[illegible]	—	—	—	—	—	436	
			II.		2. [illegible]														
				1	[illegible]	—	—	—	—	—	561	—	—	—	—	—	—	561	
				2	[illegible]	—	—	—	—	—	1,308	—	—	—	—	—	—	1,308	
				3	[illegible]	—	—	—	—	—	653	—	—	—	—	—	—	652	
				4	[illegible]	—	—	—	—	—	1,039	—	—	—	—	—	—	1,039	
				5	[illegible]	—	—	—	—	—	822	—	—	—	450	736	—	562	
				6	[illegible]	—	—	—	—	—	402	125	—	—	73	174	205	199	
				7	[illegible]	—	—	—	—	—	141	373	—	—	121	137	133	186	
				8	[illegible]	—	—	—	—	—	150	238	—	—	700	121	182	250	
				9	[illegible]	—	—	—	—	—	270	381	—	—	313	730	73	414	
				10	[illegible]	—	—	—	—	—	—	—	—	—	1,716	323	603	911	
				11	[illegible]	—	—	—	—	—	—	802	—	—	—	—	—	802	
			III.		3. [illegible]						Seed.	Seed.				Seed.	Seed.	Seed.	
				1	[illegible]	—	—	—	—	—	542	—	—	—	—	—	—	542	
				2	[illegible]	—	—	—	—	—	231	—	—	—	—	—	—	231	
				3	[illegible]	—	—	—	—	—	606	—	—	—	—	—	—	606	
				4	[illegible]	—	—	—	—	—	817	—	—	—	—	—	—	817	
				5	[illegible]	—	—	—	—	—	—	180	—	—	—	121	109	137	
				6	[illegible]	—	—	—	—	—	1,119	—	—	—	—	303	—	705	
			IV.		4. [illegible]														
				1	[illegible]	—	—	—	—	—	—	—	—	—	—	—	—	—	
				2	[illegible]	—	—	—	—	—	—	—	—	—	—	—	—	—	
			V.		5. [illegible]				Fibre.	Fibre.	Fibre.	Fibre.		Fibre.	Fibre.	Fibre.	Fibre.		
				1	[illegible]	—	—	—	179	67	—	97	—	97	81	180	60	105	
				2	[illegible]	—	—	—	—	—	548	—	—	—	250	557	710	536	
				3	[illegible]	—	—	—	—	—	348	—	—	—	—	—	—	[illegible]	
			VI.	—	6. Dyes— Indigo (Indigo fera tinctoria)	—	—	—	—	—	—	—	—	—	—	—	Plant. 11,922	[illegible]	
			VII.	—	7. Drugs— Poppy (Papaver somniferum)	—	—	—	—	—	—	—	—	—	Opium. 16	Opium. 10	—	[illegible]	

Statement showing results of experiments tried at the Agricultural Experiment Station, Cawnpore, during the 10 years 1881-82 to 1890-91.

N.B.—Except the special treatment noted in column 6, the treatment of every plot in each series in regard to ploughing, weeding, watering, manure and seed was exactly similar.

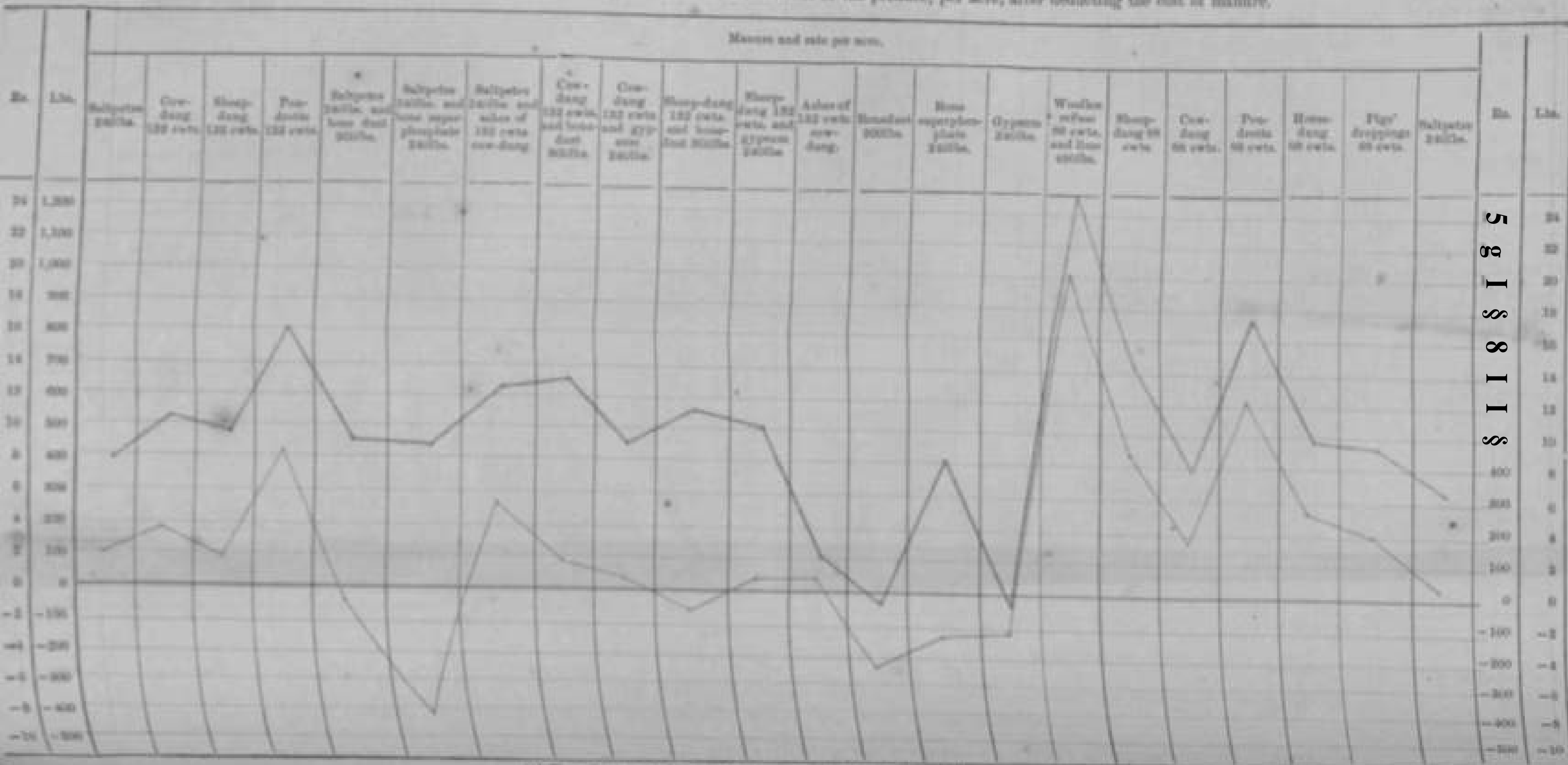
Class.	Experiment.	Crop on which tried.	Series	Serial number.	Special treatment.	Outturn per acre in lbs. 1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	Average outturn per acre in lbs.	Increase per acre in lbs.	Remarks.
													Grain.	Grain.	Grain.	Grain.	Grain.	
VII.—Miscellaneous	Restricting the growth of plant when running to leaf.	Wheat ...	I	1	Grazed by sheep when 1' high.	...	...	...	...	...	...	...	1,016	1,102	2,148	1,422	398	Compared with the plot left untouched.
				2	Nibbled with a sickle when 1' high.	...	...	...	...	...	...	...	1,093	1,128	1,103	1,108	84	
				3	Left untouched ...	...	...	...	...	...	...	...	1,041	1,100	931	1,024	...	
								Fibre.			Fibre.	Fibre.				Fibre.	Fibre.	
	To determine the effect of ratooning a cotton crop preserved for next year.	Cotton ...	II	1	Ratooned ...	...	...	85	...	...	130	85	...	...	...	100	−13	Compared with the unratooned plot.
				2	Unratooned ...	...	...	108	...	...	143	85	...	...	...	113	...	
													Juice.	Juice.	Juice.	Juice.	Juice.	
	Retaining sugarcane for a 2nd crop.	Sugarcane ...	III	1	Outturn of cane planted in the preceding year.	...	...	...	...	...	...	...	5,662	7,480	10,300	7,814	−286	Compared with 1st year's growth.
				2	Outturn of cane planted during the year.	...	...	...	...	...	...	...	8,232	9,478	6,590	8,100	...	
						Grain.		Grain.		Grain.						Grain.	Grain.	
	Preserving the seed from animal depredations by soaking the seed in Jey's purifier.	Wheat ...	IV	1	Soaked in Jey's purifier ...	...	...	1,529	...	...	...	...	...	...	...	1,529	209	Compared with the ordinary way.
				2	Not soaked ditto ...	...	...	1,320	...	...	...	...	...	...	...	1,320	...	
	To determine the effect of alternating wheat with lucerne.	Do. ...	V	1	Alternate with lucerne ...	1,205	...	2,294	...	1,488	...	...	...	...	...	1,722	334	Compared with the plot in which wheat is sown every year.
				2	Wheat every year ...	1,189	...	1,503	...	1,213	...	...	...	...	...	1,308	...	

APPENDIX II.

A.—Diagrams illustrating the effect of certain manures on maize.

No. 1.—Drawn in green, shows the average increase per acre of grain in lbs. over the unmanured plot.

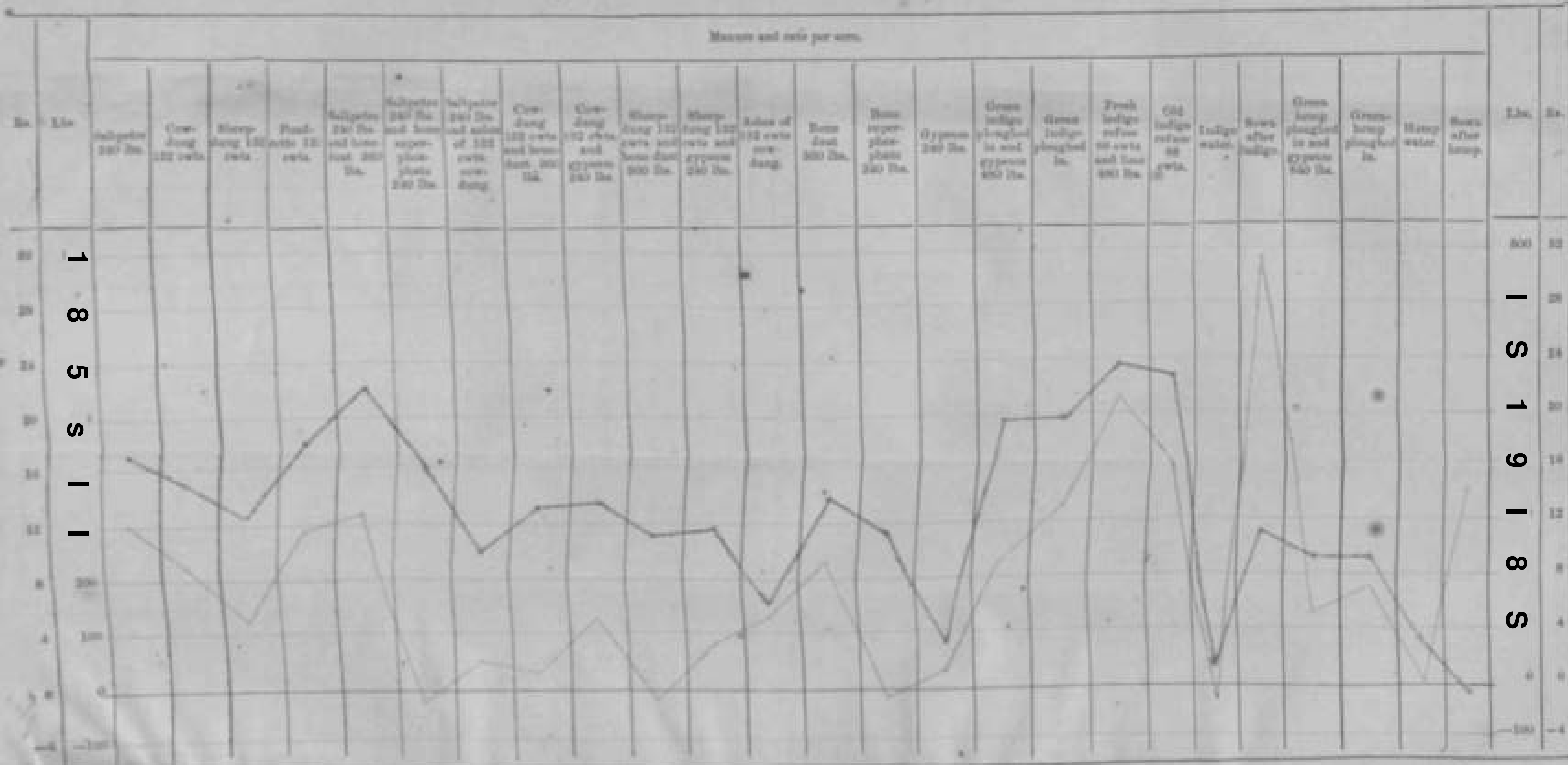
No. 2.—Drawn in red, shows the average net increase in the value of the produce, per acre, after deducting the cost of manure.



B.—Diagrams illustrating the effect of certain manures on wheat.

No. 1.—Drawn in green, shows the average increase per acre of grain in lbs. over the unmanured plot.

No. 2.—Drawn in red, shows the average net increase in the value of the produce per acre, after deducting the cost of manure.

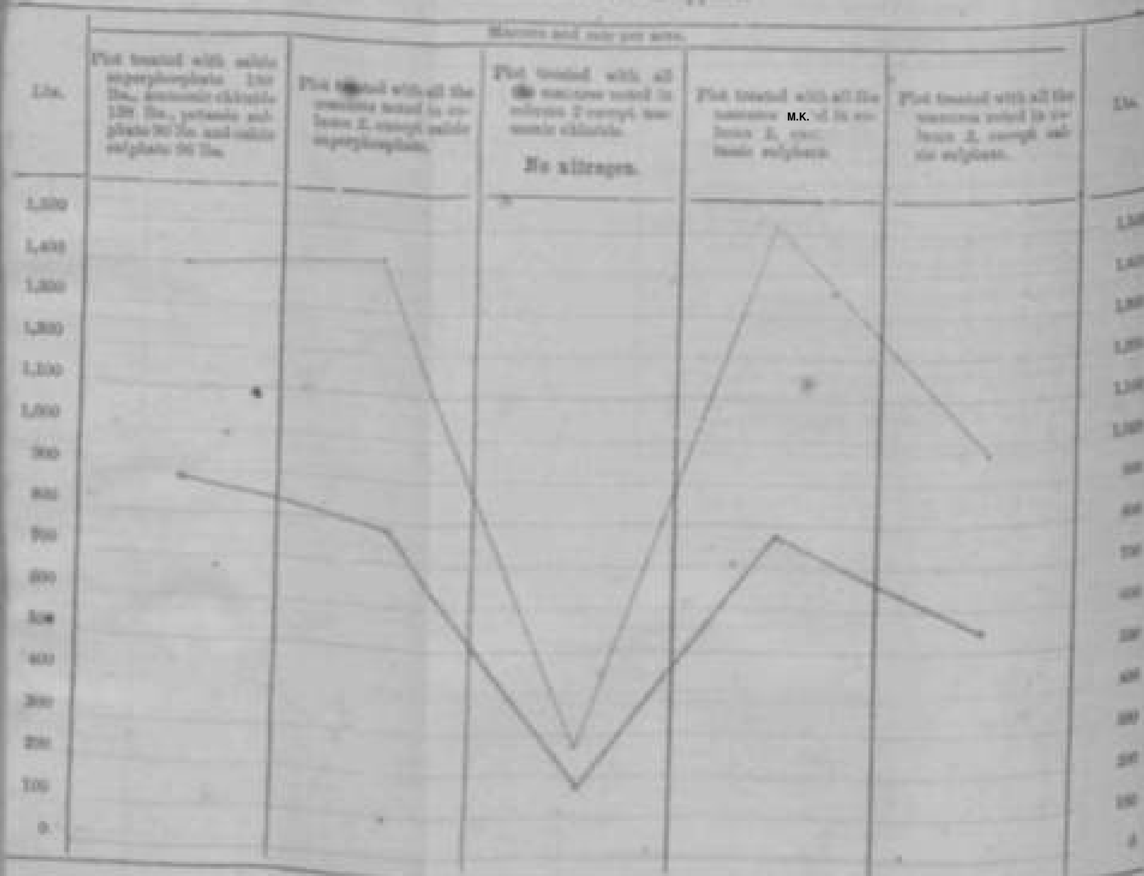


(a) These diagrams are based on the average produce given in Appendix I.

C.—Diagrams illustrating the [illegible] of withholding the supply of nitrogen from a wheat crop.

No. 1 Drawn in green, shows the increased produce, per acre, of gr[illegible] in lbs. over the outturn of the plot to [illegible]

No. 2 Drawn in red, shows the increased produce, per acre, of straw in lbs. over the outturn of the plot to which no manure was applied.



D. Diagrams [illegible] *the effect of irrigation in increasing the outturn of wheat and (b) the relative merits of canal and well water.*

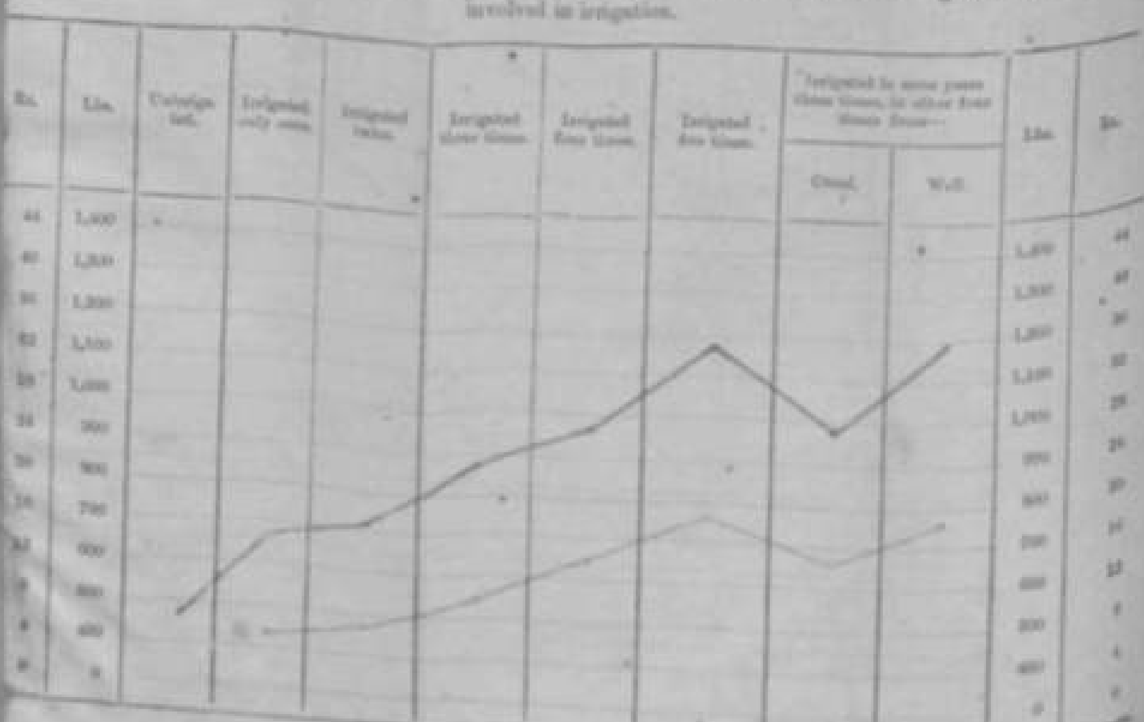
No. 1 Drawn in green, shows the average produce of wheat (grain) per acre—

(a) on unirrigated land;

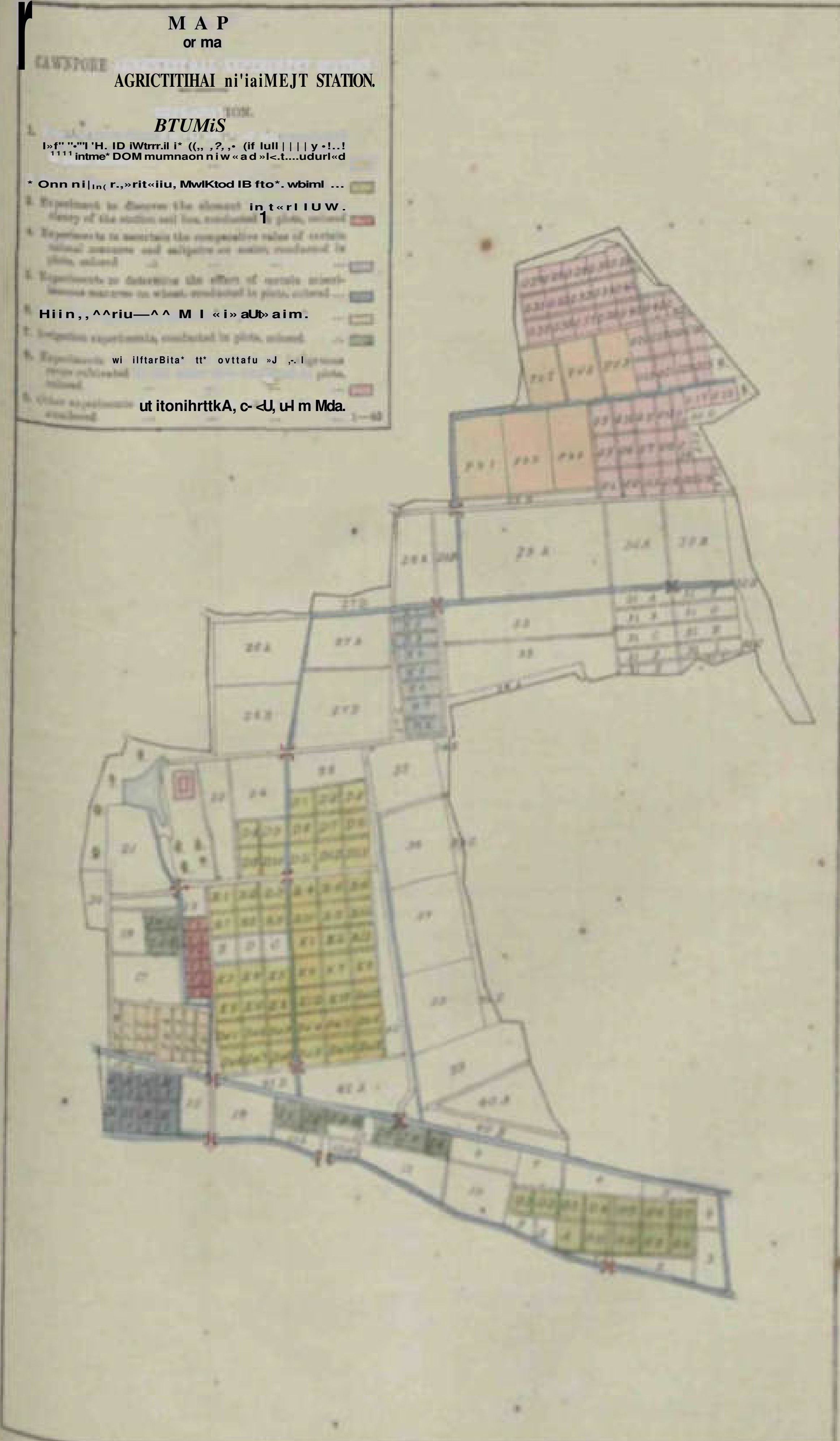
(b) on land watered from one to five times from Canal, and

(c) on land a portion of which was watered from canal and another from well;—

No. 2 Drawn in red, shows the net increase per acre in the value of produce after deducting the extra cost involved in irrigation.



Note.—In calculating the value of produce, value of both grain and [illegible]


MAP
CAWNPORE
STATION.

Errata to the Report on Cawnpore Experimental Farm for 1892-93.

Page 1I, tine US, after "THupitnUwew" *rtad «lh\u" /or " &en."*

„ *, „ 1,/w " oio*Uy" r«rf"mnuu«lly."

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No. 699 P.

DEPT. OF LAND RECORDS AND AGRICULTURE, N.-W. P. AND OUDH.

*DtUi CattnjxMrt, ti** 8<* *NoctmbtT* 1893.

From

J. (^MILLER, ESQ.,

DIMCTO* or LIKD BKOKDS AHD AGSICUITUM,

HTU-WBTKBK PKOUXCO AND Ot'DM,

To

TUB CHIEF SECRETARY TO GOVERNMENT,

NOITU-WHTKUI PHOVINCM A* I) OI

Su,

I *tun* the honor to forward the annual report on the Cawnpore 1 Farm for tin- ymr Iv.t2.9s. The Farm i* under the managcmt. Auutant Htihammad Itadi, but owing to hit aUenw on aick leave, Babti l^chtnan Farohftd wa« in charge from July to October and from the middle of < iry to April 20th,

S. LMI yoar a very complete rereiw of the experiment* conducted at the Farm t.2 thfl prewdin^ ***n* veare wu •nbmitU'd, which hae funitehed the Agricultural nirt to the O• • iih matorial* for an analyti* of the work ot the Farm, which I have been permitted to attach to the annual report. 1 on*; ;«rim«nU will 1M earned on in communication with tl :int, and hi* adri« hu already been taken ae to thoffogramnw for nest aeaeon.

3. I U nnneeeaeary Tor me to add to the rmarks recorded by the Agricnlturel tid the Am*Unt PtrectAr on the reenlta c»U the long eonr»e of' npr It is tatirfactory to find Ihat, though the detail* of a few of tboae rxperi- ti might hare been alwrwl with adwiUjje, the Ftarro ha. itill.in Dr. opir, aluable w •. Witt bit remark, a* to the wwwty of (rwat in the wttgbmente I entirely agree, and it will be undmtnod |krf ..n theee oeeaerane is an i—entiit part of the Auiitant DirvctoKi dutiM. During tli* *nbi* eeaaon, n«w report*! on, the Awiirtant Direotor ptmonally euperrUed the w menu, a:,d the AffHcttUural I *himtdt* wai prewrat at many of tliem, A> cxprmwl eome doubta i*x»nl^in ff^the »«w«7 *ot* the tyftem of wmghment il it only fair to note that Di r wa« epccully rtruck I t^uiMw, and' WII inclined to think that it erred on the tide ot ovcr-rcfiwrnrnt (page MO of h

t. The return, of the part year ihow that there wni| fand an tiooeJly (tood me* harvest at the farm. The f«Iu» of the khahf wu partly and partly h in"p«™«wed management. The permanent >«dent wu d •«• <f *Oatact,* and •i wu deficient in *f%V'* "« **• "T 1 * ^ "T » prartieal agri- under whom a rery gr«t impromwnt in the fUte of the Farm hu *htm* The pemaaeat Stiperintmdeot Uu reoeoUy ntenwd aod leepmiii charge.

5. The stallion sent to [illegible] during the year.

[illegible] experiment recommended [illegible] using brood-mares [illegible] plough. They were broken [illegible] acting Superintendent, Muzaffar Khan, and are now easily driven by any of the Farm servants.

6. Apart from its value as an experimental station, [illegible] useful purpose as a centre for the distribution [illegible] information as to agricultural methods and [illegible] example, has been taken in the stacking [illegible] customary in the northern and western districts, [illegible] making silage and for keeping manure also attract the [illegible] neighbourhood. The enquiries made [illegible] selected are [illegible] improved implements and agricultur[illegible] widespread interest [illegible] of agricultural improvement accompanied by a belief in its possibility.

I have [illegible] honour to be,

Sir,

most obedient [illegible]

[illegible]

Dir[illegible]

I; i: I < > R T

ON THE

CA WNPORE EXPERIMENTAL FARM,

FOE THE KHARIF AND RABI SEASONS 1892-93.

Rainfall.—TV mint comment*! in June, an<I in *hat and the following three months *wen* normal in their total amount, but were • ill-distribuW, *heavy* downpour* alte-tuting with [K*iodn of hot uttubiBo. The muwtoos cea*«l *t an early dale, Towird* the end of SvpUniW llip rains became ti^ht, ami in October, » strong contrast t.j the previoni iwuion, JIO rain ML In January ami February then were copioui cold »i-uon rains, and the weather was untwinlly damp an I cloud v. The tuUl raitifali wu 31'72 incbet, which it wnuwliat abow the normal, though much Wrnr the amount recorded in the prtcocdiny *ynr.* The number of rainy day* wa» 68, u compared with « Ust yew. The following table ehowi the amount and diftribalion of tbe rainfall during the year :—

Month.			Rainfall.			Rainy days.			IIMM.-U
			UU.M	UWW	Normal.	1 K'i-W	1WJ.03	Normal.	
[illegible]	—	—	·90	—	[illegible]	1	—	1	
June	—	—	·18	3·50	311	1	'	4	
[illegible]	—	—	4·73	10·73	low	7	16	12	
August	—	—	24·02	12·25	10·06	18	i»	12	
[illegible]	—	—	tl-fl	aeo	411	14	I	7	
[illegible]	—	—	·w	·	1·22	1	—	2	
Swttmhtr	—	—	—		—	—	' l	—	
December	—	—	—		M	—		1	
January	—	—	·22		·6*	1		1	
February	—	—	·50	·40	'	4	I	1	
kUrtk	—	—	—	—		—	—	1	
April	—	—	—	—	·11	—	—	1	
Total		—	42·35	tin I	at ta	47	52	43	

2. **General character of the MMOO.**—Tln> Umdjr oMiinniioMwot of th. monsoon facilitated plauffhinjf operation (or Uw»uturon cropt; but The nuixe and wttoa eropi in some parti of the Pana tiiffrnd •evin'Iy Inn un*euon*bU wMtbrr lat*r uu, The raid weather raint proved very bftwfioial to the ipnng crop*, and the ool-turn of wbtal anu unotually. jfood. It baa beta the nparinw* of recent you* tltat the outturn ira of kbarif crop* depeodi to largoly on viciuitudnt of »«MOO M to detract largely front the •CMntifie value of ciperimrnU made in that Mtwn, and th« reourd *»t* th« part year confirm* thii remit. Maoy of the experiment mu.i tmle«d be prMoaooetl inconclus:ve, aa they were is the two prroedinff yaan.

3. The experimeata oarrM on at the Farm are elaawd M « ^ m n « (" u.j " t *mforarf,*" the former bring conducted on the time plot* from year to year for an indefinite period; and the latter heir* arranged from time to to. >• the n<vrwiy for fnah experiment! ariar*. Of the "*j*rm*9*ut*" elate, tba no*t important an thaw wbieb are directed to diewrning the elfecU of different manum on QUIM in tbr autumn aeaeoo, aad on wheat in faring. Onipnally the experiment* w*re aUrted to compare the effevt of nitrogMioaa and non-nitrog«M>n* mannr« bat »• the manurial vahM ol the latur claaa pnnred to b* exlmncly imall, the form of the experineat wae changed ; aad tt loa for the latt 10 yean been dinetod to comparitij; the •Sfot of eartaia aitrogenoui manure* with mtrogeiwu* aad non-nitrogenous manures mixed.

«. The method of coaductiag the pcrmaarnt nperimmtt bae hem folly deeuribed ta prtvioM reporla. Than at* four series of plots- with]3 plots la each. O» » cropped mry year with ataiaa, atwUxr wtth wheal—UMM tw* being known a» the

[illegible]

[illegible] "Duplicate" [illegible]

[illegible] and vice [illegible]

KHARIF SEASON EXPERIMENTS

[illegible] "Duplicate" [illegible]

[illegible]

Kharif Statement No. I.—[illegible]—Manure experiment with Maize.

Serial number	Manure per acre	Outturn per acre: Grain: Average of three years	Grain: Year under report	Stalks: Average of three years	Stalks: Year under report	Increase or decrease per acre as compared with unmanured plot: Grain: Average of three years	Grain: Year under report	Stalks: Average of three years	Stalks: Year under report
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1	Cow-dung, 190 maunds + bone-dust, 4½ maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	Ditto do. + gypsum, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	Ditto do.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	Ashes of 190 maunds of cowdung	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	Saltpetre, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	Ditto do. + bone superphosphate, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	Sheep-dung, 190 maunds + bone dust, 4½ maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	Ashes of 190 maunds of cowdung + saltpetre, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	Poudrette, 190 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	Sheep-dung, 190 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	Saltpetre, 3 maunds + bone dust, 4½ maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	Sheep-dung, 190 maunds + gypsum, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	Unmanured	[illegible]	[illegible]	[illegible]	[illegible]	...	...	...	...

Note.—In 1882 and 1886 the maize crops failed altogether; these years have therefore been left out of account in striking averages.

Kharif Statement No. II.—[illegible]—Manure experiment with Maize.

Serial number	Manure per acre	Outturn per acre: Grain: Average of last 3 years	Grain: Year under report	Straw: Average of last 3 years	Straw: Year under report	Increased or decreased outturn per acre as compared with the unmanured plot: Grain: Average of last 3 years	Grain: Year under report	Straw: Average of last 3 years	Straw: Year under report
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1	Cow-dung, 190 maunds + bonedust, 4½ maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	Ditto do. + gypsum, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	Cow-dung, 190 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	Ashes of 190 maunds of cowdung	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	Saltpetre, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	Ditto do. + bone superphosphate, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	Sheep-dung, 190 maunds + bone dust 4½ maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	Ashes of 190 maunds of cowdung + saltpetre, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	Poudrette, 190 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	Sheep-dung, 190 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	Saltpetre, 3 maunds + bone dust, 4½ maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	Sheep-dung, 190 maunds + gypsum, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	Unmanured	[illegible]	[illegible]	[illegible]	[illegible]	...	...	...	...

6. Both series of plots [illegible] June—with 12 lbs of seed per acre. On the follo[illegible] [illegible]ry downpours of rain, followed by a few [illegible] dry scorching weather, which led to the formation of a

hard crust on the surface of the soil, and seriously interfered with the germination of the seed and with the growth of the young shoots, when germination had taken place. To soften this crust, a watering was given to the "Standard" plots on the 9th July, but the result was unfortunate, as heavy rains lasting for several days commenced on the 10th. It was intended to water the plots of the "Duplicate" series on the 10th, but, owing to the rain, this was unnecessary. In both series of plots the yield was exceptionally poor; but it was somewhat better, contrary to usual experience with maize, in the "Duplicate" than in the "Standard" series. The difference is attributable to the fact that the heavy rains of the 10th July and succeeding days caused more injury to the irrigated plots in the "Standard" series than to the other which had not been artificially watered. When crops suffer so seriously from climatic conditions, it is impossible to draw conclusions of any value as to the effect of various manures. Some of the plots are on a slight slope and are more liable to injury from heavy rains, while some of the manures can be more easily washed away than others. It thus becomes impossible to say how far differences in outturn are due to differences of value in the manures, and how far to unequal injury from unreasonable rains.

7. **Miscellaneous manure experiment with maize.**—This experiment was intended to be a permanent one to ascertain the comparative value of certain animal manures and saltpetre on maize; but as the Agricultural Chemist has expressed some doubt as to its value, it will probably be discontinued or altered. The experiment is conducted in 8 plots, each of which is treated exactly alike, except in respect of manure. The following is a detail of treatment adopted in the case of these plots:—After harvesting the preceding maize crop, the plots were left undisturbed till December, when there was a slight shower of rain; and they were ploughed once with the Watt's plough. Two more ploughings were given in the months of January and May respectively with the same plough. About the end of May, all the manures, except saltpetre, were spread on the respective plots and ploughed in with the country plough and levelled down. In the beginning of June, after a light shower, they were ploughed, once with Watt's and once with country plough, and levelled with the *patela*. On the 13th of June saltpetre was applied to its plot and seed was sown at the rate of 15 lbs per acre in furrows opened by the country plough. The plots were then levelled at once. When the crop was 16 days old, a watering, which was needed, was given and proved very beneficial. The plants were thus well advanced before the heavy showers of rain in July, which, in the case of the experiments mentioned before, interfered with the healthy growth of maize; and these plots were not seriously injured. The plots received the first weeding on the 9th of July, and the second on 1st August. During the process of second weeding the plants were earthed up. The crop was harvested on the 15th September.

8. The produce of each plot for the year, and the average outturn of the last five years, are given in the subjoined table:—

STATEMENT No. III.

Serial number.	Manure per acre.	Outturn per acre.				Increased or decreased outturn per acre as compared with the unmanured plot.			
		Grain.		Stalk.		Grain.		Stalk.	
		Average of last 5 years.	Year under report.	Average of last 5 years.	Year under report.	Average of last 5 years.	Year under report.	Average of last 5 years.	Year under report.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1	Woollen refuse, 120 maunds, and lime 12 maunds	1,287	2,105	8,700	6,945	+1,200	+702	+5,004	+4,223
2	Sheep-dung, 120 maunds	1,412	2,478	6,992	7,091	+725	+1,260	+3,205	+4,369
3	Cow-dung, 120 maunds ...	1,058	1,909	6,020	3,719	+508	+799	+2,318	+1,017
4	Poudrette, 120 maunds ...	1,492	2,947	6,518	5,264	+702	+1,231	[illegible]	+2,012
5	Horse-dung, 120 maunds	1,074	2,129	6,449	4,429	+587	+1,016	+2,747	+1,706
6	Pig's dung, 120 maunds ...	1,140	2,119	6,046	5,524	+659	+1,003	+2,246	+2,800
7	Saltpetre, 2 maunds ...	808	2,057	5,941	4,900	+321	+944	+2,239	+2,178
8	Unmanured ...	487	1,113	3,702	2,722	—	—	—	—

9. [illegible] yield in these plots was unusually high in the year under report, being [illegible] cent. or more [illegible] five years, but in some of these years the crops were very poor. [illegible] the year under report is due to the fact that these plots were sown [illegible] "Standard" and "Duplicate" plots, and 22 days earlier than they were sown in the preceding year, and by the time the heavy showers of rain commenced, they were so well advanced in growth, [illegible] irrigation, [illegible] benefited rather than injured by the rains. The fact that the yield increases by early sowing is sufficiently established by the early and late sowing experiment described in paragraph 11.

10. **Manure experiments with cotton.**—This experiment is to determine the effect of various manures on country cotton. The following is a description of the manner in which it was conducted:—

About the end of May, the plots were watered and ploughed once with the Watt's plough. [illegible] rain they were ploughed a second time similarly, and levelled with the *patela*. On the 19th of June manures were spread and seed sown broadcast the next day at the rate of 24lbs the acre. [illegible] country plough and [illegible] variety. [illegible] fore, irrigated [illegible] which seriously damaged [illegible] inevitable result that the yield both of fibre and seed turned out to be considerably less than the average [illegible] July, [illegible] time, and on the 23rd August the second and the last [illegible] lasted till [illegible] turn of each plot and the quantity and description [illegible]

[illegible] experiment with cotton.

[illegible]	Manure per acre.	Outturn per acre.				Increased or decreased outturn per acre as compared with the unmanured plot.			
		Cleaned cotton.		Seed.		Cleaned cotton.		Seed.	
		Average of last four years.	Year under report.	Average of last four years.	Year under report.	Average of last four years.	Year under report.	Average of last four years.	Year under report.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1	Fresh silt from canal, 200 maunds.	142	23	[illegible]	67	+35	−21	+73	−23
2	Kainit, 4 maunds, and gypsum, 4 maunds.	137	53	294	115	+30	+9	+98	+25
3	Farmyard manure, 150 maunds, and gypsum, 1 maund 14 seers.	170	70	336	166	+63	+26	+140	+76
4	Farmyard manure, 150 maunds and kainit, 1 maund 14 seers.	174	52	324	114	+67	+8	+128	+24
5	Woollen refuse, 120 maunds	220	73	411	120	+113	+29	+215	+30
6	Unmanured	107	44	196	90	—	—	—	—

All the manured plots, except that treated with *fresh silt from canal*, gave a better yield than the unmanured plot. The circumstance of this plot yielding a fairer outturn than the unmanured plot is attributable to the soil of the former containing a very much higher percentage of clay than that of the latter, and being thus liable to sustain a greater damage by excess of rain.

11. **Experiments in early and late sowing.**—This experiment is conducted with maize and cotton. In the case of maize it is directed merely to comparing the effect of early and late sowing, but with cotton the experiment is intended also to show the the outturn of different varieties.

The early sowings of maize were made on June 4th, and the late sowings on June 19th; the crops were harvested on September 4th and September 12th respectively. Cotton was sown on June 3rd and on June 19th; the picking in both cases commenced in October, and ended in April. The following statement shows the result of the experiment:—

Kharif Statement V(a).—*Early and late sowing of maize.*

Number of plot.	Date of sowing.	Produce per acre. Grain. Average of past [illegible] years.	Grain. 1902-03.	Stalks. Average of [illegible] years.	Stalks. 1902-03.
		Rs.	Rs.	Rs.	Rs.
22 A	June 19th	[illegible]	[illegible]	[illegible]	7,724
22 B	June 4th	1,463	1,329	4,903	6,514

Kharif Statement V(b).—*Early and late sowing of cotton.*

Number of plot.	Variety of cotton sown.		Produce per acre. Cleaned cotton. 1901-02.	Cleaned cotton. 1902-03.	Seed. 1901-02.	Seed. 1902-03.
			Rs.	Rs.	Rs.	Rs.
[illegible]	Sown before rain.	[illegible]	[illegible]	[illegible]	[illegible]	223
		Bani	115	[illegible]	[illegible]	124
		Dharwari	[illegible]	[illegible]	[illegible]	209
		Baroda	172	[illegible]	[illegible]	208
		Louisiana	172	138	[illegible]	280
		Jari	[illegible]	[illegible]	[illegible]	208
		Com[illegible]	[illegible]	[illegible]	[illegible]	533
P4 & P. [illegible]	Sown after rain.	Va[illegible]	[illegible]	[illegible]	[illegible]	145
		Bani	[illegible]	[illegible]	[illegible]	108
		Dharwari	[illegible]	110	110	218
		Baroda	[illegible]	[illegible]	[illegible]	148
		Louisiana	[illegible]	[illegible]	[illegible]	125
		[illegible]	[illegible]	[illegible]	46	188
		[illegible]	[illegible]	[illegible]	24	250

The experiments made at the Farm appear to establish conclusively, the result, that [illegible] cotton before the rains, so that they may get a good start before the heavy rains, by which the young plants are liable to be injured, etc.

12. Experiments with different varieties of imported cotton [illegible] commenced in 1885, with a view to determining whether foreign varieties of cotton can be cultivated successfully in the [illegible].

Eleven plots are allotted to this experiment, each being sown with a different variety of foreign cotton, and subjected to the same treatment [illegible]. The dates of tillage and other operations performed on the plots are shown below:—

Date.	Operations.
[illegible]	Watering.
9th	One ploughing with Watt's plough and levelling with patela.
10th	Cattle-dung [illegible] at the rate of 110 maunds per acre.
[illegible]	One ploughing with Watt's plough and levelling as before.
13th	Seed dibbled at the rate of 12 lbs. per acre.
14th July	Weeding.
21st August	Weeding.

Picking commenced in the last week of October and was over in the first week of April. The following table shows the yield of each variety for the four years:—

Kharif Statement No. II.—Outturn of foreign cotton.

Serial No.	Names of varieties.	1888-89. Fibre.	1888-89. Seed.	1889-90. Fibre.	1889-90. Seed.	1890-91. Fibre.	1890-91. Seed.	1891-92. Fibre.	1891-92. Seed.	1892-93. Fibre.	1892-93. Seed.
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Georgian	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	Tree cotton	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	Louisiana	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	Sea Island	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	B. R.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	Prolific	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	Jone's Improved	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

13. It will be noticed that no variety shows either a regular rise or fall in the yield. There is, however, a singular want of similarity in the annual results of each variety. No reasonable explanation can be offered for these results. The experiment will have of necessity to be continued for another period of at least ten years with a view to obtaining definite results. During the year under report "Sea Island" gave the highest outturn, "Hybrid" second, "Egyptian" third, and "Hinganghat" fourth. All the varieties, except "Garo Hills," have produced a better yield during this than during the previous year. It is also noteworthy that, as compared with the yield of [illegible] experiments, "Sea Island" and "Garo Hills" have given higher outturns. In future, therefore, the results of these two will be watched with greater interest.

14. Experiments with mixed crops.—The experiment was started this year to ascertain the outturn of each of the crops in some of the more common combinations in which crops are grown by ordinary cultivators. The plots were sown at the ordinary seed rates, and the following statement shows the outturn of each crop in the present and the past year.

Kharif Statement No. VII.—Mixed crops.

Serial No.	Crops. Name.	Crops. Quantity of seed sown.	Produce per acre this year. Grain or cleaned cotton.	Produce per acre this year. Straw or seed of cotton.	Produce per acre last year. Grain or cleaned cotton.	Produce per acre last year. Straw or seed of cotton.	Remarks.
		Sr.	Sr.	Sr.	Sr.	Sr.	
I	Indigo	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]
II	Maize	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	Cotton	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	Arhar	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	Til	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	Urd	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
III	Bajra	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Arhar	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
IV	Juar	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	Arhar	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
V	Castor	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Cotton	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	Til	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	Urd	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

RABI SEASON EXPERIMENTS.

15. The most important experiments in the cold weather are those which have already been referred to in paragraph 4 above, the details of which are given in the following statements:—

RABI STATEMENT NO. I.—Old Series.—Manure experiments with Wheat.

Serial number.	Manure per acre.	Outturn per acre. Grain. 1902-03.	Outturn per acre. Grain. Average.	Outturn per acre. Straw. 1902-03.	Outturn per acre. Straw. Average.	Increase or decrease outturn per acre over the unmanured plot. Grain. 1902-03.	Grain. Average.	Straw. 1902-03.	Straw. Average.
		lb.	lb.						
1	Cow-dung, 180 maunds + bone dust, 4½ maunds.	1,491	[illegible]	[illegible]	[illegible]	+ 417	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	Ashes of 180 maunds of cow-dung.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	1,738	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+ 050	[illegible]	[illegible]
7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	Sheep-dung, 180 maunds + gypsum, 3 maunds.	[illegible]	[illegible]	[illegible]	4,101	[illegible]	[illegible]	[illegible]	[illegible]
13	Unmanured	[illegible]	[illegible]	[illegible]	[illegible]	...	...	...	...

RABI STATEMENT NO. II.—Complete Series.—Manure experiments with Wheat.

Serial number.	Manure per acre.	Outturn per acre. Grain. 1902-03.	Grain. Average of last five years.	Straw. 1902-03.	Straw. Average of last five years.	Increase or decrease outturn per acre over the unmanured plot. Grain. 1902-03.	Grain. Average of last five years.	Straw. 1902-03.	Straw. Average of last five years.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	Cow-dung, 180 maunds + bone dust 4½ maunds.	2,214	1,268	[illegible]	2,043	[illegible]	[illegible]	+ 1,109	[illegible]
2	Ditto + gypsum, 3 maunds.	[illegible]	1,245	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible] maunds	[illegible]	1,084	[illegible]	2,170	[illegible]	[illegible]	[illegible]	[illegible]
4	Ashes of 180 maunds of cow-dung	[illegible]	[illegible]	[illegible]	[illegible]	+ 121	[illegible]	[illegible]	[illegible]
5	Saltpetre, [illegible] maunds	[illegible]	[illegible]	7,400	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	Ditto + bone superphosphate 3 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+ 262	[illegible]	[illegible]
7	Sheep-dung, 180 maunds + bone dust, 4½ maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	Ashes of 180 maunds of cow-dung + saltpetre 3 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+ 479	[illegible]
9	Poudrette, 180 maunds ...	[illegible]	[illegible]	[illegible]	[illegible]	+ 731	[illegible]	[illegible]	[illegible]
10	Sheep-dung, 180 maunds ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+ 779	[illegible]
11	Saltpetre, 3 maunds + bone [illegible] maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	Sheep-dung, 180 maunds + gypsum 3 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	Unmanured	1,754	[illegible]	[illegible]	[illegible]	...	...	...	...

!•• 1W prtparttion of UM laad for UM "Standard series" and the result of the npwtBMBta an dafenbal Wow :—

Sad U wwa at UM nU gf ifO ft* par arm. Dariaff tb* pariod of n< four ploughings with Ut*> VaU'« pfeaf* an gn«a to lb# ml at tiiMi brnmrabl' for the operation. TW plot- an rkogW ap ^ i , «t UM <W of tb* nil- and i w M with thf «*#/«. Uaaan w UMB ipn«J tad „*....*»»«! in with ih«- country plough, and ' **'' fields levelled again. Where weeds grow abundantly, the fields are harrowed. To get rid ! thm mlt, <MM awn fJooghmg - U*a gif» with UM coaaUy ateafh, «wl tut pW levelled to complete the preparation of the seed-bed. Seed is then sown behind a country plough, and covered over • by «awa «f a »wWW. Plata ftn tbr divided into irrigation M* oftll«l K-W*M>d wataml DIM tW Uuw weeks after sowing ; and ' »K*iB after a *urtbar iaUml of ft furta^bt, a «Mnad waltrin. is given. The first *din* follows after a weak. TW erop M bamiUl fawiril)/ ia th* bagi—ay of April.

17. TW ykld of «aeh plot innmg tW yw o»W report is considerably higher than tltt- of the rro.poa.lin,; |J during «^h »f tl year since the commencement of the « experiment. SWtp-diiag with tTpna ha* *• on the high a JIMM a* la*t year. Sheep-dung • alotM imaka urn. ami ww^aaa; •teaO* thtrd. ytrkliaa; Wttar results than tb.- nrt ->f U» muuM. A. a pnrUml fatluHnw, daay app*ar> to b* by far the most economical and effective manure for wheat. Dung is unfortunately burnt in tKw cuuatry by UM common ««Hivfttor at Nci. aad ih* aihat an amUahla w him for OH a* nanunv ashes alone, t.. all other manures, have yet proved III . (if:1 rlT« to M« MM BMaanal «al»». Opport unity has been lafcw of dHarauatag fr-» ta«a> MpmawaU wWtWr, by UM » addition of an artificaU n'tnfmoH mn.it to UM Mb, UM Um of oilttv-n W tl* !«'• ning of UM dnaf OOMU W m*i. «p. A* a twatt of tW put II jmi experi »•* l< is n..w rutly nwtiiiwid U»t UM aattttam «f antd« aOtpttn auk** np thw !•-• *° '' oorteia «Unt. TW yiald of U* plot tnaitU with Mitton of aaW» *o<l -W ban boavtw, b*m alwaya WJow that «f UM pU uwtftj wtUi oowdaaf aloa* t bat U mu*l W buw ia mind that ia ow m>«iiaaal ooly Ihm* wiwadi af saltpetre, con- tamiaf not awn UMB 34 Vtm of akngoa, an a&M tothaahaiaf 180 maunds of
^ - ^ I . I M —tiawaa a ——L«M W *——*-- &• I__^J 11 Tk* A# •ilfiinafti TL* &rtiAa^d supply
Qpaf*4HBVt WUKH •••* a^Ba^ ww I W H ^ •# awo'awV V aa^* •*• •a»fjaj»ajj^^Bj. • HP V> •••••^ possible
of aitmfMi » UMM w>aaiJ*mhly 1m Ua« it o*g*l to W. It m Piaaiqa—tly I* M my daiattolr WWUMT BUUB*; aitngoa ia UM (ana of aWtfatn to •abw of cow-dung m UM OIIK qoaality, a* m kwt by batata*, wwald fully noMapawaH UM I'' Saltpetre aiooe W* UM y«w fivoa a ywM of MS ft* MM UMD ww-lnnCi bot here •gata UM aawaat of aitMf** wotaiawl ia UM waifht «f adtpHn aa*l, WM decidedly MM tiiaa wbat wa* ptmot fai UM q«ft quantity of cow-dung agappliiai. U»fh UM low yield otay »U> W da*, ia a B«MI», to ito Wtag pioa9b«l ia WCon Mwia* instead of btttaf ia*d M 1 if Irnaiij It m a qwaUaa, wWtbar it w«aM r»t I advisable in fatanb»nM*UMi)»Mt quantity of salt pftnm] plots Nos. 5 and 8 of the "Standard" and its rwnaajunJiag pkrta of lb« '' I Duplicate" series from three to about four maunds the acre, a> a* to phwa that M«BIIH. wtUi r> regard to the percentage of nitrogen, theoretically, •a UM aaw fetal * with cow-dung, and to justify a comparison between v FPMII of the cow-dung and salt Mta>| ot, to avoid inter f«f«aat • with an experim-in af »u. U M uU* «taailia« »*.-. aftnte pl.H« awy U r W n rw«wWf« ia UM Yam, a*>) Iraat«a with UM innaiiiit «4taafjaiay »f Mii|<irr.

I at >H. at**h iapartMM- to tW MMMdf af wuiung fartbar Imli with • saltpetre in a rarWi variety of ways, aW M UM only available inorganic nitrogenous manure, and ha* OH UM wbobt {wowaaod me with good results.

18. The yi» ta b»Ui UM "ttaaiard" aad UM "Duplicate" series has been MMBaltr *o«l thtt y*w. Mat UM result goes to confirm the reports received from .1 4»«t. r* o! UM *^#II*I of UM kwt wheat harvest.

19. It will be observed that the average yield of «WatNkM>arfaiUM "Duplicate," than in the "Standard" series, whik ia UM mm 4 w*im, tt* - MMI» "Standard" series plots

[illegible] on the [illegible] given [illegible] "Duplicate" [illegible] follows wheat in the same year, [illegible] a short [illegible], while after the [illegible] crop. The land lies fallow for [illegible] year before the wheat is sown.

20. [illegible] No. II.—[illegible] of experiment to determine the [illegible] of Green maturing on wheat.

Serial number.	Manure applied.	Outturn per acre.				Increase or decrease per acre [illegible] the unmanured.			
		Grain.		Straw.		Grain.		Straw.	
		Average for the last five years.	1902-03.	Average for the last five years.	1902-03.	Average for the last five years.	1902-03.	Average for the last five years.	1902-03.
1	[illegible] indigo refuse 120 maunds.	[illegible]	[illegible]	2,207	[illegible]	+561	[illegible]	[illegible]	[illegible]
2	Fresh indigo [illegible] maunds, [illegible] maunds.	[illegible]	[illegible]	2,328	[illegible]	[illegible]	—	+1,313	+1,535
3	Indigo water, [illegible] feet.	[illegible]	[illegible]	1,807	—	[illegible]	—303	[illegible]	[illegible]
4	[illegible], 3,600 cubic feet.	[illegible]	1,225	1,795	[illegible]	—60	+25	[illegible]	[illegible]
5	Unmanured	941	1,500	1,865	1,585	...	...	...	...
6	Hemp stump ploughed in	1,012	1,414	1,958	1,876	+61	—84	+73	+290
7	Green hemp ploughed in	1,207	1,379	2,428	2,096	+256	121	+538	+811
8	[illegible]	1,512	1,223	2,313	2,214	[illegible]	[illegible]	+630	[illegible]
9	Indigo stump ploughed in	1,219	1,295	2,339	2,154	[illegible]	—205	+644	+569
10	Green Indigo ploughed in with 4 maunds of gyp-[illegible]	[illegible]	1,518	2,025	3,722	[illegible]	+158	+140	[illegible]
11	[illegible] ploughed in [illegible]	[illegible]	1,295	2,121	2,284	[illegible]	—205	+210	+799
*12	[illegible] lucern.	[illegible]	lucern standing.	1,803	lucern standing.	—128	—	—62	—
*13	[illegible] with lucern.	[illegible]	1,053	1,321	[illegible]	—82	—447	—80	+320

21. [illegible] 13 plots [illegible] experiment, which are [illegible] year after year [illegible] with wheat. The following [illegible] on each plot :—

Serial number.	Manure applied.	Tillage and other operations.
1	[illegible] indigo refuse 120 maunds	(a) Two [illegible] Watt's plough. (b) [illegible] (c) [illegible] Watt's plough [illegible] interval of a fortnight. (d) One ploughing in the beginning of October. (e) Levelling. [illegible] with native plough. [illegible] (i) Plough [illegible] (j) [illegible] (k) [illegible] (l) Two [illegible] (m) [illegible]
2	Fresh indigo refuse and lime	As in No. [illegible] is spread 2 days before sowing and ploughed in and levelled.
3	Indigo water	[illegible] ditto ditto.
4	Hemp water	Ditto ditto ditto.
5	Unmanured	(a) (c) Ploughing (d) (e) (f) (g) (h) [illegible]) (m).
6	[illegible] stump ploughed in	(b) Hemp stalks [illegible]
		(c) [illegible]
7	Green hemp	As in No. (1).
8	[illegible] indigo	Do. do.
9	Indigo stump	As in No. (6).
10	Do. and [illegible]	As in No. (1).
11	[illegible]	As in No. (1).
*12	[illegible] lucern	Lucern standing.
*13	Wheat alternating with lucern	As in No. (1).

*N.B.—[illegible] both these plots wheat is taken after lucern, so that when one plot bears wheat the other bears lucern.

22. Referring to *rabi* statement No. III it will be seen that all the plots that are kept under green fallow have, during the past five years, been producing better results than that kept bare fallow. The yield of the unmanured plot during the year was unusually high. Other facts worthy of mention are —

(1) that taking the average outturns for the last five years into consideration, the plots cropped or treated with indigo refuse or indigo water have given much better results than those cropped or treated with hemp or hemp-water, respectively;

(2) that plots manured with green stalks of indigo or hemp have yielded higher outturns than those from which these crops had been cut and removed, roots alone being left, with a view to enriching the land;

(3) that old indigo refuse gave the highest yield during the year under report, fresh indigo stalk and gypsum ranked second, and fresh indigo refuse alone came third.

But taking the average for the last five years into consideration, fresh indigo refuse with lime have proved superior to the rest of the green manures.

23. One of the most valuable results of experiment is to ascertain the effect on unmanured land by continuous cropping with the same crop. In the "Standard," "Duplicate," and "Green manuring" series, the yield of the unmanured plot has been as follows:—

Year	Standard series.	Duplicate series.	Green manuring series.
	Rs.	Rs.	Rs.
1881-82	777	771	...
1882-83	1,085	939	...
1883-84	1,051	2,191	1,215
1884-85	[illegible]	1,085	629
1885-86	[illegible]	1,119	
1886-87	1,041	1,208	[illegible]
1887-88	809	967	
1888-89	893	617	[illegible]
1889-90	1,307	1,371	1,444
1890-91	[illegible]	1,207	[illegible]
1891-92	[illegible]	[illegible]	499
1892-93	...	1,734	[illegible]

The yields vary [illegible] from year to year according to the character of the season, but the outturn in recent years has, on the whole, been quite as high as in the earlier seasons of experiment, and no deterioration from over-cropping can yet be traced.

24. **Deep and shallow ploughing.**—This experiment was carried on in two series of plots from 1886-87 to last year, and the results were fully noticed in last year's report. In the year under report the experiment was continued in [illegible] series of three plots. The first plot was ploughed four times, [illegible] by working one Watt's plough behind another in the same furrow; the second was ploughed four times, five inches deep, with the Watt's plough, and the third plot, eight times, three inches deep with the country plough. All the plots were then levelled with the *patela*, and sown with wheat behind a country plough at the rate of 120lbs per acre. They were then levelled

with the petals as before, and were watered once about three weeks after sowing. Weeding followed after a week. The crop was harvested in the first week of April. The following tabular statement gives the outturn of each plot.

Rabi Statement No. IV.—*Experiments with ploughing.*

Serial number.	Ploughing.			Outturn per acre.		Increased outturn as compared with the plot ploughed with country plough.	
	Kind of plough used.	Depth of ploughing.	Number of ploughing.	Grain.	Straw.	Grain.	Straw.
				lb.	lb.	lb.	lb.
1	Watt's plough	9"	1	[illegible]	[illegible]	[illegible]	+ 40
2	Ditto	6"	4	[illegible]	[illegible]	[illegible]	[illegible]
3	Country plough	[illegible]	[illegible]	[illegible]	[illegible]	...	...

The plot ploughed four times, 6 inches deep, has not only produced better results than the plot ploughed eight times, 9 inches deep, but also better than that ploughed four times, 9" deep. The latter circumstance was most likely due to the fact that, in case of plat (1), the land, which was not so well exposed to the atmospheric action as the surface soil and which therefore contained a smaller proportion of plant food, when incorporated with the surface soil, reduced the percentage of organic matter and other available nourishing materials.

25. *Experiments with foreign grains.*—This is a temporary experiment started in 1890-91, with the view of acclimatizing certain foreign grains. The outturn in each year is shown in the following statement:—

Rabi Statement No. V.—*Experiments with foreign grains.*

Name of crop.	1890-91.		1891-92.		1892-93.		Remarks.
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	
	lb.	lb.	lb.	lb.	lb.	lb.	
Wheat (1)—Adelaide	...	...	[illegible]	[illegible]	[illegible]	[illegible]	
(2)—Ladoga	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(3)—Red Fern	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(4)—[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(5)—White Fife	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(6)—Red Fife	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(7)—[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Barley (1)—[illegible], six rowed ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(2)—Danish Chevalier, two rowed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(3)—[illegible], two rowed ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(4)—Swedish, two rowed ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Oats (1)—Prize Cluster	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(2)—Canadian Triumph ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(3)—[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(4)—[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(5)—[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(6)—White Egyptian	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Rye	...	...	[illegible]	[illegible]	[illegible]	[illegible]	

26. The attempts to acclimatize foreign wheat have been unsuccessful, and the experiment will probably be discontinued, as the Agricultural Chemist has expressed some doubt of the value of this experiment. Barleys have done somewhat better. The Canadian oats yielded a magnificent crop of green fodder, but the outturn of grain was poor.

27. *Experiments with varieties of barley.*—Another experiment that has been carried on since 1889 with several varieties of barley, has given somewhat better

results; ordinary Cawnpore variety :—

STATEMENT No. VI.—*Experiment with varieties of Barley.*

Serial number.	Varieties of Barley.	Grain or Straw.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.
1	Ordinary Cawnpore	Grain	1,212	1,110	1,323	343	846
		Straw	2,572	1,080	2,814	207	1,613
	[illegible]	Grain	1,247	1,084	1,433	478	869
		Straw	2,164	2,517	2,432	1,838	1,635
	[illegible]	Grain	1,720	1,302	1,407	820	833
		Straw	2,[illegible]	2,116	2,220	1,740	1,204
	[illegible]	Grain	1,274	1,0[illegible]	1,384	1,085	1,458
		Straw	4,080	1,775	2,033	1,700	2,089

Experiments made in grinding specimens of the [illegible] barley gave the following results :—

Description.	Weight of barley ground.	Proportion of— Flour.	Bran.	Remarks.
	Seers.	Chittacks.	Chittacks.	
I. Hulless—				
(1) Chocolate	1	[illegible]	[illegible]	
(2) Green	1	[illegible]	[illegible]	
(3) Grey	1	13½	3	
II. Husky—				
(1) Country, white	1	14	2	
(2) "	1	14	2	
(3) Danish Chevalier	1	14	2	
(4) [illegible]	1	14½	1½	
(5) Polar, six-row	1	14½	1½	
(6) [illegible]	1	14½	1½	

RESULTS ESTABLISHED BY THE EXPERIMENTS TRIED AT THE FARM.

19. With regard to the general results established by the series of scale experiments, I subjoin two statements; one showing the average yield of wheat for the last 12 years (including the year under report), and the other, the financial results of each manure applied.

Statement showing the average yield of wheat during the last 12 years.

Serial number.	Manure.	Rabi standard. Average yield from 1882 to 1893.	Number in order of merit.	Rabi duplicate. Average yield from 1882 to 1893.	Number in order of merit.	Remarks.
		lbs.		lbs.		
1	Saltpetre	1,429	7th.	[illegible]	7th.	
2	Cow-dung	1,433	6th.	[illegible]	4th.	
3	[illegible]	1,408	9th.	1,513	8th.	
4	Poudrette	1,465	3rd.	1,569	2nd.	
5	Saltpetre + bone-dust	1,491	1st.	1,598	1st.	
6	Saltpetre + bone superphosphate	1,453	5th.	1,548	5th.	
7	Saltpetre + ashes	1,351	12th.	1,484	11th.	
8	Cow-dung [illegible]	1,400	2nd.	[illegible]	10th.	
9	Cow-dung + gypsum	1,433	4th.	[illegible]	9th.	
10	Sheep-dung + bone-dust	1,319	11th.	[illegible]	3rd.	
11	Sheep-dung + gypsum	1,458	[illegible]	1,602	6th.	
12	Ashes	1,440	[illegible]	1,500	12th.	
13	Unmanured	1,028	[illegible]	1,214	13th.	

Statement showing the financial return of each manure applied.

Serial number.	Manure.	Cost.	Field standard: Value of increased outturn.	Difference.	Serial No. in order of yield.	Field duplicate: Value of increased outturn.	Difference.	Number in order of yield.
		Rs.				Rs.	Rs.	
1	Saltpetre ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2nd.
2	Cow-dung ...	7·00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8th.
3	Sheep-dung ...	8·00	[illegible]	[illegible]	7th.	10·43	[illegible]	[illegible]
4	Poudrette ...	7·50	12·00	[illegible]	[illegible]	10·89	[illegible]	[illegible]
5	Saltpetre + bone dust ...	10·50	10·78	[illegible]	4th.	22·21	[illegible]	[illegible]
6	Saltpetre + superphosphate ...	17·25	[illegible]	[illegible]	—	10·78	—	—
7	Saltpetre + ashes ...	7·25	[illegible]	[illegible]	9th.	7·78	[illegible]	10th.
8	Cow-dung + bone dust ...	11·50	[illegible]	[illegible]	[illegible]	9·73	−1·78	—
9	Cow-dung + [illegible] ...	[illegible]	[illegible]	[illegible]	[illegible]	5·03	1·43	9th.
10	Sheep-dung ...	12·50	10·18	[illegible]	—	[illegible]	[illegible]	6th.
11	Sheep-dung + superphosphate ...	9·50	[illegible]	[illegible]	6th.	15·61	[illegible]	[illegible]
12	[illegible] ...	1·25	[illegible]	[illegible]	10th.	[illegible]	[illegible]	[illegible]
13	Unmanured ...	—	—	—	—	—	—	—

* Price of wheat calculated at 14 seers per rupee.

30. **Remarks** [illegible] **yield.**—Generally speaking [illegible] manures such as saltpetre [illegible] sheep-dung applied [illegible] calcic manures, such as bone dust, bone [illegible] better results than when applied alone. [illegible] equally well [illegible] case of [illegible] land.

Again, manures containing a high percentage of readily [illegible] nitrogen [illegible] as mixture of saltpetre and bone dust, have better effect on w[illegible] than those [illegible] taining a smaller [illegible] available nitrogen, such as a mixture of cow dung and bone dust.

It is noteworthy [illegible] mixed with superphosphate does not produ[illegible] such good effect on wheat [illegible] mixed with bone dust, consider[illegible] however that the percentage of nitrogen [illegible] is about double [illegible] superphosphate. The conclusion [illegible] phosphatic manure, the more [illegible] is for being used as an [illegible] trated nitrogen [illegible] phosphorus, though applied [illegible] unless supplemented with a sufficient quantity of [illegible].

31. [illegible]—From [illegible] point of [illegible] to lands, from [illegible] of wheat is [illegible] mical, and there cannot [illegible] among the native cultivators. The only [illegible] where [illegible].

Poudrette [illegible] nearly as economical as saltpetre, but a majority of common cultivators ha[illegible] serious objections to manipulating [illegible] religious grounds and owing to [illegible] repugnance.

Cow-dung comes next in respect of economy.

A mixture of bone dust and saltpetre, [illegible] yielding [illegible] profit [illegible] petre or poudrette, approaches cow-dung closely, [illegible] the highest margin of profit where wheat is taken in rotation wit[illegible] for th[illegible] manures, and shows [illegible] purely economic reasons.

Co[illegible] saltpetre [illegible].

Sheep-dung is expensive, and on that ground less profitable, than the above manures, though it pays better than a mixture of cow dung and bone dust.

[illegible] of crude potassium nitrate to the ashes of cow-dung makes it nearly as valuable as a mixture of cow-dung and bone dust, and when applied so mixed, it yields only 2·32 loss per acre as compared with cow-dung.

[illegible] hitherto mentioned,

[illegible]

[illegible] series."

[illegible] been possible [illegible] the [illegible] the [illegible] etc., 1884-85, 1885-[illegible]-90, 18[illegible] any considerable [illegible] ly destroyed, or had [illegible] the [illegible] statements.

Statement showing the yield of maize.

Serial number.	Manure.	Kharif standard. Average yield.	Kharif standard. No. in the order of yield.	Kharif duplicate. Average yield.	Kharif duplicate. No. in the order of yield.	Remarks.
		Rs.		Rs.		
1	Saltpetre	1,185	8th.	775	11th.	
2	Cow-dung	1,245	6th.	1,119	5th.	
3	Sheep-dung	1,059	[illegible]	1,194	2nd.	
4	Poudrette	1,530	2nd.	1,524	1st.	
5	Saltpetre + bone dust	1,175	10th.	869	10th.	
6	Saltpetre + bone superphosphate ...	1,180	9th.	590	9th.	
7	Saltpetre + ashes	1,249	5th.	1,141	4th.	
8	Cow-dung + bone dust	1,627	1st.	1,159	3rd.	
9	Cow-dung + gypsum	1,508	4th.	1,116	6th.	
10	Sheep-dung + bone dust	1,447	3rd.	1,052	8th.	
11	Sheep-dung + gypsum	1,256	7th.	1,105	7th.	
12	Ashes	860	12th.	904	12th.	

The [illegible] as the financial [illegible] shown in the foregoing [illegible] :—

Serial number.	Manure.	Price of manure.	Kharif standard. Price of [illegible] crop.	Kharif standard. [illegible]	Kharif standard. [illegible]	Kharif duplicate. [illegible]	Kharif duplicate. Difference.	Kharif duplicate. Number in the order of yield.	Remarks.
1	Saltpetre	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—·14	...	Price of maize is calculated at 12 lbs per rupee.
2	Cow-dung	[illegible]	[illegible]	[illegible]	3rd.	[illegible]	[illegible]	[illegible]	
3	Sheep-dung	[illegible]	7·46	[illegible]	...	[illegible]	[illegible]	2nd.	
4	Poudrette	[illegible]	[illegible]	[illegible]	1st.	[illegible]	[illegible]	1st.	
5	[illegible] + bone dust ...	[illegible]	[illegible]	[illegible]	...	[illegible]	[illegible]	...	
6	[illegible] superphos-	[illegible]	[illegible]	[illegible]				...	
7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	...	
8	Cow-dung + bone dust ...	[illegible]	[illegible]	[illegible]	4th.	[illegible]	[illegible]	3rd.	
9	Cow-dung + gypsum ...	[illegible]	[illegible]	[illegible]	2nd.	[illegible]	[illegible]	[illegible]	
10	Sheep-dung + bone dust ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
11	Sheep-dung + gypsum ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	...	
12	Ashes	[illegible]	[illegible]	[illegible]	7th.	[illegible]	[illegible]	[illegible]	

33. **Remarks on the yield of maize.**—[illegible] phosphatic or calcic manures to organic nitrogenous manures is more [illegible] addition of [illegible] same to an inorganic nitrogenous [illegible] tilizer. Concentrated nitrogenous, phosphatic or calcic manures, either applied singly or in mixtures, have not shown any remarkable

fertilsinj enVu, TV \>\\>*c* mantm on tlw other hand seem to bo very effective in increasing the yieM of *mMOtfnp,*•hawing tli«t presence of organic matter in the soil is very aueatuil f jr tfai* pUnt, Antony the dun<* nun are- tried at the Finn on mnuut, pouJrette hM, on toe whole, yietdoi the UrgMt outturn. A m:.xture eowJung »nj boae^lnit tmnk* 0ext.

3+, Financial retoltl-—Application of p->U'!i¥tt* to *mtuie* crop pay* bwt, and ciwdunjj CORK* next. A mixtun) of wltpfltw and ulus is not any way less :aying tiun cow-dung. Cowdung mixed with bo&O dust also occupies » (jool position in point of economy,

35. The following appending are attached to this report :—

Appe<iif<* I to* T/.—Six sUtement< showing the financial results of various manures applied to maim and wheat in the permanent experiment*.

*Appt**ii I'll.*—R*p«rt on Cawnporo Eipwiroenul Farm by Dr. J. W. Lather, Agricultural Cherai*t to the GoT«raineDt <f India.

CAWXFOU :
The 12th October Lew.

SAIYID MUHAMMAD MAM, M.I.A.C, M.R.A.S.,
Assistant Director.

Appendix No. I—Kharif Standard Series, *vide* Kharif Statement No. I.

Statement showing financial result of manures applied.

Serial number.	Manure per acre.	Price of manure.	Grain or stalk.	Increase or decrease over the outturn of the unmanured plot per acre. Average of last five years.	Increase or decrease over the outturn of the unmanured plot per acre. [illegible]	Value of the increased or decreased outturn. Average of last five years.	Value of the increased or decreased outturn. [illegible]	Total value of the increased outturn. Average of last five years.	Total value of the increased outturn. [illegible]	Net profit or loss after deducting the cost of manure. Average of last five years.	Net profit or loss after deducting the cost of manure. [illegible]	Remarks.
		Rs.		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
1	Cow-dung, 180 maunds + bone-dust, 4½ maunds.	11·20	Grain ...	553	472	10·43	9·17	12·65	10·79	1·45	—·41	The outturn has been calculated at the following rates— Grain 22 Rs per rupee. Stalks 1312 Rs per rupee.
			Stalks ...	3,045	3,336	2·22	1·62					
2	Cow-dung, 180 maunds + gypsum, 3 maunds.	8·50	Grain ...	920	447	10·13	8·59	11·73	10·27	3·23	1·77	
			Stalks ...	2,110	2,214	1·60	1·68					
3	Cow-dung, 180 maunds	7·00	Grain ...	591	217	11·17	4·17	12·92	4·17	5·92	—2·83	
			Stalks ...	2,304	—	1·75	—					
4	Ashes of 180 maunds of cow-dung.	1·25	Grain ...	297	40	5·51	—·54	7·12	—·52	5·87	—1·77	
			Stalks ...	2,304	250	1·61	—·42					
5	Saltpetre, 3 maunds ...	6·00	Grain ...	257	109	5·51	2·23	7·02	3·03	1·02	—2·97	
			Stalks ...	1,302	400	1·51	·83					
6	Nitre + bone-superphosphate, 3 maunds.	17·25	Grain ...	628	217	12·63	4·17	13·24	5·12	—4·01	—12·13	
			Stalks ...	779	1,236	·61	·95					
7	Sheep-dung, 180 maunds + bone-dust, 4½ maunds.	12·50	Grain ...	723	847	14·60	16·28	16·95	17·04	4·45	4·54	
			Stalks ...	3,105	1,074	2·35	·76					
8	Ashes of 180 maunds of cow-dung + saltpetre, 3 maunds.	7·25	Grain ...	606	49	12·80	·92	15·23	1·14	7·98	—6·11	
			Stalks ...	3,134	200	2·43	·22					
9	Poudrette, 180 maunds ...	7·50	Grain ...	725	103	14·51	2·00	17·06	4·91	9·56	—2·59	
			Stalks ...	3,262	3,702	2·55	2·91					
10	Sheep-dung, 180 maunds ...	8·00	Grain ...	649	72	12·90	1·38	15·96	3·46	7·96	—4·54	
			Stalks ...	4,017	2,214	3·06	2·08					
11	Saltpetre, 3 maunds + bone-dust 4½ maunds.	10·50	Grain ...	486	131	8·39	2·32	10·45	2·99	—·05	—7·51	
			Stalks ...	2,730	463	2·06	·67					
12	Sheep-dung 180 maunds + gypsum 3 maunds.	9·50	Grain ...	772	328	14·89	10·30	16·42	11·44	6·92	1·94	
			Stalks ...	2017	1,503	1·53	1·14					

Appendix No. II.—Rice [illegible] Statement No. II.

Statement showing financial result of manures applied.

Serial No.	Manure per acre.			Increase or decrease in the out-turn over unmanured.		Value of increase or decrease.		Total cost of manure.		Net profit or loss after deducting the cost of manure.		Remarks.
				Average of five years.	1892.	Average of five years.	1892.	Average of five years.		Average of five years.	1892-93.	
1	[illegible]	[illegible]	Grain / Stalks	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	Grain / Stalks	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	Grain / Stalks	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	Ashes of 180 maunds of cowdung	[illegible]	Grain / Stalks	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
5	[illegible]	[illegible]	Grain / Stalks	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
6	Ditto + bone superphosphate 3 maunds.	[illegible]	Grain / Stalks	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
7	Sheep-dung, 180 maunds, + bone-dust 4½ maunds.	[illegible]	Grain / Stalks	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
8	[illegible]	[illegible]	Grain / Stalks	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
9	[illegible]	[illegible]	Grain / Stalks	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
10	[illegible]	[illegible]	Grain / Stalks	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
11	[illegible]	[illegible]	Grain / Stalks	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
12	Sheep-dung 180 maunds + gypsum 3 maunds.	[illegible]	Grain / Stalks	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

[illegible] Statement No. III.

Statement showing the Financial result of manures applied.

Serial number.	Manure per acre.	Cost of manure.	Grain or stalks.	Increase or decrease of outturn over unmanured plot per acre. Average of last 5 years.	Increase or decrease of outturn over unmanured plot per acre. 1892-93.	Value of increased or decreased outturn. Average of last 5 years.	Value of increased or decreased outturn. 1892-93.	Total value of increased or decreased outturn. Average of last 5 years.	Total value of increased or decreased outturn. 1892-93.	Net profit or loss after deducting the cost of manure. Average of last 5 years.	Net profit or loss after deducting the cost of manure. 1892-93.	Remarks.
		Rs.		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
1	Woollen refuse 120 maunds + lime 22 maunds	3·40	Grain ...	1,330	202	29·45	13·07	32·71	22·28	27·31	19·88	The value of the outturn has been calculated at the following rates:—
			Stalks ...	3,064	4,323	3·86	3·21					
2	Sheep-dung [illegible] maunds	2·50	Grain ...	332	1,300	17·79	[illegible]	20·30	[illegible]	[illegible]	32·74	Grain, 27 lb the rupee. Stalks 1,312 lb the rupee.
			Stalks ...	3,202	4,370	2·51	[illegible]					
3	Cow-dung 120 maunds	4·50	Grain ...	508	722	20·92	32·30	12·69	10·18	[illegible]	[illegible]	
			Stalks ...	2,318	1,017	1·77	·77					
4	Poudrette 120 maunds	2·90	Grain ...	705	1,234	17·18	20·73	[illegible]	23·71	16·08	20·71	
			Stalks ...	3,216	2,602	[illegible]	[illegible]					
5	Horse-dung 120 maunds	4·50	Grain ...	567	1,018	[illegible]	19·24	13·98	20·65	[illegible]	16·29	
			Stalks ...	[illegible]	1,746	2·09	1·80					
6	Pig's dung 120 maunds	5·30	Grain ...	423	1,092	12·07	20·48	[illegible]	22·65	3·94	17·35	
			Stalks ...	3,540	3,920	3·47	2·17					
7	Saltpetre 3 maunds	6·00	Grain ...	361	944	6·72	19·15	8·45	[illegible]	2·45	13·61	
			Stalks ...	3,292	2,178	1·73	1·60					

Appendix No. IV.—Rabi standard series, vide Rabi Statement No. I, Crop, Wheat.

Statement showing the Financial results of manures applied.

Number.	Manure per acre.	[illegible]	Grain.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Average.	[illegible]	Remarks.
		Rs.		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
1	[illegible]	6·00	Grain	[illegible]	[illegible]	9·75	[illegible]	11·95	[illegible]	[illegible]	[illegible]	[illegible]
			Straw	[illegible]	[illegible]	[illegible]	[illegible]					
2	[illegible]	10·50	Grain	[illegible]	[illegible]	[illegible]	[illegible]	11·90	[illegible]	1·49	[illegible]	
			Straw	[illegible]	176	[illegible]	[illegible]					
3	Cow-dung 180 maunds	7·00	Grain	[illegible]	[illegible]	[illegible]	[illegible]	12·00	[illegible]	[illegible]	[illegible]	
			Straw	741	[illegible]	[illegible]	4·87					
4	Cow-dung [illegible]	[illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	15·72	[illegible]	[illegible]	
			Straw	[illegible]	[illegible]	[illegible]	[illegible]					
5	Cow-dung 180 maunds + [illegible]	6·50	Grain	[illegible]	878	[illegible]	[illegible]	[illegible]	[illegible]	8·90	[illegible]	
			Straw	[illegible]	[illegible]	[illegible]	[illegible]					
6	Sheep-dung 180 maunds	[illegible]	Grain	[illegible]	1,108	10·62	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
			Straw	[illegible]	[illegible]	[illegible]	[illegible]					
7	[illegible]	[illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	21·00	[illegible]	[illegible]	
			Straw	[illegible]	[illegible]	·42	1·24					
8	Sheep-dung 180 maunds + bone-dust 4½ maunds	[illegible]	Grain	[illegible]	[illegible]	3·09	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
			Straw	[illegible]	[illegible]	[illegible]	[illegible]					
9	[illegible]	[illegible]	Grain	[illegible]	[illegible]	7·62	[illegible]	[illegible]	[illegible]	−6·08	[illegible]	
			Straw	[illegible]	[illegible]	2·73	[illegible]					
10	[illegible]	[illegible]	Grain	[illegible]	1,277	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
			Straw	[illegible]	[illegible]	[illegible]	4·84					
11	[illegible]	[illegible]	Grain	[illegible]	344	13·96	33·71	[illegible]	[illegible]	11·18	[illegible]	
			Straw	[illegible]	1,138	[illegible]	[illegible]					
12	[illegible]	7·25	Grain	[illegible]	[illegible]	11·60	[illegible]	[illegible]	[illegible]	0·42	13·04	
			Straw	435	[illegible]	[illegible]	[illegible]					

APPENDIX No. V.—RABI DUPLICATE SERIES, CROP WHEAT, vide RABI STATEMENT No. 11.

Statement showing the Financial results of manures applied.

Serial number.	Manures per acre.	Cost of Manure.	Grain or Straw.	Increase or decrease only the outturn of the unmanured plot per acre: Average of last 5 years.	Increase or decrease: 1882-83.	Value of increased or decreased outturn: Average of last 5 years.	Value of increased or decreased outturn: 1882-83.	Total value of increased or decreased outturn: Average of last 5 years.	Total value: 1882-83.	Net profit or loss after deducting the cost of manure: Average of last 5 years.	Net profit or loss: 1882-83.	Remarks.
		Rs.		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
1	Saltpetre 3 maunds ...	6·00	Grain ...	120	252	3·17	9·52	9·75	10·97	[illegible]	4·57	The outturn has been calculated throughout at the following rate:— Grain 28¼ lb per rupee. Straw 205 lb per rupee.
			Straw ...	622	202	3·02	1·77					
2	Saltpetre 3 maunds, + bone-dust 4½ maunds.	10·50	Grain ...	518	320	19·30	12·10	23·11	14·34	12·61	3·84	
			Straw ...	946	455	4·61	2·24					
3	Cow-dung 180 maunds ...	7·00	Grain ...	455	140	17·60	5·50	22·27	4·96	15·27	−2·14	
			Straw ...	958	−30	4·67	−·14					
4	Cow-dung 180 maunds + bone-dust 4½ maunds.	13·57	Grain ...	137	460	5·60	16·42	7·70	22·26	−5·80	10·70	
			Straw ...	431	1,236	2·10	5·84					
5	Cow-dung 180 maunds + gypsum maunds.	9·50	Grain ...	54	521	1·92	19·07	3·45	22·99	−6·05	13·09	
			Straw ...	315	808	1·58	3·92					
6	Sheep-dung 180 maunds ...	8·00	Grain ...	212	521	7·60	18·60	11·59	22·36	3·59	14·36	
			Straw ...	618	772	3·09	3·76					
7	Ashes of 180 maunds of cow-dung.	1·25	Grain ...	140	121	5·00	4·32	6·79	4·85	5·53	3·60	
			Straw ...	365	106	1·79	·53					
8	Sheep-dung 180 maunds + bone-dust 4½ maunds.	13·50	Grain ...	1,331	521	47·60	18·60	51·45	23·73	38·05	14·00	*
			Straw ...	771	1,003	3·85	5·13					
9	Saltpetre 3 maunds, + bone super-phosphate 3 maunds.	17·25	Grain ...	262	617	9·35	22·17	10·79	22·24	6·49	4·67	
			Straw ...	296	−1,432	1·41	−0·16					
10	Sheep-dung 180 maunds + gypsum 3 maunds.	9·50	Grain ...	397	580	14·17	20·71	18·53	26·43	9·03	16·93	
			Straw ...	964	1,174	3·36	5·72					
11	Poudrette 150 maunds ...	7·50	Grain ...	436	712	15·64	26·93	22·42	33·35	14·92	25·73	
			Straw ...	1,300	1,610	6·50	6·42					
12	Ashes of 180 maunds of cow-dung + saltpetre 3 maunds.	7·25	Grain ...	91	635	3·30	22·67	5·26	25·06	−2·00	17·81	
			Straw ...	392	479	1·96	2·39					

APPENDIX No. VI.—RABI EXPERIMENT WITH GREEN MANURING, CROP—WHEAT, 1913 RABI STATEMENT NO. III.

Statement showing the Financial Results of manures applied.

Serial number.	Name of plot.	Cost of manure.	Crop.	Value of increase or decrease over the average of the standard plots: Average of last 5 years.	1912-13.	Value of the increased or decreased outturn: Average of last 5 years.	1912-13.	Total value of the increased or decreased outturn: Average.	1912-13.	Net profit or loss after deducting the cost of manure: Average of last 5 years.	1912-13.	Remarks.
		Rs.		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
1	Old indigo refuse 120 maunds	50	Grain	[illegible]	141	[illegible]	[illegible]	27·40	22·04	[illegible]	[illegible]	The value has been calculated throughout at the same rates as in the Standard Duplicate, i.e.,— Grain Rs. per maund, Straw per maund.
			Straw	1,393	[illegible]	67	16·26					
2	[illegible]	[illegible]	Grain	1,10	—	4,173	—	[illegible]	7	[illegible]	2·43	
			Straw	[illegible]	[illegible]	[illegible]	[illegible]					
3	[illegible] 1,000 [illegible]	2·00	Grain	[illegible]	[illegible]	[illegible]	-12·00	[illegible]	948	[illegible]	-12·48	
			Straw	11	71	[illegible]	[illegible]					
4	[illegible]	2·00	Grain	7	[illegible]	114	[illegible]	[illegible]	471	[illegible]	1·72	
			Straw	[illegible]	[illegible]	·69	[illegible]					
5	Hemp stump ploughed in	—	Grain	[illegible]	-44	117	[illegible]	[illegible]	[illegible]	[illegible]	-1·00	
			Straw	71	[illegible]	[illegible]	1·42					
6	[illegible]	2·00	Grain	[illegible]	-121	9·14	-4·21	11·76	-·57	9·76	[illegible]	
			Straw	239	812	[illegible]	3·05					
7	[illegible]	6·75	Grain	[illegible]	7	[illegible]	[illegible]	[illegible]	6·00	5·21	[illegible]	
			Straw	[illegible]	[illegible]	[illegible]	3·16					
8	Indigo stump ploughed in	—	Grain	[illegible]	[illegible]	[illegible]	-7·83	[illegible]	-4·55	12·71	-4·55	
			Straw	644	[illegible]							
9	Green Indigo ploughed in + 677 maunds	[illegible]	Grain	[illegible]	128	2·42	2·04	6·15	[illegible]	3·02	0·21	
			Straw	140	·117	·69	[illegible]					
10	[illegible]	2·00	Grain	[illegible]	-202	4·07	-7·03	[illegible]	-1·43	-·04	[illegible]	
			Straw	[illegible]	720	1·17	[illegible]					
11	[illegible]	—	Grain	[illegible]	—	[illegible]		-5·43	—	[illegible]	—	
			Straw	[illegible]	—	[illegible]	[illegible]					
12	Wheat alternating with Lucerne.	[illegible]	Grain	[illegible]		114	[illegible]	1·43	13·43	[illegible]	[illegible]	
			Straw		[illegible]	[illegible]	[illegible]					

APPENDIX VII

Report on the Cawnpore Experimental Farm by Dr. J. W. Leather, Agricultural Chemist to the Government of India,

[illegible] 1877-78, but [illegible] by Mr. [illegible] Agricultural [illegible] then remained [illegible] of the Assistant D[illegible] from 1882-84 [illegible] Pitcher, from 1884 [illegible] under [illegible] Muhammad [illegible] it.

2. Many of the experi[illegible], however, some exceptions, [illegible] XIV, XVB, XVC, [illegible] unnecessarily [illegible] there [illegible] recourse has been had to a different and less accurate method of arriving at the outturn than [illegible] whole [illegible] a equivalent [illegible] produce [illegible] any inequality in the [illegible] selected, and indeed [illegible] little errors which are ever present in the determination [illegible] the outturn per acre are multiplied by 50 or 60, whereas, if the whole produce of each plot (about 1/12 acre) be threshed out and weighed, the errors only multiplied by 12.

The latter plan has been re-adopted this year, and I would recom[illegible] be [illegible]

3. No opportunity [illegible] offered itself [illegible] the present of having [illegible] &c., employed in the experi[illegible], analysed. [illegible] can, however, now [illegible] Agricultural Chemist to the Government [illegible] India, and [illegible] an advantage if average samples of all those materials which [illegible] readily [illegible] were forwarded [illegible] the different [illegible] be determined.

4. Most [illegible] the plots [illegible] small, measuring about 400 [illegible] yards each. In manurial experiments [illegible] errors which are ever present, due for instance to [illegible] qualities of soil, manuring, sowing, &c., &c., are so great that plots should not measure less than [illegible] acre [illegible] had such been adopted [illegible] Cawnpore. This farm has, however, [illegible] small plots, which are [illegible] other [illegible] fairly [illegible] would seem best to leave them [illegible] present at least.

[illegible] perhaps be most convenient, [illegible] in some cases singly and in others in [illegible] where it might [illegible] 1881-82 to 1890-91 [illegible] year 1891-92.

[illegible] oldest experiment and was initiated by Mr. [illegible] 1880. [illegible] simplified [illegible] has been retained and consists in the manuring of four series of plots on which wheat and maize have been grown with different manures.

* See Report on Experimental Farm, 1891-92.

On Seriea I maize only, and on Series III wheat only, bat bees grown year by year. On Series II and IV wheat and maize have been grown alternately. In each tenet there arc now 13 plot*, aod the corresponding plot of each series is treated with the tame special mimire at its follow. Plot I of each scries, for instance, hot been manured with saltpetre for «cbcr»ji it has Wne. IV cultivation of each plot hat been otherwise identical

Several of the manures, which have been employed iu this experiment, */., sheep dung, dung and bone dutt, dung and gypsum, are altogether utelest for purpose* of experiment; these dangt from different animal* are t lietntelre* mmewliat indefinite, and it can answer no good purpr>.- be one Again tt the other. Not M • mis ture of . -mi; and bone or dung and gypsum a pnttttal manure. It would never be used by cultiraton.

In adilii t o U reranrkod that the dung probably con taint nearly- much phosphate and gypsum at the extra dressing of bone or gyptum.

In tbe case of the application of saltpetre, moreover, this should be epplisd as a " top dressing " to the <• p after it hat come up above ground and Dot with th» seed, In the latter i**c the manure being fre«ly soluble in water it apt to be t\ ashed out of tbe reach of the young plant before it lias emerged from tbe germinating *ugo.

Tbe ploU wliich are of valae are 1 saltpetre, & cow dung, * poudratta, S saltpetre and bone duit, o saltpetre and «ujKrrpbo»phaUi, 7 saltpetre and ashes of eow dung, 12 ashes of cow dung, IS bone du#t, H «nper, 16 gypsum, 16 no manure. Of these No*. 13, 1* "d 1& B*M> ***B discontinue. Hut rince tbe experiment hat been carried out in its pre-ent form »o long, I would not recommend any alteration. It is always undetiraUe t» introduce change if they can be avoided.

Looking now at the results, wliich will be found *t pajc* 17 and 18 of the report, 1*91-92, we find that in the main they aw fairly Wacordant and show quite clear It tke Taluc of a ntt rogenous manure for wheat and moiae u distinguished from s phr-, phatic on"- This result in the cate of wheat it a corroboratton of what English experiments have proved, and UM> retail » a valuable one. The exparimunt hat now been in progress for man than 19 yean.

7. Tli- experiment, Series V, VI iai VII, U called"'. \ no,, i>pri»U' n»in- be " Onm mammring," but it JIM* n< t entirely consist in this, for nM part <f th- experimen n is to les*n the valae of growing wbeat after a leguratn- ous crop ju* been grown and thaa <f the land, and again the manorial value of indigo refuse is also M'luded.

The results which luvo been bioaghl not *o far are mnelutiva at to the value of ploughing in of a gn*n crop, aad tin- valw of indigo refute as a manure it ahw thowtj. Growing wheat. afi*r an indigo crop;, Jus Uwn Ulwn off, it likewise shown to be advantageous, but the wheat erop grown afurr " ***p " (really " falw hemp " mUUtrim juncea, or ther kkjuminana plut) has not be«n inorMMd, either iu the tune lm\ tion or even regularly. I:, :i(,t wriss uf tii year the outturn ha* been .«* than that gf , t p . « . ared plot, «Uii*i lr*> outturn afi indigo showed an increase ia each year but lb« h (1890-91), and then there ''''** ottI y * '''t-'' difference. Some of the applications are useless. There can be little good in adding trypsum fploi lj until we know that i;rj.»um it a valuable tnauur. for indigo or t^emp, a fact which it being tested I in anaUwr e*rK- of experiment *- Itldi ff° »»1 ''''mp wau-r applications an «(ual)T usrifls. for the rm*r«u hardly soota* much plant food d aod would I* uted by the ryot «m]ity ai irrigation waur when* • it happened to be at hand, wniltt M regards the latter (hemp water) it is not, I believe, in the ryot 'I poeSMtwm.

The u*rful pt.iU in tin. eiperimenl are New. 2, t, *, fl, 8, 10 and 11, and I woald recommend that these be retained, tagsibw with plot No. IS (not tnUnd i» the mutU) on which lueerc*> it grown in alWraaW* wilh wbeat, [illegible] plots 1, 5, 7, 9, 11 [illegible] well to introduce other crops such as *dal* or *arhar*, after which to grow wheat, and if rape could be got to grow in August (which I am afraid is doubtful), it might be ploughed in as a green crop. [illegible] plot 7 *arhar* [illegible] alternation [illegible] might be tried on plot 5 or 9 and ploughed in, if it were [illegible] to cultiv[illegible] plots would then [illegible] —

(1) *Dal* and wheat *alternately*.
(2) [illegible]
(3) Fresh indi[illegible] (ditto).
(4) [illegible] (ditto).
(5) [illegible] d in (ditto).
(6) Indigo and wheat *alternately*.
(7) *Arhar* and wheat *ditto*.
(8) Hemp ploughed in (manure.
(9) [illegible] *alternately*.
(10) [illegible] *ditto*.
(11) *Nil*.
(12) [illegible] *alternately*.

[illegible] wheat [illegible] manured *directly* by ploughing in a [illegible] for the purpose, whilst, on the other hand, it tests the question whether a cereal crop is benefited generally [illegible].

It is [illegible] suggested new treatments [illegible] continued.

8. [illegible] "*Falls*" series [illegible] principle [illegible] foods, is applied on one plot (No. 1), whilst in [illegible] plant foods is excluded; [illegible] here we have proof of the value of a nitrogenous man[illegible] phosphatic [illegible]

9. Experimental Series XVA [illegible] object of testing the effect of manuring indigo [illegible] it is a [illegible] experiment. Plot 2 is, however, unnecessary. [illegible] ble substance such as gypsum. It might be well [illegible] to test [illegible] it is sulphate or carbonate [illegible] lime which [illegible] this could be done by manuring plot 2 with [illegible] carbonate [illegible].

[illegible] ent, in which the effect of farmyard manure as against farmyard manure and gypsum is tested, is useless—the dung itself containing gypsum, and there can be no good purpose in continuing it.

10. The exper[illegible] ll more or [illegible] of the [illegible] man, he would put all the [illegible] flow, can[illegible] would not (in India at leas[illegible] Moreover, if such an exp[illegible] number of factors into consideration, the chief among which would be the amounts of water [illegible] of plant fo[illegible]

Then, again, [illegible] Series [illegible] materials are of such — [illegible] is worth having [illegible].

In the end of Series X. the testing of the value of refuse from seed-crushing may be important both in relation to the dung which is produced by feeding it to cattle, as likewise to the direct application of such material to the land. In fact, so far as the refuse castor [illegible] is concerned, I think it would be well to apply it in the case of any new experiments commenced in the future.

But the determination of the value of the dung produced by animals fed on these materials (oil cakes, castor pomace excluded) is a much more complex matter and one requiring great care and attention in carrying it out. Moreover, I am doubtful whether this question has a direct bearing on Indian agriculture at present.

11. *Ploughing experiments, Series* [illegible].—The results obtained in these, some of which were initiated by Mr. Fuller and have been continued since, afford ample evidence that the improved plough is advantageous, and this experiment in one form or another might be continued more with the object of demonstrating the value of the implement to the cultivators than to find out anything new.

12. *Irrigation (Page II).*—For several reasons I consider this experiment quite useless. It has now stopped, but it may be remarked that when we compare well water with canal water we are only experimenting with the water of one well in one district, while the water in wells in different parts of the country may, and probably does, vary considerably in composition, and (2) the cultivator irrigates according to whether there is much or little rainfall and does not decide beforehand how often and when he will irrigate.

13. *Methods of sowing* [illegible].—Some of these are practically experiments [illegible] in Series I and II (early and late sowing) [illegible] it may be desirable to know if a crop [illegible] broadcast or in lines and at what distance apart; but I cannot think that any definite results come from sowing on the top as distinct from the sowing on the side of a ridge.

14. *Varieties of seed (Pages 21 and 26).*—These experiments are [illegible] of considerable value. It is necessary, however, that they should be continued in a scientific manner; the seed or crop of each variety should be critically examined each year by experts, and those varieties which prove unsuitable should be "weeded out" and the useful ones only retained. For instance, when the series of experiments on different varieties of cotton was commenced, the cotton was annually submitted to an expert for valuation, but this has latterly been omitted and merely a record of the weight of crop kept. But the value of an experiment is much enhanced if [illegible] the better [illegible] which produce the greatest weight. Then, if after testing a certain variety for a few years the outturn is not large and the quality poor, in other words the variety gives no encouragement to grow it, it should be weeded out and only the better sorts retained in the experiment.

Experiments on different varieties of cotton, potatoes and oil seeds may thus lead to valuable results.

On the other hand, I am doubtful if any good end can be served by [illegible] different varieties of wheat and barley [illegible] which are indigenous are known to be excellent for the purposes of the people.

In the case of the experiments with sugarcane, it would be well if the juice of the different sorts were analysed at the time of crushing.

15. The experiment on the outturn of [illegible] is a good one, and will in the course of a series of years yield valuable information.

19. *Conclusion.*—It will be seen from the foregoing that there is ample evidence that the Cawnpore Farm has been productive of valuable information. From its experiments we learn that in India, as in England, wheat is benefited more by an

application of t nitTOfrnon* •»«•«» than by a phospUatic one, that ihe same holds good for mane, lhat tbe wheat crop is increased by a preceding leguminoo* crop, and that it is also increased by ton ploughing in of a green eropi

Among imi>l.'in*tiU, to, we fiml continual evidence of the advantage winch ar«u« in ti»inj- lh,- dftpai plough aod lix> *A* • has been [• m,,t economical water-raising appliaw* *U* reruin depths, and baa been adopted by lb« surrounding dutintors.

17. I re, very deiirable that those eiperinn-iit« which have been well planned »bould continue without inUrruption. I understand that t ^n*-ferriofr Ibis farm to Lwcknow is n under consideration by tbe «overo> and 1 would ulc- tbu opportunity of | Fsrm on iU pneent ettc for the sake of m eontinui nU, The te-tinp of tbe value of different manorial lubtUn* cannot he bvooght t* •uceestfnl conclution in me or twg years only—generally indeed a eerie* of at least. yean >s necwetry in order to arrive at any positive mult. Abo it f r pens tliat for two or three year* afUr ft new experiment ha* commenced, the reeul different plots are irregular owing to the diff«vnl treatment « m»y previously reoem-d. Tbe Cawnpore Farm would appear to possess ft •mlaUe rite, •oil is similar to ft great part of the Gangce-Jumna Doab. It i» fairly level, and ftre ft number of valuable eiperiments in progwa. wWck should be wntin«d. It would therefore be a pity t • with it.

18. Again, th« rmdeoea of the Assistant Dirwtor of Land Rocord* ar. i tnre, who has ehargv of tbe nperimenU, w at tbe Farm, which emlJesmm ' more dtrwt sop^rrUion to it than tf be lived etsewhere. Indeed, it i» r*U* that tbe Farm ifaould hav«f prominent claim on *the* time of the Aanstar * at ^riain critical periods. For imUnw, bf sbmiU b» abb to devote the whole of h»» time to it whilst the threshmjr proewds, «ad tb* w«ghrng of all the crops should be underUken Uy him personftlly. Any allshW made at this time ar* psr<i«l«'ly arrioos, and would vitiate the malts. At tbe time of patting on U* different manor**, too, bis preatme* would be a great advantage in otder to ewmra their bwojt pot right plots. Theee an matter* which sbould not be left to lbs working Soperin"-dent, wbuee edueation has never fitted him for «uch aevnute work.

I cannct help thinking that some of the tmgnUritM* which ap)>ear in ibe tabte* of n*ulte, an du* to mistakes Wring been mad* at OM or other of these stage*.

It. Agricultural esparummu always OMMJM tome considerable <mUay, and unless the work is throughly done, th* results obtained eaonol be depended upon, and the expenditure is ia a great measure thrown away.

to. In Bngtaad, wherever such experiments: are entttttted to th* care of » farm baJKf, they are ranly prodMtm ef «k* definito rasatU ae would warrant o« placing mu«h relianae upon them, aftd the n*td of th* eonsttnt att of an educated ofieer has been esUUtshed. 1 fuel the neeessitx «f raferrtog I be<wi»« m two MM durring my recent viaU, wetfbings wbieh wer* tftkeo by lh l«riatondettt wtre incomet tone, V N a t mu«b aa $0 ft*, wrong), and althou|c)>»pp«n«d to M of no gn»t o«Msqn*nc*t they war* MV*itbele*> soppMed to be c« aad an rawtqpekUy caampks of what might •*«, '»e» when sa«h mistakes would be •er.uiM. Tb* praarat Fan i m*a for tbe post t Wis iMiyetw and has ma heart tbor«aghly in tbe work net expect him to perform datte* tor which bis treiuiag has nerer fitted him.

11. Finally, I add a aeto on some «tperimeuU *tt* a tomearhat different naf wbich tuv* bem cawri»! .j^J Barmah on ..me land, whit is doee to the site of U» BxptrimenUl Farm, and which appear to mt to U of consi-derabkTftlM.

J w\i,ri.i; LIATHIB,

Jgti.mltmtti Cktmitt it H 0«t*tmmtmt* t;f India.

NOTE ON BABU LACHMAN PARSHAD BARMAH'S FARM.

Close to the site of the Cawnpore Experimental Farm is a plot of land which, a few years ago, was so cut up by ravines, that it was rapidly going out of cultivation. A rent of Re. 2 per acre could not be obtained for it.

It was taken up in 1885 by Babu Lachman Parshad Barmah, Personal Assistant to the Director, Land Records and Agriculture, who has since displayed not only great energy, but has likewise met with success in its reclamation. In addition to this he has carried out a number of experiments upon it on the growing of crops, the results of which have been embodied in Appendix A of the Farm report for 1890-91.

The reclamation was effected by levelling and embankments, and in this way practically the whole of the area of 18 acres has been brought under excellent cultivation. Moreover, the ryots, who had failed to make a living by the cultivation of the land in its former state, have returned, and there is now a flourishing village which has sprung up entirely during the last few years.

Besides the reclamation and the manurial experiments to which reference has been made, there is a fuel reserve of babul and dhak (*Butea frondosa*) trees, which were planted in 1888-1889. It occupies 1½ acre (·88 acre of each sort of tree), and is intended to demonstrate the value of cultivating firewood, in order to set the dung at liberty for manurial purposes.

The first cutting of firewood has just been made; about ¼ of the babul plantation has given 80 maunds. Babu Lachman Parshad informs me that this quantity is sufficient to supply three cultivators' families for one year. Thus the *babul* plantation is propagated by self-reproduction.

The *dhak* plantation has not yet been cut.

The operations on this farm form an excellent object lesson. The reclamation is now almost completed, and it is satisfactory to note that it has been a financial success. Regarding the "Fuel Reserve" experiment, the results obtained so far are satisfactory; but such an experiment should be watched for a considerable period after the commencement of cutting. The area, the number of trees, the number of people (or families), using the plantation and the *weight of firewood* should be recorded, as also the method employed in propagating the reserve, whether by self-reproduction or otherwise, and what measures adopted for its protection against wilful damage and for the distribution of the firewood.

It seems very desirable that advantage should be taken of any information which may be obtained from this experiment, and with which the owner would no doubt readily provide the Director, Land Records and Agriculture. If at any future time Babu Lachman Parshad should be compelled, through promotion or other cause, to leave Cawnpore, it would be a great advantage if an arrangement could be made whereby the permanent carrying out of this experiment would be effected.

J. WALTER LEATHER,

Agricultural Chemist to the Government of India.

No. ^ of 1894.

DEPT. OF LAND RECORDS AND AGRICULTURE, N.-W. P. AND OUDH.

Dated Cawnpore, ike)tt September 169i.

From

F. E. TAYLOR, Esq.,

Offa. Diwctoi Of L*KD RECORD* AND AoircutTrn,

NoiTti-Wssms Ptovixcn AJID OUBK,

To

TB» C1UKF SECRETARV TO GOVERNMENT,

Nomi-WemiK Pwviwcw INDOCHH.

Sir,

I have the honor to inbmit the report on the Government Experimental Farm at awnjwre for the y»r !893-94. The Fa>a * nnder the control o£ the Awutnnt Director, WyM Muhammad Hadi, ind the r-port hai boon written Vy him. The delay in the robmiwwn of the report w dnc to it living Wn found neocmry by my pndeoeawr to return the fint draft of the report to the Anutant Director for •t plans lion* on certain point*.

8. The permanent Farm StiprrintenJent, Saiviil Ali Bonn, ivinrnrd from Poona where he h»l been ving at the rtwh College of Science w*1 «*amed charge of hU «l duties «n l»t (k-tober 1893. Tho weiRbinc nf mwiurw at the time they were applied to the hod and or the pmd«oe of the kbimf and r»hi cropt were carried cut in the prwenoe of UK A>i»Unt Direetor.

S. It it Dot neomur for roe to pre • detailed reriew of the conduct ilunng the y«w of the «pwiment» omrrii*! out on tl» ?»""• J wouU - bowtrw, noto that •- ploU .offer from w%ter-l>jnnng when mnrh rain LIU w.tim a limited period. Th is is notice,) io irvml p»rt. of the report and I also *w *>'• -»in,1 lllinK « ray "• visits to the Farm. It is evident that if one plot Uttllyto&n from nowofnouture the crop on it •nwt be hal,it«ally p oer, with the result that «V mannr* applied to iueh a plot will Uil to yive results capable of comparison with the effects of , tb ,, mMnIW W t- letter >utMl plot.. The AiwrtMl Director wi I be wired to make propotal. for ia.51 • .lraiw of the • " '*"*• ^^ uf tbe P*rWt

4.* Tbe Arabttaliwn which «M »-nt to Ui* r'arm in May 1681 w well u tlte two brood mam »n rtiU wrf for p»o»«Bmf. The .ullion Mffd +6 man* durinK Uie year. „ he result of the •ritisT '* not yet k''''wn 'n '• "**** • o' tn<l '•emaindw • •' eight were failures, five mares have >k•d «nd one appmin to be in foal. One of the brood mare* bwM about five months ago.

t The dwtiibutwn of #e^d* an.) i«p!«*menU WM 9MHamti .lurintf the ywr and the IUUI of applk»tioi» for informalwn «n »«rictiltor»] qu^tiom La* iocreMed.

I hare the honor to bt,

B.i,

Vo«r mxt obedient tortMit,

Offg. Director.

REPORT

OK Till

CAWNPORE EXPERIMENTAL FARM,

FOB THE

KHARIF AND RABI SEASONS, 1893-94.

General character of the season.—Tin- *jmt* under report ni not • good agricultural ywur on tlw wbok TV rains in July, August and September we» excessive and the total rainfall traa emjriderably above the normal, The following •tatement iliown the amount and dUlribution of rainfall during the year :—

Hnntltt				IUioML			Rainy days.		
				1WIUS.	MM!	Kamal.	MM	IV..3-IM	Normal.
*)>nl	ISM	—	—	—	"o-ei	•ll	—	—	1
...	"	—	—	—			—		1
JUB.	"	—	—	9·90	ew	M I	0	U	4
Jilt	"	—	—	10·73	21 i;.	m::.	10	16	IS
A«MI	"	—	—	13·25	tl u		18	9	i t
FMmbai	"	-	—	t'CO	8 SO	4 83	5	8	7
OetoW	-	—	—		1·17	1-tt	—	a	1
Xvmto	•	—	—	-01	0·24	—	1	i	—
December	"	—	—	—	<m>	W	—	—	t
JUHTJ	ISM	—	—	·90		S4	4	1	1
Mnan	"	—	—	. .	0·56	. .	S	3	I
torch "	"	—	«.	—	<K«	is	—	—	1
Taul			—	SIM		111!	B	•	41

Gnwrtllr fpeakinff all Kbarif cmpi except maiu were injured more or *Urn* by Uw • U « M of rain wh'cb, however, ca><*ted gtmiar* damage to Uw rain cm]*. The American and Khandesh varieties of cotton suffered particularly during the Kharif Miidi. The effect of weather have been fully noticed under the various ci]»enma>ta deacribed hereafter.

2, TV njlij.tined tal»l« rompara the average and masintum yield of wheat and maize during ihe year onder report with that in tbe two jmowding yearf :—

StaUm*ni tie* •>>•""»• "*' attract jttlJ of wktoi and* M.aize.**

				i n n n jkM pur *ma**.		Maximum yield per acre.	
				Wheat.	Maize.	Wta*	Maize.
				lb.	lb.	lb.	lb.
1893-94	—	—	—	IJM	1,942	LtM	3,551
1892-93	—	—	—	1,732	1,123	2,777	3,078
1891-92	—	—	—	1,133	I.TW	2,093	1,816

3. TV <experiment• trwt at thefann are elaamed a* ' Permanent' and ' T«m[iurary.'

Tht' I'wnia!, experi-nwmta are earriod on year alter year on the note nkfc of Uud awl -iih (I.*- MM aurt *»t* tmtntent

The ' Temporary ' rvperiaKflU are to o»Il«J with rrf«t»oe to thnr dunUon aad the land m.

Tba ' IVrtimtirnt ' nperimenti arc dinvtol to »how the effects of—

(«) CViU.n uitrogotoua a&d aos-lutrqreiHHU manure* 90 mais« awl wbeat;

(4) Peep and shallow ploughing an wheat j

it) CerUin green manures on wheat.

TV temporary experiment* are tried in tin? kharif chiefly with cotton and indigo, and in the rabi with yaU, poUtoe*. and jfram.

A detailed account of these will be found in tha succeeding pangnpb*.

KHARIF SEASON *Y.XFZ* RIMENTS.

4 Khanf Statements I and \\.—*Kr/urimrtt* riM •ji.-*.—This experiment is carried i on in two *tenet* of 13 plots mob.. In tbe lit which i* »1W the ' Standard Series' matxe is sown year aft«r year without any change of treatment. In the find or _' Duplicate Series ' maixe iltornate* with wheat, and u town about three months after the nemand of tlw wheat crop, tk object >*»»& P»rtly to T«ify U« *naaliM* of the ' Sundarl Seriea ' and paitly to detefmiiM tb» eoonony of jrrowing iwiu in roU-lion with wheat. The mumre apptiMl to on* plot of tbe Standard Seriea i* nlao appli ' to the corweponditig plot of tbe Daptica te Series.

9. Tbe ' Standard S«rm' plut* w«re watered with t*nal water on tbe 50th and 3Ut May <» W&r to soften the soil for: the final ploughing, but bafbr* tli- ' Duplicate ' plots vould be Irwu-d »imiUrty, rain* fell early in June di»|rn*.n£ with tba neoewty of adopting limilar treatment fur them. Seed wa* tonn Wbiad tbe cwr -*M* <>n the 6th and Tlh June and germinated in • weak. A heavy ahower of r» fell on tbe 1Mb of July mu»inp great a«MimubUiun of water in all tbe fields. It was drained off from all tlw ptota neept Nns. 3, • and 9 of tho Dnptioftte Serim from whtrb it ecnld not be got rid of owing to their low wtuatwo. lieooe these plota were duaagvd and gave a poorer outturn oMBpantinly.

fl. An untuuaily heavy storm on tb>- 9th July knorked down *torn** plsitU in the Standard 1 Series, bat tbe damage was not ocnevlerable. The asMon wai otberwise very f•vorable for maiM.

7. The fotbwing statement il abows the ,,,,,!. of the S:«ndard Serw :—

Kn*wr STATMKST NO. I.—Standard AVIM.—Jfjanr* *trytrimtut tnli* maize.

Number of plot.	Manures applied per acre.	Outturn per acre: Grain: Average	Outturn per acre: Grain: Year	Outturn per acre: Stalks: Average	Outturn per acre: Stalks: Year	Increase or decrease per acre as compared with unmanured plot: IIrx.: Average	IIrx.: Year	Stalks: Average	Stalks: Year
		H	i	*l*	I		ii	[illegible]	i
		lb.	lb.	lb.	lb.	lb.	lb.	ft.	lb.
1	Cow-dung, 150 maunds + bone dust, 4½ maunds.	[illegible]	*>»	[illegible]	[illegible]	[illegible]	• m	[illegible]	[illegible]
2	Cow-dung, 150 maunds + gypsum, 8 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	S
3	Cow-dung, 150 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	•1	[illegible]	[illegible]
4	Ashes of 150 maunds of Cow-dung	[illegible]	[illegible]	[illegible]	,- MM	[illegible]	[illegible]	[illegible]	[illegible]
5	Saltpetre, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	Saltpetre, 3 maunds + bone superphosphate, 3 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	•MI	[illegible]	[illegible]
7	Sheep-dung, 150 maunds + bone dust, 4½ maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	Ashes of 150 maunds of Cow-dung + Saltpetre, 3 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	• MM	[illegible]	+1,7"
9	Poudrette, [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	••••Da	[illegible]	[illegible]
10	Sheep-dung, 150 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	Saltpetre, [illegible] + bone dust, 4½ maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	• IB*.	[illegible]	[illegible]
12	Sheep-dung, 150 maunds + [illegible] . 4 i.uwli	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—
13	—	[illegible]	[illegible]	[illegible]	[illegible]	—	—	—	• - :

Note.—In 1896 the maize crops failed altogether: that year has therefore been Ml art of account in striking averages.

[illegible] mixed [illegible] outturn. Ashes of cow-dung and saltpetre rank next, [illegible] the [illegible] of the mixture not yet fully known to the common cultivator. The results of the mixture have been equally favorable in the rabi season.

Poudrette has acted more effectively than [illegible] cow-dung [illegible] bone dust and with gypsum. The addition of concentrated manure, to cow-dung has naturally had a more beneficial effect upon the yield [illegible] cow-dung alone [illegible] saltpetre alone [illegible] capable of [illegible] only nitrogen and potash, but its value [illegible] above [illegible] addition of [illegible] to it. Its property of too quick decomposition in the presence of [illegible] of [illegible] it an unprofitable manure for crops grown during the [illegible] and [illegible] out of the [illegible]

9. The following statement shows the outturn, &c. of the Duplicate Series:—

maize.

	Manure applied per acre.	Outturn per acre. Grain. Average of four previous years.	Outturn per acre. Grain. Year under report.	Outturn per acre. Stalks. Average of four previous years.	Outturn per acre. Stalks. Year under report.	Increased or decreased outturn as compared with the unmanured. Grain. Average of four previous years.	Increased or decreased outturn. Grain. Year under report.	Increased or decreased outturn. Stalks. Average of four previous years.	Increased or decreased outturn. Stalks. Year under report.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
4	Cow-dung, 180 maunds + bone-dust, 4½ maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	Cow-dung, 180 maunds + gypsum, 3 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	Cow-dung, 180 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	Ashes of 180 maunds of cow-dung	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	Saltpetre, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	Saltpetre, 3 maunds + bone superphosphate, 3 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	Sheep-dung, 180 maunds + bone dust, 4½ maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	Ashes of 180 maunds of cow-dung + saltpetre, 3 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	Poudrette, 180 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	Sheep-dung, 180 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	Saltpetre, 3 maunds + bone dust, 4½ maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	Sheep-dung, 180 maunds + gypsum, 3 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	Unmanured	[illegible]	[illegible]	[illegible]	[illegible]	—	—	—	—

In this series of plots the [illegible] inferior [illegible] compared with the Standard Series owing to the fact that [illegible] months' [illegible] previous wheat crop [illegible] the sowing of the maize, whereas in the Standard Series there is a fallow of about 8 months before the next crop of maize is sown. Among these plots sheep-dung and poudrette have given [illegible] and the mixture of saltpetre and ashes also produced a fairly good [illegible] Standard Series. Plots [illegible] particularly from stagnation [illegible]

10. It will be noticed that the plots to which bone dust was applied have given a very much higher outturn in the Standard Series than in the Duplicate Series. This is due to the fact that [illegible] require a long time to decompose, and therefore a greater portion of the residue left by one crop of maize in the Standard Series becomes fit for use of the succeeding crop by slow decomposition during the long fallow of 8 months, while in the Duplicate Series, only a smaller portion of the residue left by the previous wheat crop becomes [illegible] for the succeeding maize crop, the period of fallow between the wheat and the maize being of only 2 months.

[illegible] table:—

KHARIF STATEMENT IIA.—*Showing Financial results.—Manure experiment with maize.*

Manure applied per acre.	Cost of manure per acre.	Standard Series. Cost of cultivation (including rent, seed, labour, &c.) per acre.	Total cost of cultivation per acre.	Value of produce per acre in 1893-94, @ [illegible] the rupee of grain and straw, respectively.	Net profit or loss.	Order according to profit.	Duplicate Series. Cost of cultivation (including rent, seed, labour, &c.) per acre.	Total cost of cultivation per acre.	Value of produce per acre in 1893-94, @ [illegible] the rupee of grain and straw, respectively.	Net profit or loss.	Order according to profit.
	Rs. a.		Rs. a.	Rs. a.	Rs. a.			Rs. a.	Rs. a.	Rs. a.	
Cow-dung, 180 maunds + bone dust, 4½ maunds	16 1	Rupees 15-8 per acre.	32 9	60 7	+27 14	VII	Rupees 15-8 per acre.	32 9	22 15	− 9 10	XII
Cow-dung, 180 maunds + gypsum, 3 maunds	12 10		27 2	61 3	+34 1	VI		27 2	34 2	+ 7 0	VIII
Cow-dung, 180 maunds	5 6		21 14	47 6	+25 8	VIII		21 14	39 2	+17 4	IV
Ashes of 180 maunds of cow-dung	5 6		21 14	39 9	+17 11	XI		21 14	23 0	+ 1 2	XI
Saltpetre, 3 maunds	9 0		25 8	44 12	+19 4	X		25 8	39 5	+13 13	V
Saltpetre, 3 maunds + bone superphosphate, 3 maunds	30 0		46 8	59 0	+13 8	XII		46 8	27 2	−19 6	XIII
Sheep-dung, 180 maunds + bone dust, 4½ maunds	16 1		32 9	76 5	+43 12	I		32 9	37 3	+ 4 10	X
Ashes of 180 maunds of cow-dung + saltpetre, 3 maunds	14 6		30 14	70 1	+39 3	IV		30 14	50 7	+19 9	III
Poudrette, 180 maunds	5 6		21 14	58 13	+36 15	V		21 14	58 3	+36 5	II
Sheep-dung, 180 maunds	5 6		21 14	68 4	+42 6	III		21 14	58 6	+36 8	I
Saltpetre, 3 maunds + bone dust, 4½ maunds	19 11		36 3	47 13	+11 10	XIII		36 3	40 13	+ 4 10	IX
Sheep-dung, 180 maunds + gypsum, 3 maunds	10 10		27 2	69 10	+42 8	II		27 2	35 11	+ 7 9	VII
Unmanured	—		16 8	39 12	+23 4	IX		16 8	24 6	+ 7 14	VI

The results vary considerably as compared with those of [illegible] the dissimilarity is due mainly to the fact that during the twelve months (October 1892 to [illegible]) [illegible] water drain was made upon [illegible] Duplicate plots by raising 2 crops, [illegible]

13. [illegible] manure experiment with maize.—The object of this experiment is to [illegible] maize. The plots [illegible] sown on 7th [illegible] and were [illegible] considerable [illegible] on [illegible] of July, which could not be drained off owing to the low situation [illegible]. Plot 6 [illegible]

14. The subjoined [illegible] during the year, [illegible] of the eight years during which this experiment has been under trial:—*

KHARIF STATEMENT NO. III.

Serial number.	Manure applied per acre.	Outturn per acre. Grain. Average of last 8* years.	Grain. Year under report.	Stalk. Average of last 8* years.	Stalk. Year under report.	Increased or decreased outturn per acre as compared with the unmanured plot. Grain. Average of last 8* years.	Grain. Year under report.	Stalk. Average of last 8* years.	Stalk. Year under report.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	Woollen refuse, 120 maunds and lime, 12 maunds	2,014	3,902	9,160	[illegible]	[illegible]	+ 2,[illegible]	+ 4,[illegible]	+ 8,[illegible]
2	Sheep-dung, 120 maunds	1,800	3,551	7,547	13,765	+ 1,222	[illegible]	+ 3,742	+ 9,756
3	Cow-dung, 120 maunds	1,320	[illegible]	5,432	7,588	+ 371	+ 1,259		+ 3,304
4	Poudrette, 120 maunds	1,663	3,150	3,745	7,617	+ 1,067	+ 1,581	+ 2,583	[illegible]
5	Horse-dung, 120 maunds	1,401	2,467	4,006	7,620	+ 748	[illegible]	+ 2,591	[illegible]
6	Pig-dung, 120 maunds	1,401	3,115	4,800	7,441	+ 742	[illegible]	+ 2,759	+ 8,[illegible]
7	Saltpetre, 3 maunds	1,075	[illegible]	3,215	4,062	+ 417	+ 212	+ 1,819	+ 233
8	Unmanured	658	899	2,306	[illegible]	—	—	—	—

*This includes the year under report.

During [illegible] sheep-dung has given [illegible] year. Plots [illegible] and 4 of the [illegible] in most of the previous [illegible] outturn than the [illegible] plots of the Standard Series, owing to the fact that they enjoy the [illegible] advantage of being situated on a higher [illegible] not stagnate [illegible].

15. The subjoined table gives the financial results of the experiment showing that among manures ordinarily available sheep-dung and poudrette are almost equally economical. The net profit is based on the average outturn of the present and seven [illegible]

Kharif Statement No. III A,—*Showing financial results of miscellaneous manures tried on maize.*

Serial number.	Manures applied per acre.	Cost of manure per acre.	Cost of cultivation, rent, seed, &c., per acre.	Total cost per acre.	Value of the average outturn per acre for [illegible] years.	Net profit.	[illegible]
		Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
1	Woollen refuse, 110 maunds and lime, 12 maunds	5 [illegible]	10 5 0	[illegible]	47 8 0	[illegible]	I
2	Sheep-dung, 120 maunds	2 10 0	16 8 0	[illegible]	[illegible]	15 9 0	III
3	Cow-dung, 120 maunds	3 [illegible]	16 8 0	[illegible]	[illegible]	[illegible]	VI
4	Poudrette, [illegible] maunds	4 [illegible]	16 6 0	21 [illegible]	30 [illegible]	15 9 0	II
5	Horse-dung, 120 maunds	2 [illegible]	16 8 0	[illegible]	31 [illegible]	10 12 0	V
6	Pig-dung, 120 maunds	2 10 0	16 8 0	[illegible]	[illegible]	11 9 0	IV
7	Saltpetre, [illegible]	[illegible] 0 0	16 8 0	[illegible]	27 [illegible]	[illegible]	VII
8	[illegible]	—	16 8 0	16 [illegible]	17 [illegible]	[illegible]	VIII

[illegible]

16. This experiment has been given up at the suggestion of the Agricultural Chemist, as, he said, it was not customary with the cultivators to store up the dungs of various animals separately, and the conducting of such experiment would not therefore be of much practical value. The following are the general conclusions drawn from the results of the past eight years :—

(1) That woollen refuse mixed with lime acts more beneficially than any other animal manure;

(2) That sheep-dung is more suitable for maize than the dung of any other animal;

(3) That poudrette is also a valuable fertiliser for the crop;

(4) That horse-dung and pig's-dung are both superior to cow-dung.

16. Manure experiment with country cotton :—The object of this experiment, which is conducted on 9 plots of 400 square yards each, is to ascertain the effect of different manures on country cotton. The plots were manured on the 20th of March and sown on the 4th June at 8 lbs of seed per acre.

The results are given in the following table :—

Kharif Statement No. IV.—*Manure experiment with cotton.*

Serial number.	Manures per acre.	Outturn per acre. Cleaned cotton. Average of last [illegible] years.	Outturn per acre. Cleaned cotton. Year under report.	Outturn per acre. Seed. Average of last five years.	Outturn per acre. Seed. Year under report.	Increase or decrease over unmanured. Cleaned cotton. Average of [illegible] years.	Increase or decrease over unmanured. Cleaned cotton. Year under report.	Increase or decrease over unmanured. Seed. [illegible]	Increase or decrease over unmanured. Seed. Year under report.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	Fresh cotton seed, 200 maunds	[illegible]	243	[illegible]	443	+ 33	+ 109	[illegible]	+ 175
2	†Kainit, 4 maunds and gypsum, 4 maunds	170	[illegible]	[illegible]	411	[illegible]	+ 107	+ 115	+ 153
3	Farm-yard manure, 180 maunds and gypsum, 1 maund 14¼ seers	[illegible]	[illegible]	[illegible]	478	[illegible]	+103	[illegible]	+ 204
4	Farm-yard manure, 180 maunds, and kainit, 1 maund 14¼ seers	120	[illegible]	[illegible]	401	+ 70	+ 58	+ 158	+ 133
5	Woollen refuse, 110 maunds	[illegible]	171	471	[illegible]	+ 134	+ 37	[illegible]	+ 79
6	Unmanured ...	[illegible]	134	221	268	—	—	—	—

* [illegible] 1922-23 in which the crop failed owing to unfavourable season, have not been taken into account in striking averages.

† Kainit is a potassic manure containing sulphate and chloride of potassium, also chloride and sulphate of magnesium and chloride of sodium.

NOTE.—The cost of cultivation may be taken [illegible] including all charges except that on account of manure. [illegible] the rupee of cotton fibre, and [illegible] the rupee of seed. At these rates, the profit [illegible] would be [illegible] years would respectively be Rs. 9-8, 14-1 and 20-3.

17. During the year under report the cotton crop was unusually high. Owing to the exceptionally early advent of the rains (about the end of May), the crop was sown on the 4th of June, that is, about a fortnight earlier than the usual time for sowing country cotton. The plants thereby received such a fair start as to escape the effects of unfavourable weather which followed and injured other plots of cotton. [illegible] Kharif Statements V(a) and V(b) *infra*. The plot treated with woollen refuse, however, did not give the highest outturn as in the previous years, for the crop in the plot advanced very rapidly in growth of foliage, and owing to the shade the soil remained too damp at a time when [illegible] was decidedly in progress, inviting an attack of the insect [illegible], and imperfect development of the bolls. The comparatively high yield from the usual plot may be due to the very high percentage of organic matter in the silt obtained and applied during the year.

18. Experiment in early and late sowing:—The object of this experiment is to determine the effect of early and late sowing on maize and cotton, as well as to ascertain the comparative outturn of different varieties of the latter.

The following tables give the results of the experiment:—

KHARIF STATEMENT No. V (a).—Early and late sowing of maize.

Number of field.	[illegible]	[illegible]	Outturn per acre. Grain. Average of last two years.	Grain. Year under report.	Stalks. Average of last two years.	Stalks. Year under report.
			lb.	lb.	lb.	lb.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	1,842	1,501	4,794	[illegible]

N. B.—The cost of cultivation is [illegible] while in the case of [illegible] it is increased by Rs. 5 on account of irrigation. The value [illegible] lb. of grain and Re. 1 per [illegible] lb. of stalk for fodder. According to these rates the outturn of the early sown plot during the year under report was worth Rs. 20-15, and that of late sown Rs. 25-5, the profits on the plots being respectively Rs. 17-7 and Rs. 18-13. The average [illegible] of early sown plot, Rs. 16-6, and in the [illegible] -13.

KHARIF STATEMENT No. V (b).—Early and late sowing of cotton.

Number of field.	Time of sowing and variety of cotton sown.		Outturn per acre. Cleaned cotton. Average of last two years.	Cleaned cotton. Year under report.	Seed. Average of last two years.	Seed. Year under report.
			lb.	lb.	lb.	lb.
17	Sown before rains	Varadhi ...	137	64	259	63
		Bani ...	99	66	239	28
		Dharwari ...	114	22	273	78
		Navsari ...	128	20	248	109
		Louisiana ...	120	42	250	126
		Jari ...	90	65	210	128
		Country ...	122	114	302	237
*A.C. Series ...	Sown after rains	Varadhi ...	60	113	133	139
		Bani ...	43	34	66	97
		Dharwari ...	73	37	104	130
		Navsari ...	46	42	102	144
		Louisiana ...	36	54	85	102
		Jari ...	48	64	113	130
		Country ...	67	74	137	146

* "A.C." is an arbitrary name given to the plot.

As in previous years the early sown crop of maize gave a higher outturn than the one sown late.

The cotton crop in the early stage was severely damaged by the larvæ of an insect locally called *Bhunjka*. Though the grubs were destroyed by sprinkling soap-water and tobacco decoction, yet the crop could not recover to full vitality, and the yield was therefore very poor, contrary to previous years.

19. Experiment with different varieties of imported cotton seed.—This experiment was started in 1888 to ascertain whether certain foreign varieties of cotton can be grown successfully in this part of the country, tilling and other operations similar to but ...

The following table shows the outturn of cleaned cotton and seed during each year since the commencement of the experiment :—

KHARIF STATEMENT No. VI.—Outturn of Foreign Cottons.

Serial number.	Name of cotton.	1888-89. Cleaned Cotton.	1888-89. Seed.	1889-90. Cleaned Cotton.	1889-90. Seed.	1890-91. Cleaned Cotton.	1890-91. Seed.	1891-92. Cleaned Cotton.	1891-92. Seed.	1892-93. Cleaned Cotton.	1892-93. Seed.	Average of the five years 1888-89 to 1892-93. Cleaned Cotton.	Average. Seed.	1893-94. Cleaned Cotton.	1893-94. Seed.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	Upland Georgian	111	255	160	365	103	228	54	131	80	171	103	230	34	102
2	Tree Cotton ...	128	282	148	354	116	252	82	181	100	201	117	264	21	71
3	Louisiana ...	111	263	194	437	126	319	50	128	192	222	135	278	15	77
4	Garo Hill ...	97	263	134	308	93	137	105	186	98	217	117	222	80	157
5	Hybrid ...	166	245	182	445	118	262	55	138	100	288	123	277	28	83
6	Sea Island ...	92	207	134	314	91	251	54	135	182	302	121	204	32	70
7	Egyptian ...	97	225	194	434	80	194	65	102	155	309	118	267	15	90
8	Hinganghat ...	9	221	183	457	102	253	64	154	123	306	102	279	20	66
9	S. R. Mowry ...	24	48	180	320	60	100	29	64	72	154	72	133	23	70
10	Shine's Early Prolific.	24	48	140	280	40	100	18	42	91	154	62	121	23	72
11	Jone's Improved.	24	48	150	302	40	120	20	58	41	99	66	130	65	97

20. The yield of each plot was very poor during the year under report. This was due to two reasons, viz. :—

(a) In the early stage the plants were severely attacked by ... Specimens of the grub were sent to the ... but could not be identified. As the practical way of getting rid of ... a weak tobacco decoction was sprinkled over the leaves. These measures resulted in ... destruction of the grubs, but the crop could never regain sufficient vigour.

(b) The untimely and frequent rains ... prevented full development of bolls and spoilt the quality of fibre in those that burst, the weather being rainy.

21. Samples from the ... were sent to two experts ... of the Muir Mills Company, Cawnpur) for opinion as to quality, and their opinion together with my remarks on each was forwarded to the Agricultural Chemist. The Agricultural Chemist and myself having agreed

upon the exclusion, from the experiment, of the following varieties, their cultivation will be discontinued :—

(1) Upland Georgian

(2) S. B. Mercy.

(3) Jone's Improved.

(4) Shine's Early Prolific.

22. Steps are being taken to obtain fresh seed from America of the American varieties retained in the experiment. Fresh seed of the "Garo Hill" has already been obtained from Assam to sow this season, and that of Hinganghat will be obtained from the Central Provinces.

23. The opinions of the experts and my remarks referred to above are given in the following statement :—

Serial number.	Name of cotton.	Opinion of the Managing Director of the Muir Mills Co., Cawnpore.	Opinion of the Managing Director of [illegible] Mills Co., Cawnpore.	Remarks by the Assistant Director, Land Records and Agriculture, North-Western Provinces and Oudh.
1	Upland Georgian	A very fine staple cotton, but staple short as compared with other varieties—what might be called a medium variety.	No remarks	Should be rejected as both the yield and the quality are poor.
2	Tree cotton	An exceedingly fine stapled cotton, some staples as long as 1¼ inches, clean, but seeds appear abundant.	Ditto	I shall grow this variety next season from the seed we have got at the Farm, but fresh seed will be ordered from America.
3	Louisiana	A fine staple but considerable irregularity in length, the seeds in this variety also abundant.	Ditto	Ditto ditto. This is worth giving further trials.
4	Garo Hill	[illegible] harsh cotton, runs ⅞ to 1 inch staple.	Garo Hill is a short staple (⅞") and something like our Madhogarh cotton.	This is one of the best varieties of Indian Cotton. I have obtained some fresh seed this year from Garo Hill which will be sown [illegible] season.
5	Hybrid	A nice fine staple silky cotton somewhat similar to Khandesh staple medium.	No remarks	Cultivation to be con[illegible]
6	Sea Island	A very silky fine staple cotton, some of the fibres over 1½ inches long used to be considered the finest cotton in the world with a mean staple of 1·8 inches, the Edisto island variety having staple over 2" long.	Is undoubtedly the finest cotton having a staple 1½" long and is a fine soft yet strong fibre.	Ditto ditto ditto.
7	Egyptian	Similar characteristics to American cotton but somewhat short stapled.	No remarks	Though the staple is short yet the variety yields a fair outturn [illegible]
8	Hinganghat	This cotton appears to me to be somewhat different from the best Hinganghat cotton, being less silky and having a weaker [illegible] itself [illegible] has a fibre varying from 1 to 1¼" inches. Of course a good spinning cotton.	Ditto	variety [illegible] Fresh [illegible] the [illegible] Land Records [illegible] tried next season.
9	S. B. Mercy	The usual characteristics of American cotton, very silky appearance and if anything a finer staple.	Ditto	Not worth keeping on. Cultivation should be given up.
10	Shine's Early Prolific.	A very silky soft cotton—fibres beautifully fine and long, but not very strong, staple 1 to 1½ inches long and fairly regular—a splendid spinning cotton.	Ditto	The outturn has always been very poor. However fine this variety may be for spinning purposes, its cultivation would never be a financial success; I therefore propose to discontinue its cultivation.
11	Jone's Improved	A similar but not as good cotton as "Shines early" and fibres and seed apparently less abundant, good color but a little leafy.	Ditto	This is admittedly inferior to the last mentioned variety and its cultivation should be given up.

24. **Experiment with mixed crops.**—This experiment has been under trial for the last three years. The object is to ascertain the comparative outturn of the various crops in the commoner mixtures in which they are generally grown by the native cultivators.

The subjoined table gives the yield of each crop :—

Statement No. VII.—*Experiment with mixed crops.*

Serial number.	Crops.	Quantity of seed sown.	Outturn per acre during the year under report: Grain or ginned cotton.	Outturn per acre during the year under report: Straw or seed of cotton.	Outturn per acre last year (1902-03): Grain or ginned cotton.	Outturn per acre last year (1902-03): Straw or seed of cotton.	Cost of cultivation including cost of seed, rent, labour, &c., per acre.	Value of outturn, i.e., seed, straw, &c.	Profit or loss.
		lb.	lb.	lb.	lb.	lb.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1	Arhar ...	1	[illegible]	[illegible]	197	506	16 8 0	20 1 0	—
	Cotton ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	—
	Til ...	[illegible]	[illegible]	[illegible]	—	[illegible]		—	—
	Urd ...	1	[illegible]	[illegible]	21	[illegible]		1 8 0	—
							16 8 0	42 9 0	+25 1 0
2	Bajra ...	1	[illegible]	2,4[illegible]	[illegible]	4,0[illegible]	14 8 0	7 4 0	—
	Arhar ...	1	[illegible]	2,302	371	1,1[illegible]		24 [illegible] 0	—
							16 8 0	32 2 0	+15 10 0
3	Juar ...	2	[illegible]	[illegible]	[illegible]	[illegible]	16 [illegible] 0	[illegible] 10 0	—
	Arhar ...	1	[illegible]	2,210	1,424	3,400		2[illegible] 11 0	—
							16 8 0	34 5 0	+17 12 0
4	Cotton ...	1	[illegible]	—	807	—	16 8 0	[illegible] 11 0	—
	Cotton ...	[illegible]	[illegible]	2	[illegible]	[illegible]		[illegible]	—
	Til ...	[illegible]	—	—	—	—		—	—
	Urd ...	4	[illegible]	223	7	66		1 [illegible] 0	—
							16 8 0	13 [illegible] [illegible]	−[illegible] 4 6

1 lb. of Arhar seed calculated @ 48 lb. the Rupee, and of Arhar stalks @ 500 lb. the Rupee; of cotton fibre @ [illegible] per Rupee, and of cotton seed @ 60 lb. the Rupee; of Urd seed @ 20 lb. the Rupee, and of Urd stalks @ 250 lb. the Rupee; of Bajra seed @ 40 lb. the Rupee; of Juar seed @ 30 lb. the Rupee, and of Juar stalks @ 432 lb. the Rupee.

The highest money profit was obtained from mixture 1.

25. **Experiment to determine the comparative effect of gypsum and other manures on indigo.**—This experiment was taken up during the year under report with the object of ascertaining the comparative effect of gypsum, bone dust and farm-yard manure on indigo crop. Four plots each measuring 1,210 sq. yards have been allotted to the experiment. The plots were watered on the 23th April to soften the soil and manures applied on the 2nd May which were ploughed in the same day. The seed was sown on the 4th of May at the rate of 12 lb. per acre. Two waterings were given, one on the 20th of May and the other on the 17th of June, and the crop was cut on the [illegible] of August.

The following table gives the outturn of each plot :—

Statement No. VIII.—*Experiment to determine the comparative effect of gypsum and other manures on indigo.*

Serial number.	Manure applied per acre.	Cost of manure.	Outturn of green indigo per acre.	Increased or decreased outturn over the unmanured plot.	Value of the outturn.	Net profit or loss.
		Rs. a. p.	lb.	lb.	Rs. a. p.	Rs. a. p.
1	Cow-dung, 150 maunds ...	[illegible]	12,130	+ 4,7[illegible]	12 14 0	+[illegible]
2	Gypsum, 2 maunds ...	[illegible]	10,[illegible]	+ [illegible]	[illegible]	+[illegible]
3	Bone dust, 20 maunds ...	[illegible]	10,[illegible]	+ 3,[illegible]	[illegible]	−[illegible]
4	Unmanured ...	—	7,[illegible]	—	—	—

Cow-dung has given better result than either gypsum or bone dust, and the latter has proved anything but economical from a financial point of view.

3

25. At the request of the Upper India Chamber of Commerce, an interesting experiment was tried with indigo seeds varying from 1 to about 5 years old [illegible] their comparative vitality and productive power.

The seeds were sown in 5 different plots [illegible] measuring 684 square yards. The following is a detail of operations performed in the fields :—

Date.	Operation.
17th April 1898 ...	... First [illegible] for ploughing ;
18th " ...	... [illegible] ploughing ;
18th " ...	... [illegible] watering ;
19th " ...	... " ploughing ;
1st May 1898 ...	... Third watering ;
20th " ...	... Fourth watering ;
5th August 1898 ...	... Stalks cut down for sale and stumps 6" high left in the soil. These stumps gave off new shoots which produced the seed.
20th to 30th September ...	... Weeding.
14th December ...	... Harvesting.

The result of the crop is detailed in the subjoined table :—

KHARIF STATEMENT No.

Serial number.	Detail of seeds.	Outturn per acre. Plant.	Outturn per acre. Seed.	Cost of cultivation, seed, rent, labor, &c.	Value of the plant.	Value of the seed.	Total value of the produce.	Net profit or loss.
		lb.	lb.		Rs. a.	Rs. a.	Rs. a.	Rs. a.
1	Indigo seed [illegible] harvested in 1898	4,849	133	Rs. 17 per acre.	27 8	6 6	33 14	16 14
2	Indigo seed 1 year old ...	5,718	172		32 6	6 15	39 5	22 5
3	" " 2 years ...	4,963	157		28 3	5 4	33 7	16 7
4	" " 3 " ...	4,062	152		23 3	6 1	29 4	12 4
5	" " 5 "	3,532	142		17 6	5 10	23 0	6 0

The results of plots 2 to 5 show that the older the seed the poorer is the yield, both of stalks and of the seed, but this [illegible] hold good [illegible] of plot 1 in which the crop was attacked by [illegible] (crotogonus). It is [illegible] noteworthy that [illegible] a belief among the native culti-

RABI SEASON EXPERIMENTS.

27. The programme of [illegible] by me and approved by the Agricultural Chemist, and they were conducted [illegible] modifications made thereby in the old experiments will be [illegible] experiments.

28. The season was on the whole unfavourable at Cawnpore as it was in many other districts of the N.-W. Provinces.

The wheat crop suffered generally from [illegible] and excessive rains in February, and certain plots were besides injured more or less by rust. The hail storm of 6th February 1899 did a certain amount of damage to the crop generally, and the excess of moisture caused by the winter rains resulted in the too luxuriant growth of straw. The grain therefore became thin and small.

29. The most important experiments with wheat [illegible] two [illegible] each consisting of 13 plots of 400 square yards each.

One series in which wheat is grown year after year is called the "Standard" and the other in which a crop of maize is taken alternately with wheat is called the "Duplicate." The manure applied to each plot of the one series is also applied to the corresponding plot of the other, and [illegible] tillage operations in both the series are similar in all other respects.

30. The following statements show the results of the Standard and the Duplicate Series:—

RABI STATEMENT No. I.—*Standard Series.—Manure experiment with wheat.*

Number of plot.	Manure per acre.	Outturn per acre. Grain. Average of last five years.	Outturn per acre. Grain. Year under report.	Outturn per acre. Straw. Average of last five years.	Outturn per acre. Straw. Year under report.	Increase or decrease per acre as compared with the unmanured plot. Grain. Average of last five years.	Increase or decrease. Grain. Year under report.	Increase or decrease. Straw. Average of last five years.	Increase or decrease. Straw. Year under report.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
4	Cow-dung, 180 maunds + bone dust, 4½ maunds.	1,756	1,700	3,105	3,300	+325	[illegible]	+735	+1,129
5	Cow-dung, 180 maunds + gypsum, 3 maunds	1,659	1,610	3,079	3,122	+429	+492	+643	+941
3	Cow-dung, 180 maunds	1,581	1,788	3,014	3,333	+400	+542	+587	+1,152
7	Ashes of 180 maunds of cow-dung.	1,327	1,452	2,413	2,604	+146	+306	−14	+423
1	Saltpetre, 3 maunds ...	1,413	1,630	2,776	3,327	+232	+484	+349	+1,146
9	Saltpetre, 3 maunds + bone superphosphate, 3 maunds	1,378	1,869	2,808	3,252	+197	+723	+381	+1,071
8	Sheep-dung, 180 maunds + bone dust, 4½ maunds.	1,584	[illegible]	2,937	3,300	[illegible]	+917	+510	+1,609
13	Ashes of 180 maunds of cow-dung + saltpetre, 3 maunds.	1,442	2,048	[illegible]	3,763	+261	+902	+211	+1,582
12	Poudrette, 180 maunds ...	1,699	1,538	3,611	4,264	+518	+392	+1,184	+2,083
6	Sheep-dung, 180 maunds ...	1,610	2,015	3,423	3,778	+429	+869	+996	+597
2	Saltpetre, 3 maunds + bone dust, 4½ maunds.	1,480	1,632	2,666	2,886	+299	+500	+239	+705
10	Sheep-dung, 180 maunds + gypsum, 3 maunds.	1,748	1,898	3,009	[illegible]	+567	+700	+582	+1,528
11	Unmanured	1,181	1,146	2,427	2,181	—	—	—	—

RABI STATEMENT No. II.—*Duplicate Series.—Manure experiment with wheat.*

Number of plot.	Manure applied per acre.	Outturn per acre. Grain. Average of last five years.	Outturn per acre. Grain. Year under report.	Outturn per acre. Straw. Average of last five years.	Outturn per acre. Straw. Year under report.	Increase or decrease per acre as compared with the unmanured plot. Grain. Average of last five years.	Increase or decrease. Grain. Year under report.	Increase or decrease. Straw. Average of last five years.	Increase or decrease. Straw. Year under report.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
7	Cow-dung, 180 maunds + bone dust, 4½ maunds.	1,392	1,302	3,182	2,533	+232	+157	+707	+381
9	Cow-dung, 180 maunds + gypsum, 3 maunds.	1,228	1,712	2,778	3,423	+168	+605	+305	+1,279
6	Cow-dung, 180 maunds	1,719	1,482	3,241	2,946	+459	+375	+970	+792
8	Ashes of 180 maunds of cow-dung	1,096	1,474	2,626	2,237	+46	+327	+153	+110
4	Saltpetre, 3 maunds	1,422	1,756	2,681	3,016	+62	+629	+206	+912
11	Saltpetre 3 maunds + bone superphosphate, 3 maunds.	1,363	1,986	2,303	3,461	+303	+829	−170	+1,307
10	Sheep-dung, 180 maunds + bone dust, 4½ maunds.	2,582	2,023	3,356	3,345	+1,322	+926	+881	+1,201
3	Ashes of 180 maunds of cow-dung + saltpetre, 3 maunds.	1,564	2,184	2,819	2,736	+304	+1,077	+421	+602
2	Poudrette, 180 maunds ...	1,668	1,875	3,944	4,223	+508	+768	+1,469	+2,069
1	Sheep-dung, 180 maunds ...	1,502	1,730	3,036	3,794	+242	+623	+561	+1,669
5	Saltpetre 3 maunds + bone dust, 4½ maunds.	1,556	1,743	3,034	3,566	+296	+635	+559	+1,412
12	Sheep-dung, 180 maunds + gypsum, 3 maunds.	1,524	1,962	3,279	4,283	+564	+855	+1,104	+2,129
13	Unmanured	1,060	1,107	2,475	2,154	—	—	—	—

31. The operations carried on in these plots were similar to those reported in full last year. The only alteration in the [illegible] consisted in the application of [illegible] (3) and (9) of the Standard, and (4), [illegible] Series as a top-dressing [illegible] that manure being plough[illegible]

32. The results of this year only confirm the facts established by the trials made during the 13 preceding years that the manures are the best for wheat. Sheep-dung and a mixture of sheep-dung with bone dust or gypsum have given very good results in this series. There is not the slightest doubt as to the value of the sheep-dung as manure; as a fertilizer it appears to contain a higher percentage of nitrogen than the dung of other animals—a fact which has yet to be determined by a series of chemical analyses. Ashes of cow-dung with saltpetre have given the highest yield this year in the two series. The mixture was first among the Duplicate plots, and second among the Standard, and similar results have been obtained by the application of the mixture elsewhere at the Farm, tending to show that the loss of nitrogen caused by the burning of the dung is amply recompensated by the addition of saltpetre to the ash.

33. The application of saltpetre as a top-dressing has proved more beneficial, as the yield of the plot to which it was applied as a top-dressing has been considerably higher than the average of the part of the plot in which it was applied at the time of sowing. This fact substantiates the theory that nitre being a quickly decomposible manure should be applied best at the time when the crop is sufficiently advanced to fully utilize its main fertilizing agent, the nitrogen.

34. Saltpetre mixed with superphosphate has given higher outturn than Saltpetre alone, a fact in accordance with the principles of science. Cow-dung alone has given poorer results this year than it did in most of the previous years. In the Duplicate series it has been turned by saltpetre and ashes. The old manure pits at the farm were flooded by water from an adjoining tank owing to heavy rains and most of the manure ingredients were consequently washed into the tank. The value of the manure left in the pit was highly doubtful and it was preferred therefore to apply dung collected in another pit at the farm during the rainy season. As this dung was comparatively fresh, it could not fully decompose during the period of growth of the wheat, and the whole of nitrogen was not therefore assimilated by plants. This would explain the low yield of the cow-dung plots. The experiment suggests the conclusion that cow-dung does not produce its best effect unless applied to wheat in a thoroughly rotten condition.

35. The following statement shows the financial results of these experiments :—

Rabi Statement II (a).—Showing financial results.

Manures applied per acre.	Standard Series. Cost of manure per acre.	Cost of cultivation (including rent, seed, labour, &c.) per acre.	Total cost.	Value of produce per acre	Net profit or loss.	Order according to profit.	Duplicate Series. Cost of cultivation (including rent, seed, labour, &c.) per acre.	Total cost.	Value of produce per acre	Net profit or loss.	Order according to profit.
	Rs. a. p.		Rs. a. p.	Rs. a. p.	Rs. a. p.			Rs. a. p.	Rs. a. p.	Rs. a. p.	
Cow-dung, 180 maunds + bone dust 4½ maunds.	[illegible]	Rupees 22 per acre.	[illegible]	[illegible]	[illegible]	IX	Rupees 22 per acre.	[illegible]	[illegible]	[illegible]	XIII
Cow-dung, 180 maunds + gypsum, 9 maunds.	[illegible]		[illegible]	[illegible]	[illegible]	VIII		[illegible]	[illegible]	[illegible]	VII
Cow-dung, 180 maunds	[illegible]		[illegible]	[illegible]	[illegible]	V		[illegible]	[illegible]	[illegible]	XII
Ashes of 180 maunds of cow-dung.	[illegible]		[illegible]	[illegible]	[illegible]	X		[illegible]	[illegible]	[illegible]	IX
Saltpetre, 3 maunds	[illegible]		[illegible]	[illegible]	[illegible]	VII		[illegible]	[illegible]	[illegible]	VI
Saltpetre, 3 maunds + superphosphate, 3 maunds.	[illegible]		[illegible]	[illegible]	[illegible]	XIII		[illegible]	[illegible]	[illegible]	X
Sheep-dung, 180 maunds + bone dust 4½ maunds.	[illegible]		[illegible]	[illegible]	[illegible]	III		[illegible]	[illegible]	[illegible]	V
Ashes of 180 maunds of cow-dung + saltpetre, 3 maunds.	[illegible]		[illegible]	[illegible]	[illegible]	IV		[illegible]	[illegible]	[illegible]	III
Poudrette, 180 maunds	[illegible]		[illegible]	[illegible]	[illegible]	VI		[illegible]	[illegible]	[illegible]	I
Sheep-dung, 180 maunds	[illegible]		[illegible]	[illegible]	[illegible]	I		[illegible]	[illegible]	[illegible]	IV
Saltpetre, 3 maunds + bone dust, 4½ maunds.	[illegible]		[illegible]	[illegible]	[illegible]	XII		[illegible]	[illegible]	[illegible]	VIII
Sheep-dung, 180 maunds + gypsum 9 maunds.	[illegible]		[illegible]	[illegible]	[illegible]	II		[illegible]	[illegible]	[illegible]	II
Unmanured	—		[illegible]	[illegible]	[illegible]	XI		[illegible]	[illegible]	[illegible]	XI

Tin- IDst economical nwulb bu e been obkaioad from (a) sheep-dung applied singly or with artificial manure*, (6l jioudrette, and (<•) mixture of sal!i>«'tr.' with ashes which mixtuire seems to *be* the lust available inorganic; nuaare suitable for wheat.

36. The following statement show* the ratio between grain and straw in the series taking grain as a Bait !—

KABS STATKMKST II (B).

Series.	Utnar* »j>pli«L	lUtio Ulwurn (rmin arul >tn* during 1K1U-M. Maalml	Duplicate Series.
1	Saltpetre, 3 maunds	1 : 2·04	1 : 1 7 1
2	Saltpetre, 3 ammtt + bone dust, 4½ maunds	1 : 1·75	[illegible]
3	Cow-dung, ...	1 : 1·97	[illegible]
4	Cow-dung, 180 ma, nib * boM &»t. «t "i»unJ.	: I 1*5	[illegible]
5	Cow-dung 180 maHI< + itjinutn, a ml	[illegible]	[illegible]
6	Sli«rp-Jorii{. ISO awawk	[illegible]	1 ii-18
7	Aiha of 100 mMiml* <if «>w.ili><	[illegible]	[illegible]
P	maunds	[illegible]	1 : IT*
I	Mtprtn. :i mmud. + !K>M ia|*rvboa|>l»lr. 3 maunds	; I 7 t	[illegible]
1U	R 1 1 I C . 1*) oiuind + f*'" » "»»nd	[illegible]	[illegible]
11	UnmanuM	[illegible]	[illegible]
u	Poudrette, IHfl m*timl>	:»ia	[illegible]
13	Ashes of 180 maunds U (cow-dung + saltpetre, S m.ond. ...	[illegible]	[illegible]

TIKT hifjlut pon-cnUKe of straw was yielded by J OH poodntM plot in both the In the -undard it was uanmully hyli showing thai on att^.iint of tbo exctv<]itiltlly MtitbiiUlini; mture ol lhe manur *h* »'<l«l ^y tlll! «ff«u of winter rjins, it oted the growth of s•*lk at the eiiwnsc of grain.

Green• *manuring Serit*.*

,J7. Thi« ctpenmcat wu itartod ia 1884, ami than arc 13 |>lat* tinder it, each 400 M]uartt >»nls in araa.

Tbaobj«-tof the «iwrimonl *i** r**lly a double one. On tbe *out* hand either a green crop or an organic vegetable anon w plouj{h.J in to »ct directly ii.n wheat.

On the odwr it in doU-rmined *fMOm* th« root residue of a ltifiiininoito crap benefits L succeeding *i\ cm}**. Tin- axpniaHnt h« b«n adroitU-J to be a valoable one bj th^ Igricultu •! Ch—W ^Ih. hw, however, mod l f d tlie treatment of certain)>loU of llu* wruM.

The aft*r»tiopt are a» follows :—

No. of plot.	Treatment up to 1892-93.	Agricultural Chemist tn tb* the Government of In...	Treatment adopted during the year.
3	Indigo water, MOO cubic feet	Rape (Sohada) to be ploughed in.	Wheat grown. (Sohada will be grown next August).
4	Hemp water, 3,000 mMr l ...	Gram and wheat alternately ...	Gram sown.
6	Wheat sown after hemp crop had been cut.	Hemp and wheat alternately ...	Wheat sown.
10	Green indigo ploughed in, and maunds.	Urd and wheat alternately ...	Wheat sown.
11	N*. W- ploughed in, and 6 maunds.	Arhar and wheat alternately	Wheat sown.

Tbe lilU^cand othw operations carried on in the other plots were identical

38. The following statement shows the outturn, &c., of the plots of this series :—

RABI STATEMENT No. III.—*Showing results of experiments to determine the effect of green manuring on wheat.*

Serial number.	Manure applied per acre.	Outturn per acre.				Increased or decreased outturn per acre as compared with the unmanured plot.			
		Grain.		Straw.		Grain.		Straw.	
		Average for the last five years.	Year under report.	Average for the last five years.	Year under report.	Average for the last five years.	Year under report.	Average for the last five years.	Year under report.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	Old indigo refuse, 120 maunds ploughed in.	1,644	1,548	3,573	4,197	+550	+606	+1,647	+2,417
2	Fresh indigo refuse, 120 maunds ploughed in.	1,634	1,349	3,427	3,526	+530	+473	+1,501	+4,108
3	Rape to be ploughed in, wheat this year.	958	736	2,011	1,087	−141	−121	+86	+237
4	Gram and wheat alternately, gram this year.	—	1,113	—	1,222	—	—	—	—
5	Unmanured	1,094	877	1,926	1,750	—	—	—	—
6	Hemp and wheat alternately.	1,087	1,031	1,914	2,119	−7	+154	−12	+369
7	Green hemp ploughed in	1,302	935	2,431	1,794	+208	+58	+505	+64
8	Green indigo ploughed in	1,442	750	2,573	1,957	+348	−127	+647	+227
9	Indigo and wheat alternately.	1,202	696	2,350	1,576	+108	−181	+424	−154
10	[illegible] wheat alternately. [illegible] will be sown [illegible]	1,312	935	2,460	1,878	+218	+58	+534	+148
11	Ashes	1,167	1,028	2,272	2,154	+73	+151	+346	+404
*12	Lucerne and wheat alternately, wheat this year.	865	1,108	1,867	2,065	−229	+231	−59	+1,255
*13	Lucerne and wheat alternately, lucerne this year.	946	Lucerne standing.	1,878	Lucerne standing.	−148	—	−48	—

Note.—The cost of cultivation may be taken @ Rs. 27 per [illegible] of manure. For calculating value of produce the following rates have been taken :—
(a) Grain @ 32 lb the Re.
(b) Straw @ 240 lb „ Re.

The value of the [illegible] giving a net profit of Rs. 7-7. For the [illegible] 5-1. The net profit this year of Nos. 1, 2, and [illegible] the previous five years was Rs. 29-14, Rs. 37-11 and Rs. 7-12, respectively.

* [illegible] two plots are so arranged that when one plot bears wheat the other bears lucerne.

The best results were obtained from plots Nos. 1 and 2. [illegible] results obtained during the [illegible] have been [illegible] of clover in Eng[illegible]

Hemp [illegible] extent [illegible] roots.

Green [illegible] after indigo [illegible] crop having been seriously damaged by the [illegible] *Gadahi* [illegible]

Plot No. 12 [illegible] plot, growing wheat year after [illegible] lucerne. In 1893-94 a crop of wheat was taken for the first ti[illegible] reference to this plot, therefore, [illegible] denote t[illegible] outturn during the year under report.

39. An [illegible] certain other green leguminous crops was [illegible] a plot of ground elsewhere [illegible] Farm. This plot was comparatively inf[illegible] crops

were sown on 4th June 1893, and ploughed in on 3rd August 1893. Wheat was sown on [illegible] November 1893, and watered twice. The results are shown in the subjoined

A.

STATEMENT SHOWING THE OUTTURN OF FIELD No. 27.—*Rabi Experiment*, 1893-94.

No.	Treatment.	Outturn per acre, Grain.	Outturn per acre, Straw.	Increase or decrease as compared with the unmanured, Grain.	Increase or decrease as compared with the unmanured, Straw.
		lbs.	lbs.	lbs.	lbs.
1	Green hemp ploughed in [illegible]	[illegible]	3,147	+[illegible]	+[illegible]
2	[illegible] ploughed in [illegible]	[illegible]	[illegible]	+[illegible]	+[illegible]
3	[illegible] ploughed in [illegible]	[illegible]	[illegible]	+ 175	+[illegible]
4	Unmanured	[illegible]	[illegible]	—	—

It is clear that all these crops benefit the succeeding wheat crop. [illegible] which might be sown [illegible] with [illegible] advantage for the purpose of green manuring. It gives slightly better results than hemp.

40. Ploughing Series.—The object of this experiment is to determine the effect of deep and shallow ploughing on the growth of wheat without the application of a manure. There are 3 plots under this experiment, each 2,450 square yards in area. Nos. 1 and 2 are ploughed [illegible] times [illegible] and 5" deep, respectively, with an improved plough (the Cawnpore [illegible]) and the third plot [illegible] times 3" deep with the ordinary native plough. In other respects the treatment of all the 3 plots is alike. The following statement shows the results of the experiment:—

STATEMENT No. [illegible]—*Ploughing experiment with wheat.*

No.	Treatment.	Cost of ploughing per acre.	Outturn per acre, Grain, Average of the last [illegible] years.	Outturn per acre, Grain, Year under report.	Outturn per acre, Straw, Average of the last [illegible] years.	Outturn per acre, Straw, Year under report.	Increased or decreased outturn compared with the native plough, Grain, Average [illegible]	Increased or decreased outturn compared with the native plough, Grain, Year under report.	Increased or decreased outturn compared with the native plough, Straw, Average [illegible]	Increased or decreased outturn compared with the native plough, Straw, Year under report.
		Rs.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	Ploughed 9" deep 4 times with improved plough.	3	[illegible]	1,078	[illegible]	[illegible]	+[illegible]	+ 7[illegible]	−[illegible]	−[illegible]
2	Ploughed 5" [illegible] with improved plough.	3	[illegible]	[illegible]	[illegible]	[illegible]	+[illegible]	[illegible] 70	+[illegible]	−[illegible]
3	Ploughed [illegible] with country plough.	6	[illegible]	1,003	[illegible]	2,494	—	—	—	—

N.B.—The cost of cultivation [illegible] Rs. [illegible] per acre, including [illegible] of ploughing. The value of produce, at a reasonable estimate, [illegible] Rs. [illegible] of grain and Rs. [illegible] straw. According to this estimate the outturn of the first plot was worth Rs. [illegible], of the second plot worth Rs. 42-8, and of the third plot worth Rs. 41-8. Deducting from these the cost of cultivation (viz., Rs. 21) plus cost of ploughing noted opposite each plot, the profit [illegible] Rs. 18-8, [illegible] 13-8, respectively, showing [illegible] ploughing with the improved plough is [illegible] ploughing with the native plough.

41. The yield [illegible] inferior as compared with the average of the past five years, owing to the unfavorable character of the season. There was no remarkable difference between the outturn of plots 1 and 2, but the results [illegible] yet go to prove that deep ploughing [illegible] economical, as shown in previous years, than shallow ploughing with a native plough.

42. Remarks on the quality of the grain.—With regard to quality, the produce of the Standard Series was generally speaking, the best. The Duplicate Series came next in this respect. The most plump, white and uniform grain were found in

the produce of the plot treated with saltpetre in both the series. Plots treated with sheep-dung and cow-dung mixed with bone dust produced fine plump grains, but not equally gn«d in color. The grain fr>m tW wltpptm ami •ttp*rpho»ptanl* plot *M •uprrior in quality to that of th« oow-dong plot in ttw aUatUrd Rftrioa.

10 th* *gntn* manuring am** ttw pmdu '11 and 7 ni atiprrior in mpf .t «f quality u> tb>t of the mt, but inferior in «t»ry rwnect to tb* beat HUBBIM •i tlic Standard m.l tin- Duplicate SorM.

«. Intiw ploutrhntji wria tbvplat ploughed V d*^> pradnoaJ tb» r M tat qnalitir of giuo in th* lot, but infmor l« ti* Wt plM of gTMn mMwnnf «M.

45. Experiment with Grun.-Tbi. »pcrimttit ««. uk» a„ tbt*y<jar with the obi«a«f drt<*miwntt ti mMmrk! "ff»rt of JJ) mlphnU of ti (gypmm) upon tl* kguminoa* cr»p#, and *tl)* grou: ^rhtcfa OMMU cnirtU .f , carbonate of lime in compa . UMJH with Karrn-vsuvl ntanur* iad bow «up*tpho«p»U, Th«- imAf w»*fiif'5 wdrred at th- tam *.tti a AMM and n*«d fur UM nrat tiiw a* * man urn. a»l tb# •im wu to find out wbrthvr limn w mU brte«l a Itgtnm crop if applied in the form of carbonate (which » dmytf) u well M in th.* form ofoili'haU'. Tin- .'[-raii consisted of:—

(1) Flouduug, 3 *liam* with tfaf Watt'* plnitgb.
(<) Ditto l»w with tlw eovatry pUo(«.
(3) Lmlling with tbr ^.
(4) Sowing at ttw rat* of S3 *9m,* pw aap

Tlie tvltowinit ubb |pVM UM ouUum of Mcb plot —

RABI STITSXK> No. V.— flwrfaf *tl* f«t %(ttrtmm m mn* as on gram in 1893-94.

No. of plot.	HIIBI «f1>Bri pr acre.	Outturn per acre.		Increased or decreased outturn as compared with the unmanured plot.	
		Grain.	Straw.	Grain.	Straw.
		lb.	lb.	lb.	lb.
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible] , »t mds.	[illegible]	[illegible]	[illegible]	[illegible]
I	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	Unmanured	[illegible]	[illegible]	—	[illegible]

46. TV value of ->|I-IITO M ft fptniai inuu» for Ugumiaoiw orop h« been recognised I in EngUnd afuv y<*n of npWiMaUti»», and tin- nanlu obUiwu »• tlu» experiment X abow llutl tl ia capabla el producing if nqually ^J *ff t 1Q tlu* country ona«r favorable cttvanxtanoM. TW 4MU plot, though it :*n> raulUr jrifU than plots 1 and 2, ha. outstripped the <rphn«plu plot -Uwmtf Ibat lima atft beneficial to gram if applied 1 in the ' form of carbonate in which tit vory commonly foitad in nalurv. The pmfit or looi on <m-\> nanurrd plot wa* JU under :—

(1)	—	[illegible]
(2)	—	[illegible]
(3)	—	[illegible]
Hi	—	-ii • «

Tnii abuwi that *$fy*xxm u* u»f *totmornkmi.*

Tlw raU at vkith T»1M of ontiurn W b«M oa!.ui»t«l m ttw at».», n|wnttwnt i* given below :—

Grain [illegible] the Re.
Straw [illegible] the Re.

EXPERIMENTS WITH FOREIGN GRAINS

47. EipcrunenU rrinbag t« t^i^t^nna of furJ^n* varieties oT wbr>t and barley have been discontinued at my suggestion, •ad wtlb UM A^TKultural Cbnutt't

approval, but the experimental cultivation of Canadian oats carried on during the past 3 years has Iran allowed to continue With a view to obtaining MIDO deflnite result, The outturn of the different varieties of oats is given in the subjoined statement :—

STATEMENT No. 12.—Showing outturn of Canadian oats.

Variety of oats.	Outturn per acre, at [illegible] 8 jan.		[illegible]	
	Grain.	Straw.	Grain.	Straw.
	lb.	lb.	lb.	lb.
(1) PriMOiMtfr	M	MOt	in	
(2) Canadian Triumph		4,:in		3,530
(3) Kranlc'* l*rin>	m	1,8(0	544	
(4) Welcome	461	4,294	MO	[illegible]
(5) IkHUUlU	439	4,082		11,000
(6) White Egyptian	40T		192	

Date of sowing of each plot, 27th October 1893.

48. The outturn of grain is at once very poor as compared with the yield of Cape oats which produced 14 maunds or 1,115 lb. per acre, on an average, at the Pijierimmul Station during the year. An attempt was made in the earlier stages of the growth of the Canadian oat crop to check the too luxuriant development of straw by nibbling the tops with a sickle to the extent of about 6 inches and thus to give the crop a chance of yielding greater outturn in grain, but this was unsuccessful. The crop grew inordinately in spite of the previous treatment—the plants giving off larger number of shoots most of which did not bear. Canadian oats appear therefore to be excellent for raising heavy crops of nutritious green fodder.

49. Manurial experiment with country potatoes.—This was started during the year with the approval of the Agricultural Committee on five plots with the object of determining the effect of certain nitrogenous manures as compared with the Farm-yard manure on the FamiLhaWl potatoes, which is a most favourite variety with the natives. The following full detail of the operations carried on :—

STATEMENT A.—Details of potato cultivation.

Date.	Operations.
May to 9th	Country plough.
10th October	Manuring.
5	Spreading the manure.
13th and 14th October 1893	Ridging. The ridges being damaged by rain, hence,
October 1893	Ploughing again.
[illegible]	Ridging again.
20th November 1893	Tubers planted on ridges 2 feet apart @ the rate of 10 maunds per acre.
14th	[illegible]
15th	1st Watering.
22nd to 25th November 1893	Earthing up.
6th December 1893	2nd Watering.
17th to 19th December 1893	Earthing up.
23rd December 1893	3rd Watering.
4th to 8th January 1894	Earthing up.
12th January 1894	4th Watering.
29th	5th Watering.
28th February 1894	Harvesting.

5

The sowing was delayed a fortnight, owing to late arrival of the consignment of the seed from Farrukhabad. The statement below shows the yield of the various plots :—

Rabi Statement No. V II.—Manure experiment with country seeds.

Serial No.	Manure applied per acre.	Cost of manure per acre.	Outturn (tubers) per acre.	Increase or decrease in outturn over the unmanured plot.
		Rs.	lb.	lb.
1	Farm-yard manure, 200 maunds	6	10,170	+2,377
2	Poudrette, 200 maunds	8	6,553	—1,240
3	Castor oil cake, 12 maunds	12-12	11,410	+3,617
4	Bone superphosphate, 4 maunds + saltpetre, 4 maunds	40	11,505	+3,712
5	Unmanured	—	7,793	...

Note.—Taking the cost of cultivation, exclusive of manure at Rs. 24 per acre, and the average rate at which potato was sold at Re. 1 per 100 lbs., the financial result of the experiment is as follows :—

	Rs.	a.	p.
(1) Profit	11	11	0
(2) Loss	[illegible]		
(3) Profit	[illegible]		
(4) "	[illegible]		
(5) "	[illegible]		

10. The highest yield was obtained from plot 4. Plot 3 stood next with regard to outturn. It is a popular belief that castor oil cake is a beneficial manure for potatoes. In this experiment this manure has produced the best financial result. The tubers of this plot were far more numerous, though much smaller in size, than those of other plots.

The yield of plot 1, though less in quantity than that of plots 3 and 4, was superior to all the rest in quality, the potato varying from [illegible] in diameter, and weighing about [illegible] oz. on an average. This is explained by the fact that Farm-yard manure being more bulky than other manures, renders the soil more loose, and the tubers find greater scope for development.

In the poudrette plot the growth of plants was too luxuriant owing to the highly stimulating effects of the manure, and they were so seriously knocked down by rain accompanied with hail storm on 7th of February, that the yield suffered considerably than that of the unmanured plot. The potatoes of the unmanured plots were mostly small but uniform in size; the largest weighed about 4 ounces.

According to the Kotwali rates, the best potatoes for table use were those produced from the Farm-yard manure plot.

11. Similar experiment was tried with hill potatoes in five plots. The seed was obtained from Naini Tal through a contractor. The results will appear from the following table :—

Rabi Statement No. V III.—Experiment with hill potato.

Serial No.	Manure applied per acre.	Cost of manure per acre.	Outturn (tubers) per acre.	Increase or decrease in outturn over the unmanured plot.
		Rs.	lb.	lb.
1	Farm-yard manure, 200 maunds	6	[illegible]	[illegible]
2	Poudrette, 200 maunds	8	[illegible]	[illegible]
3	Castor oil cake, 12 maunds	12-12	2,656	+1,575
4	Bone superphosphate, 4 maunds + Saltpetre, 4 maunds	40	2,961	+1,880
5	Unmanured	—	1,081	—

The crop was almost a total failure owing to very bad germination and the experiment will be repeated next year.

MISCELLANEOUS.

52. Fodder crops:—Some experiment* were tried with fodder crops oV ing the year under report, of which the most important and interesting was the on? relating to eattti ation of Egyptian or Barsee i-l-wr (7VI/VI/I'»» *Atex.i*>trt**m)* tho s«d nf which waa obtained *h* om Egypt. It arrivwl at Cawnpore aiwut the middle of November I S'J3, and was tiiwn tint on the £l«t November. The fallowing are briefly the prol•. ble conclusion* that can be drawn from the result* obtained by tbe experinr ents trie: on different plot*:—

1. That the clover can be grown •uceeaaf ully in this part of the country ;

2. That M i l 1<»m is the most suitable soil for the crop, and that in a ftiff clay <wit tbe crop it almost a failure;

3. That early sowing in winter i* wwntial for its tucceuful growth ;

4. Thai manure it not essentially necessary, and that probably heavy manuring <lof* more barm than good ti> the crop ;

6. That weeding and irrigs' ion in the earlier stages of growth arc beneficial.

Tbe twoMtity for producing an much teed as possible prevented the determination this year of the number of cutting* that can be Uken during the growing period, and of the total yield per acre of the pa-en food. Theae potnU will he attended to nexi year. Green clorer i» eaten with reliih by the cattle and *ikantt,* and *to* u the clover hay, and neither «een» to produce cofttvtmtns or#flatulon«. As tho experiment is quite new, I subjoin • itatomcnt(fivingfull details of the treatment »nd yield of the several pi->*u* • a which it v>i tried.

MISCELLANEOUS STATEMENT No. I.—*Showing experiments with clover* (*Rabi*, 1893-94.)

Serial number.	No. of Field as per farm map.	Area in square yards.	Class of soil.	Treatment.	No. of ploughings.	Seed sown per acre.	Method of sowing.	Date of sowing.	Date of reaping.	No. of weedings.	No. of waterings.	Average height of plant.	Actual outturn per plot. [illegible]	Actual outturn per plot. Grain.	Actual outturn per plot. Straw.	Outturn per acre. Grain.	Outturn per acre. Straw.	Remarks.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
						lbs.						Ft.	lbs.	lbs.	lbs.	lbs.	lbs.	
1	27. (Corner)	800	Light loam.	No manure.	2	6	Sown in the furrow opened by a country plough.	21-11-93.	3-5-94 ...	5	5	3 ft.	28	2¾	30½	26	478	This plot which had been lying fallow during the rains was artificially irrigated before sowing and ploughed twice. The seed was then sown behind the country plough and buried about 3 inches deep. Germination did not take place until after 15 days after sowing. A light watering had to be given before germination, and the crust found at the surface softened by *kheryi*. The seed did not germinate where it was buried too deep in the ground. The crop was irrigated 5 times from December 1893 to March 1894. It began to flower early in February 1894, and the growth of stems continued till the end of March. When fully grown, the average height of the plants was about 3 feet. The flowers were white in color. The seed began to form about the end of March and was of yellow brown color in the end of April when fully ripe. Before formation of seed, two kinds of bees were frequently seen hovering about the flowers and these were probably the fertilizing agents. This plot gave the highest outturn of seed showing that early sowing in winter and light soil are apparently essential for successful cultivation of the crop in this part of the country.
2	24	842	Heavy loam.	Ditto	3	6	Broadcast	5-12-93 .	3-5-94 ...	2	4	2¼ ft.	41	$\frac{1}{16}$	40$\frac{1}{16}$	2¼	345	These two plots which had yielded kharif crops before, were first irrigated and then ploughed 3 and 7 times owing to stiff nature of the soil. The seed was sown broadcast and covered over with earth. The germination was even and uniform. The plants did not grow as high as in case of plot Serial No. 1—and the number of flowers was considerably less, the sowing of seed having been done a fortnight later. The land had received no manuring during the past 3 years. Plot No. 3, whose soil was lighter than that of plot 2, gave a comparatively higher outturn of seed and straw.
3	17	496	Light loam but containing somewhat high percentage of clay.	Do.	7	6	Do.	5-12-93 ...	2-5-94 ...	1	3	2¼ ft.	49	1	47¾	9¾	459	
4	A.D. plot 1	1622	Heavy loam.	Do.	6	6	Do.	7-12-93 ...	3-5-94 ...	1	5	2¼ ft.	106	2½	103¼	8¾	302	The treatment of this plot was similar in all respects to that of plot 2. The yield of grain was about the same in both, but that of straw from plot IV was much inferior.
5	23	946	Stiff clayey	Liquid manure.	2	6	Do.	27-12-93...	2nd & 3rd May 1894.	1	3	2¼ ft.	123	1	122	5	604	The soil of this plot was exceedingly rich from a manurial point of view. The growth of plants was therefore very luxuriant in the beginning and the crop "lodged" before flowering. The seed was sown very late, purposely in order to compare results. The yield of seed was very poor, but that of straw was fairly high.

53. Another experiment has been starts] during the year 1 to determine the relative economy nf towing meant by 3 different method* shown in tbc mbji>iued table :—

MlfctLLiXEOL'l StATitMiXt No, II—*Skewing effect of idfferrn! mttkodt of towing on Zwemt,*

Serial number.		llrtl.od of i	Oirtlnm prr u ».		
			IMioa Ant mt-Hat.	TwUIM cuttiuf.	Total.
1	C •	1. Sown broadoMt	lit	214	ITS
2	B •	I Sown to fomrm	Mt	we	m
	A *	S. oWnooridtM	U N	617	1.7OI
4	i M*nurisf jilol 13	4,	V M	U12	

• A. B. C. *tn* I i trUtnHlf ifiin, to ciruin j.lou f_r f^ilitj of nfmu.

All tbe plot* wcry town on find November. The »nil in tfca firat three phti either failed to germinate or germinated ao Mantily that they had to be town again on 18ih January 18M, I"ho lergert quantity of green fudder wu yielded by the. two ploU in whieh the crop wu town on rid-es, but the result has to 1, wttcUed in the nieceediDg yean in order to arrive at aome definite conclunon.

54. Among other fodder mpt growa were Sorghum S« charatttro, Reana Ituuriana, Mangel wvrvl, and Ouinea graaa. Tbe produce of each was utilixed fur foedin^r the Farm cattle and tbc brood marei bought lut year and btol en in the]itough.

55. EmiUp.—(1i'-'i>H fodder, if *f*«P*Aj* prwamd in $_r$it«, pMridee exeolleni food fi»r (rattle in winter when green forage w naturally M W . Dunng the year under report fodder wu atioed in two pitt. A detail of operatioQi and rwulu it giren bdow:—

Pit Jte. (1). *Squart • tajmtitf,* 21« «*»« *f*H.*~Tbc j^it w» ftrvt allowed to get perfectly dry in the tun. On 27tfa June 1993, nuke plaot* of wbii-A voU bad been removed, were fir»t hud at the bottom till a layer uf about 1 fout wu formed and a etmilar layer about 8 inchea thick wu nude ronud tia bar walli imide tbc pit. Eighty nunoda of green maize «ulkx Ml lh"« cut with a chaff-cutter, filled Ea by instalments in tbe »il» in oourae of S day*, and well truddan down by labourer*. \ layer of maise <t*lk*. 1 foot thick, wu thi-n vproad over tbe oompreaasd fodder, and the pit covered over with earth. The autface wu then IfaonfUjr rammed and «lope« made la in order to prevent prttaiKility *tl* damage by rain water. At the mrfaoe sank owing to ahri&kaf* of fodder more earth wu put up and rammed.

The pit wu opened 00 let January 169*. The topmoil layer of about 1 foot depth, wu found unmtitable for uae u cattle food owing to bad im. 11, bat the tUage Wow thi« layer wa* perfectly good, and wu eaten by cattle witb much reh»h. Tb» total weight of ediUo fodder obtained wu, bowwr, only *tl* maundi. Tbe loai of carbonaceous matter due to fomentation wu apparently ronttderable.

/•fc AY (I). *CifKitj.* 480 *ewtie/Mi.*—Thb wu filled aimilarly in Sepumiber with 104 maund* of ehopnod dry nui» atolki, but u rain fell while tbe ailo wu being filled, tbe nperiment proved uniucceMrul; the pit when opened in March 18»* having; been found to oontain hufUy fermented and totally deoompoevd fodder quite unfit for oosummpQon.

M. Tbe two tablra given brlow fbow the effect of continuom cropping on us-manured land :—

(«) with oat and the aatne emp;

(t) with two crept (wheat and maue) uk«a in rotauun.

MISCELLANEOUS STATEMENT No. III.—*Showing effect of continuous cropping with one and the same [illegible]*

Year.		Outturn per acre of unmanured wheat year after year.		Outturn per acre of unmanured plot cropped with maize year after year.		Outturn per acre of unmanured plot of A, B, series, cropped every year with cotton.
		Rabi Standard Series.	Green manuring series.	Kharif Standard Series.	Kharif miscellaneous or experimental manure series.	
		lb.	lb.	lb.	lb.	lb.
1881-82	—	777	—	1,239	—	—
1882-83	—	1,065	—	1,002	—	—
1883-84	—	1,031	1,215	930	—	—
1884-85	—	625	623	1,044	684	—
1885-86	—	313	1,307	329	581	—
1886-87	—	1,041	847	435	1,222	—
1887-88	—	908	786	Crop destroyed.	145	—
1888-89	—	893	653	Do.	Crop destroyed.	145
1889-90	—	1,307	1,404	279	368	62
1890-91	—	1,222	1,102	871	109	94
1891-92	—	902	820	2,030	736	129
1892-93	—	1,300	1,300	218	487	44
1893-94	—	1,146	877	1,645	209	134

N.B.—Wheat is sown in October and harvested in April, and the land is fallow till the next October.
Maize " June " September " " " " June.
Cotton " " " " " " " " "

MISC. STATEMENT No. IV.—*Showing effect of continuous cropping with two crops raised alternately.*

Year.			Outturn per acre of unmanured plot cropped with wheat and maize alternately				Remarks.
			Duplicate Series A.		Duplicate Series B.		
			Wheat.	Maize.	Wheat.	Maize.	
			lb.	lb.	lb.	lb.	
1881-82	—	—	771	—	—	—	In these two plots wheat follows maize after an interval of about 12 months, and maize follows wheat after an interval of about three months.
1882-83	—	—	—	924	989	—	
1883-84	—	—	2,031	—	—	802	
1884-85	—	—	—	564	1,025	—	
1885-86	—	—	1,119	—	—	[illegible]	
1886-87	—	—	—	295	1,258	—	
1887-88	—	—	—	—	—	Crop destroyed.	
1888-89	—	—	—	Crop destroyed.	617	—	
1889-90	—	—	[illegible]	—	—	802	
1890-91	—	—	—	911	1,307	—	
1891-92	—	—	[illegible]	—	—	620	
1892-93	—	—	—	927	1,734	—	
1893-94	—	—	1,107	—	—	260	

The variations in the successive yields of the various plots were due to the effects of the season, but the outturn in the recent years has been sufficiently high in most cases to show that no exhaustion [illegible] place on account of the continuous cropping.

The yield of maize in the [illegible] Series in which the crop [illegible] after [illegible] 3 months rest is generally inferior to the yield of maize from the unmanured plot of the Standard Series which gets a rest of about eight months between two crops. This result is fully consistent with reason.

CAWNPORE; } SAIYID MUHAMMAD HADI, M. R. A. C., M. R. A. S.,
The 12th June 1894. } *Assistant Director.*

J. A. D'M.—P. No. [illegible]—[illegible]—[illegible]. Press Dept.

REPORT

ON THE

Cawnpore Experimental Farm

FOR THE

Kharif and Rabi Seasons, 1894-95.

ALLAHABAD:

ntrtto* AT** -rat jtotni.irwTiM ***nonwam **i> *ovon aornmaun* PRESS.

1895.

No. 1515 of I 8 » ,

OEPT. OF LAND RECORDS A>JD ACRICULTURE, N.-WP. AIMDOUDH.

Doled Camnp'ire, He 2Sr/ *Stp'.tmh:r* 1895.

FROM

C. HOPE, Esq., C.S.,

OFFB. DIJIECTOK *Of* Li-tD RECORD AX© AOBICCLTPRS,

NoBTU-WsnuV PlloVIXr ES iXO I Oudh,

To

Tun CHIEF BEC&BTABY n I GOVERNMENT,

North-Western Provinces • Asr. I Oudh.

Su,

I HAVE tlic honor to forward UH Annual Report on the Cawnpore Farm (or 1894-95.

2. The report lias bwn draws up on the IfBH n suggested by the Agricultural Chemist to the (Jovcrnmontof India, and tfatsmagtanat *9* tharefbfi different from, that adopted in ptrioMjua It » the record ofa»auoii that w« I>y a„ *meuu* wti»facWy fn.ni an ttpanmaota] point of view. Ttw *txatminly m** weather damaged ,)l() *e* crops etptoklly the kliartf crop., and delayed the. prepann ion of the ground for t ,]8 gprin^ crop». The outturn was thmia many ca«a extraordinarily knr, an.1 it maid be unvn«r to attach too much importance to the ruiutti.-. At UH MM timo my prvdecewor wag not aatistied that the pair nsulti *mn* Mtfaoljrowisg to the bad weather, and he waa obliged to make WIM clange in the •nnnKeiiwnla for tiu i control of the operations at the farm.

3. The moat important rxperimenta wore : those conducted I with ^uraut*, which dcriw a apMial valuu from tlwanalytic road. the Igrieoitanl Cbtmift, IUI.I diiuuMed by htm in hi» note which form* an appewlix to tl the report. In tlww province* cxnn of the *p.n,n,U* vanoljf. are nut urdmarily n used for the production of sugar ; ,hUt ^ w-> »howi» by an npariaaat D»d« bj UM Principal of Uw AgrMalttnl School, to kttefit <>f ilia »Lu.l.!il», tfaaU excellent gur could be made from the *pu**4i* i canes groirn in U» neighbourhood of ;lie farm by ordinary cultivator. Tb«M var: req un? much mi in- e«t«fa] ami txpMI • Ih.- ordinary kind), (nit limy triveavrry mu< h hbjbtr oottam per acre; «nd ir the exporuomi m made this year pro.(% nwcwsful when r*i*at^I on a blfff Male,! *grvx* impetus should be given to thetr cultivation aa acauenula! de for sugar f manofa cture. Several varieties are now l«tD(f tiperimet)ti<d with at the Urin ; ami tho anah »i< u .. by the Agr rfoullural Chemist next year will tie *liuM* forward to with tnUnsl, a» Ih.r n-.ulu oftkeit i experiments may prove to be of very great practical importance.

4. Ttw ulkw inn* introduced from A- by Mr. Darrah thfJVK well ti> May, when the hot waatber killad thuni. It will he iweaaary to repeat the experiment to aittrttain whether they can, with proper precautions., mrrhn the hot MMOD; but the price oUkiaaUf for the *m* at preaent M> low tin I doubt whether thfrtpfrimrnt will prove a financial su••«•.

5. Tlte rialiion ki*pt at tl»e Unn h-w prowl nniuc^ewful, ..r at I>.»<t my m„- »• • t«fel*Krttrr, and I>aa bren rrplaccd by moUwr. *Then* i< already a fairly good demand for the »eni«a of a aUltion, but. a* the AnwiUnt Director • points out, the •area Mat are not alwaya of a p''»l Uttedinff *claa* or ap«, and it toaj be necessary »o aoae ca«« lo r»fu*» the KtvicM of the rt*lli<>ti in future.

1 liaw t!i honor to ht,

In,

Your most obedient utrut,

C. HOPE,

Officiating Director a/ *Land Records and Agriculture.*

REPORT

ON THE

CAWNPOHK EXPERIMENTAL FARM

roB THE

KHAR1F AMD RABI SEASONS, 1894-95

In compliance with G. O. No. $\frac{1150}{I-250}$ j-, dated Rth May 1895, encloting copy of Cironlar from Government of India, No. g ~ > dated 2find April 1895, together with a note from the Agricultural Cherout to Government of India on the recording and publication of rcsu'.U of tEptriMBtl carried out on farm* in India, the form of thin report hat boon altered thi* year and the information embodied herein clasiified under the following head* :—

I. History of the farm.

It. Genera] character of the *ea»on.

III. Trial of manure*.

IV. Method* of cultivation.

V. Trial of implement!.

VI. VarietiM of crop, including fodder*.

VII. Diitribution of implement*.

VIII. Ditto of seeds.

IV Sericulture.

\ Ilone-hreeding.

XI. Cattle ud cattle-breeding.

I. HISTORY OF THE FARM.

I. The OoteramMit Farm, Cawnpow, i» tituaUd in riltage Gotaia al. out three milr. t^nth-w-t of Cawnpow dtj. It i* n«r the lUwstpur lUtiou of the Borabajr, Baroda and Central lulia Railway, and iU di.Ut.ee from the Cawopore Eait Indtin Railway itatwa i« abool four mil«,

Th« bnd ocewpwd *•• originally rental ftmi, tlir Mtafadafi ->f Ootaia in M*i-1851, and in tUal)«*r »'••• imp«'"*»'>t manurial M[*rimenl» *till ctrriwi on in the "standard" and " duplicate " tenw, mUe\i «ill he described proaenlly, w«c »Urt«l by Mr J. H Fuller Within a ihort iM—M »f the farm prwniaef, a mull workihop for making and »|»iriD5 agricultural ijnplemeoU and a «eed-«U)re w,-re erected.

During th* firrt yt*n of management tl« an» of ihr farm underwent fr*ju«nt changes. Iml of late year* it ha* not varied. The farm j.M|*r, «f wbich a map • attached, extends to 61*t atrw, eiclnJini: *»< t»nd covered by tlw canal di»lnl>uUry

It rtj<7» apeeial facilitief for irrigation, being traTerml by a diatribatary fwmtb* Ganges Canat.

Th« aoil pf the farm maj be accepted a> a fair vample of tU h'ghl reddiah loam which «««re *»»r a Urge portion tit the «angt».Jttmn» Do4l> It w*a cheumically

•naiyW HUM limr before 1882 by Mr. S. A. Hill. B.Sc., Meteorological Reporter to A t l» x< run.. »' • •' the North-Western. Province*, and the analysis is given below :—

Constituents.	Composition per cent.
Combined water	2·04
Organic matter	trl
Carbon dioxide	0-1*
Ammonia	\ Ml
	(Til
Cfclwuw	
Sulphur trioxide	Do.
Phosphorus pentoxide	0·51
Silica and insoluble oxide	0·13
Alumina	4·20
	S!
U M	
Magnesia	0·34
M a *	(Ftl
Soda	
o*r J-T..PP-J bj u, s o» Uamiu out* <4 i«"	•akll
	FWM

Several fields had been f..un-l l,r ntpmmr* to wfor (root waUrlogfpitf wbrft much rain Ml within * limttetl pshod. Ttt* U\A «f tuch flatib WM raited l«>" m powil>:« to do so) in 189-i *j B M M of *pn«duifc «rtli -lojf oat from uncultivated .trip* of land «lj<>inifli!, in urdsr to impwf* tba dnuu«* Lwy* qoaatitiM of earth •taken from tli* w u l dutri^uUry wrn >pr«ad for •imilar porpoM on a plot (field No. 9 nn tb* map) wtucb natd to U oadnvmUr In th« gnatrr part of UM niny season every year.

II. GENERAL CHARACTER OF THE SEASON.

3. TV rmt uder wport WM mv vpi»TtMnU* tm agricultural operations. The total niafall WM v#ry Imw, Utnk' nwrr tUn donUe of tlw nnrnut. IV rains mmowuMd at tb» propdr tiiM in Jq»» but mottmied, with few lm«kt, to ao exceptionally late prnod. The following taUomt >lio«s the amount and distribution of rainfall dttrinn tin- jmt nnd«r rtpor- and the iiMadiay ytwt t—

Months.	Rainfall. Normal.	Rainfall. In 1893-94.	Rainfall. In 1894-95. Rainfall in Cawnpore as published by the Meteorological office.	Rainfall. In 1894-95. Rainfall at the Government experimental station as registered at the station.	Rainy days. Normal.	Rainy days. In 1893-94.	Rainy days. In 1894-95.
April	0·11	...	...	...	1	—	1
May	0·32	0·62	0·53	0·35	1	3	10
June	3·11	4·50	4·30	7·86	4	10	12
July	10·23	21·45	10·67	9·80	12	16	15
August	10·08	12·14	10·71	10·02	11	9	23
September	4·83	9·50	9·32	10·12	7	8	9
October	1·22	7·17	13·20	10·17	2	9	6
November	...	0·24	3·03	3·04	—	1	2
December	0·24	...	0·60	·98	1	—	2
January	0·64	0·02	2·02	2·01	1	2	5
February	0·28	0·56	0·32	·32	1	2	1
March	0·28	0·02	0·40	·30	1	—	1
Total ...	31·13	59·02	54·45	52·88	43	55	73

The continuance of rains considerably interfered with the weeding of crops in the kharif season and the ploughing up of fields intended for rabi crops.

... greatly damaged by the excess of rain, while bajra and t-ii ww» MspUtoty tUrtrojf,].

TU plot, uftdn ranAMi of sugarcane . M U I H J «ra«t tnjwy ftMM floods, and a severe •Una > IW wl «| July last Utf « o « * e4rUia ollut plot*. The rain: ordinarily heavy fall in October proved extremely injurious to cottons of all kinds, and delayed the preparation of tilth land for the succeeding rabi. Further delay was caused by heavy showers in the beginning of November, and it was found impossible to commence the rabi sowing until the 23rd of November. The continuance of wet or cloudy weather in the months of January and February resulted in the appearance of rust, which caused great injury to a number of plots under wheat.

The subjoined table compares the average and maximum yield of wheat and maize during the year under report with that in the three preceding years :—

Year.	Average yield per acre at the farm.		Maximum yield per acre at the farm.		Remarks.
	Wheat.	Maize.	Wheat.	Maize.	
	lbs.	lbs.	lbs.	lbs.	
1904-05	901	806	1,727	1,258	
1903-04	1,232	1,041	2,784	3,551	
1902-03	1,792	1,123	2,777	3,073	
1901-02	1,158	1,799	[illegible]	1,915	

The average yield of wheat from unirrigated area during the year under report was 1,184 lbs. per acre, while that from the irrigated area was only 798 lbs.

CLASSIFICATION OF EXPERIMENTS.

4. The experiments conducted at the farm are classed as "permanent" and "temporary."

The former are conducted on the same plots year after year for an indefinite period, and are directed to show the effect of different manures on maize and wheat and of deep and shallow ploughing on the latter. The "temporary" experiments are arranged from time to time for limited periods, and are at present tried in the kharif, chiefly with cotton, sugarcane and indigo, and in the rabi, with potatoes, peas, gram and certain varieties of crops.

III.—TRIAL OF MANURES.

(a).—Permanent manure experiments with maize.

5. This experiment is tried on two series of plots called the "standard" and "duplicate" series. In the standard series, which consists of 13 plots (plots K1 to K13 on the farm map attached) maize is taken every year after a fallow of nine months. The duplicate series consists of two sets of 13 plots each, namely, plots Ala 1 to Ala 13, and Alb 1 to Alb 13. Each set is cropped alternately with maize and wheat, maize following wheat after a fallow of about three months and wheat following maize after a fallow of nearly 13 months. Thus, when one of these two sets bears maize, the other remains fallow.

The object of the experiment is to determine the effect of certain manures on the yield of maize of the Jaunpur variety when grown year after year on the same plots and when taken alternately with wheat. The manure applied to each plot in one series is always applied to the corresponding plot in the other. The experiment was originally started in 1881, but the trial of certain non-nitrogenous manures applied singly was subsequently dispensed with, and other manures were added to the experiment until the latter assumed its present form in 1884.

The method of cultivation followed is alike in case of both the series.

The plots of the duplicate and the standard series were flushed with canal water on the [illegible] and [illegible] of June previous to ploughing, and sown on the 20th and 21st of June, respectively, with seed at the rate of 12lbs per acre. Rain fell continually from the 22nd to 29th. The total rainfall during these days amounted to nearly 7·8 inches, of which [illegible] inches fell during the three days which immediately followed completion of sowing. [illegible] from 2nd to 9th July, and the total rainfall during this period amounted to [illegible]. The [illegible] was [illegible].

[*)

the fields greatly interfered with gonnmftli- a All pa«ib)« tnwwnrti w«r* lakm to Jw it of , but with imperfe • (IMCMM. Tlirrr wai • *Utmk* bttwMn 16th and **th J uly nece *«U(u>g irrigation of the enp, an 1 HK plot* wff* wal»-ml on the 27th ami 28th of July. Tin* wa*$_t$ bowf-vrr. tacwnlMl ttnioniiAtrir \>*y* hrm*y tb''»er« of ratn «biib continued thro •nr'i.'-Mt UM MMog, Uwra Uinf ao 1«M tlun 8S nunv Jar* in August »'oot with a total rainfall of'' 19 inclxx.

l'lou X<». 4,5, 9, 9, 11 ID.) 13 of th»fa»iUnlMnMMd 3,4,9,6, 13 iwl H of the du j.iiv»i* Mriat wart graatly duBagcd by Uw M O M o(nun ; all theolhir pl<** alto •t.fl.TMt nv<r<-T)«-»« mlh (1* «an* can**, kid the tmttiirn in both the Bprtm *« *verj* pA»r on the wholr, a* nouUl «fijw (ran UM foUowmif •.'.aU-m«ttt*in wbich *On-'* ratalU are UbttlaUd.

Th» *M** baviDif t.iff^rel to amaiimly fn.m tUe nin, it i* na«t« U tin'' any conclusions about the effects •f tuiouiT Moat of the plots of the duplicate series, which are on a somewhat higher lent UH! tbrrrfotr In* liaU« tn «ftUrWgginff tbat> the standard ploU, liate, ronlivy to tbr rwuld obUmWl in good ynum, girM b- ter yield tbaa the *Und*nt plots, abowittg tlut in ut lUonnmJly mt ywt auit< is particularly liabl I to injury in bwlyiog field* j- which w >tn n.ar ttigutr.

Statement showing the outturn of the Khandesh standard series.

Plot number.	Plot area.	Treatment with reference to manure per acre.		1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.
				Outturn per acre in lbs.													
K1	Each plot—400 square yards.	C. [illegible] maunds	grain	650	484	1,720	1,032	[illegible]	[illegible]	Crop destroyed by rain.	48	1,210	488	[illegible]	600	1,082	1,101
			straw	—	488	3,879	6,298	[illegible]	[illegible]		354	9,470	627	[illegible]	8,146	[illegible]	6,806
K2		C. [illegible] maunds	grain	1,218	758	1,644	1,014	[illegible]	[illegible]		—	1,150	246	[illegible]	605	[illegible]	1,077
			straw	—	283	3,733	7,869	[illegible]	[illegible]		337	7,187	67	[illegible]	2,064	[illegible]	9,210
K3		C. [illegible]	grain	633	169	1,462	[illegible]	[illegible]	[illegible]		—	1,300	66	[illegible]	431	[illegible]	702
			straw	—	823	3,518	[illegible]	[illegible]	[illegible]		131	7,247	[illegible]	[illegible]	780	[illegible]	6,498
K4		[illegible] dung	grain	723	52	1,073	[illegible]	[illegible]	[illegible]		24	805	[illegible]	[illegible]	160	[illegible]	278
			straw	—	60	3,165	[illegible]	[illegible]	[illegible]		169	7,817	[illegible]	[illegible]	1,266	[illegible]	3,780
K5		[illegible]	grain	—	2,100	1,068	[illegible]	[illegible]	[illegible]		34	1,041	[illegible]	[illegible]	387	[illegible]	423
			straw	—	3,176	3,715	[illegible]	[illegible]	[illegible]		494	8,870	[illegible]	[illegible]	1,210	9,822	4,876
K6		[illegible] maunds + bone-superphosphate	grain	—	—	[illegible]	[illegible]	[illegible]	[illegible]		Crop destroyed by rain.	1,260	[illegible]	[illegible]	455	2,408	738
			straw	—	—	[illegible]	[illegible]	[illegible]	[illegible]			1,408	[illegible]	3,824	2,000	10,348	4,919
K7		[illegible] maunds + bone-dust 44 maunds	grain	—	—	[illegible]	1,318	[illegible]	[illegible]			1,827	[illegible]	[illegible]	1,065	3,291	1,149
			straw	—	—	[illegible]	6,625	8,790	[illegible]			8,180	[illegible]	[illegible]	1,734	12,927	7,829
K8		cow-dung + saltpetre	grain	—	—	[illegible]	1,314	776	[illegible]			1,162	[illegible]	[illegible]	200	3,122	400
			straw	—	—	[illegible]	3,193	6,508	[illegible]			9,525	[illegible]	[illegible]	1,040	10,866	4,308
K9		[illegible]	grain	[illegible]	—	—	1,022	461	726			1,012	[illegible]	[illegible]	327	[illegible]	472
			straw	—	—	—	7,938	3,173	[illegible]			8,204	[illegible]	[illegible]	4,452	[illegible]	6,244
K10		[illegible] dung	grain	—	—	—	1,316	290	701			1,198	[illegible]	1,212	200	3,055	611
			straw	—	—	—	6,092	1,073	373			9,862	[illegible]	8,689	2,064	10,466	7,071
K11		[illegible] + [illegible] nut [illegible] maunds	grain	—	—	[illegible]	1,644	486	[illegible]			1,271	[illegible]	665	230	[illegible]	320
			straw	—	—	[illegible]	6,632	3,698	[illegible]			10,376	[illegible]	1,094	1,030	[illegible]	4,033
K12		dung 180 maunds + [illegible] 8 maunds	grain	—	—	[illegible]	1,269	330	847			1,206	[illegible]	1,108	738	[illegible]	774
			straw	—	—	[illegible]	5,778	2,060	6,376			6,304	[illegible]	8,249	2,321	11,447	8,040
K13		No manure	grain	1,289	1,002	[illegible]	1,044	[illegible]	433			279	[illegible]	344	219	1,640	194
			straw	—	7,135	[illegible]	5,773	[illegible]	5,747			4,247	5,224	2,009	750	7,315	3,327

N.B.—1 maund=82 lbs.

Statement showing the outturn of the kharif duplicate series.

Plot number.	Plot area.	Treatment with reference to manure per acre.	1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.
			Outturn per acre in lbs.													
Ala 7	Each plot—400 square yards.	Cow-dung [illegible] maunds { grain / straw	[illegible]	[illegible]	1,377 / 3,108	1,308 / 7,008	[illegible]	[illegible]	Crop destroyed by rain.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala 8		Cow-dung [illegible] maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala 6		Cow-dung [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala 9		Ashes of [illegible] maunds of [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala 4		Saltpetre [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala 11		Saltpetre mixed [illegible] superphosphate	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala 10		Sheep-dung [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala 3		Ashes of sesamal [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala 2		Poudrette [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala 1		Sheep-dung [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala 5		Saltpetre do [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala [illegible]		Sheep-dung [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala [illegible]		Unmanured { grain / straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

N. B.—One maund=82lbs.

(I)—Permanent manure ffptrimrnf mti tektet.

fl. Like the permanent manure experiment with maiw, this experiment i* tri^l M two teritM of 1$ ploU each. In tbo one called tu> " «Undard " aerie*, wheat i» mown jear after year, and in the other callnl" duplicate " §eri*», it is takmi in rotation with maize in the manner elated in detail under the maize experiment in paragraph &.

The objw-t of ili-' eiperiment b lo determine :—

(a) the effect of ordinary ami artificial manures on wheat ;

(6) tbe utility of rotation ;

(r) tbe length of tbe period for which wheat can I* tuccctsfully grown year after year on tbe fame land.

TV .•x|>rrunent auumed iU prwent form in 188-t aiul has ti&dergonn no modifi^atk>M siwe then. Tbe aeed wed ii of tin- Sf*at*affimagar variety and io sown at the rate of 120IU per aero. Manure i§ appliwl before sowing bi all the ploU euvpt thoae tn«W with («) wltpatre, {«) laiipetn anil bmi*-duit,and (•) taltpelre and bone fuperphoephaU, in WIIOM caae the «ali]*'trc U uxsl ac a topdreawing when the plant* are fairly »p. Only one watering wa* required (hu year in plaoe of the three usually given.

On account of woeaaive rain» in October and the tint week of November the ra&iaeaton ploughing cauId rr*>t uonunance xwoer tliati th> IStb, and towing »uU not be done until the 23rd of November, *i.e.,* more than a month after it fthould. have beei i in an ordinary drjwaion. T'— tropwaa bunettod en th<' 11th-f April. Tbe out* turns froi a 1S4US2 to 189W5 i* »hown in the two iUtemcnbi following :—

Manure experiment with wheat standard series.

Plot number.	Plot area.	Treatment adjacent to manure.		1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.
				Outturn per acre in lbs.													
[illegible]	Each [illegible] square yards.	Cow-dung + bone-dust 4½ maunds	grain / straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Cow-dung + gypsum 3 maunds	grain / straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Cow-dung	grain / straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Ashes of cow-dung	grain / straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Saltpetre	grain / straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Saltpetre [illegible] maunds + superphosphate [illegible]	grain / straw	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Sheep dung + bone-dust	grain / straw	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Ashes of 1 maunds [illegible] cow-dung + [illegible]	grain / straw	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Poudrette	grain / straw	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	grain / straw	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Saltpetre + bone-dust	grain / straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Sheep + gypsum	grain / straw	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Unmanured	grain / straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

N. B.—One maund = 82 lbs.

Manure : [illegible]

Outturn per acre in lb.

Plot number.	Plot size.	Treatment with reference to manure.	[illegible]
A1b1		Cow [illegible]	[illegible]
		Cow [illegible]	[illegible]
		[illegible]	[illegible]
		[illegible] cow-dung	[illegible]
		[illegible]	[illegible]
		[illegible] + bone superphosphate	[illegible]
A1b8		[illegible]	[illegible]
		Ashes of [illegible]	[illegible]
		Poudrette	[illegible]
		Sheep-[illegible]	[illegible]
		Saltpetre [illegible]	[illegible]
A1b10		Sheep-[illegible] + gypsum	[illegible]
A1b11		Unman[ured]	{ grain / straw [illegible]

N.B.—One maund = 82 lb.

The yields were generally poor as compared with the majority of the past years, the crop having been under the [illegible] of a shorter period of growth on account of the sufficiently late sowing. The plots, however, completely escaped the attack of rust, which caused considerable damage to other experimental crops of wheat.

Speaking generally with reference to the results of manures, the effects of sheep-dung applied alone or with other artificial manures are, as in previous years, particularly marked, and the results may be taken, on the whole, to be in favour of the value of this particular class of dung. Sheep-dung [illegible] and sheep-dung with gypsum, produced the heaviest yields in the duplicate and standard series, respectively. Sheep-dung [illegible] very fair results in both the series. The plot to which nitrate of soda alone [illegible] applied as a top-dressing [illegible] second in the standard series, and third in the duplicate series. [illegible] the latter outturn all other plots in the duplicate series except the [illegible] with [illegible] though the nitrate did not [illegible] in the standard. Superphosphate with nitrate of potash acted more beneficially this year than with nitrate of soda. The yield from poudrette, which is [illegible] in nitrogen, was greater in each series as compared with the outturn from cow-dung. Cow-dung with bone-dust produced more grain in both the series than cow-dung alone. These results confirm the fact reported in previous years that sheep-dung is the most useful fertilising agent for wheat.

The highest quality of straw [illegible] obtained in the standard and duplicate series, respectively, [illegible] both of which are nitrogenous. The proportion of straw to grain [illegible] in the case of the standard and sheep-dung plots of the standard series, [illegible] and in the duplicate series [illegible] higher in the case of the cow-dung and unmanured plots. The poudrette plot in the duplicate series also gave a high proportion of straw to grain.

(c.)—Manurial experiment with indigo.

7. The object of this experiment is to determine the manurial effect of gypsum and bone-dust as compared with cow-dung on the yield of indigo, an unmanured plot being also included in the experiment. It was started in the year 1893-94 in field No. [illegible].

The plots were sown early in May after a preliminary watering. The crop received three waterings subsequently and was cut on the 9th September.

The following statement gives the details, &c., of each plot.

Statement showing the comparative effect of gypsum and other manures on indigo.

Plot number.	Plot area.	Manure applied per acre.	Outturn of green indigo stalks in pounds. 1893-94.	1894-95.	Remarks.
273/1	Each plot = 1210 square yards.	Cow-dung [illegible] maunds	12,170	2,214	
273/2		Gypsum 3 maunds	10,4[illegible]	1,954	
273/3		Bone-dust 5 maunds	10,0[illegible]	2,0[illegible]	
273/4		Unmanured	7,000	2,204	

N. B.—One maund = 82lbs.

The yield was considerably below the average, due to a very bad attack of the insect *godahi* ([illegible]) in the early stages of the growth.

(c.)—*Sugarcane experiment.*

8. Two experiments were tried with sugarcane in 1894-95 under instructions from the Agricultural Chemist to the Government of India. One of these, which was to determine the effects of certain manures on sugarcane crop, was conducted in a series of nine plots, each plot being ⅛ of an acre in area. The plots were ploughed twice with [illegible] plough and each ploughing was followed by levelling the ground once with the *patela*. They were then ploughed eight times with the country plough, and cow-dung was applied to plots 1 and 3. Three more ploughings were made with the [illegible] plough subsequently and the land was levelled with the *patela*. Cuttings of cane of the [illegible] variety were then planted on 8th March 189[illegible] in the country fashion, in furrows opened by a native plough, and the experimental manures were put in the furrows immediately before planting. The cuttings had been previously kept in a pit for ten days and covered over with earth which was moistened with water every alternate day. The fields were again pressed with the *patela*, and this was followed by the making of [illegible] water channels and dividing the plots into small irrigation beds. The plots were watered three times and weeded [illegible] times.

There was a long break from [illegible] to 29th of July [illegible], and the crop had therefore to be artificially irrigated from [illegible] to 29th July; but there was unfortunately a heavy fall of rain immediately after the irrigation, and that fall was followed by continuous and heavy rain up to the middle of September, when there was a break of only about ten days, and then there were heavy rains [illegible].

A considerable number of plants were laid in consequence of the storm accompanying the rain of 29th July in plots 7, 8 and 9; plots 1, 2 and 3 also suffered from the same, though to a less extent. Attempts were made to raise the laid plants, which failed totally, being followed by the breaking up of such plants. The storm accompanying the heavy rain of 4th October proved still more injurious. Under such unfavourable circumstances the action of manures would not naturally be as good as it would have been, and it is therefore unsafe to draw conclusions about the comparative effects of manures from the results obtained.

9. The Agricultural Chemist to the Government of India personally [illegible] the crop of some of the plots and analysed samples of juice and [illegible]. The [illegible] were weighed separately from the laid [illegible]. Likewise their *gur* was made separately. For making *gur* the services of an expert were [illegible] who used a mixture for clarifying the juice. It is prepared and used in the following manner:—

Bugl[illegible] and *bhindi* [illegible] (crude carbonate of soda) [illegible] are steeped in 12 lbs. of water for 24 hours [illegible] rubbed between the [illegible] and the liquid strained through a fine piece of muslin. One tola or about three drams of powdered alum is added to the liquid. The latter is then boiled till it is reduced to half its original bulk, [illegible] piece of cloth and [illegible] mixture is added to each [illegible] has been removed in the [illegible] taken off. The mixture keeps only for a week.

10. Generally speaking, the *gur* from laid cane [illegible] and sugar crystals to that from the standing cane, and sold at less price.

11. *Results*.—The results obtained from the nine plots are summed up in the following table :—

Plot number.	Plot area.	Treatment with reference to manure.	Weight of yield per acre in pounds. Cane.	Juice extracted from cane.	Gur made of juice.	Percentage of Juice expressed.	Gur. In juice.	In cane.	Weight of green tops.	Weight of dried leaves.	Total weight of tops and leaves.
									lbs.	lbs.	lbs.
23/1	Each plot = 1,210 square yards.	Unmanured	30,224	15,300	3,102	47·23	16·48	8·12	4,033	911	4,944
23/2		Cow-dung 7 tons ...	36,414	19,150	3,134	52·61	16·30	8·27	4,401	608	5,009
23/3		" 14 " ...	34,712	17,780	2,836	51·22	15·95	8·17	4,128	604	4,732
23/4		Bone superphosphate 5 cwts.	37,440	19,028	3,195	50·52	16·80	8·54	4,300	724	[illegible]
23/5		Saltpetre 2 cwts. ...	35,272	18,050	3,100	51·00	16·88	8·71	4,501	764	[illegible]
23/6		Bone superphosphate 5 cwts. + saltpetre 2 cwts.	30,022	15,062	2,656	49·28	17·63	8·60	3,837	606	[illegible]
30A/1		Bone-dust 5 cwts. ...	47,370	24,928	3,484	52·40	13·98	7·32	4,574	1,373	5,947
30A/2		" + 2 cwts. saltpetre.	41,808	21,630	3,070	51·98	14·18	7·35	[illegible]	507	[illegible]
30A/3		Unmanured	43,120	21,640	2,976	50·20	13·75	6·90	[illegible]	[illegible]	[illegible]

The highest yield of gur was given by plot No. 30A/1, and the lowest by plot No. [illegible] [illegible] of juice, [illegible] [illegible] outturn of [illegible] plot 23/6 [illegible] poor, [illegible] [illegible] gur in [illegible]

12. A fact of some interest [illegible] [illegible] [illegible] the [illegible] [illegible]

This is sufficiently [illegible] from the results obtained with particular care in case of plots 30A/2 and 30A/3, which [illegible] proportion of la[illegible]. The results are given in the following table :—

Plot.	Kind of cane.	[redacted]	[redacted]	Weight of gur.	Percentage of juice expressed.	Percentage of gur. In cane.	In juice.	Remarks.
		lbs.	lbs.	lbs.				
30A/2	Standing cane ...	4,315	2,408	407	50·21	9·28	16·41	With a view to obtaining these results the quantity [illegible] in [illegible] it was crushed accurately in case of [redacted] kind of cane for a was separately boiled down to gur.
	Laid cane	[illegible]	2,584	362	[illegible]	[illegible]	[illegible]	
30A/3	Standing cane ...	3,341	1,650·5	261	47·00	7·81	[illegible]	
	Laid cane	[illegible]	3,611·5	458	[illegible]	[illegible]	[illegible]	

[illegible] laid cane was also decidedly inferior in quality to the *gur* made [illegible] these two points are proved [illegible] years, they [illegible] [illegible]clusion that highly stimulating manures, which may cause too luxuriant a growth, are not suitable for sugarcane.

{e}.—Xjptrimtnt with tvielitt of tuyareant.

15. Tlit8 experiment WM triwl to determine which of four rariclitw of cane pave the Itfit outturn of *gur*. It ahould [irogierly come utnl.-r the beading " varieties of crop*/' but it is mi *re* oonranittt to deal with i.he m^ar-une experiments together. Tba plot! sadar kbj *tout* varietiea of cane were manured with farmyard manure at the rate of 300 nuuudtpr Jiore. ID other respect* their methyl of cultivation wan th« saroo as that of the nine ploU nmler the mannrinl ftj><>rimi'»t ' Ail the plot* wore very injurioutly •ffcci'-l *by* t be flw«J* of AugtiNt and again of October, but the Baraukha and Sarauti ploU, which were more tubject to waterlogging, rafltnd jiartiuularly. The yield whioli was consequently muuti below tliu average ia sbuwn iu tin euhjoined table :—

St.tUmeut tivicinj tkl outturn of four varies iti of sugarcane.

Plot no.	Plot area.	Treatment with reference to manure.	Name of variety.	Outturn. Weight of cane per acre.	Weight of juice per acre.	Weight of gur per acre.	Weight of refuse per acre.	Percentage of Juice expressed.	Gur in cane.	Gur in juice.	Refuse in cane.
				lbs.	lbs.	lbs.	lbs.				
33/1		300 mds. per acre.	*Matna (Cawnpore)** ...	...	...	...	...	...	...	...	...
n/I	i		*Dhaul (Delhi)*† ...	10,117	4,929	837	4,448	49·71	8·27	16·99	43·56
33/3	¼ of an acre		*Dikchan* or *Katara* (Gonda, Jahangirabad) †	10,280	5,442	M	4,112	51·40	8·53	16·71	39·94
•a/4		i	*Baraukha* or *Rensi* (Lucknow, Unao and Bahraich).†	kfl	2,050	832	3,016	44·29	6·82	15·41	49·71
33/1		S	*Sarauti* (Fyzabad)† ...	4,277	1,922	288	1,922	45·01	6·73	14·96	45·61

rj.-0MMu4.Hai,

* Not crushed—left for seed.

t Caat *trim* | of cath plot <ru cat UMI *matfd* *nt tit* Join 1-ilnJ IDIO jmr. tU remaining ¾ was left far)>'u»liBf purfi-i Tl» «*Uura ₜ«r *ttr* W U«P t*k«l*M fro m the quantity actually crushed.

(f).—Experiment witk pounda M *ae.*

14. Now Cawnpon and in U e province I (reoerally it i» a popular belief that *ft ti.ii,* wbieh ar* well known *m* ieties of e ragaruane, a« twt oash for mi I ;«r, atvl th« tludento «f Uw A^ni uiiural Mwol had no doubt in their mindt Uw corrw-'trii^or tbe bolarf.

\\ .MI a virw to detnoMlraU to tb«n tbat *pmumfot* can I* uaed for *gur*-making, and to Wat iheir abaolut* wid «*!«]>•»« tive value when m»d M anch, a tmall p| ot of /«•«*/# crop uf the Madraai vrnficty vu bought from a cultivator at Jubi near Oawnportr by tlw Prin«i«l of tt* Agricultural SdwoJ, in ordn to try the rxprriment. TW ana from which U»r *j>a»*da* cue WM cut WM 181 a<juat« yanla. H *mm* crj»hed ia 111* u»ual maaber and thr juiw Uulcd dawn to *$mt.* Tbe following iigurw *thow* Uw tt»ult of lita vxprrimvBt :—

...	83,760
	lbs.
Weight of canes per acre ...	93,720
" tops and leaves ...	13,280
" Juice per acre ...	62,080
" refuse per acre ...	17,720
" *gur* per acre obtained from boiling the juice ...	10,080

4

gar was of very good quality. tad Ita wld pa am WM about 3 OS tinw the h%btat ottttara obtained froia Uat *wutimm* warty.

16. A *oU by Dr. J. W. I*»tba-, Agtiddtaml CIMOM to the Government of India, on UM abiaataal oompnaitioa of aofaraa* aod •ugaraaa* JUIM and of tbe r»» augat obUiBMl in UM varioa* aagaiaaaa «sparimmta ia ap p*ad*d to Urn report («•*« Appaadis A).

*(g).—Pfrmt*t*t ttp*nm*t with frtn* anm'a;.

S**i»- A.

IS. Hat nprriaaest m atariad ia UM-8t. It bw lar it* obj* I ii determination of UM maasjial aAect oa wkaat of—

(a) UM ploughiag itt ot a gnaa crop ia UM ratof pf*c*lia(UM ruitmtwa of wheat;

(*; the root Mddw of a bpuaiMBa crop Ukrn inuaadUuly W o n wheat

The *mtnt* tnatnMatofpbto), «,«, lOaad 11 WM adoptad oaty la*t year in accordance «ilb UM vine* of tb* Ajrieultafal Cbcmut to Uw Go*ernai«nt of India, aadtaalr prtmu, baUaMat ia aaowa iaj UM aubjoiiMd •utravnt uadrr preceding years.

Of fttl tb* cxptriatBUl plot* ond«r wb«t, U» plot* of LhU MOM nffmd mart from UM rSfcU of iiawoMbU WMUMT, owing pmrtly to tbeir low Mtuaban *"A* partly to Uw awn ntmlira Mtar* of Utnr •oil. Uw fivjurtit iwry abowtn «* July ud Aagaatitrtafftn4 witi tat plottgbiaf unuJiy doat ia UM rainy afAtoo, and tba */'»*• *[Mr*m* Miira) mm oa plot S bilod to famiaata. Tb» ovtrflo* ofaUakiBUwaaafhboaraood and UM nub of iraUr from aa arijmninf oaaaJ <distri-UUry ioodad tbt plota « Uw Mb Oetobar, waaa tarn «a. a bll of MT fa 24 hours and tbo water which atafoaud oa *ii*m* van«d from IV* to 1} f««t in d«i>tb.

Tba aUadiac crop* of bnap tad a*, on | loU ? and 10 nr. Mcompletely destroyed, and «r4*r on plot 11 partially <kaa(*d. Raiw ooattaaad ttnttl UM 4ta of November aad tba field* oold not pi lafflaliiUy dry to admit of ploa«Hk»ff opmlkaa tinul tb« 19th of NoTftabtr, *i. t,* abaai a mooth later Uiaa UMJ tbonkj hart bam atva.

Tb* grand wa* Um pnpand for •owtaf ai <jakkly aa poanbb. bat U»ar« w*» •» time I for bamwhv or cbaaina; UM field* TVy «m oown w>0> wad at Uw *nU* of 120IU. per ac» oa tf'Jnl Xovaaabar lhffi.

RBJ4 BMJJO ita appaataaoa ia all ploto aboat UM aad «f Jaamary, and p trtiouUHf damage ploU «, 3, t,7, 6 and » Tbt crop wa* barraatad oa 8th April aw) tb* yiald waa uucb poonr tbao m any of ib« (molding yaara. Tat folWwia; uU« abow* the result.

RABI STATEMENT.—*Showing the result of experiments to determine the effect of "green manuring" on wheat.*

Plot number.	Plot area.	Manure applied per acre.		1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	Remarks.
				Outturn per acre in lbs.														
G1	Each plot—400 square yards.	Old indigo refuse, 120 maunds ploughed in	Grain ...	...	...	2,580	1,430	1,313	1,307	1,370	1,206	1,013	1,742	1,301	1,042	1,348	817	
			Straw ...	...	...	4,043	1,809	2,420	2,287	3,398	2,077	4,058	3,478	2,848	4,519	4,187	1,173	
G2		Fresh indigo refuse, 120 maunds ploughed in	Grain ...	...	...	2,336	1,281	1,379	1,452	1,498	1,429	1,742	1,742	1,706	1,500	1,349	289	
			Straw ...	...	...	4,846	2,003	2,008	2,517	2,964	2,408	3,713	4,109	3,042	3,110	3,538	774	
G3		Rape to be ploughed in	Grain ...	...	...	...	...	...	...	...	...	...	...	...	...	...	280	
			Straw ...	...	...	...	...	...	...	...	...	...	...	...	...	...	730	
		Indigo water, 3,000 c.ft.	Grain ...	...	...	2,000	934	1,113	738	865	730	1,222	1,016	665	1,137	...	...	
G4		Wheat and gram alternately. Wheat this year	Grain ...	...	...	...	...	...	...	...	...	...	...	...	...	...	306	
			Straw ...	...	...	...	...	...	...	...	...	...	...	...	...	...	730	
		Hemp water, 3,000 c.ft.	Grain ...	...	...	2,170	995	1,283	774	678	738	1,102	1,186	690	1,525	...	...	
G5		Unmanured	Grain ...	...	...	1,514	622	1,367	847	786	653	1,404	1,162	690	1,500	877	287	
			Straw ...	...	...	2,031	1,123	2,383	1,900	1,379	1,267	2,735	2,422	1,512	1,583	1,730	787	
G6		Hemp and wheat alternately	Grain ...	...	...	...	...	1,116	641	1,041	893	1,260	889	641	...	1,031	408	Until now, wheat has been taken in plot G6 after removal of a green crop of hemp, i. e., before it produced seed.
			Straw ...	...	...	...	...	2,310	1,292	2,039	1,615	2,110	1,210	1,561	...	2,189	1,041	
G7		Green hemp ploughed in	Grain ...	...	...	...	1,209	1,139	871	907	1,029	1,973	1,128	1,004	1,379	933	420	
			Straw ...	...	...	...	2,552	2,209	1,812	2,408	1,553	4,005	2,326	1,615	2,300	1,794	1,089	
G8		Green indigo ploughed in	Grain ...	...	...	2,358	1,244	1,494	1,270	920	714	1,670	1,084	1,370	1,373	730	281	
			Straw ...	...	...	4,715	2,472	2,052	2,064	1,024	1,779	2,077	2,536	3,087	2,214	1,337	7,200	
G9		Indigo and wheat alternately	Grain ...	...	...	1,500	1,107	1,701	1,288	1,879	895	1,098	1,136	1,818	...	696	287	
			Straw ...	...	...	2,813	1,778	3,104	2,209	3,049	1,072	2,650	2,287	2,080	...	1,576	774	
G10		Urd and wheat alternately	Grain ...	...	...	...	...	...	...	...	...	...	...	...	...	...	429	
			Straw ...	...	...	...	...	...	...	...	...	...	...	...	...	...	986	
		Green indigo ploughed in and gypsum, 6 maunds	Grain ...	...	...	2,300	2,100	1,845	1,597	617	702	1,319	1,452	1,307	1,028	...	...	
G11		Arhar and wheat alternately		...	...	...	...	...	...	...	...	...	...	...	...	...	...	
		Green hemp ploughed in and gypsum, 6 maunds		...	...	2,260	1,476	1,068	1,319	871	855	1,452	844	1,307	1,298	...	...	
G12		Lucerne and wheat alternately (lucerne this year)	Grain ...	...	...	...	...	1,761	36	902	907	1,174	847	...	1,053	1,108	...	
			Straw ...	...	...	...	...	3,521	2,980	1,800	629	2,202	1,706	...	2,109	2,055	...	
		No manure	Grain ...	...	...	1,315	623	1,367	547	786	623	1,464	1,162	690	...	...	...	This was an unmanured plot until the year 1891-92 and its outturn up to that year is also given.
G13		Lucerne and wheat alternately (wheat this year)	Grain ...	...	...	...	...	...	...	...	...	...	...	...	...	...	402	
			Straw ...	...	...	...	...	...	...	...	...	...	...	...	...	...	702	

N. B.—One maund=82 lbs.

(i).—Green manure experiments.

Series B.

17. The experiment was taken up [illegible] with a view to ascertaining the manurial effect on wheat of the ploughing in of certain green-crops [illegible] other than [illegible] in the [illegible]. The green crops which were sown [illegible] of July [illegible] were ploughed in on the 26th September and wheat sown on 2[illegible] November at the rate of 120 lbs. per acre.

The following table shows the outturn:—

Plot number.	Plot area.	Description of plot with reference to manure.			Outturn per acre in lbs.	
					1903-04.	1904-05.
27a/1	1,210 sq. yards per plot.	Green hemp ploughed in	Grain	...	837	264
			Straw	...	2,147	633
27a/2		Green [illegible] ploughed in	Grain	...	858	206
			Straw	...	[illegible]	806
27a/3		Green sod ploughed in	Grain	...	720	279
			Straw	...	1,336	1,124
27a/4		Unmanured	Grain	...	341	414
			Straw	...	1,339	1,0[illegible]

The plots were [illegible] with [illegible] the rainy and stormy weather of [illegible], the [illegible] plot [illegible] the [illegible] that cause. The [illegible] was poor both as regards quality and [illegible] and the results obtained [illegible] do not therefore lead to any conclusion as to the effect of the green manures.

(ii).—Experiments with gram and peas.

18. The object of these experiments is to determine the relative manurial effect of (a) gypsum, (b) ground *kankar* (crude carbonate of [illegible]), (c) [illegible] and (d) bone superphosphate on the yield [illegible]. There is also an [illegible] plot in each series [illegible].

The experiment with gram was [illegible] taken up in the year under report.

In October, which was the proper time [illegible] were under water. The soil remained so wet in consequence, that it was not practicable to plough it up sooner than the 7th of December, and there was no time then to leave the land exposed to atmospheric action or to thoroughly clean it.

Seed was sown in both the series of plots on 10th December, when there was yet abundance of moisture in the soil.

The germination was not bad, but the plants were stunted in growth and looked very weak and sickly. The crop of gram was a failure and the yield of peas very poor, as would appear from the subjoined statement.

RABI STATEMENT.—*Showing the effect of certain manures on gram and peas.*

Plot number. Gram.	Plot number. Peas.	Plot area.	Treatment with reference to manure.		Outturn per acre of gram in lbs. 1893-94.	Outturn per acre of gram in lbs. 1894-95.	Outturn per acre of peas in lbs. 1894-95.
315 / 1	31a / 1	Each plot = 400 square yards.	Farm yard manure 150 maunds ...	Grain	1,543	324	580
				Straw	1,080	449	1,783
315 / 2	31a / 2		Gypsum 3 maunds ...	Grain	1,730	324	203
				Straw	1,470	593	411
315 / 3	31a / 3		Ground kankar 2½ maunds ...	Grain	1,130	35	327
				Straw	1,031	187	665
315 / 4	31a / 4		Bone superphosphate 3 maunds ...	Grain	1,128	61	315
				Straw	920	192	435
315 / 5	31a / 5		Unmanured ...	Grain	856	21	184
				Straw	584	85	254

N. B.—one maund = 82 lbs.

Experiment with country potatoes.

19. These were taken up in 1893-94 to ascertain the effect of certain nitrogenous manures [illegible] compared with farmyard manure on the Farrukhabad potato, a famous variety in the Doab, the seed-potato being obtained from the Cawnpore market. This experiment was tried on smaller plots in 1893, but in the year under report the area of each plot was extended to [illegible] square yards, with a view to obtain more reliable results.

The tillage operations were delayed owing to excessive winter rains, and the land, which had to be too hurriedly prepared, was not in a fit state for sowing until the 28th November, when tubers were planted at the rate of 820lbs. per acre.

The germination was slow and uneven, owing to the rains that followed planting, and on digging at the spots where plants had failed to come out the seed tubers were found to have rotted. In a case like this, an ordinary cultivator should have planted fresh tubers, but in an experiment, it was impossible to do so.

The outturn was low and is shown in the appended table.

Statement showing the effect of certain manures on country potato.

Plot No.	Plot area.	Treatment with reference to manure.	Outturn per acre in lbs. 1893-94.	Outturn per acre in lbs. 1894-95.
			lb.	lb.
28 / 1	Each plot = 750 square yards.	Farmyard manure, 200 maunds ...	10,170	4,103
28 / 2		Poudrette, 200 maunds	5,053	6,153
28 / 3		Castor cake, 12 maunds	11,410	2,250
28 / 4		Bone superphosphate and saltpetre, 4 maunds each.	11,300	2,488
28 / 5		Unmanured	7,110	1,718

N.B.—1 maund = 82 lbs.

IV.—METHODS OF CULTIVATION.

20. The object of this experiment, which was started in 1887, is to ascertain the effect of early and late sowing on the yield of maize.

The early [illegible] manured, ploughed and sown between the 21st and [illegible]th of May, [illegible] the late sown plot [illegible] June and sown on the 19th. They were harvested, respectively, on the 18th of August and the 9th of September. The plots were [illegible] by the heavy rains of [illegible] the end of July and in the first week of August, and were, moreover, flooded [illegible] of August by the overflow of the adjoining tank. On [illegible] wholly or partially rot[illegible] in both the plots was consequently very poor, and, contrary to experience in the majority of past years, it was [illegible] in the early sown plot, as the [illegible] damage from waterlogging.

The results are [illegible] in the following statement:—

(a) Experiment in early and late sowing of maize.

Plot No.	Plot area.	Quantity of manure applied.	Description of sowing.		Outturn per acre in lbs.							
					1887-88.	1888-89.	1889-90.	1890-91.	[illegible]	[illegible]	[illegible]	[illegible]
Field No. 35	Plot area = 1,452 [illegible]	Farm-yard manure, 250 maunds per acre.										
35a			Early sown	Grain	734	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
				Stalk	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
35b			Late sown	Grain	810	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
				Stalk	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

N. B.—1 maund = 82 lbs.

(b).—Experiment in early and late sowing of cotton.

21. The object of the experiment is to determine the effect of early and late sowing on certain varieties of cotton and to ascertain their comparative outturns. It has been under trial since the year 1891.

The early sown plots were watered on [illegible] May 1894, ploughed on [illegible], manured on the [illegible], and sown on the 27th of May with seed at the rate of [illegible] per acre. The same operations, with the exception of watering, which is not done in the case of the late sown plots, were carried on in the latter between 16th and 20th June. Both series of plots were weeded and hoed four times.

Picking commenced on the 16th of October and was over on [illegible] December. The heavy fall of [illegible] inches accompanied with storm on the 4th October severely damaged the crops. The flowers and the bolls were knocked [illegible] in the [illegible] ance.

The following statement shows the outturn:—

Plot number.	Plot area.	Treatment.	Varieties.		Outturn per acre in lbs. 1891-92. Fibre.	Seed.	1892-93. Fibre.	Seed.	1893-94. Fibre.	Seed.	1894-95. Fibre.	Seed.
[illegible]	[illegible]	[illegible]	[illegible]	Early	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]				Late	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			Bani	Early	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]				Late	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			[illegible]	Early	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]				Late	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			[illegible]	Early	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]				Late	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			[illegible]	Early	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]				Late	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			[illegible]	Early	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]				Late	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			Country	Early	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]				Late	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

N.B.—One maund = 82 lbs.

Though the yield is poor, yet the results are distinctly in favour of early sowing, and also show that, as compared with other varieties, the country variety is [illegible] capable of standing the effects of bad weather, and [illegible] gives a satisfactory outturn.

(c.) *Experiment with mixed crops.*

11. This experiment was started four years ago, with the object of determining:—

(a) the comparative outturn of certain kharif crops in some of the more common mixtures in which crops are generally grown by the ordinary cultivators.

(b) the mixture whose produce yields the most profitable outturn.

The fields were prepared in the ordinary native fashion, and the mixtures were sown broadcast. The following statement shows the outturn :—

Experiment with mixed crops.

Plot number.	Plot area.	Name of crop.	Quantity of seed sown per plot in lb.	Outturn per acre in lb. 1868-69.	1869-70.	1870-71.	1871-72.	1872-73.	1873-74.	1874-75.	Cost of cultivation including rent, of seed, rent, labour, &c., per acre.	Value of outturn, seed, straw or fibre.	Net profit or loss.	Remarks.
											Rs. a. p.	Rs. a. p.	Rs. a. p.	
M.C. 1	Each plot = 1,210 square yards.	[illegible]	[illegible]	—	—	—	1,806 4,133	137 508	1,166 2,055	808 2,452	16 8 0	21 13 10	—	Price of arhar seed calculated at the rate of 40lbs. the rupee, of arhar stalks at 800lbs. the rupee, of cotton fibre at 4lbs. the rupee, of cotton seed at 30lbs. the rupee, of til seed at 16lbs. the rupee, of til stalks at 320lbs. the rupee, of juar seed 30lbs. the rupee, and of juar stalks 240lbs. the rupee.
		[illegible]	[illegible]	—	—	—	30 81	5 12	1 5	13 21		3 3 4	—	
		[illegible]	[illegible]	—	—	—	80	—	—	—		—	—	
		[illegible]	[illegible]	—	—	—	166 328	21 209	21 215	42 152		4 12 8	—	
											16 8 0	30 0 10	+13 8 10	
M.C. 2		[illegible]	[illegible]	97 —	97 —	97 —	210 734	271 1,310	742 2,302	— 1,194	16 8 0	2 2 3	—	
		[illegible]	[illegible]	— 308	— 2,030	— 908	85 1,408	524 4,007	280 2,434	— —		—	—	
											16 8 0	2 2 3	−14 5 9	
M.C. 3		[illegible]	[illegible]	203 —	203 —	207 —	696 1,070	1,434 3,600	236 2,210	599 1,341	16 8 0	15 6 11	—	
		[illegible]	[illegible]	[illegible]	— 2,040	— 3,314	592 6,071	700 4,308	343 3,052	32 3,315		10 13 9	—	
											16 8 0	26 4 8	+9 13 8	
M.C. 4		[illegible]	[illegible]	—	—	—	451	557	255	—	16 8 0	—	—	
		[illegible]	[illegible]	—	—	—	55 60	1 3	2 2	7 11		2 0 11	—	
		[illegible]	[illegible]	—	—	—	52	—	—	—		—	—	
		[illegible] Grain Stalk	[illegible]	—	—	—	51 408	7 56	29 321	63 145		4 14 10	—	
											16 8 0	6 15 9	−9 8 8	

The bajra and til crops, while in flower, were completely destroyed by excessive rains; castor also failed, and the outturn of cotton and *urd* was poor.

As in the past year, the largest money profit was yielded by plot 1.

(d). Experiment with old and new indigo seed.

23. The object of this experiment is to determine the comparative quality and productive power of indigo seed varying from four months to over four years old. It was started in 1893, at the request of the Secretary to the Chamber of Commerce. The fields were flushed with canal water early in May and ploughed up; seed was sown at the rate of [illegible] per acre on 8th May, and the crop received three waterings between 17th of May and 12th of June, and was weeded twice. It was cut on the 30th of August and the green stalks sold for dye. The stumps were left to ratoon and produce seed. The seed crop was harvested in the middle of January and seed threshed out.

The following table shows the outturn.

Experiment with old and new indigo seed.

Plot number.	Serial number of plot.	Plot area.	Detail of seed.		Outturn per acre in lbs. 1893-94.	Outturn per acre in lbs. 1894-95.
15/1	1	Each plot 605 square yards.	Indigo seed 4 months old	Stalk	8,840	10,204
				Seed	150	115
15/2	2		Ditto 1 year and 4 months old	Stalk	9,710	11,102
				Seed	173	111
14/1	3		Ditto 2 years and 4 months old	Stalk	6,063	8,048
				Seed	137	99
14/2	4		Ditto 3 years and 4 months old	Stalk	6,063	6,808
				Seed	152	98
14/3	5		Ditto 4 years and 4 months old	Stalk	5,222	3,608
				Seed	142	18

As in previous year, the yield of green stalks saleable for extracting indigo was highest in plot 2, and the Secretary to the Chamber informed me that this result was identical with what had been obtained by experiment elsewhere. The yield of seed in 2 was, however, slightly smaller than in 1. The experiment will be continued with a view to confirming the result.

(e.) Experiment with lucerne.

24. This was started last year with a view to determining the relative economy of sowing lucerne by the three different methods shown in the subjoined table:—

Plot number.	Plot area.	Manure applied.	Treatment.	Outturn per acre in lbs. 1893-94.	Outturn per acre in lbs. 1894-95.	Remarks.
A.	Area = 400 square yards.	Farmyard manure 200 maunds per acre.	Sown on ridges	1,218	8,122	
B.			Sown in furrows	771	7,706	
C.			Sown broadcast	325	6,005	
G13.			Green-manuring plot, series A	8,000	*	* This plot was under wheat in 1894-95.
G12.			Ditto ditto	†	2,028	[illegible]

N.B.—1 maund = 82lbs.

The wheat was sown in the same time as ... [illegible] ... on the 1st of November, but failed to germinate and had to be resown ... after ... [illegible]. The crop was ... [illegible] ... up to the 21st of May. ... [illegible] ... from each plot between the 13th of March and the 14th of ... [illegible] ... farm ... [illegible]. As in the last year, the largest yield ... [illegible] ... plot in which the crop was sown on ridges ... [illegible] ... in which ... was sown in furrows, the plot ... [illegible] ... plots.

To ... [illegible] ... of the manuring series ... [illegible] ... in furrows as in case of plot B, and the ... outturn is due to the presence of an ... amount of moisture ... [illegible] ... during the early winter rains.

V.—TRIAL OF IMPLEMENTS.

(a) Permanent ... [illegible]

... [illegible] ... in 1882. Its object is to determine the effect of deep ... [illegible] ... yield of wheat. Of the three plots under the experiment, No. 1 ... [illegible] ... four inches deep with the ... plough; No. ... [illegible] ... five inches deep with the ... plough; while No. 3 ... ploughed ... [illegible] ... with the country plough ... [illegible] ... in the (Cawnpore ... [illegible] ... being ... in all other respects.

The main point in the experiment is to ... [illegible] ... with reference to the saving of labour and time, it ... [illegible] ... to the native plough.

All the plots ... [illegible] ... with wheat.

As will appear from the ... [illegible] ... the two plots ploughed with the improved ... [illegible] ... than the ... of the third plot, but from a ... point of view ... [illegible] ... a failure during the year under report, owing to ... [illegible] ... weather.

Ploughing series.

Plot number.	Plot area.	Treatment.		[illegible]	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.
P1	[illegible]	Ploughed 5 inches ... with ...	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
P2		Ploughed 3 inches deep with improved plough.	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
P3		Ploughed ... inches ... with native plough.	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

(b) Testing of new or improved implements.

Of the ... [illegible] ... the farm during the year under report the following ... [illegible] ...:—

1. Water-lift ... [illegible] ... lift consists of two galvanised iron troughs, each having a valve at the bottom opening upwards. They are hinged on a wooden beam fixed on the ground at the discharging level and are raised and let down alternately by means of a system of pulleys and ropes.

Only one balfoefc i» nvpirol Id work the lift, ami it has to *gn* »OIH! and round without • vcr **hftriag** to revi-rmj ii* motiou. Recently an arran^im-nt W Wn improvtded wli, reby the loss of wat(>r in course of raising is minimised and ivater lifted bran *greater depth Una before.*

It in » uwful i ntrivane •' f°r lifting water from Laul;n *and* canal, from a (!••[>(h of

tfam to five feet. **Prim R». 30.**

***// ~-JtU'tJto*r milt.*—Thetnillwa* rorvive-l f/otn the O.werotnflnt of India for trial. It coi: I Jirrangen^ & rollers whit^by the mheal in clr.i utd -.'..und respectively, Midi UP (jr-numl hull into a box, diviil^l inl^i four • IIBIIII.TV provided with iron sieves nfiiiff'-r. liiwn—. iiilwwW to pnkhm fine and c ant Bow. Tlia mill(*ii be worked 1 by »lt'nm*nower only.**

Difficulty **vat , iiiui w«rkin:r it, but wa- got over iti-** •utety witbti help of Mr. Chater, Engineer to Messrs. Cooper, Ul«a .v i *a,* **Cwr***

The mill, however, gave uiwatUf.i 10 bwi bmnjr the one in which from •ne iiiaund of when ground in I otaa Hie qmtolity of fine and conne flour obttiB-rd MM 1 llbi. and 3 5lbs. respectively. md rf bruited atid kibblotl grain MBw. Tlii> last-named, pradoet • • il*i'l-

The •i^llinwil w». notir^l in foil detail in tU list of impl—enl tried, which went to Government i- October 1894. >ulre bnn taken to make iu woi king successful il, and furitier expfrimeat* *wn* in «mr«e of progTea*, the remit of which will tw- noted in ttif nrit report.

III.—*Tit Ihkta tiMi&imp* ««*ii««.—Thu lias been lattii brought out by MCMII. ThoiMitii an>l Mylne. It *it* fl f'llir • h t*cti»n being of the ihape of a wheel which ii made to move round on tlto mi prop in ur-ler to liimU out tbp urain. On, two, or more sections c»n be worked at a time uxunling to th»- area of the threshing floor.

Tri»!» with tin* imi4em«nt ww —*At* »t the GorertMnfnt I^iry Farm, Chherat, Aligarh i, and the (.'awn|xin' BxyefiflMBtel r»rm At Chherat it *mu* triad witb a crop of paddy <f Ik* *t\nr* variety called *ramgi,*

Tliroe veciioni of tbe nutchino ww w«rk«l at a Utn« with «•« *pwr of t.Kffafaet.*

In an bour flitsIb». of *H*n* wrre obtained from l^OUlba. or judy.

***Kmjtojiag im*p*i** •fbmfftlw* at the •*>• same time to ^-ail down *»n* «("»' Wl eight <f |aldr by tb« ordinary ttatiw method, 319 ib«. of *din , wen* a obtained from tin? paddy ra «nr boar^ad .'ii minute*.**

The </<!*• tbtvthnt by the Bebe* thruhtrr MI qort« f>.> from »*1 kuidn of tlirt and none of it «a» left in Uw «traw, Tbe fman.'i.tl cwoi) was distinctly in fav>ur of tbe Bebes thresher, which cost nearly one anna and nine pies to thresh 1,000 lbs.

Wnti, . the cost of threshing **the aame <(iuuiii'>' by the ordinary m.-ilul wa« out** less than **t o o uw** and nine pies.

In \\x- pa»t rabi barvwt * trial **waa** rtuvle at (Vvn, **SaparinU** ndent of the Government Experimental Kann with *W at sheaves. Only two sections of the machine were worked together at a time, the other two sections received at the farm having been called back by the makers. i • Two lots of wheat sheaves of 1,394 lbs. each the other worked by the machine with one pair of bullocks, the arrangement of toothed plates "•inn the same as was kept when testing the work of the machine in the case of paddy. By the former method the work **M I eon** pleted in 28 hours, and by the latter in 30 hours, the straw obtained by the former method being finer. As regards the separation of grain there was nothing special in favour of either method. The treading under bullocks gave more grain, but that was due to the •b-»*o» I elonging to a U>t< field. The machine could have probably finished bl tbe • work more quickly !LM! there bwc three

•Mtum at work, at in the east of ut paddy, n wa* m u w w
a larger quantity of »hr»r« a«d with the twtb lamed outwanl., Vut k-r..n- thi. «oM bv arra«(t«d for, ib* makon prM»4 th« ^p-rtmaot bf a morn of tho •»*«•!•" t-tok it back for trial •towbcr*. lu m.l wiih * U t ahoarw a* -»"•» ""] wu ttMtrfora inompteu. and tba rwntu mown. 'w'> n*0" lti<li **** * ' with th. .b«»tw «f ibo tio«lU« and ap» <«t«: •«»• »f tbi fonnrf »od SM*»- «• the Uttor bw»s thmhcd. r«aprrtiT*)y, in UM «mm of 10 «»«l « **•"* In tb* """* ONthritnvwu wliwl t., tb* d«.ir*l.l- lUwlvdof fineom, but in the fottMf i wu «it, aa the «prri««t bad to b* brought to a eloM abruptly, ia tnlw to rfttrt U tnlh.

VI.—VARIETIES OF CROPS INCLUDING FODDERS.

W *Krperimt* with Jr*

TV ibMMjwnnwtiaUiMmpawt^ywklofd.r, cotton > mioeabicUof tWmarrm^t ' ih'* wl clim»l« of tiii* part of tbe oottnt:

ThonpcrioMtwuaUruaiB li^. Oriffiwlly tb«» «m 11 TaiWtiw trial. IQ tin yMr IS»5-»1 cpinwa. o[tw« •!]«•«• w«« oldatnwl aa *'' of tba ptwliw* oMaiwd at tb» fara. »ml *ih«t* with tb- B|»pro«a] of tlw Agw'''» „ Ch#mirt o tb* t of Ir> p i *. ..». tb. u l (Awun).
TW •nftWr^wrt

TliophiU with «Ml wster oa Cftlb M»y. r»t* *U* UIU paracra. Tba «m b«d

Uk*oUwr w.lton fWLU. UMOT plot* «u- ifr from ,of «»•• lt «l*m».r »irf 6o» nf»1 . "d •»«• Hin^nglat tuffrml taMt from th* 1^ . roW *nJ ^otmiml till th* ISUi of Oacawbtr.

TV folk'WintC I'M* K"M *JM «ail«ifn of •*. h j.!..t from IM

Statement showing … of imported cotton seed.

Plot number.	Plot area.	Name of cotton.		Outturn per acre in lbs. 1896-97.	1897-98.	1898-99.	1899-00.	1900-01.	1901-02.	1902-03.	Remarks.
41 A./1	[illegible]	Upland Georgian	Fibre	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	
			Seed	[illegible]	[illegible]	[illegible]	til	ml	M	—	
41 A./2		Tree cotton	Fibre	[illegible]	[illegible]	[illegible]	[illegible]	tw	U	[illegible]	
			Seed	[illegible]	[illegible]	[illegible]	[illegible]	Ml	11	41	
41 A./3		Louisiana	Fibre	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	»		
			Seed	[illegible]	[illegible]	[illegible]	[illegible]	a»	n	[illegible]	
41 A./4		Garo Hill	Fibre	[illegible]	[illegible]	[illegible]	[illegible]	M	M	—	
			Seed	[illegible]	[illegible]	[illegible]	[illegible]	UT	in	—	
41 A./5		Hybrid	Fibre	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
			Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	a	

Plot number.	Plot area.	Name of cotton.		Outturn per acre in lbs. 1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	Remarks.
41A./6		Sea Island	Fibre	97	104	91	64	152	32	38	
			Seed	235	514	252	135	363	70	69	
41B.		Egyptian	Fibre	97	104	60	65	155	15	30	
			Seed	221	434	194	162	300	90	70	
		Mingangliat	Fibre	111	183	109	64	153	30	23	
			Seed	235	427	251	158	300	66	41	
		S. B. Mercy	Fibre	24	180	60	20	73	33	...	
			Seed	48	320	100	64	134	90	...	
		Shine's Early Prolific	Fibre	24	140	40	18	91	23	...	
			Seed	48	280	100	43	184	71	...	
42/5		Jones's Improved	Fibre	24	180	60	22	41	66	...	
			Seed	48	360	120	28	93	87	...	

It being desirable to change the seed, steps have been taken to obtain fresh seed from America, of the American varieties included in this experiment.

(*b*) *Experiments with varieties of cotton obtained from Central Provinces and Assam.*

28. This was started during the year under report, with a view to determining whether the varieties named in the following table could be successfully grown in the Doab. The seed was obtained through the Directors of Land Records, Central Provinces, and Assam. The land was prepared in the same manner as in the case of the foregoing cotton experiments, and sown with [illegible] of seed per acre. The Garo Hill plot was sown on the 22nd of June, and the other three plots on the 3rd of July. [illegible] of these plots could [illegible] the detrimental effects of the unfavourable season, yet the bolls of the Garo Hill variety were larger in size than the farm had produced before, and the fibre was very fine and long. The following statement shows the outturn.

Statement showing the outturn of different varieties of cotton imported from the Central Provinces and Assam.

Plot number.	Plot area.	Treatment with reference to manure.	Varieties of cotton.		Outturn per acre in lbs. 1894-95.	Remarks.
18/1	1,210 square yards each plot.	Nil.	Jari (Central Provinces)	Fibre	17	
				Seed	34	
18/2			Bani (Ditto)	Fibre	10	
				Seed	24	
18/3			Jaintiya (Assam)	Fibre	5	
				Seed	13	
42/5 and 42/4	600 square yards.	Farmyard manure.	Garo Hill (Ditto) (sown broadcast)	Fibre	10	
				Seed	20	
43/4 and 42/3	Ditto.	Ditto.	Garo Hill sown in [illegible]	Fibre	17	
				Seed	33	

N.B.—One maund = 82 lbs.

7

t M)

(•) JttnJltn.

29. A ooarw variety of paddy eailad Baa Dban, which u nid to produce high outturn in Anun, WM obtain*! from A«eam at UM in»taiK* of Mr Parrah, and *>wn at the farm in tba ordinary way. Tbe plot WM Vi6 tp&re yardi in ansa and UM ; yield 12 Iba. TU oataalated yWld par aert aavmaU t> I.J74lbi., which i* above UM I average yield of most of the coarse varieties of dhan common in the plains of these provinc*.

*{i) £*f*nmnt with kill fUitm.*

30. Tbia WM itarted ia 1>?3 with th* MJM obJMt M UM OM nMntion«d mad ond« UM cxpMinuat with eountry j^tatcpw, M alao of dtttnnining whethw hill pot*W» U moMM/uUy P » D on lh« to.) of Um fana. Tht MM! WM oUain*.! from the Sa[xrinUnd»nt. Motwar Nomry, Kumiun. at n nrt ooat of tta. &-1S-0 p« ma and (MB«). Tfiii «Ki>cnmenl WM a futon in 1(193 on aocooatof waMwhat luw fitoat«m of th- pt«t« on which it WM tiM. Plot, aitwtodon a higher kvtl wtM lhcrrf»»» albttad (or tUl txfwimtol in tU y<w «nd« report. Tht field operations were .miilar to thoM cwried oat in th« CM. »*t* tbe)Mt BMwtion«) manam) «tptrinwnt with Pamkhabad p.,tato«. " &rt* * ($_{nt}$ tabtr.) wen town at U* r»U of «6«fl«. p* am on UM W DwwaW, Tkearop WM nhNqwatly WM«Udandwatend tbiM and few time*, mpwtiwly, and b*n«Ud on the &h of April iHff&. TU ofltam u shown in UM unt»d lUUOMt and may b. Uk«a. fairly tfood.

TU prodvo, whkh WM of good qnaJUy, WM told locally at U» rate of 4 lbs. UM—

fertilising effects of manu --- but nothing MII U Mki$_M$ ta thrir tvktiv. Tahao until UM nptriurot u continued *tor* •out yea*n* to MM.

Experiment with hill potatoes.

Plot number.	Plot area.	Manure applied per acre.	Outturn per acre in lbs. 1902-03.	Outturn per acre in lbs. 1903-04.	Remarks.
			lbs.	lbs.	
20a1 / IV	Each plot = 780 square yards.	Farmyard manure, 200 maunds	1,004	7,424	
20a2		Poudrette, 200 maunds	2,532	6,399	
20a3		Castor-oil cake, 12 maunds	2,050	6,502	
20a4		Bone superphosphate 4 maunds, and saltpetre 4 maunds.	2,501	7,014	
20a5		Unmanured	1,081	5,409	

N.B.—One maund = 82 lbs.

with Canadian oats.

•1. ThM rtt^mptfi, whidi winai111 in 1»W, W Uw> fctpt oe daring tt*; year iiwl-t r»(-»rt. Tb« *iu of Iht nptTinvnt WM htirrwr ahumii. wad no wanort was •pplt»l to UM wop dvriag Ib* jwx mdw t*poH$_f$ fa ftffer to >M wtt«tW that measure wcttU tnwmit Uw nlnwfdinarilj Imamnt crowtb of itnw at UM otpmM of grain, which KM alwa/i kw UM Hart *pri\ai»mitmUtn* of UM fM«lu obulwd at UM farm with UMM varieties.

A. la case of other tabt crops, the preparation of the ground •,, considerably delayed on account of unusual humidity in the soil, and the seed could not be sown earlier than the 5th of December. The fo ^ ^ of grain was na lurally datay*!- in consequence of the late sowing, and while the seed was yet imperfectly d.Tri.»H.th' but wtfid* oi April dried up the ears, causing the grain to become thin. TUyWIdof p«*« was poor, but that of straw was high in proportion to the grain, as mal. Th* ra»oll«

still *go* to indicate that tbe crop ii more luitaUe to be grown for green fodder thai for grain. Tbo following table givet details of outturn :—

Sitftmrtit tkowing ih« outturn 0/ Canadian eati.

		VtrMjof Ml*.		Outturn p<r *ten* la ft*.					Bimuk*.
				1M04L	UU4B.	WM M.	IMM*	*taum.*	
		PrittCUttrr	Oi»in ...	MO	B40	8U	178	14S	
			BUft» «		IJM		MCC	MM	
		Cuullu TriotapL	Oimla ...	787	Ml	110	100	71	
			fbaw ...	im	UNO	MID	MM	8,517	
		R« •>!*• PriM ...	Gnla ...	471	106	3-)	6U	164	
			Stn* ...	i. .-	PH	ua	IMM	MM	
		Walerua	Onto ,,,	m	t40	41S	too	71	
			Siirnw ._	MM	m	0.7*0	MM	MM	
		B*—"*	Onis -	787	US	»77	sin	UN	
			tin* ...	MM	Olt	IMK	IMH	t.o»o	
		TOUKm(ta:	Onto ...	647	900	151	in	M	
			l,w••••	MM	Ml	7,110	MM	MM	

It tnty U remarked that the outturn of *grain* oLiuned at tbe farm from » good crop 0* CapaoaU wu 1.9SSII*. pet acre daring U» year under report, showing iUmperiontj onr the Canadian *»U a* » gTain-jrivMing vanetjr,

(/) Effplitn QT funi'm f/wrr fTrij'etiuut At,xa<lriw*m),*

32. Thta foddor crop, which «n> rmuad with tome raoceN in the part year fror awd Unportwl from Egypt, completely failed during tbe year under report. S«td produced at the (arm is 1893-94, a* well M the old wed originally obtained from Egypt, wttre mm am and over again in each plot aaugwd to tbe espcrimont, bot both failed to germinate, owing probably to abundaaoe of moisture in Uw toil. Fneh Mtd hai betn again obtained from Egypt, and vill be tried in tbe next *nil* season.

It may ba remarked tUt tht coed distributed to other farms for trial fuled similarly to germinate at thow fame during the year under rqmrt.

VII. DISRTIBUTION OF IMPLEMENTS.

33. Tbor* *i§* » small worktop attached to Uw Esperimoutal Farm in whic improrcd impWm«nw aro maatLtactural and ropairad by native workmen. Tbe mun imporUDt part* of oerUin implement* are, however, imported from England.

The following aUUment ahowi tbe distribution of implement* during the ye*r •ading 31st March 18»6 r-

Name.	Sold.	btMieaWat	'oiiwosblj*,	Total.	*UctzuU*
Chain pumps	14			51	
Baldeo water-lift	IM			101	
Total ...	154	29	24	207	

The• ptoitgli which bat bad tbe krgert mk WM tbt OM tailed tbt BaUoo pi nantd after the tnraitur, who originally made it at tbe workshop.

Ita price WM raieed from t U l l o B * . t-B, ia ordw to mart tbt Mtra eott of tog it itronger tnd rnort efficient. It ia gaining tome popularity among tbt cultivator*. Some uf tbrm who had gt«n it » fair trial cant on foot from Farrukh- »bmd ia get a few of thaw from the farm. Tbt efficiency of tbe ebain-|»mp for water from tanka and canal it asknawbdgtd aartatrndl/ by thot* who baft it at work, and iU <am among taltivatort of fair moan* will, it m hoped, •totdily.

IndetiU for chain-pomp* war* laetivtd doriug tiw year from Bengal and Si

In accordion* with a wiah nun—ml by tbt Local Ooftrnmnt in 1891, atUOj w*rt made to aetl tbt pumpt on tbe bin tytteta, but only funr ban been told that tyrtam «not then. A wattr-oft rattabb for Unk irrigation and invttr Baldeo ia attracting tome attention and bat bam indented for by ctrtats tetaUe.

Tht R. Hunt kibbler and chaff-cotter «tcit* tome iatereat among tbt pablie at the agricultural fain, and art willingly porebaetd by lamtadan who can afford have them.

VIII. DISTRIBUTION OP SEED.

3». A Mtd etore u abo k»pt up at tbe farm, with tbe object of tapplyiag •• agricultural wad to tbt public. Bead prodnoed at tbe farm and pawhattd from ouUtdr ia. after being thoroughly cleaned ana pta»*d through the eaad ttfarator, ie*u*d to

TW f..IIowing Ubk tbowt the diatnhmtioo <1 Htd donagtlMytv tiling 31»' March 1M& -

K m	Quantity.	Remarks.
	ftk	
Wh<M — — — „	HUM	
> M U ... —		
Maize — — — —		
Sorghum — — — —	16	
— — — —	11	
— — — —	M	
Oats — — —		
li*m ~ — — —	74	

•if tbt ytar tb«rt bat btw a tall ia tbt dtjnutd for oatt, of wbiifa th<** WM a largt balaaot In ttodt at tat tad of the *ymr.*

Tbt demand for Iwerot utd aorghttai i»rtwililjwiirattiiiq. ml tbtl (or Oatot* r»Uy larger than Lht farta it eaoabk) of laming tilbar from if 0WP or *inn* purcfaaatd stock. *Boa** taatatt *tot* Uutaw f i w tt*J w«t tattaA«d Itu j car.

IX SERICULTURE.

35 Under tbtordan of Mr II, Z. Dkrrab, tbe UU Officiating Director, some of rn etlWuim (/'4t/*»j««w *rimm)* wtte i in June 169ft. Tbe atlkworau »crt roaml bwee of tbt ratter tU ptaat. TWy pnaaetd a** eyelet April U*t MMI ttriwJ wall tmtil then, yiakliag ty W tkoM olitamed from Aamm. Il«t tbe ofatt of tbt hot wMlber Mtroto indfttd.' TU m.ith* that «m*tfai from tbt opcoost ia tbe Ufiwnaf *et* ,,»..n dwd in matidmble numUf* bator« layuV *HtS* Tlw«> tbat Mga laid ft «ajjr M •n«, awl tb> wora* tbat cam* oat fn,m rrtUt is int comnaot a w«k. Cocoon* •*! wortnt bad ab» bam dfatobattl «M>ng lo pnvftU ptnoat la tbt aaiiblwaibotd ** **' hm and la U*«tww, , tbtrn, loo, »ll tbt wonai died Ly tU lOtb*ot* M«y. Tbt Ugh Uot|»i»i«

April and May is obviously ... plains of this industry, and it remains to be seen ... matter ... cost. A fresh supply of live cocoons ... for ... arrival the experiment will be resumed and continued on a very limited scale.

X. HORSE BREEDING.

36. The Arab stallion "Kishmish," whose work was noticed in previous reports, continued at the farm during the year. The subjoined table shows the result of coverings done by him in the year under report and the preceding year :—

Result.	1893-94.	1894-95.	Remarks.
1. Foaled	8	2	
2. Reported to be in foal	—	3	
3. Failure	38	9	
4. Results of covering not known yet ...	—	*30	*One of these mares died three months after covering.
Total ...	46	44	

The high percentage of failures in the past year cannot be attributed solely to defects in the stallion, but is also due to the fact that a large number of mares served were past the age of foal-getting. Of the two brood mares kept at the farm, one foaled twice during these two years, but in the case of the other the coverings were unsuccessful.

The results having on the whole been unsatisfactory, the stallion was at the close of the year under report replaced by another from the Civil Veterinary Department, which is reported to be a more successful foal-getter. It is intended to reject in future the mares that are obviously unfit for breeding purposes.

IX.—CATTLE AND CATTLE-BREEDING.

(a) *Cattle-breeding.*

37. A young bull of the Kosi (Muttra) breed was kept at the farm throughout the year for breeding purposes. It covered 17 cows, of which eight have calved and nine are in calf. The calves hitherto produced are very promising. The bull commenced its work only in the past year, and cows were received only from the neighbouring villages. Endeavours are being made to make known to the public the presence of a good bull at the farm, and as it becomes more widely known it is hoped there will be an appreciable rise in the number of coverings. One bull of the Kanwaria ... was procured by the farm ... who has located it at the Demonstration Farm for breeding purposes.

(b) *Veterinary hospital.*

38. A veterinary hospital was opened on a small scale in the year under report, and placed in the ... Veterinary Assistant, who has undergone a short course of practical training at Babugarh. The necessary surgical instruments and drugs were obtained from the Civil Veterinary Department. The hospital began to receive patients in the beginning of November 1894. No fee was charged on account of treatment, and medicines were dispensed gratis.

The following statement shows details of work done until the close of the year under report :—

Number.	Disease.		Number of patients treated.	Number of patients cured.	Number of patients found to be incurable.	Number of patients that died.	Remarks.
	1		2	3	4	5	6
1	Black quarter	...	1	1	—	—	
2	Pneumonia	...	2	—	—	—	
3	Indigestion	...	3	3	—	—	
4	Fever	...	13	12	—	—	
5	Lameness	...	5	5	—	—	
6	Diarrhœa	...	3	2	—	—	
7	Cough	...	1	1	—	—	
8	Fracture	...	1	—	—	—	
9	Dislocation	...	2	2	1	—	
10	Catarrh	...	2	2	—	—	
11	Mange	...	1	1	—	—	
12	Other diseases	...	13	13	—	—	
	Total	...	46	42	1	3	

(e) *Miscellaneous.—Yield of cattle dung.*

39. In order to determine the weight of manure obtained from farm cattle in course of a year, the cattle shed at the farm was divided into two sections, in each of the which straw, dry grass or leaves were spread as bedding at certain intervals. Seven bullocks were housed in each section at night.

From section A dung was removed daily and stored in a pit, while the litter, soaked with urine, was removed once a month and preserved in another pit.

In section B the dung and the litter were allowed to remain throughout the month and were removed together at the end of the month to a third pit.

Each pit was sheltered with a *chhappar* thatched over it. The weights of dung and litter for each section were recorded in a register immediately after removal, and the quantity and kind of food and of bedding used were also noted regularly. The contents of each pit were weighed at the close of the year after having undergone decomposition.

The results of both the sections put together indicated that on an average 21,403lbs of fodder and concentrated food were allowed to each pair in 12 months and 984 lbs of litter were used for each pair in the same period.

According to the weighments made at the time of each removal of the manure from the two sections the total quantity of fresh manure, including litter, came to 19,596lbs for a pair of cattle in a year, but the weight of the rotted farmyard manure obtained at the end of the year was only 9,722lbs for each pair. The average weight of fresh dung and urine (excluding litter) for a pair in a year amounted to about 18,600 lbs.

CAWNPORE,
The 12th July 1895. } SAIYID MUHAMMAD HADI, M. R. A. C.,
Assistant Director.

APPENDIX A.

Note by Dr. J. W. Leather, Agricultural Chemist to the Government of India, on the chemical composition of sugarcane and sugarcane juice and of the raw sugar obtained in the experiments made at the Cawnpore and Poona Farms during 1894-95.

In the following note the results of a number of analyses of sugarcane juice and of the raw sugar are submitted, and in addition reference will be made to the results of several analyses of the whole cane.

The analyses obtained at these two farms are discussed in one note, with the object of comparing, as far as may be, the differences which occurred in the quality of the juice and of the raw sugar.

1. *Juice.*—The amount of cane sugar was determined in [illegible] number of [illegible] of juice from the cane immediately after pressing at Cawnpore and at Poona, and the results are tabulated in Statement I.

STATEMENT I.—[illegible] of sugarcane juice.

Plot number.	[illegible]	Per cent. cane sugar.
	Cawnpore sugarcane juice.	
	[illegible]	[illegible]
	[illegible]	10·81
	[illegible]	[illegible]
	14 tons [illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]
10	[illegible]	[illegible]
11	[illegible]	[illegible]
12	12 tons poudrette	[illegible]
13	[illegible]	[illegible]
14	[illegible]	10·10
15	[illegible]	17·17
	[illegible]	[illegible]
	½ normal water allowance	[illegible]
	Normal water allowance	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]

Plot No.		Per cent. cane sugar.
M	rwnttU 12 months old	14·12 u-u
1*	ClH(lt>Wl	i*«t Ut»t

A» will ba ma, tb* pertmUtfe of nyw (port* of rugae per 100 parta of jtrit* '/ vri'yi/} v*ri*d »ery much not* at Cawapor* than at Pooaa. Tbia *it,* in all j>rou» owiag to tb» fast tbat al *Cammpn* tbe crop >u tery modi [4] laid " ia all tb* pl«t» by excessive raia.

ft>ar aaaplaa of the jaio* of ttcb eaa* w*r* ao*1*»*J and, a» will I* wen, tie percentage of lugar ia three of I ben »ae MtM*d«rably lower than Itiat of the jtuec of tb* standing-"cane. The pcrotatage of ra^ar ia tb* jaw* of tlta "«Uaduag" cane ranged from Mooawntt uwltr liparoeat. ap to a* much at II » pereeat. Tbe latter » aa exceptional Gjjur*. and tae pamaUge of eugar in the jiuo* of la« Cawapof may be taltea to bavt varied from *\!tb* to 15 4 percent. Tbe peneaaUg* of •agar ia lb« jnioc of tb* J*,PMM mgareaDe *enf* wa» d^tamitMd in a much larger number of sample*, ami ia tb*a» tber* waa rery mocfc gnaUr aoifornity titan in the jn M analysed at Cawapnra, Tbe crop wa* ia BO eaat " laid " by raia to any extent, aad these fact* takes together teed a eertaia aaoaat of rapport to UM opinion expressed also T* that tbe jtiioe of " U*d " can* w ill coataia a lower peroentaf a of eaa* sugar than tbat of cam* not ao bad.

i. *Mm Mmt* ("ear " *r *'fMt"),*~Tbe Stataawat* II aad tit eibiUl tbe »n*-lyaia of eamplea of taw eugv from UM Cawaper* aad. Vooaa ParsM, In fcdJ ition it w u thoogbtiiwnUa to aaalya* aotM of lie *fwr* prepared by (u!iii»lor». Tacy are all eamptcs aelavted from tbe Nonb-We«Urn Provtsea* daiUicla. Savpte* ofcal-tivatora' *§mt* ptrpam) aear Pwaa wen act aoalyaid tbi* year, OM amount o(work baving Ucotae already too gnat to admit of it at pretest*

STATEMENT II.—*Samples of gur from Cawapore.*

Description.	Cane sugar.	Glucose.	Water.	Ash.
Cawnpore Plot I	73·42	8·57	10·92	• M
" " I laid	*7->I	...	...	...
" " II	74·12	9·47	!I*I	KI
" " nt	74·61	MI	HIT	2·09
" " *..	75·01	8·76	I M	1·94
" " V	73·08	9·38	I H «	I'M
" " VI	n u	H i	ira«	i-m
" " TH	Til*	10·27	u «	2·61
" " Mil	rtfj	a y	14·67	r»»
" " \IIIbtf	t-I T»	14·33	it-j	1 *
" " tt	M I	lrwl	13·77	M I
" " 12 ieM	A	it»i	irr*	I «
Cawnpore Dhaul	70·45	7·13	• al	rM
" Dikchan	70·03	ft u	• u	» «
" •aMUa	T«*4	I U	ia«a	» i*
" HaJF	71·07	9·74	M M	r«*
IWOH«f«	70·85	8·92	7·03	j*ti
ta*a	*>•*	10-11	U M	rt*
Unao	72·39	9·66	1MB	re*
Fyzabad	70·14	9·31	• M	»«*

STATEMENT III. *Samples of gur from Poona.*

Description.	Cane sugar.	Glucose.	Water.	Ash.
Plot No. 1	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

In the case of the raw sugar, it was possible to determine not only the amount of cane sugar, [illegible] acid.

[illegible] suppose [illegible] relating [illegible] from 10·9 [illegible] 70 per cent. to [illegible] ter.

In [illegible] samples of [illegible] were separately analysed an[illegible] seen, the percentage of cane sugar was [illegible] coincide [illegible] being laid by he[illegible]

The figures in the second division of the Statement [illegible] varieties of cane grown on [illegible] subject to waterlogging than that of plots [illegible] aged that the weight of sugar obtained is, I believe [illegible] it ought to have been. If [illegible] of the juice and "*gur*" of some of [illegible] the surprising [illegible] to find that the percentage of cane sugar is [illegible] glucose and water generally lower than in the "*g*[illegible]" of the adjacent crop of "matna" cane [illegible] X). The proportion of [illegible] of these four varieties of cane were made, and it is not [illegible] what [illegible] crops these varieti[illegible] the [illegible] were really good [illegible] sug[illegible] might [illegible] other these varieties [illegible] year's results may throw light [illegible] feature in their composition.

In the third division of Statement II are exhibited the analyses of several samples of "*gur*" prepared by cultivators [illegible] column. They are, on the whole, of about equal quality to that prepared on the farm. Their worst feature was the amount of dirt, bits of cane and earth which they contained.

This is of course readily understood when it is borne in mind that the juice at the farm was all passed through a cloth before being boiled down, and this of course the cultivators can readily do so soon as there arises any call for it in the bazar.

In Statement III are exhibited the analyses of the various samples of raw sugar ("gul") selected from that prepared in the Poona experiments. The percentage of cane sugar varies from 69·1 to 79·2, and in the majority of samples it was higher than that prepared at Cawnpore.

The glucose, however, with one exception was distinctly higher than in the Cawnpore samples. It varies from 9·53 to 13·88, one sample, however, containing only 5·89 per cent.

The moisture, with the exception of one sample, which contained only 4·8 per cent., varied from 7·1 to 11·55 per cent., and was generally less than what the Cawnpore "gur" contained.

The proportion of mineral matters varied from 1·16 to 1·88, which is distinctly less than that in the Cawnpore "*gur*."

It may be well in concluding this paragraph to refer briefly to one or two points in connection with the quality of the Cawnpore Farm "*gur*" and the Poona "*gul.*" Both names apply to the raw sugar obtained by boiling down the juice until it will solidify on cooling. Doubtless it is, from the cultivators' point of view, the most important thing to produce as great a weight of sugar as possible, irrespective of any niceties of composition, and judging by the analyses of the five sam[illegible] "*gur*" exhibited in the third div[illegible] better purposes their [illegible] there-fore, we find that [illegible] more as much raw sugar per acre is produced at Poona as at Cawnpore, it w[illegible] be evident that this result must, at present at any rate, bear a value very much above that of the composition of the gur.

It is, however, to be noted that in the neighbourhood of both these farms refined sugar is being made on a large scale, and it will not be out of place if, whilst determining the variety of cane, and the mode of growing it, which will produce the most raw sugar, we bear in mind that there will probably be a demand for raw sugar for refinery purposes. It is for this reason that I draw attention in the next place to the amounts of glucose and mineral matters in the raw sugars which have been produced at the farms. The percentage of cane sugar was much about the same in the two sets of samples. But the proportion of glucose is distinctly less in the Cawnpore samples than in those from Poona. It may be that this is to be referred to some inherent quality of the juice of the cane; but I think it may in part be owing to the fact that at Cawnpore a mixture of po[illegible] and a mucilaginous substance was added to the juice, in order, on the one hand, to neutr[illegible] the juice and thus prevent to a greater or less degree the inversion (*i. e.*, glucose formation) of a part of the cane sugar, and, on the other hand, to cause a precipitation of the albuminoids of the juice, and the analyses would indicate that the alkali has really had the above indicated effect to a certain extent. This is a point which will be worth while experimenting with another year.

I am inclined to think that potash is not the most suitable alkali to employ, and it may prove better to add some caustic lime or carbonate of lime instead. The other point to be noted is the distinctly higher percentage of "mineral matter" in the Cawnpore *gur* than in that made at Poona. Possibly the higher proportion at Cawnpore is to be referred in part to the addition of potash to the juice (as above mentioned). That it is important for refinery purposes to keep the proportion of mineral matter low, will be appreciated when it is mentioned that refiners consider that one part soluble mineral matter will prevent five parts of crystal[illegible]ble sugar from crystallising. All the mineral matter in the raw sugar is not soluble, and the amount of soluble mineral matter was determined in only three samples, in which it amounted to 2·06, 2·79 [illegible] per cent. respectively. It may be of value, however, to bear this point in mind.

4. *The total sugar in the cane.*—When the cane is crushed in an ordinary mill such as those employed by the cultivators, only a portion of the juice, and consequently of the sugar also, is extracted. A certain portion remains behind and is lost.

An '.(.tempt wns m iJo to dctornrne the amount of tins in two way*. The one WM by dete raining tlw amount of *sag*** '''^ ln ''i0 rt'f usa crushed fa no, the other by deter-mining the total anw I t of su pw in tlw eatui tram whtcli would)« subtracted that) the jui;-. The results of ncitli-r oMthod were, however, satisfactory. Difficulties, which need not be here entered upon, won* mot witli ant] it matt be left to * future ceuuion to perfvot the methods employed and thin writ-eat the result.

An approximate estimate ha« bcon made by an indirect method, (he net result of which KOe« to *h>w that at Poem frura 2 to 3'5 per utnt. of »ujar was thus lo»t, whilst at L'awnpore the low WM not Iww than 5 per cent. The Utter amount is certainly very large, MMDBting to (ally two-fiftlu uf iliu total *tag* ir in the MMO The CWIF« of thu must not be hastily put down t> the millt employed. On the contrary, the resulti obtained with tlw *'P*»*t*'* can*, e'm<> of which WM oraebtd by Mr, SuUhiah at the Cawnpore Karro, «how a very tiifffrtnt re«ult. In the *nut* of the "matoa" cane, whirh ni tlit- main crop in 'h' "jiwnp^re experiment', only 5> p>r cont .if juice WM eitnu-ted, whilst no \>-*n* than d-[1,1] per cent. of juice KM ubi liiwJ from tha *I'aunfa* cane with a wrrwpoii-ing proportian of *ytr,* ami altlioag't n<> analywa were maJ« of the *Pamad,,* cane or its juice, there cannot have been ;ii ire than i per c«?nt. of nuijar left in the refuse, an-! it WM probably mioli lem Tiio amonnt "f *w* obtaiH I «*a- f.ir higher than any grown at tbe farm, »nd the proportion " • , n»m.'ly, 13-7 from 100 part* of emne, was distiactly hi^h. Tbh "*Pi**d-t"g*t* g»T« th* bllowiag rc*ulL» un anatysia *—

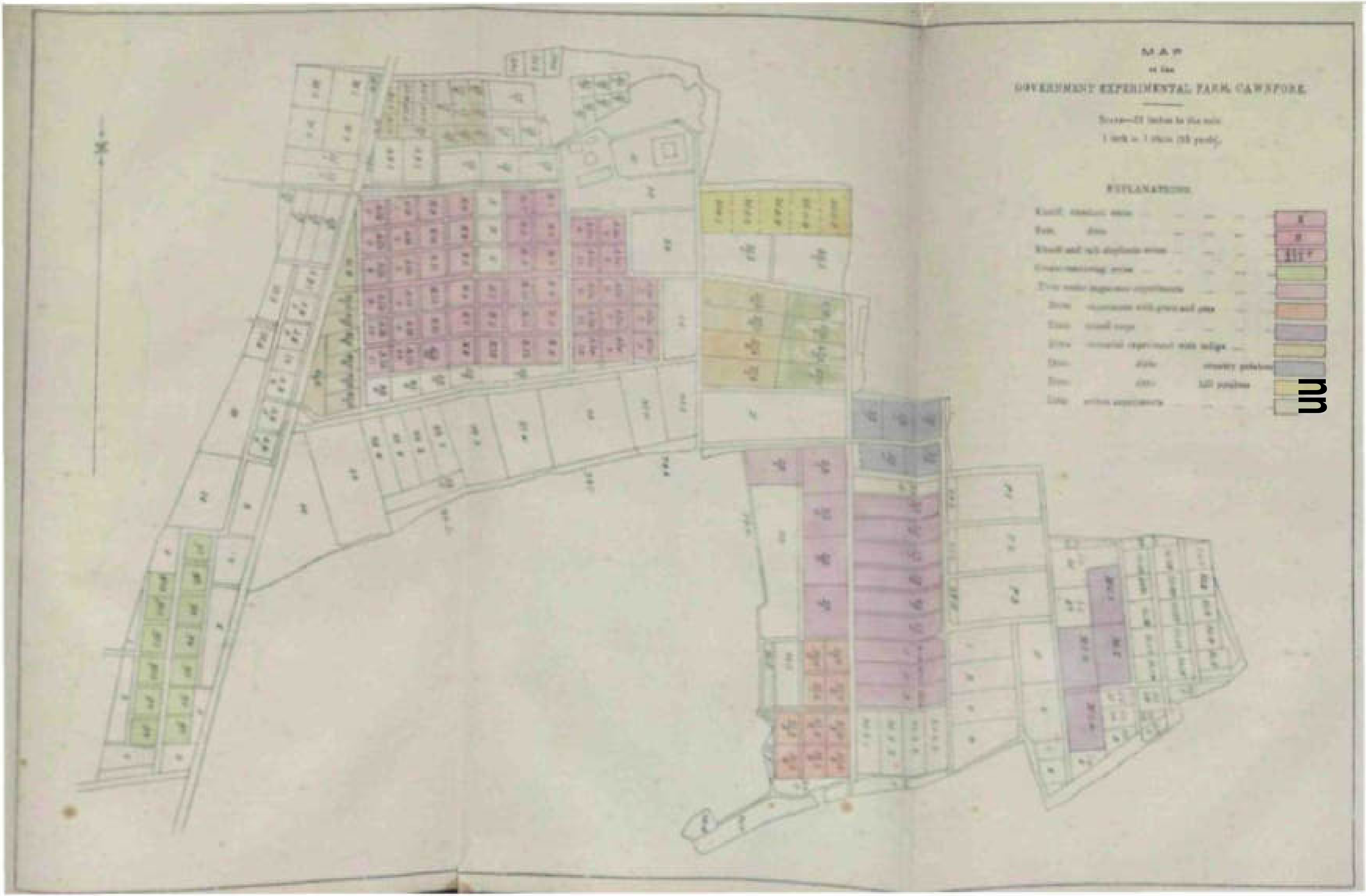
M» mfv.	Olscow.	*k%b.*
76-70	111"	1·92

showing it to U i ^ • • I i»Jipl« "i raw su :"•• ^ w TM'^ ^PP***! tharefire, that the high proportion of sugar »"t *t*tr4* ated at Cawnpor* w*« • ore likely occasioned by the quality or liinlnta* ol ttu If ; and if ihts iboaM prove to be the ewe, it will show the dentrobtlity of growing a cane from whiilt a high proportion <f tbe juice may be extracted.

5. 7i# *amount »/ Pkotpkoric 4<*d and Mtrofem /« tit tHfarcaw* ero/>.*— The fUKarcano irop i« generally mppowd U> be a *ery "nhamting" orop, and it u therefore of intcrwt *U* dr^rmine a* aonrauly as pmaible the a«outit of nitrogen and photpboric add, tiflU and pota*h which it Ultft from the wil. An attempt waa made t> di-tenuiti.* iho nitr^cn and phoapboric acid ; bo* in this oaae, ai in the deter-mination of tN t>Ul »utf»r, difficullic* were expericooed, cnn»U(iii ettkfly in gtrttin^ what were nally wpwiMrtatiw mmpl« of iht- nataebb, and a funhi-r endeavour to overcome l!if Jittivulli'f ati>l m»Le more «i»i:t dct*rmin»!joni will be utulortaken next y*ar. So tar, b>wever, M one can jaigt *hy* *uoh analyw* AS bave been rnide, tlit ami»unt« of nitrogen aoJ pho-i^aric acid in the i-rop. at the two farroa, reapwtivdy, an a< followa ;—

A*»uming W.000 poundt of cane and t,000 t^pa per acre to reprewnt tha Cawn-pore crop, the (»Ul amount of pho.pbone acid wan .tout *U\)m.* and the nitrogen 34 pw,nds per acre. In *t\a* ciiHi »f the Poona crop and awuming l00,W)Oft», of rane and 14,000lbs. of tops pram the toUl UBoat of phoaphooo acid <w about 5IIIW and the oilrox*n abjul fltlb* p-'f *Uf.*

A wbwt crop of flUOll*. of *gnia* i*r ten will including (be straw) remove about 8 pounds of phosphoric acid and 1J pounds of nitrogen per acre.


MAP
of the
GOVERNMENT EXPERIMENTAL FARM, CAWNPORE
EXPLANATIONS

REPORT

ON THE

Cawnpore Experimental Farm

FOR THE

Kharif and Rabi Seasons, 1895-96.

AhhABABAU:

Printed at I** *Xertk. Wfltrn frvrimrf nntt (hath Gotvmwmt Press.*

No. IT9-1 of 1896.

DEPARTMENT OF LAND RECORDS AND AGRICULTURE, N. W. P. AND OUDH.

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From

SAIYID MI liAMMAD MAPI, M. R. A. C,

ASST. DIltMTOIl IX CIIAKfIK OP TUE DtFtBTXEXT
OF LAID BICOXM AKD Ar.air.Ti.TrwE,
North-Western 1'aovixcta ASD Onm,

To

Titr CHIEP SECRETARY TO GOVERNMENT,

NOETH-WtSTEHS PkOVINCES AXD OfBH.

Bo,

I *UA\I.* tlve honor to submit the Anoonl Report on the Cawnpore Farm fnr 1&95.95 and to say that the report liai Wen examined liy ih* Africottwa] CbemUt to Uu- Government of India.

t. ThcIarmwM throughout the yew under the immediate charge of Mr. P. V. Subliah, Principal of tbe Agricultural School at Cawupore, and the greater part of tbe report i* bawd on the notes kept and furnished by him.

The y«ay under report was characterised hy deficiency of rainfall, which, though not very keenly felt at tbe Farm on account of facility* of cana! irrigti inn, r-uuted same damage to sugarcane, a crop which oeeupi« • very prominent plaw in tlie programme of orpwimenU under trial. In the kharif the field of maiio wat my good- The rabi crops on u a W f t t d lands gave a very poor outturn, 1,ut the yield of wheat on irrigated areas under high oultiv»Uon wat much heavier than usual, Tbe different import.-d varieties of cotton gave a remarkably nigh outturn at compared aritfa Ifct past year*, and an interesting fact discovered during the year under report in the matter of cotton cultivation wai that several varieties under trial at tbe Farm were capable of yielding successive outturn! of fibre and *oed if the planU were, iniicad of lieing sat down at the completion of tIn- Tint picking, allowed to «Undin the field. Kxprimenta will be continued with a view to determining Uie economy of thii method of cultivating cotton.

3 The Agricultural < 'In-mitt to the Government of India made a abort stay at tbe Arm during U» eane-cruihiag aaaaon, to analyse tbe juice and suprrviw the manufacture of *fnr.* As interesting note in which be baadtseutaed tbe rwultn of the sugarcane Mftrimen** and art forth tbe eoncltuions arrived at, formi an appendix to the report. Witk regard to the Paunda cattn which are Dot ordinarily used EM the production of sugar in th«e provinces, Uu eiperimetrta made daring tbe year under report ba«« contrmri the results obtained last year, namely that gowl *gmr* could sr»e-cea«fully 1* produced from the Paunda canee, a fact worthy of the notice of native •oltrnti rt,

4. The expenmtuU with fodder crops have proved that ;« a r and *guar* are *n»\-* l«tf»»dder.yUUmgrt»r*Md*wcaf*U" or PTM1^ ^"w « » « * cuttings in a year, aUo that they oould sucowfuD/ ** *t*0"* "iti> *** ^ of wtincial irnemiion for f.id-der purpowj* »o the hot weather, when green fodder is generally tcarce. Canadian oats have again baw found to yield a very high outturn of »traw, and coiw^umtly to be especially wiUhle for culUvalion in winUrfor foddw.

6. Tbe various systems ol conserving cattle manure now under trial at the Farm are, Ukely to lead in tun* U> HUM r»uJU of economical value.

0. Tlu mriag of «inlk worm oUftbfd from A « u h*i •ftin pnnd a failure. It appears that (her coaot »Uad tb* bet climate of Ckvnpoi*.

7. Tb* new Afab rtallwa rmiraJ from tbe Ciril V«Uriawy IVputmrut bt» kept ver rcoodbmttbtburaibMtUMTMr. Tbm ia raougb *6aami* f*r ku unricM. but : tb* mAna ntwtfKi u« not grocnllf cf • good Lratliay cbM. On!/one m»tr wnrtd bj Km bu fMltd to ftr, wl tb,. Supnislradrat of U* Civil Veterinwy Dvputnwsl «M fuJljr *wttk&td* witb tbe tjiialitj of b«r fad oa Uw <xa*ion of ba but rint. It t% however, too wrl;]r«l *U>* form a dcfiaiW opbin witb ngw* to tb« iUUwa't work.

8. Tb« 1'hDoptt • miinpaat of tb« opcrmtioni *mi* tb« Fkrm bM, w far, U«o fully satisfactory.

1 t» r« tbt boowr to b».

Sir,

Your most obedient servant,

B. M. UADI,

Asst. Dir. in charge of the Dept. Land Records and A

N.-W. Provinces and Oudk,

REPORT

ON THE

CAWNPORE EXPERIMENTAL FARM

FOR THE

Kharif and Rabi Seasons, 1895-96.

I.—HISTORY OF THE FARM.

THE Government Farm, Cawnpore, is situated in village Gutaia, about three miles south-west of the Cawnpore city. It is near the Rawatpur station of the Cawnpore-Achnera Railway, and its distance from the Cawnpore East Indian Railway Station is about four miles. The land occupied was originally rented from the zamindars of Gutaia in May 1881, and in that year the important manurial experiments still carried on in the "standard" and "duplicate" fields, which will be described presently, were started by Mr. J. B. Fuller. Within a short distance of the Farm premises a small workshop for making and repairing agricultural implements and a [illegible] store were erected.

During the first years of management the area of the Farm underwent frequent changes, but of late it has not varied. The Farm proper, of which a map is attached, extends over [illegible]1·33 acres, excluding the land occupied by the canal distributary. It enjoys special facilities for irrigation, being served by a distributary from the Ganges Canal.

The soil of the Farm may be accepted as a fair sample of the light [illegible] loam which occurs on a large portion of the Gangetic Doab. It was chemically analysed some time before 1882 by Mr. S. A. Hill, B. S. C., Meteorological Reporter to the Government of the North-Western Provinces, and the analysis is given below :—

Constituents.	Composition per cent.
Combined water	2·04
Organic matter	0·16
Carbon dioxide	0·16
Ammonia	None.
Nitric pentoxide	0·11
Chlorine	Trace.
Sulphur trioxide	Do.
Phosphorus pentoxide	0·11
Silica and soluble silicates	0·13
Alumina	4·20
Oxides of iron and manganese	3·50
Lime	0·90
Magnesia	0·91
Potash	0·22
Soda	0·08
Clay decomposed by H_2SO_4 { Alumina oxide	2·14
{ Silica	3·27
Insoluble siliceous matter	79·56

Dr. Voelcker, in his report on the "Improvement of Indian Agriculture," records the following opinion regarding the Farm :—

"In fact, I was much pleased with the Cawnpore Farm, but was not prepared to find in India anything which so nearly came up to my idea of what an experimental station should be."

Several fields had been found by experience to suffer from waterlogging when a rain fell within a limited period. The level of such fields was raised (where it was possible to do so) in 1894 by means of spreading earth dug out from uncultivated strips of land adjoining, in order to improve the drainage. Large quantities of earth taken from the canal distributary were spread for similar purpose on a plot (Field No. 9 on the map) which used to be under water in the greater part of the rainy season every year.

: : GESEHAL CHARACTER OP THE SEASON

During the rainy [illegible] be hardly sufficient for agricultural requirements, and the autumnal rains which were consequently looked forward with great anxiety failed alto • * • • Detrimental as this was to the progress of agriculture, [illegible] xperimental Farm, where the deficiency in the rain was almost made up by canal irrigation. Still the sugarcane crop, which requires a moist ^ suffered to ^ MtM fr [illegible] in want of rain, and gave, [illegible] than it would have given in a season of better rainfall.

But for cotton the absence of rains in October and November and for wheat the absence of the rust-causing cloudy weather in February were very beneficial. The predominance of clear weather in the month of September gave sufficient time for a thorough tillage for the *rabi* crops, which were consequently sown earlier than usual.

Owing to clear weather and the early appearance of spring, the *rabi* crops ripened earlier during the year under report, and were harvested about a fortnight before the usual time.

The subjoined table shows the amount of rainfall during the year under report and the year preceding it :—

Month.	Actual				Normal.		Remarks.
	Rainfall.		Rainy days.		Rainfall.	Rainy days.	
	1894-95.	1895-96.	1894-95.	1895-96.			
April ...	—	—	—	—	·11	1	
May ...	0·22	—	2	—	·52	1	
June ...	7·88	1·54	10	5	3·11	4	
July ...	9·50	9·08	16	10	10·25	12	
August ...	13·02	7·54	7	12	10·08	12	
September ...	10·17	*5·03	6	5	4·93	7	* Of this 4·93 inches fell by the 3rd and the remaining ·10 inches fell on the 19th and 20th, as the rainy weather practically came to a close by the 3rd September.
October ...	10·12	—	3	—	1·22	2	
November ...	3·04	—	1	—	—	—	
December ...	0·29	0·02	—	1	·34	1	
January ...	2·16	—	2	—	·64	1	
February ...	0·32	—	3	—	·28	1	
March ...	0·20	—	—	—	·25	1	
Total ...	52·88	24·00	51	33	31·12	43	

II. •'-Tsutor MANURES.

(a) *Permanent manure experiments with maize and wheat.*

These experiments are carried on on four sets of 13 plots each. One set is sown with maize and another with wheat year after year, and the remaining two with maize and wheat alternately. The first two sets of plots are called the "standard" series and the last two the "duplicate" or alternate series. The manures mentioned in the following four statements are applied to the thirteen plots of every one of the four sets, so that the effect of every one of the 13 manures is tested on four plots every year.

Kharif standard and duplicate series.

Between the 3rd of January and 3rd of July 1895 the plots of the kharif standard series were ploughed six times with the Watt's plough, and were watered once on the 29th June before sowing. The plots were sown on the 4th July with Jaunpur maize at the rate of 12 lb of seed per acre.

Six ploughings were given to the plots of the duplicate series from 3rd February to 3rd Juh 1895. Plots Nos. 4, 9, 10, 11, 12 and 13 of this series were watered on the 29th June before sowing. The rest were not watered, as there was a fall of rain. Maize was sown in these plots on the 4th July at the rate mentioned before, and from 24th to 31st July seedlings raised elsewhere at the farm were planted in blank places where seed had failed to germinate.

•i,... respective outturns of the two series are shown in the following statements.—

Statement showing the outturn of the kharif standard series—maize.

Plot number.	Plot area.	Treatment with reference to manure per acre.		Outturn per acre in lb.														
				1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	1895-96.
K. 1	Each plot = 400 square yards.	Cowdung [illegible]		[illegible]	2,434 / 9,438	1,720 / 2,879	[illegible]	472 / 4,221	[illegible]	— —	48 / 254	[illegible]	488 / 927	652	500 / 3,146	[illegible]	[illegible]	[illegible]
K. 2		[illegible]		[illegible]	,708 / 188	1,044 / 3,734	[illegible]	[illegible] / 3,321	[illegible]	— —	— / 157	[illegible] / 7,187	140 / 171	[illegible]	605 / 2,944	[illegible]	[illegible]	[illegible]
K. 3		[illegible]		[illegible]	105 / 828	1,405 / 3,518	[illegible]	266 / 3,493	[illegible]	— —	— / 131	1,200 / 7,917	153 / 118	[illegible]	485 / 730	[illegible]	[illegible]	[illegible]
K. 4		[illegible]		[illegible]	1,452 / 7,159	1,073 / 3,165	1,250 / 3,707	327 / 3,107	[illegible]	— —	24 / 109	895 / 7,617	310 / 304	641 / 3,710	103 / 1,306	[illegible]	[illegible]	[illegible]
K. 5		[illegible]	Grain / Straw	— —	2,100 / 9,176	1,066 / 3,712	1,028 / 4,303	871 / 4,204	507 / ,209	— —	24 / 104	1,041 / 5,870	186 / 794	327 / 925	287	[illegible]	[illegible]	850 / 3,873
K. 6		[illegible]	Grain	— —	— —	1,282 / 3,783	1,200 / 4,212	320	847 / ,708	— —	— —	1,246 / 1,403	[illegible]	1,053 / 3,824	[illegible] / 2,008	[illegible]	[illegible]	1,034 / 8,277
K. 7		manure		— —	— —	1,708 / 3,463	[illegible]	[illegible] / 3,780	[illegible]	— —	— —	1,827 / 8,193	[illegible]	472 / 4,235	1,065 / 1,754	[illegible]	[illegible]	2,314
K. 8		cowdung +		— —	— —	— —	[illegible]	720 / 6,509	[illegible]	— —	[illegible]	[illegible]	[illegible]	1,234 / 3,368	266 / 1,040	[illegible]	[illegible]	[illegible]
K. 9		[illegible]		1,488 / —	— —	— —	[illegible]	461	[illegible]	— —	[illegible]	[illegible]	[illegible]	496 / 3,445	237 / 4,422	[illegible]	[illegible]	[illegible]
K. 10		[illegible]		— —	— —	— —	[illegible]	[illegible]	[illegible]	— —	— —	[illegible]	[illegible]	1,312 / 3,689	200 / 1,964	[illegible]	[illegible]	[illegible]
K. 11		[illegible]		— —	— —	1,739 / 3,069	[illegible]	[illegible]	[illegible]	— —	— —	[illegible]	[illegible]	665	320 / 1,032	[illegible]	[illegible]	[illegible]
K. 12		manure + gypsum 3		— —	— —	1,495 / 3,905	1,363 / 3,773	[illegible]	[illegible]	— —	— —	[illegible]	[illegible]	[illegible]	728 / 1,251	[illegible]	[illegible]	2,232 / 7,278
K. 13		[illegible]	Grain / Straw	1,220 / —	,065 / ,123	980 / 3,842	1,044 / 3,779	[illegible]	485 / 4,747	— —	— —	4,247	171 / 124	[illegible]	218 / 760	[illegible]	104 / 3,027	1,029 / 4,327

Statement showing the outturn of the kharif alternate series—maize.

Plot number.	Plot area.	Treatment with reference to manure per acre.		Outturn per acre in lb. 1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	1895-96.
	Each plot = 437 square yards.	150 maunds a lime [redacted]	Grain ...	—	1,845	1,377	1,508	620	663	—	262	1,331	1,118	956	262	877	[redacted]	1,110
			Straw ...	—	7,148	3,109	7,106	3,603	3,372	—	308	7,310	7,908	3,872	3,021	[redacted]	[redacted]	4,472
		[redacted] + gypsum 2	Grain ...	—	1,704	979	1,224	641	572	—	423	1,555	1,053	744	533	[redacted]	[redacted]	1,180
			Straw ...	—	4,755	2,040	6,037	3,042	3,844	—	702	7,023	8,133	4,333	3,300	[redacted]	[redacted]	3,209
		[redacted] —	Grain ...	—	2,020	1,170	1,266	605	665	—	131	1,273	659	662	560	1,142	[redacted]	1,004
			Straw ...	—	7,855	2,597	6,116	[illegible]	4,001	—	411	6,900	6,340	3,479	[illegible]	6,826	4,323	2,020
		[redacted] cowdung ...	Grain ...	—	222	713	866	315	592	—	—	720	300	344	1,113	409	852	750
			Straw ...	—	3,865	2,327	4,009	2,371	3,461	—	181	6,069	3,148	3,751	3,290	8,270	4,707	2,904
		[redacted] —	Grain ...	—	1,279	820	874	484	530	—	—	1,077	620	484	470	1,503	750	792
			Straw ...	—	7,052	2,323	4,769	2,829	3,067	—	145	6,601	3,346	2,178	2,902	7,744	4,826	2,807
		[redacted] bone-super-	Grain ...	—	—	1,048	852	702	580	—	—	1,222	1,367	478	708	974	337	898
			Straw ...	—	—	2,837	4,420	3,519	3,166	—	200	1,779	8,143	3,105	4,077	5,262	6,063	3,383
		[redacted] bone-dust	Grain ...	—	—	300	1,052	208	286	—	—	1,346	1,254	1,250	404	1,331	1,080	1,146
			Straw ...	—	—	2,222	4,305	2,436	3,844	—	200	970	8,379	4,906	3,790	6,338	7,173	4,247
		[redacted] cowdung +	Grain ...	—	—	—	1,134	622	477	—	200	1,013	899	871	544	1,673	690	1,447
			Straw ...	—	—	—	2,648	3,863	4,250	—	671	6,792	7,272	3,014	4,829	10,033	7,100	3,445
		[redacted] —	Grain ...	—	—	—	1,729	622	1,161	—	248	1,379	1,290	1,101	1,210	2,111	1,263	2,097
			Straw ...	—	—	—	7,063	[illegible]	3,029	—	702	7,348	3,244	2,062	6,843	12,044	7,054	3,023
		[redacted] —	Grain ...	—	—	—	1,109	847	776	—	131	1,370	1,202	990	1,235	2,037	865	1,160
			Straw ...	—	—	—	3,707	4,133	4,210	—	244	8,325	8,376	3,140	3,470	8,760	3,602	2,941
		[redacted] dust 1½ maunds.	Grain ...	—	1,026	1,244	1,260	623	544	—	—	1,040	774	786	788	1,032	722	1,063
			Straw ...	—	7,183	3,040	4,018	3,541	4,622	—	242	7,324	2,466	3,038	2,050	7,373	6,403	4,671
		Sheep-dung 180 maunds + gypsum 2 maunds.	Grain ...	—	—	1,341	1,974	520	259	—	295	1,422	1,488	942	795	1,343	871	1,535
			Straw ...	—	—	3,031	4,769	3,321	4,491	—	344	10,477	4,750	2,214	4,271	7,207	6,686	3,834
		Unmanured ...	Grain ...	—	324	602	504	194	205	—	268	302	471	629	337	746	290	774
			Straw ...	—	5,026	2,049	3,342	262	3,436	—	662	4,400	5,994	3,378	3,713	6,062	3,403	2,178

It will he wen that during the year under report the tf₄rec «heep-dung plots and the pntnlMt" jiloti have piven the 1 w*t outturn*; the cowdun? plot* come next;1hen oom« llw unmanured plot, and the saltpetre and a»hec plot* « which the germination m particularly poor come the lart.

An explanation for the *lower* outturn* given by taltpetre aim menu to lie in the fact that 3 maundi of thi* manure *upplr a mnch (mailer quantity of (itrogen to the wit u enmparad with the ibeep-dang, pondrctte mad oowilsng in the (jaantitie* ia which they are applied in thi* experiment. Thi* Cut ha* been determined by a chemical analytw of tbe cereral manuref.

mbi standard and duplicate terifjf.

Tbe following it a detail of U» cultivation of the *rain* ttand&rd and alternate series :—

Fro•a the middle of June 1895 to the beginning of October 18»6 the plot* were ploughed three time* with the Watt'* plough and the land levelled with the *patela* aft<r each ploughing. Tbty wore aown on the Uth October with Muiaffarnagar wheat at the raU of 13! H> per acre. The plot* were watered throe time* between NovetBba 1S9& and February 1S9B.

The crop ws* hanreattd about the end of March 1890.

The following table* *Aaw* the outturn* of both the teriei:—

Statement showing the outturn of the rabi standard series—wheat.

Each plot = 400 square yards.

Plot num ber.	Plot area.	Treatment with reference to manure per acre.	1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	1895-96.
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Statement showing the outturn of the rabi alternate series—wheat.

Plot area.	Treatment with reference to manure per acre.	1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	1895-96.
Each plot [illegible] yards.	Cowdung 1[illegible] maunds.	178	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,634	[illegible]	[illegible]	[illegible]	[illegible]	1,280 / 1,621	1,000 / 3,330
	Cowdung 1[illegible] [illegible]	204	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2,511 / 2,633
	Cowdung 1[illegible]	738	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2,346	[illegible]	[illegible]
	Ashes of 1[illegible] [illegible]ung	378	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,434 / 2,257	[illegible]	[illegible]
	Saltpetre 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,730 / 3,916	[illegible]	[illegible]
	Saltpetre 3 maunds + bone superphosphate 3 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2,000 / 3,884	[illegible]	[illegible]	1,086 / 3,401	[illegible]	[illegible]
	Sheep-dung 180 maunds + [illegible] maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2,060 / 3,448	[illegible]	[illegible]	2,033	[illegible]	[illegible]
	Ashes of 180 maunds of [illegible] petre 3 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,070	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Poudrette 180 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2,074	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]ung 180 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,701 / 2,420	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Saltpetre 3 maunds + [illegible] maunds.	1,375	2,080 / 3,534	2,301	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,742 / 2,904	2,771	[illegible]	[illegible]	[illegible]	[illegible]
	Sheep-dung 180 maunds [illegible] maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,724 / 2077	[illegible]	[illegible]	[illegible]	[illegible]
	Unmanured	771	1,708	3,672	[illegible]	[illegible]	3,859	1,779	617 / 1,240	1,876 / 3,054	[illegible]	1,585	[illegible]	2,154	1,077	3,170

Outturn per acre in lb.

Here also the best outturn was given by sheep-dung plots, the next best by cow-dung and poudrette. The lowest outturn was obtained from saltpetre and ashes.

As a rule, the outturns of the *rabi* alternate plots are higher than those of the *rabi* standard. The explanation to this lies in the varying length of time each of the four series has between two crops borne by it, *i.e.*, the crop of one year and that of the next. Thus:—

Kharif standard (maize after maize) has a fallow of about ... ... 9 months.
" alternate (maize after wheat) ... ... 3 "
Rabi standard (wheat after wheat) ... ... 6½ "
" alternate (wheat after maize) ... ... 12½ "

This year, however, the yield of the *rabi* duplicate plots was, contrary to past experience, lower than that of the *rabi* standard plot, owing to less uniform germination and the consequent smaller number of plants in the last-mentioned plots. This [illegible] alternate plots were maize [illegible] and [illegible] out into, large [illegible] first ploughing [illegible] [illegible] into powder [illegible] of sowing; [illegible] in the [illegible] series [illegible] the time of [illegible] sowing was f[illegible]

The unusually high [illegible] at the Farm were, in a great measure, [illegible] *rabi* of 1895-96 [illegible] good for irrigated crops. The general opinion of *rabi* 1895-96 [illegible] true for unirrigated crops; but the Farm crops being irrigated were better th[illegible]

(f) Manurial experiment with potatoes.

This was started in 1893 on two sets of five plots each. One set was grown with the white skinned country [illegible] "Madrasi" [illegible] the other with [illegible] hill variety from Naini T[illegible]

Details of cultivat[illegible] country variety:—

Tillage.—Ploughing began on the 8th of July. Two ploughings were done with the Watt's plough, subsoiling once, cultivating three times with the Planet J. R. Horse Hoe, and levelling the land with the *patela* [illegible] obtained was about 10 inches deep.

Manure.—Spread a few days [illegible]

Sowing.—Was done on 16th October in rows 1½ feet apart from row to row and about 8 to 9 inches apart in the row. Medium sized whole tubers 1,210lbs. per acre were planted. The seed was good and germination uniform.

Earthing up.—[illegible] November.

Irrigation.—Five times.

Digging out the tubers.—On [illegible] months.

The following statement gives the outturn of the country variety in 1895-96 and in the previous years:—

Statement showing the effect of certain manures on country potato.

Plot number.	Plot area.	Manure applied per acre.	Outturn per acre in lb. 1893-94.	1894-95.	1895-96.	Remarks.
26/1	Each plot 750 sq. yards.	Farmyard manure, 200 maunds ...	10,170	4,103	17,374	Supplying about 100lb. of nitrogen.
26/2		Poudrette, 200 maunds ...	8,062	6,823	18,061	Supplying about 100lb. of nitrogen.
26/3		Castor-cake, 12 maunds ...	11,410	3,290	17,273	Supplying about 40lb. of nitrogen.
26/4		Bone superphosphate and saltpetre 4 maunds each.	11,300	2,499	14,027	Supplying about 20lb. of nitrogen.
26/5		Unmanured	7,138	1,718	13,080	

It will be observed tliat daring the year under report the outturns in all the plots were generally good. Ptajifttfts Rave the beat outturn and cwtor-calce nnd farm-yard manures have done nearly equally well. The high outturns on ail the plota and the outturn of 12,6801b, oa the untnanuml plot are chiefly due to the bare*fallowing of the plota for 8 month*, good tilth add aeed and uniform germination. The yields of the several ploU were aoM at under :—

Kmrmyurd manure plot for Rs. 26-11-6 or Bs. 182-2-3 per tore. Powlrrtt* plot for R*. *tS-b-S* or tU. 194-3-0 per acre. Caator-ctlrc plot for Re. 28-13-10 or Kc *ISi-t-t* per ten- Sapafpbaepatta and nitre plot for IU. S1-H-11 or Us. 149-8-2 per acre. Unmanured plot for 11*. 1&-15-3 or It*. 129-3-3 per acre.

With a view to determine the outturn of country potatoes under high cultivation a Beit of *,0d k *qnaro yardi and in fair oondition was grown with potatoej. The manure applied wat poudrette at the rate of 890 maun *U* per acre. Tlio yield obtained wai 13,85ttb., ML, about £01 maunds per acre. Thd produce was told for H*. 1*1-4-0 which ii equivalent to a return of IU. 109 per acre.

Details o/ettf(«w<K>K.—For the hill potatow :—

Tillage—Three |.lunBhingt with the Watt's plough; cultivating four times witb tbe Plaxwt J. S. Howe Hoe. Tbe rwt as in the eottntry variety,

Manure—Was spread a day before sowing.

Sowing—Was done on the iSth and 20th November. Tuber* cut to peices obtaining two or more buds were planted at the rate of l,0Q21bt. per acre. Seed and germination were good. The ridge* were 2 f feet apart from centre to centre and tbe " seta " were planted a foot apart on the ridges.

Karthintj—On<<« betides the ridge* that were made before towing.

Irrigation-*fltf times.

Diggins <'** *** *tvlxrt*—On the 15th April 189fl.

0WM*e* ami »Mj'«-rte«—Tbe germination wta good, the plants came up well and were promising till about the middle of February when the leaves began to dry and thii itate iocratted more and atore in §pite of watering. It was clearly due lo the drier and hotter weather of February and March thU year than u.ual The tubers were alto attacked by white anu—to a greater extent on tbe cowdung and poulrotte plots than on tbe other*. Hut fur three two injuries the crop would have yielded a higher outturn than it did.

Tbe results of the experiment are tabulated in the statement below •,—

StaUmtnt Aoving Ih rtnJU of tiu txperiment with Kill potato*.*

Plot number.	Plot area.	Manure applied per acre.	Ottfcw far MM ia ft.			Remarks.
			IIH H.	1894-95.	1895-96.	
If	Each plot = 780 square yards.	Farmyard manure, 200 maunds ...	1,664	7,424	MM	
		Poudrette, 200 maunds ...	2,532	8,532	UN	
20a 3		ttifc>r*l emit, II i maunds ...	3,036	8,068	5,207	
		Bone superphosphate 4 maunds and saltpetre 4 maunds.	2,881	7,018	5,810	
20a 5		Unmanured ...	1,081	5,402	3,177	

Th« plan of tbe manurkl nperiment with the two wietiaa of potatoet haa ttoc* htJB matrna.Hr tttmd by the Agricultural Chtmist to the Oonrnmnt of India and Is described fully !* bis noU (Appendix A).

(f) MitnuruU trptrivunl vtitk indigo,

Hut wai started io 1893-94.

The following table shows the results of the experiment :—

Statement showing the comparative effect of gypsum and other manures on indigo.

Plot number.	Plot area.	Manure applied per acre.	Outturn of green indigo stalks per acre. 1893.	1894.	1895.	Remarks.
			lb.	lb.	lb.	
275/1	Each plot = 1,210 square yards.	Cowdung, 150 maunds	13,136	3,214	11,420	
275/2		Gypsum, 3 maunds	10,406	1,004	3,400	
275/3		Bone-dust, 5 maunds	10,020	3,370	10,818	
275/4		Unmanured	7,200	2,304	8,224	

Experiment with gram and peas.

The subjoined table gives the results of this experiment :—

Statement showing the comparative effect of certain manures on gram and peas.

Plot number. Gram.	Peas.	Plot area.	Manure applied per acre.		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Remarks.
[illegible]	[illegible]	Each plot = 400 square yards.	[illegible] manure, 100 maunds	Grain / Straw	[illegible]	[illegible]	1,-19 / 478	[illegible]	[illegible]	
[illegible]	[illegible]		Gypsum 3 maunds	Grain / Straw	[illegible] / 1,470	[illegible]	[illegible]	[illegible] / 411	[illegible]	
[illegible]	[illegible]		Ground kankar, [illegible] maunds ...	Grain / Straw	[illegible]	[illegible] / 157	1,200 / 1,204	[illegible]	[illegible]	
[illegible]	[illegible]		Bone superphosphate, 3 maunds	Grain / Straw	1,128 / 320	61 / 182	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		Unmanured	Grain / Straw	835 / [illegible]	21 / [illegible]	[illegible]	[illegible]	[illegible]	

(c) Sugarcane manurial experiment.

This was started in 1894-95 in accordance with instructions received from the Agricultural Chemist to the Government of India. The variety chosen for the experiment was [illegible] the same plots were used during [illegible] as in the previous year.

Details of cultivation.—

[illegible] the 22nd J[illegible] 5 ploughings were done in all [illegible] once with Watt's plough; cultivating once with [illegible] harrowing twice. The land was levelled twice with the patela.

Planting.—[illegible] March by dropping the cuttings in furrows [illegible] the native plough in the ordinary country way. The [illegible] part.

[illegible] Weeded twice, hoed twice, plants earthed up once.

Irrigation.—Ten waterings were given in all.

General.—The germination was irregular in (1) the superphosphate (2) the superphosphate and nitre and (3) the bone-dust plots. In all the plots except the first three plots of the series viz. V, V and V the growth of plants was very slow and especially so on the superphosphate plot. The failure of rains in September and October also checked the growth of plants somewhat and a borer caused some damage in September. The following statement gives the results of the experiment for 1894-95 and 1895-96 :—

Statement showing the result of manurial experiment with sugarcane.

Plot number.	Plot area.	Treatment with reference to manure per acre.	1894-95. Yield per acre of— Cane.	Juice.	Gur.	Percentage of— Juice to cane.	Gur to juice.	Gur to cane.	1895-96. Yield per acre of— Cane.	Juice.	Gur.	Percentage of— Juice to cane.	Gur to juice.	Gur to cane.	Weight of green tops.	Weight of dried leaves.
			lbs.	lbs.	lbs.				lbs.	lbs.	lbs.				lbs.	lbs.
28/1	Each plot = 1,210 square yards.	Unmanured ...	30,254	15,006	3,102	49·33	10·48	8·13	21,250	10,643	1,806	49·5	17·4	8·4	16,170	5,075
28/2		Cowdung 7 tons ...	26,414	13,156	3,124	52·61	10·00	8·07	15,808	7,177	1,212	45·5	16·02	8·26	15,823	4,882
28/3		Cowdung 14 tons ...	34,713	17,760	2,836	51·22	15·95	8·17	13,036	6,413	1,153	40·6	17·0	8·4	13,379	4,676
28/4		Bone superphosphate 2 cwts.	37,440	18,929	3,106	50·55	16·40	8·24	5,480	2,610	344	48·2	12·9	6·2	7,417	2,071
28/5		Saltpetre 2 cwts. ...	35,272	18,336	3,100	51·00	16·90	8·71	12,626	5,556	1,018	40·7	18·2	7·4	13,869	5,450
28/6		Bone superphosphate 2 cwts. + saltpetre 2 cwts.	30,033	15,082	2,656	49·23	17·61	8·60	10,180	4,328	775	42·8	17·9	7·6	9,612	3,808
28A/1		Bone-dust, 5 cwts. ...	47,575	24,028	3,484	52·40	13·06	7·32	11,055	5,054	852	45·7	16·9	7·7	9,638	3,747
28A/2		Bone-dust 5 cwts. + 2 cwts. saltpetre.	41,808	21,050	3,076	51·88	14·18	7·35	8,167	3,797	602	46·5	15·8	7·8	7,077	3,543
28A/3		Unmanured ...	43,120	21,048	[illegible]	50·20	13·75	[illegible]	7,630	3,341	582	43·8	17·4	7·6	8,802	3,546

It will be observed that the outturns in 1894-95 were in all the plots much higher than in 1895-96. This was partly due to the fact that the plots were in better condition in the first year. The cane crop of 1894-95 had probably taken up a considerable quantity of plant-food from the soil and to replace it before the next crop, the succeeding year with no more rest for the land than that of about 2 months, much heavier manurings than those provided in this experiment were necessary.

In both the years the 14-ton plot has given a lower outturn than the 7-ton plot and the first unmanured plot; the saltpetre plot has done better than the bone-dust and saltpetre, and saltpetre alone has done better than saltpetre and superphosphate. This shows that the difference in the produce is not due to difference in manures but to other causes, chief of which is the want of uniformity in the condition of the land. This manurial experiment has therefore so far led to no definite conclusion as regards the effects of the several manures used.

It has, however, shown that the quantities used in this experiment are insufficient to produce appreciable effect on the yield. The plan of this experiment also has been altered as suggested by the Agricultural Chemist to the Government of India. The details of the new plan are given fully in his note appended to this report (Appendix A). Another point worthy of notice is the uniformly higher percentage of juice obtained in 1894-95 than in 1895-96. This was due partly to the canes having been in the former year longer, thinner and more juicy, and partly to the fact that some of the mills used during the year under report were not in such perfect working order as those used in 1894-95.

(*f*) *Permanent experiment with green manuring.*

Series A.

This experiment was started in 1895-96 and has for its object the determination of the manurial effect of—

(a) Ploughing in a leguminous crop.
(b) Growing a leguminous crop in alternation with wheat.
(c) Indigo refuse as manure.

The [illegible] applied to plots Nos. 3, 4, 10, 11, 12 and 13 was adopted some years ago in accordance with the advice of Dr. Leather, the Agricultural Chemist to the Government of India.

The hemp on plot No. 7, the indigo on plot No. 8 and the urd on plot No. 10 were ploughed in on the 2nd September 1895. The hemp on plot 6 and the indigo on plot 9 were cut off the field on the 16th September 1895. The rape on plot 3 was sown on [illegible] August 1895, and ploughed [illegible] October 1895. The rainy weather practically closed on the 3rd September. Thus a great part of the rainfall was utilized by the green [illegible] crops that occupied the land in July and August, and the plots under these were, in September and [illegible] at the time of sowing in October, much drier [illegible] exposed [illegible] The result [illegible] the plot which carried a green manuring crop in the rainy season (with [illegible] rape) the tilth obtained for sowing in dry and full of clods [illegible] seed sown on 16th October did not germinate until a few days after they were watered on the 9th November. While plots [illegible] 3, 4, 5 and 11 germinated in about a week after sowing and thus the wheat crop on these plots had a clear start of about [illegible] over the plots which bore a green manuring crop in the kharif. Besides [illegible] these latter plots had to be done in about a month's time while the former plots i.e. Nos. 1, 2, 3, 4, 5 and 11 had a period of 4 months for their tillage. The tilth of the plots under green crops was therefore more artificial and less weathered. The [illegible] to the action of the weather was strikingly [illegible] of the rape plot [illegible] which the ploughings done though equal in number to those done in other plots of the series, had to be completed in about a week (i.e. between the 5 and 15th October) and the seed-bed obtained was as fine, moist and deep as on the unmanured and other plots whose tillage extended over four months. But the wheat crop on the rape plot was strikingly pale and miserable from the beginning to the end for which there appears to have been no other cause than the want of weathering of the seed-bed.

With a view to know the quantity of organic matter that is ploughed in, the hemp, the indigo &c. were all cut and weighed before ploughing them in or removing them off the fields. Specimens of the plants ploughed in have been submitted to the Agricultural Chemist to the Government of India for analysis, so that we may know definitely how much nitrogen has been ploughed in, but the analyses have not been yet received and therefore simply the weights of stem and leaves of the several plots are noted below :—

Plot No. 6 Hemp removed	...	...	...	12,030 lbs per acre.
Do. No. 7 Do. ploughed in	...	...	...	14,865 lbs ditto.
Do. No. 8 Indigo ditto	...	...	...	3,021 lbs ditto.
Do. No. 9 Do. removed	...	...	...	3,000 lbs ditto.
Do. No. 10 [illegible] ploughed in	...	...	...	15,279 lbs ditto.
Do. No. 3 Rape ditto	...	...	...	2,523 lbs ditto.

The hemp and urd crops were good but the indigo on the two plots was bad and had been poor in the previous 2 years also, for which no exact explanation is known.

In some places there is a belief current amongst cultivators that indigo cannot be successfully grown on the same land year after year unless the land is rich. Perhaps this may be the case with these plots. The very low outturn of rape is due to the fact that it is a rabi crop and has been experimentally grown as a *kharif* crop, but without success so far. The following statement gives [illegible] the year under report and the previous years :—

STATEMENT.—Showing the result of experiments to determine the effect of "green manuring" on wheat.

		Manure applied per acre.	Outturn per acre in lb.
[illegible]	[illegible]	[illegible]	[illegible]

[illegible] indigo [illegible] done [illegible]. The high[illegible] of the unmanured plot [illegible] former [illegible] enough [illegible] without the help of artificial irrigation and [illegible] crop of [illegible] fortnight over the plots that [illegible] crop. [illegible] of wheat than [illegible] plot [illegible] explained.

Temporary green [illegible]

Series II.

An experiment on another set of four plots was started four years ago to serve as a duplicate to the [illegible] series. The weights of plants ploughed in this series are given below:—

Hemp ploughed in ...	5,780lbs per acre.
Urd ditto ...	13,330lbs do.
Kharti (Dolichos biflorus) ...	6,201lbs do.

The out-turns of wheat obtained are given in the following statement. The plots of this series also needed artificial irrigation to complete the wheat germination:—

Statement showing the result of temporary green manuring series—crop wheat.

Plot number.	Plot area.	Manure applied.		Outturn per acre in lbs. 1903-04.	1904-05.	1905-06.	Remarks.
27a/1	730	Green hemp ploughed in ...	Grain ...	837	264	572	
			Straw ...	2,147	682	1,764	
27a/2	730	Green kharti ploughed in ...	Grain ...	828	200	1,059	
			Straw ...	1,343	806	2,117	
27a/3	730	Green urd ploughed in ...	Grain ...	720	270	731	
			Straw ...	1,820	1,124	1,318	
27a/4	960	Unmanured ...	Grain ...	341	414	1,139	
			Straw ...	1,360	1,050	2,152	

IV.—METHODS OF CULTIVATION.

(*a*) *Early and late sowing of maize.*

This experiment was started in 1897.

The "early sown" plot [illegible] August; the "late sown" plot [illegible] October. The following statement shows the results of the experiment during the year under report and the previous years.

Plot number.	Plot area.	Quantity of manure applied.	Description of sowing.		Outturn per acre in lb. 1897-98.	1898-99.	1899-00.	1900-01.	1901-02.	1902-03.	1903-04.	1904-05.	1905-06.
Field No. 25. 45a	Each plot = 1,525 square yards.	Farm-yard manure 200 maunds per acre.	Early sown	Grain	784	1,168	2,002	500	1,043	1,076	1,825	212	553
				Stalk	3,711	3,467	7,090	7,060	3,686	7,724	4,762	4,078	3,006
45b			Late sown	Grain	616	1,080	1,502	465	1,506	2,028	1,201	275	1,053
				Stalk	4,004	3,362	3,640	3,124	3,070	6,314	3,320	4,546	3,583

The "late sown" plot gave, in 189*, better results than the "early sown" plot, contrary to general experience.

(b) Experiment in early and late sowing of cotton.

The experiment was started in 1891.

The "early sown" plots were sown on the 11th June and the "late sown" plots on the (1st) July. The results are tabulated in the subjoined statement which will show that in the past year five out of the seven varieties gave higher outturns by earlier sowing and that the outturns have been sufficiently good owing to a favorable season for cotton:—

Statement showing the results of early and late sowing of cotton.

No. of plot.	Area.	Treatment referred to.	Varieties.		1891-92 Fibre.	1891-92 Seed.	1892-93 Fibre.	1892-93 Seed.	1893-94 Fibre.	1893-94 Seed.	1894-95 Fibre.	1894-95 Seed.	1895-96 Fibre.	1895-96 Seed.
17/1 A.C.	1 plot = 242 square yards.	pounds per acre.	Varadi	Early	[illegible]	200	90	223	[illegible]	[illegible]	33	30	[illegible]	404
1				Late	[illegible]	102	75	145	118	128	26	24	—	237
2 A.C.			Bani	Early	115	281	41	[illegible]	[illegible]	[illegible]	27	[illegible]	[illegible]	[illegible]
2				Late	20	42	52	108	[illegible]	[illegible]	10	27	[illegible]	[illegible]
17/3 A.C.			Dharwari	Early	[illegible]	[illegible]	[illegible]	[illegible]	22	78	17	20	[illegible]	[illegible]
3				Late	42	[illegible]	[illegible]	219	[illegible]	[illegible]	6	10	[illegible]	[illegible]
17/4 A.C.			Baroda	Early	172	[illegible]	[illegible]	[illegible]	25	100	20	36	148	[illegible]
4				Late	32	[illegible]	69	145	42	136	10	17	80	[illegible]
17/5 A.C.			Louisiana	Early	[illegible]	420	128	[illegible]	42	[illegible]	[illegible]	30	134	[illegible]
5				Late	22	45	54	123	54	102	22	23	84	[illegible]
17/6 A.C.			Jari	Early	60	[illegible]	118	228	[illegible]	128	24	26	111	[illegible]
6				Late	22	46	73	183	64	60	18	20	128	[illegible]
17/7 A.C.			Country	Early	172	345	133	[illegible]	[illegible]	227	34	76	[illegible]	[illegible]
7				Late	22	84	113	[illegible]	74	[illegible]	40	[illegible]	[illegible]	336

(c) Experiment with mixed crops.

This experiment was started four years ago with the object of determining.—

(i) the comparative outturns of certain kharif crops in terms of the more common mixtures in which these crops are grown by the ordinary cultivators;

(ii) which of these common mixtures is the most profitable.

The following statement gives the results of the experiment during the year under report and the previous years:—

Statement showing the result of experiment with mixed crops.

Plot number.	Plot area.			Quantity of seed sown per plot in lb.	[redacted] acre in lb.								Cost of cultivation including seed, labour, rent, &c., per acre.	Value of out-turn.	Net profit or loss.	Remarks.
					1897-98.	[illegible]	1900-01.	[illegible]	1902-03.	1903-04.	1904-05.	1905-06.				
				No.									Rs. a. p.	Rs. a. p.	Rs. a. p.	
M.C.1	1	[illegible]	Grain / Stalk	1	—	[illegible]	—	[illegible]	137 / 508	1,180 / 2,700	808 / 2,432	125 / 450	20 10 0	18 14 0	−1 12 0	
		[illegible]	Fibre / Seed	2	—	—	—	[illegible]	1 / 12	1 / 3	12 / 21	22 / 53				
		[illegible]	Grain	1	—	—	—	[illegible]	—	—	—	2				
		[illegible]	Grain / Stalk	4	—	—	—	[illegible]	21 / 209	31 / 315	43 / 182	50 / 224				
M.C.2	2	[illegible]	Grain / Stalk	1	—	37	37	[illegible]	271 / 1,100	756 / 2,808	— / 1,194	101 / 477	22 14 0	27 8 0	+4 10 0	
		[illegible]	Grain / Stalk	2	[illegible]	[illegible]	509	[illegible]	224 / 4,047	299 / 2,424	— / —	320 / 1,900				
M.C.3	3	[illegible]	Grain / Stalk	1	[illegible]	[illegible]	587	[illegible]	1,424 / 3,460	530 / 2,210	209 / 1,541	155 / 409	24 0 0	42 12 0	+18 12 0	
		[illegible]	Grain / Stalk	2	[illegible]	[illegible]	—	[illegible]	500 / 8,208	349 / 3,092	32 / 2,315	734 / 4,606				
M.C.4	4	[illegible]	Seed	1	—	—	—	452	387	253	—	94	23 1 0	24 2 0	+1 1 0	
		[illegible]	Fibre / Seed	2	—	—	—	30 / 63	1 / 2	2 / 2	7 / 11	20 / 52				
		[illegible]	Grain	1	—	—	—	32	—	—	—	4				
		[illegible]	Grain / Stalk	1	—	—	—	61 / 403	7 / 16	28 / 235	40 / 153	104 / 1,406				

(d) *Experiment with old and new indigo seed.*

This was started in 1893, at the request of Mr. Whitehart, Secretary, Upper India Chamber of Commerce, with the object of determining how long indigo seed can be kept without undergoing deterioration in its vitality and fitness for sowing.

The following table shows the outturn:—

Statement showing the results of experiment with old and new indigo seed.

Plot number.	Serial number of plot.	Plot area.	Detail of seed.		Outturn per acre in lb. 1893-94.	1894-95.	1895-96.
[illegible]	1	Each plot = [illegible] square yards.	Indigo seed 4 months old	Stalk	8,843	10,004	10,712
				Seed	120	115	—
[illegible]	2		Ditto 1 year and 4 months old	Stalk	9,719	11,122	11,733
				Seed	173	111	—
[illegible]	3		Ditto 2 years and 4 months old	Stalk	6,903	5,048	8,202
				Seed	137	99	—
[illegible]	4		Ditto 3 years and 4 months old	Stalk	6,303	6,808	5,445
				Seed	132	98	—
[illegible]	5		Ditto 4 years and 4 months old	Stalk	3,222	3,000	3,504
				Seed	143	18	—

The results of the year under report and those of previous years show that "4 months old" and "1 year and 4 months old" seed have given nearly equally good outturns of stalks; that "2 years and 4 months old" and "3 years and 4 months old" seed have undergone appreciable deterioration; and that when kept for a year more the seed became much less valuable for sowing. Mr. Whitehart's experiments elsewhere are said to have yielded similar results. The experiment at this farm was done before taking a crop of seed from the stubbles, and it was no longer considered necessary, and the land was required for other purposes.

(e) *Experiment with lucerne.*

This was started in 1893-94 with the object of determining the relative merits of sowing lucerne broadcast, in furrows and on ridges.

The seed was sown at the rate of 20 lb. per acre but germinated indifferently, and blanks had to be filled in twice. From the time of sowing on the 30th September up to 15th June the plots received eleven waterings in all. The crop is now still standing and will be continued as long as possible, but the weeds, especially on the plot sown broadcast, are putting down the crop, and this plot required weeding, with hand-labour, from the time of sowing up to 15th June.

Statement A below gives the results of the experiment for the past three years and Statement B shows more detailed information for the three plots, in 1895-96:—

Statement showing the results of the experiment with "lucerne."

STATEMENT A.

Plot number.	Plot area.	Manure per plot.	Treatment.	Outturn per acre in lb. 1893-94.	1894-95.	1895-96.	Remarks.
A.	Area = [illegible] square yards.	Farmyard manure, 200 maunds per acre.	Sown on ridges	1,769	9,123	19,372	
B.			Sown in furrows	771	7,706	16,525	
C.			Sown broadcast	371	6,108	12,068	

Statement showing the different [illegible] of [illegible] lucerne.

STATEMENT B.

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	400	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,440	
[illegible]	[illegible]	[illegible]	2,705	[illegible]	[illegible]	
[illegible]	2nd May 1926	[illegible]	2,395	[illegible]	1,779	
[illegible]	[illegible]	[illegible]	1,408	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
		350	13,372	14,276	13,088	

Transplanting wheat.

Two years ago [illegible] on a small scale on the demonstration plots of the students of the Agricultural School for filling up blank spaces in the crop. In the year under report also and for the same purpose wheat seedlings about [illegible] days old were pulled out from the thickly grown parts of [illegible] fields and planted in blank spaces in the crops with generally very [illegible] water or [illegible] richer field [illegible] took [illegible] more readily. [illegible] fast shorter than the plant produced by seed and bore generally longer ears filled with more grain. These are points well known to cultivators regarding transplanted paddy, maize, juar, &c. In the current year a plot has been allotted for determining more systematically the outturns and other merits of transplanting wheat as compared with sowing [illegible].

V.—TRIAL OF IMPLEMENTS.

(a) Permanent experiment with deep and shallow ploughing.

This was started in 1892. Its object is to determine the effects of deep and shallow ploughing on [illegible]. There are three plots one of which is ploughed four times [illegible] the second four times five inches deep with the Watt's plough, and the third eight times four inches deep with the country plough.

The soil of the plot ploughed nine inches [illegible] with [illegible] improved plough lost a good deal of [illegible] ever of the soil till near the time of sowing and the same [illegible] to a less extent, [illegible] ploughed five inches deep.

Owing to deficient rainfall during the year the result was that as regards the moisture of the seed-bed and consequently the germination, plot No. 3 ploughed with the native plough was the best, that ploughed five inches deep with the improved plough was next best and the plot ploughed nine inches deep was the worst. This was anticipated, but could not be helped, as the experiment was a permanent one and the details of ploughing laid down long ago had to be literally carried out.

The subjoined statement gives the results of the experiment, showing that in the year under report the plot ploughed with the native plough gave better outturn than the other two plots. But the advantages of the improved plough do not lie so much in increased outturn [illegible] in the greater economy, speed and efficiency with [illegible] ly for sowing.

[illegible] 12 years are the reverse of the last year's results. It may be remarked here that these three plots did not receive any manure :—

Statement showing the results of the experiment with deep and shallow ploughing.

Plot number.	Plot area.	Treatment.		1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	Average of outturn 12 years.	1895-96.
				Outturn per acre in lb.															
P1.	Each plot = 2,420 square yards.	Ploughed 9 inches deep with improved plough.	Grain ...	...	1,036	1,220	721	258	597	...	994	920	1,000	601	1,350	1,078	265	802·06	1,180
			Straw ...	...	1,030	1,758	1,113	1,178	852	...	1,304	1,710	1,823	1,210	2,787	2,308	806	1,002·75	2,009
P2.		Ploughed [illegible] deep with improved plough.	Grain ...	...	771	673	850	210	408	...	933	634	807	678	1,427	1,073	228	729·50	1,250
			Straw ...	...	1,306	1,374	1,274	1,049	694	...	1,040	1,582	1,865	1,339	2,983	2,221	464	1,453·33	1,949
P3.		Ploughed 3 inches deep with native plough.	Grain ...	...	580	402	372	274	403	...	742	661	678	372	1,223	1,005	183	615·83	1,434
			Straw ...	...	940	900	908	1,113	281	...	1,500	1,062	1,258	1,198	2,738	2,484	456	1,209·91	2,077

Implements.

The following implements were tried at the Farm during the year under report.

I.—THE WOODEN COUNTRY SEED-DRILL.

In the Central Provinces, Bombay and a few of the Telugu districts of Madras a cheap and simple form of seed-drill is in common use. At the instance of Dr. Leather two such drills were obtained from the Central Provinces, one suitable for sowing kharif crops and the other for rabi crops. With the latter, one-half of a field in fair condition and which had been lying fallow for 7 months was sown with wheat and on the other half the seed was dropped in the furrows made by the native plough in the ordinary way. No manure was applied to the crop and no watering was done. The seed-drill is provided with three tines.

The furrow made by the central tine was about an inch deeper than the furrows made by the two lateral ones and the [illegible] as it was found that the seed choked the tubes [illegible] the two lateral tines and frequently blanks were left in the field. Probably want of experience in working with the drill was the cause of [illegible] in places where the drill is in use the labourers are trained to drop the seed in the hopper and [illegible] men who have special practice. It is hoped, however, that these minor difficulties will be got over, in the current year, by the substitution of [illegible] for the lateral tines.

The following statement gives the results of the experiment. The difference in the outturns of grain in favour of the ordinary sowing would certainly have been more than made up if the blanks referred to had not occurred in the drill-sowing:—

Statement showing the different methods of sowing wheat.

Plot number.	Plot area.	Treatment.	Outturn per acre. Grain.	Outturn per acre. Straw.	Remarks.
			lb.	lb.	
[illegible]	[illegible]	Sown with the drill ...	[illegible]	[illegible]	
[illegible]	[illegible]	Sown in the ordinary way ...	[illegible]	[illegible]	

One great advantage claimed for sowing in drills is the facility of bullock-hoeing and the greater economy and facility with which the crop can be kept free of weeds [illegible] between the lines. In the current year attempts will be made to determine the comparative outturn and quality of the drill [illegible] bullock-hoeing [illegible] of the bullock hoes now at the Farm or with our specially made to suit the drill, [illegible] the cost [illegible] when the drill is in use.

11 —Tma P U M T J, R. HoaainoK.

Tliim ha* now become a wmmou impkmnt at the Farm and w raaik work* a pair or nalinrn *md* bullocks. After the field b*l bean broken to tb« required deji- 4 (.lou^h, tin* implvmesl waa Urjf!v uml in the year under report and wit; r iut>««{ut>ntlr patvefamsg tbo ami and cleaning weeds for wheat, potato**, entton, nigarcane, fee , and for boaoff «rop* aoaru in !«*•• twa '"** rtlwr apart. Ordinary fann lainumr* eaefly adjtut it for hoeing crept drill varying width* and fuxl u> diffi'-nlty in working il saneraily.

The implement is li:ht and ttrong and w aniUhW ia India f>r atool B« S3 It can work 1| to ej acm a day aoeonJiAf to th« power of eattlr, tbe condition of th* »oil and th* seal of the dri*«r.

Ill .-HaMOW.

A aiapk and ucfal *it*en*[(»o of harrow that baa bean in twa al th*Saidfat farm for many *ymr** WH m.de at It* *Vun* workabop taat year aod baa brni ir»« full trial with *aU.foiory naolu. It h« baoona now OM ttf tba common implements in ua» at tb« farm. It owU R«. 1& and can be enpplwd bum tbe Fans workshop. It goes over 1 to 41 acne in a day according to tbe powrt of tbe rnttle \mA tbe cooditioo of th« auiL It can be worked l.y a pair of audium aiacd bnlloeba-

IY<— HovABtt'* Pwtr Pu>'

Tbi*. wUo fittrd witU a ttnlJ. Share made at the Para, baa bam fowl » «O' tuefttt imfUnirni for d«vpir tilkay*. It go«* down to a drptb of about * inclw, •** whan the awl ia baid a* in tbe wat of a mJ» atabbla in A; *l«-o «nl i for aasaraaiw lt-.-„ it i* worked with two patn, but in ordinary caaei with a single pair of good sized cattle.

OF CROPS INCLUDING KOnDFRU

(a). Experiment with foreign varieties of cotton.

Thia was started in 1888 with the object of determining which, if any, of the foreign cottons are suited for cultivation in these provinces. Originally the experiment bafan with lU varieties, but in 1893 four were »(„!M ^ j , , trial on aw«n! of low yield or of .fwior q ttl

TV following ia a detail of npmtioaa **rri«d oo in Uw , experiment :—

.;!•«! tanc« with KM ami hammed t*

Mu: J«att»d# per acre waa tymd on the plots just before sowing.

Away.—Tint wa» done on tie »rd Jane wilb twefull/ aalaetm) »ml. lute* w«n> fiiat marked on the plota 3 fat aaw nurkad oroatwaw * faet apart. At ibj »o or ' arad* war* dil.-lin] hy kbamren in mail bulat nWr * h n«tr with earth. Tbna tbe dibtJis; waa d«M on oaraera of hatlqrtfaaV

?1>—iaa.-Wben the pl.at. were about a amtb oW, an «M bajf 4 fawb plot the •ap*raW«a aod weaker pleau wer» palUd owl, laavtay en* plan: bela and two plant* «a tbe otbtr half. Tbw UD half of each |J •*• •il«r wa# onlf OM plant for 0 «}aai« U n»l. t, th. other naif *i* |iaau w«re alkm«l for amr/ < *tuar* faet. Tba famgn ruvtn pat farib a «nmbar larkad in theaa. whik waeaUvwed to gin each pU«t faUmp-lor lateral dtialopaaMt - MbtUer toalWw oa<|Mre feet for on* than for two pU

<;.—Tba arop aw weeded «Wi nasnml kl» hi •ce bafara aeanag. and we* Ulli.ir. hoad tbnee ..U> Caww* J K Ue«Ht4M>

irr^u(.uW.-.Tbi> waa d«M eaee U aaftaa lbe Ud for Uig* and fear '» dwu>» » * • • » • * • the arep on the following dates —MUJ No?anib ltod Daaraabar, 4Ab Aftil aaJ I W I Ma/.

Diseases and Injuries.—In September the foreign varieties alone and not the Country varieties were attacked by an insect which was identified by the Superintendent, Indian Museum, to be a curculionid beetle (weevil) belonging to an undescribed species of the genus *Myllocerus* which was previously sent to the Museum as attacking cotton in Lalmai in 1898. To get rid of these insects sprinkling of tobacco solution, ashes and lime-water were all tried without success. Eventually the worms were picked one by one by the hand and killed. The crop had no trouble with this insect afterwards.

Picking.—The season of picking began in the middle of October and closed in the middle of January. In the latter month plants again put forth fresh shoots, new leaves, flowers and bolls. The gathering of this second crop began in the beginning of May and closed altogether by the middle of June.

General.—As a result of the monsoon rains the plants put forth a luxuriant, rather rank, growth and are now bearing flowers and bolls.

The following shows the outturn of cotton in the previous years and in 1895-96, together with the yield of the second crop gathered in the hot weather of 1896:—

Statement showing the outturn of different varieties of foreign cotton.

Plot number.	Plot area.	Names of cotton.		Outturn per acre in lb.									Remarks.
				1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	1895-96.	Second crop in 1896.	
[illegible]	Each plot = 240 square yards.	Upland Georgian.	Fibre ...	138	160	103	54	86	34	—	—	—	
			Seed ...	352	365	228	131	171	102	—	—	—	
[illegible]		Tree cotton ...	Fibre ...	111	146	113	82	100	31	23	209	141	
			Seed ...	273	334	251	181	201	71	41	628	285	
41 A./3		Louisiana ...	Fibre ...	97	134	120	50	103	35	25	210	229	
			Seed ...	263	457	319	128	223	77	59	718	469	
41 A./4		Garo Hill ...	Fibre ...	100	134	91	103	98	85	—	—	—	
			Seed ...	242	308	137	186	217	157	—	—	—	
41 A./5		Hybrid ...	Fibre ...	81	163	108	52	103	39	27	289	195	
			Seed ...	207	445	259	138	298	83	57	773	399	
41 A./6		Sea Island ...	Fibre ...	97	104	91	54	182	32	28	320	160	
			Seed ...	235	314	213	130	363	70	63	868	365	
41 B.		Egyptian ...	Fibre ...	97	134	80	45	135	15	20	314	154	
			Seed ...	221	434	194	102	309	60	70	869	322	
		Hinganghat ...	Fibre ...	111	168	103	64	123	30	23	237	113	
			Seed ...	253	457	231	158	300	60	41	640	232	
		S. B. Mowry ...	Fibre ...	24	180	60	29	73	33	—	—	—	
			Seed ...	48	320	190	64	134	70	—	—	—	
		Shine's early prolific.	Fibre ...	24	140	40	18	91	23	—	—	—	
			Seed ...	48	290	160	43	184	71	—	—	—	
45/8		Jones's improved	Fibre ...	24	150	60	20	41	36	—	—	—	
			Seed ...	48	300	120	50	98	97	—	—	—	

The outturns obtained in the past season are extraordinarily good. But how far such outturns are possible in other years, and to what extent each of the several factors, namely, the favourable season, the allowing of sufficient room for the full development of each individual plant, the waterings, the bullock-hoeings, &c., concerned in the production of such good crops are responsible, further experiment and observation will be required before any definite opinion can be formed and the subject will be studied with special interest in future.

Experiment with the Khandesh and Assam varieties of cotton.

The experiment was started in 1894-95.

The cottons [illegible], but they were not bullock-hoed as the seed was sown broadcast.

The following statement gives the results of the experiment :—

Statement showing outturns of Khandesh and Assam varieties of cotton.

Plot number.	Plot area.	Manuring.	Varieties of cotton.		Outturn per acre in lb. 1894-95	1895-96 ([illegible])	Second crop in 1896.	Remarks.
10/4	Each plot = 200 square yards	Poudrette 200 maunds per acre.	Jari (Khandesh)	Fibre	17	221	133	
				Seed	34	616	279	
11/3		Ditto	Bani do.	Fibre	10	118	97	
				Seed	24	304	298	
10/2		Ditto	Jaintya (Assam)	Fibre	6	220	207	
				Seed	13	430	344	
10/1		Ditto	Garo-Hill do.	Fibre	13	220	108	
				Seed	28	413	197	

(c) Experiment with Canadian Oats.

This [illegible] started in 18[illegible] and [illegible] these [illegible] a luxuriant growth, putting forth a [illegible] of tillers, but followed by poor ear-heads of grain. The crop takes about [illegible] more than wheat and about 20 days more [illegible] may be [illegible] grain proper[illegible] [illegible].

The crop was sown on the 7th [illegible] at the rate of [illegible] per acre, but owing to [illegible] not [illegible] germi-[illegible]

The germination took place [illegible] plots a few days after [illegible] tion on the 10th November, [illegible] of hot-weather a better outturn [illegible] obtained.

The following table shows the results of the experiment :—

Statement showing the [illegible] of Canadian [illegible].

Plot number.	Plot area.	Variety of Oats.		Outturn per acre in lb. 1890-91	1891-92	1892-93	1893-94	[illegible]	[illegible]	[illegible]	Remarks.
[illegible]	Each plot [illegible] square yards	Prize Cluster	Grain,	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
			Straw,	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
		Canadian Triumph.	Grain,	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]		
			Straw,	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
[illegible]		[illegible]	Grain,	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
			Straw,	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
		Welcome	Grain,	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	
			Straw,	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	
[illegible]		[illegible]	Grain,	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
			Straw,	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
		White Egyptian.	Grain,	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
			Straw,	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	

(d) Experiment with American wheat.

The Political Agent of Bundelkhand sent a variety of wheat which he saw in 1894-95 [illegible] the garden of a Maharaja [illegible] free from [illegible], while the neighbouring fields were attack[illegible]. [illegible] it was an American variety and he took [illegible] measuring 1,21[illegible] into two [illegible] was sown [illegible] variety of wheat. The [illegible] containing saltpetre) and received no other [illegible].

The seed germinated well and grew into vigorous plants looking more like barley wheat and the ears also were more like those of barley. The plants of this variety wer* generally akrnt ft foot Ujghtf, tlum those .-f tlie Vtizaffarnftgur variety growing «tde by tide and U>ok about 10 dayB more to mature. The htffe r variety . r jn (be other half of the *ame field and on nnu other Sekb of the Farm had ruat, while the American variety WM perfectly fr«. The came Wat the ease on another field where UM variety tnu jrn>wn. Tbo teaion of the year, wa* not, howovt-r, favorable for n«t and it remain* t» b« wen if this varirty will be ruit-jtnwf in a trOIM year al*o.

TIIP pmin of the American variety is l.anl, •emi-tranii«rent, nddiih and long, than th- ordinary country wheat, The grain prgdaoad iit the farm was larger and m..r.- plomp tlwn that NMped hon th- 1'nliliial Agent. Thi» variety ii offered by *ti** di-al.*m in Cawnjwrc at a little higher]im- tlian the ordinary wheat.

Tlie reattlU of the exftcrinK'nl are tatjulat<il in the fnlliiwiim ihitumit :—

Statement showing the results of the experiment with American wheat.

Plot number.	Area.	Name of variety.	Outturn per acre.		Remarks.
			3	I	
			lb.	ft.	
10/4	lack plot 004 square yards 1	American wheat	M*	Mn	
11/4		Muzaffarnagar wheat	MM	1,556	

(r) *Exjxrinu-nt with varietit* of m\ parcane.*

Thi» WM «Urted in 16»» bat in the ye»r under report the qaurtuka of manure, the ro.t!wd of ptantinjf, fa»., wert greatly changed. The vmrwtiei growu in tbe year were;—

The "*Madrani*" ;ionda,—T!i« ii the variety grown vory largely near Cawnpor« and I.nek now for chewing ad pnpuWly IWUCVAI to U> unfit for making "*gur*" from. It grows 8 to 10 feet h:^!t tad more anil caoea wnghing abmt 3 It» each are commonly met with in the Canti|mre ami Luckiiow nwkirt«.

Tl.i "*gur*" made from it waa *)?HA* in retpect of grain and hwdnew and WM, for all jirtctical jmrpotei, aa good ft* the "</ttr"ti *matna.* It wld at 10} *la* 11} seers a rupee,

The *Poonn* pkunda.—Th» waa ip»cially otitained from Toona for trial at the Farm. It hat a llraw-eolorad ikin an<l n a *uoft* variety, breaking«uj|y. It ^rotrttaller than the Madran and ii euually thick, but at the farm ila canea felt down very much not* by their own weight than by wind. Iu aoftncaa, want of •tanking power, the quality of breaking rmlik. t!i • Udency I « » « to«rack or cleave and iu requiring very frequent and regular irrigatinn wan the bad point* that were iioli<-«d in this v*rifty during iu growth at the Farm. Iu un« ff."«l ijualuy WM the luxuriance with whkh it grew. The " ffw " w»> slightly B»ra raddiah in colour, mfri-r in cooaiatency and poorer in grain Uun tha- of the EadatL Tito "*yitr*" watwld at Ii to J] *ue?n* * rup««.

J),, Sahdranpur variety.—Thi» it al«j a jmunda and ii pMwn for ehewiag. h i* the common variety of jwunda in Sahanopurand the adjoining dictricU. It it abet. Ur and Unnrwr and na> »horter iatemodta than th« MadraiL It u a aoft rarirty haimg green akin gwwrally getting a gotden tinge when ri|*. It breakt very readily. Ttw"ir«r" made from il w»» ir*"l io gr«m and hard, but more rtddith in rulour than thai «f thr MaJra.i and auld at »i-'ut II «w« ft rupee.

Dikchan.—Tbit nntty ii grown for cniihinj,. ami not for chewing generally. 11 is considered out o(the Ui varieties f U«»* pwrin««, btinjr genrrutly ;MW« with more manure and bttUr cultivation and ii uiorr common nrar Sliuhjahjupur. It gate ll* i rest "gur" of all UM fi n rariettM In nM]w;t of colour, • consistency • and grain, wnkh wa*tolJ a< 13 to Ifi Mnini|«t.

"*Dhaul*".—TV can** of tin* variety are generally thin and tall «od arc ea»ilr Uid by niwfe, *»|*c»l!y on nch or weU-ounurtd landa. They are hard and i traw-

(H

Thi* variety \ i#M*l " </n,- " of good toloar and mntittmfty, but WfM what |>->rrr in -n.n than that.»(UK- Madnui and the Sahanuipvr varwUM. TV gur sold •l I Ml to 11) mi a ropM.

•w.—Wu not grown M *oat* of tbt TWWUM, but only on the *9* mannrii plots. IU «w* haw •iwrU-r inlotrwd** than tfeta of UM *Diktkan* « the " *Dhaul* " asd *an* mam^otourad. lu *gur* «u tU brrt of at) the fit* WMUM in flftloMr, haidiiM and grain awl wit aa at 10 la 11 Hvn a Dprt

Details of cultivation.—

IWd —Ploughing t W'»n on tht t»th of Jaaumrj 1995 am) in all* ploughing* were dor* with the Watt's plough, two, Mb^gifey, wtlh UM aa»», *on* flashing* with tlw natin plongh awl harrowing 0 *Umr**.

Ma I hM 11 H ,.nd tkrre hundred naaada «f pnodnl U Tor tht t«r*r paan-du naowty. Poon., Madmi and S^li^inpuri. and 1,000 martad* far tlw olhiT (we varieties—Dilwbaa and DhuiL TV «t« 300 maunds would h»e injt»«J U>e Wur \ij proda.inj; rank gmwth.

Planting.-W « dan* MtUn.hr.ud furrow system. Tb# fum>w, for the *Dhaul* and *Dikchan* were 1½ feet apart from centre to centre and for the paundas 2½ feet apart.

Tba owNnpi *mm torn* roooa nrmm wrr* pb< 23rd and 24th Febr the *Dhaul* and the *Dikchan* on the 28th ; and UM *ilo* on 11th March 1895.

Irrigation.—Eighteen waterings were (jiti-n t> the foou and tht hwtsfwi a&d 15 to tlw JbUdnu, Dhm) aad thketmn.

After cultivation.—Honng t«rk»aad «rt«diaf twioa. Eartliio^ thrra for the Poona and oww lor tb* *othn* mirtiM j tht two ^rthiap for the Poona were necessary for r«'H»«mf«oaain|.apr..Kt«th«|4wU. Th.fciBeooe.fwdl it* rmri* ties. Tying twice for UM P09M a&d ooct for tht remaining varieties.

Diseases and Injuries.-All tht varirtin made very good progress till the beginning of SrptnuWT wbta pmhapa owiog to UM abanw* of raia« tbt IMTM began to dry and a irrut, », Bwralljr on tb. Fano mod tD c.ltiralon oaU »«,od, (bow) boring down the stem from above till it came to a hard B«U froa. whtb it {MM! out by boring through the sides. The grub was identified 1 at tbt Isdimi) MOM:, Calcutta, to be a *Lepidopterous larva*. Tobacco solution — lrMdl«f,tk..o«wwi TI-.l attack was popularly believed to be due to the deficiency of rainfall and its practical absence, after the third of September. The loss caused by the grub may be put at not less than 15 per cent.

month of October and afterwards the flttto got o*«r litr 4MWM to a mwibraiat »unL

Cutting.—W J-doDafM«iWl*lhtot«»i:tl, February partly ; the remaining part the crop was cut towards the close of March and the beginning of April. The following statement gives the result of the experiment :—

Statement showing the results of the experiment with five varieties of sugarcane.

[illegible]	Plot area.	[illegible]	[illegible]	1894-95. [illegible] per acre. [illegible]	[illegible]	[illegible]	1894-95. Percentage of [illegible]	[illegible]	[illegible]	1895-96. Outturn per acre. [illegible]	[illegible]	Weight of gur.	1895-96. Percentage of Juice to cane.	Gur to juice.	Gur to cane.	Weight of green tops.	Weight of dry leaves.	Remarks.
				lb.	lb.	lb.				lb.		lb.				lb.	lb.	
25.	Each plot = 1,210 square yards.	[illegible] 1,500	[illegible]	...	[illegible]	...	...	[illegible]	...	52,009	[illegible]	[illegible]	62·8	15·8	9·9	12,252	6,436	
28.		Ditto	...	...	[illegible]	...	...	[illegible]	[illegible]	45,450	[illegible]	[illegible]	64·18	16·9	10·8	14,104	6,588	
13.		Ditto	Saharanpuri paunda	...	[illegible]	...	[illegible]	[illegible]	[illegible]	50,555	[illegible]	[illegible]	50·6	16·7	9·4	11,250	8,100	
43.		1,000 maunds per [illegible]	Dikchan or Kalara	10,380	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	50,814	[illegible]	[illegible]	54·8	13·5	7·4	14,001	10,740	
48.		Ditto	...	10,117	[illegible]	[illegible]	...	...	...	40,837	[illegible]	[illegible]	51·9	15·13	7·8	13,702	9,021	
...			...	38,509	[illegible]	3,071	[illegible]·06	10·02	[illegible]	12,004	[illegible]	948	45·6	17·31	7·80	11,132	4,228	The figures denote the average of the figures for the nine plots of the manurial experiment with sugarcane described before.

The Poona panada La* givea tat kjgwt outturn of *gur* eqna! to alioat 42'* maaodt j<r acre; nut roava tin Madrui with an outturn of atmat «" mausd* |MT acre ; and the Sattaranpori cornea tlw U*t with a compatalivrfy tow outturn of 30 monad* an acrr. Ttii* *lowvr* out tarn it Jw to)»• niM»ti»facterr conditkm of ibe *«J-cane meemd from Sahanuipar and th» on^tamt unwrn ^rrainaiion of th« cutting planted. It WM alao dua to tht gnator daiaay* wbk-b raU did to tliw rari»ty than to tba rwl.

Th« awood portion .if >U wop (cot in Marrb) ««maift«d of oouidmbly drwd np and injured cat** and pan a antalUr proportion of rwwtr jaic* and a cortMflwadingly •matUr *wtigU* of jttf, the UtUr lebg iafanor to taal oblatamt *lr»m* tW lint cattinf.

If approximau nwoey *nhttm ha* pot on tb* quantity gf jpir obtatoed pw a«* th I nhttiei will atand in tbe [ol)o«iair «rd« .—

Name of variety.	Outturn of *gur* per acre in lb.	Approximate value of the average outturn of *gur*.	Remarks.
	lb.	Rs. a. p.	
Malvad	4,944	224 11 7	@ 22 lb a Rupee.
Poona	5,136	205 7 0	@ 25 lb do.
Dhaul	3,208	143 3 4	@ 21·5 lb do.
Dikchan	2,772	134 11 5	@ 20 lb do.
Saharanpuri	2,803	134 12 8	@ 21 lb do.

Percentage of juice to cane.—This de ... and the thickness and length which tbt M^^l <**. attain. TUUrgw la* «r«tit of a given number of canes, the grea ... tage of juice they have been found to yield even when the variety is the same. Again in the case of two canes of equal weight one longer and thinner than the other, the latter cane appears to give a higher percentage of juice. The canes of the crop cut in February belonging to th . -ia. »a«W plot. and to the five varieties, were regularly counted and weighed ... s and of the juice extracted were recorded. These figures, together w«U, Uioi of -rUia otl-r minor experiments, are tabulated in the following statement to illustrate the point under reference :—

Varieties.	Number of canes.	Weight of canes in lb.	Weight of juice expressed in lb.	The average weight of a cane in lb.	Percentage of juice to cane.	
Mature Plot No. 1 ...	8,021	2,064¼	1,039¾	·25	51·7	
Do. do. 2 ...	8,032	1,970	779	·19	49·6	
Do. do. 3 ...	9,740	14,231¼	651¼	·17	40·7	
Do. do. 4 ...	5,110	2,061	237½	·09	44·9	
Do. do. 5 ...	7,033	1,387¼	652	·18	47·0	
Do. do. 6 ...	8,380	1,255	594½	·14	46·2	
Do. do. 7 ...	9,340	1,738¾	476	·13	45·9	
Do. do. 8 ...	9,000	1,207¼	451½	·14	49·2	
Do. do. 9 ...	7,780	1,096	432	·14	45·3	
Poona ...	5,000	5,352	2,401¼	1·07	64·6	
Malvad ...	4,000	4,317	2,403	1·08	64·14	
Saharanpuri ...	8,940	2,845¼	1,920	·28	57·2	
Dikchan ...	12,050	4,514	2,271	·37	53·9	
Dhaul ...	14,050	3,952½	1,095¾	·37	57·03	
Malvad ...	61	192	135	2·90	69·6	Good canes.
Do. ...	73	200	141	2·13	70·6	Do.
Poona ...	84	200	142	2·38	70·2	Do.
Do. ...	140	200	123	1·42	60·0	Inferior canes.
Red cane (Lal Pundia) ...	160	312½	240	1·90	77·9	Thicker and shorter canes.

Gur-making.—Pans of the shallow pattern were used for boiling down the juice, which was, as a rule, strained through a cloth while pouring into the pans. To assist in removing the scum an infusion of [illegible] j * ^ *mv* ilaginous substance—and milk diluted with water in the proportion of 1 to 3 were found useful. The [illegible] was soaked in water for 24 hours and then rubbed in it with the hand. The infusion was then strained through a cloth and kept in corked bottles for use when needed. It was made once in four or five days. When the scum that comes off naturally was removed, the [illegible] infusion was poured twice at an interval of a few minutes, about an ounce each time. After this the diluted milk was poured twice at an interval of a few minutes, about two ounces each time.

The *gur* made was as good as the canes would admit of. The colour of the *gur* depended to a certain extent upon the colour of the canes used: the red canes giving redder *gur*. The canes of yellowish or straw colour gave the gur of the neatest appearance and the gur obtained from green coloured canes [illegible]. Dr. Leather found by a comparison of the analyses of the juices and gurs of the several varieties that the proportion of glucose to cane-sugar in the gur was higher than in the juice it was made from; and that this increase was due to the inversion of a part of the cane-sugar in the juice (*i.e.*, the change of cane-sugar into glucose) during the process of boiling. With a view to prevent this inversion he tried a few experiments by adding "milk of lime" in varying quantities to the juice, to neutralise its natural acidity. The details and results of these experiments are given in his report (Appendix B).

The *gurs* made by adding "milk of lime" strikingly improved in their grain or consistency, but they became darker in colour. Thus the addition of lime raised the value of the gur from a sugar-refiner's point of view, but lowered it in the eyes of the ordinary purchaser, who looks as much to the neat appearance as to its quality.

(*f*). *Gujrat Bajra.*

The seed was obtained from Bombay at the suggestion of Dr. Leather. It was grown side by side with the indigenous variety of these provinces, the area of each plot being 400 square yards. The outturns obtained are given below:—

Name of variety.	Plot No. 1.		Plot No. 2.		Remarks.
	Grain per acre.	Straw per acre.	Grain per acre.	Straw per acre.	
	lb.	lb.	lb.	lb.	
Gujrati		14,073		12,044	
The country variety of these provinces ...	1,488	16,112		10,833	

The plants of the Gujrat variety grew taller, tillered more freely and put forth longer and thicker ear-heads with larger grain than the country variety. The former also took about 10 days more to mature which will be a disadvantage when, as is often the case, it is intended to grow a rabi crop after removing the bajra. But for growing in mixture with arhar the Gujrati bajra is, in every way, better than the country bajra.

(*g*.) *Fodder crops.*

In the year under report juar, maize, guar &c., were grown for fodder and gave good results. The year's experience in this respect shows that abundant green fodder can be easily produced for cattle in any part of the year. It also shows the excellence of juar and guar as fodder crops and their capability of yielding 2 or more cuttings where irrigation is available. If sown after the setting in of the monsoon, two or three ploughings to prepare the land and about 30 to 40 lbs. of juar seed per acre are all that is necessary. If sown before rains, artificial irrigation to soften the land for tillage and during the growth of the crop is necessary.

The following statement gives the weights of green fodder from the cuttings of the several fodder crops. To make the statement complete the crops grown on the green manuring plots have also been included in it:—

Statement showing the outturns [illegible] from [illegible] Lucerne.

	1st cutting.			2nd cutting.			3rd [illegible]			Total number of days of growth.	[illegible]	Remarks.
	Date of cutting.	Period of growth in days.	[illegible]	[illegible]	Period of growth in days.	Weight of green [illegible] acre.	[illegible] cutting.	Period of growth in days.	[illegible]			
[illegible] (alone).												
[illegible] sativa).												
— —	20th May '95.	43	17,300	'95.	23	[illegible]	'95.	13	[illegible]	117	43,279	
— —	25th ditto	53	16,021	do.	48	[illegible]	[illegible]	17	[illegible]	117	42,000	
— —	17th ditto	28	19,023		—	—		—	—	28	19,035	
— —	1st June '95.	53	[illegible]		—	[illegible]		—	—	53	18,120	
— —	2nd ditto	53	[illegible]		—	[illegible]		—	—	55	21,723	
Vigna catiang).												
— —	21st May '95.	45	[illegible]	do.	65	15,403		[illegible]	—	110	[illegible]	
— —	22nd July '95.	81	[illegible]		—	—	—	[illegible]	—	81	[illegible]	
— —	[illegible] ditto	81	[illegible]	—	—	[illegible]	—	[illegible]	—	81	[illegible]	
— —	[illegible] ditto	81	[illegible]	—	—	[illegible]	—	[illegible]	—	81	[illegible]	
[illegible]).												
— —	5th June '95.	53	[illegible]	—	—	[illegible]	—	—	—	53	[illegible]	
[illegible]).												
[illegible] —	5th Sept. '95.	60	10,452	—	—	[illegible]	—	—	—	60	[illegible]	
[illegible] —	2nd ditto	73	13,573	[illegible]	[illegible]	[illegible]	[illegible]	—	—	[illegible]	[illegible]	
[illegible] —	21st Jany. '96.	113	9,436	[illegible]	[illegible]	—	—	—	—	[illegible]	[illegible],436	

VII.—DISTRIBUTION OF IMPLEMENTS.

THB anhjoined table ihow* ih^ distributi'ii of agricultural imjilvmoat*. Tb'ere was t nmnrkalilf increaae in the nuraW of plough*, chaff-cutter* am) kihblen distrilmi ted during the y**r. It wa§ due chiefly to tin • offorta of tho rep men ta lives of the Department in briqgiag tbe improved implements into prominenco at tbe Agricultural Show*. Amony; the plough* the otw that bad the large** aale wat tbe " Improved ttaldto Plough " iattstod by tlw Farm mi*lri.

A now flour mill workwl hy band power wa« in»p$_D$U?d by Baldeo in the year under report and it* working wa» nhown to Hit Hoaor tfaa Lieuteiunt-Goveroor on tho occa»ion of hi* vi«l to tbe Farm in tbe month of January 1896. Under His Honor'* ord-Tn a mill m eent to each of the Central Jail* at Agra, Allahabad and Benares when they were tried. The mult of trial hu *hown that then are wnw slight; ilefeota in the mill which tbe inventor ii now trying to remove.

Statement showing the distribution of implements during the year ending 31st Mortk 1890.

Name.	UN4(,				im.wi.			
	M.I.	TrW.	11 in.	Total.	Sold.	Tri.1.	Htr..	Total.
					W	(*>	(4	
Ploughs	ut	17	IS	161	132	so	27	n)
Clabl) p**p>	14	4	s	SI	14	4	4	
H*1«lr> Wi'.tt '• . „	1	—	—	1	1	—	—	i
B*ii*« Dear Mill	—	—	—	—	1	—	—	3
Horse Hoe	—	—	—	—	1	—	—	i
R. Hunt's Kibbler	a	3	—	"" 8	n	" 1	—	n
K*b«i KIMbn ...	4	—	—	4	t	—	—	i
CMF-roitrr.	4	1	—	•	10	" 1	—	
Sugar-pan	1	m	...	1	—	—	1	
Harrow	—	—	—	—	1	—	—	
Krtl Tttm „	—	„	—	—	1	—	—	
Dredgers	—	—	a	•	—	t	8	
»rta 4 boriitf U»b	—	4	_.	4	—	l	1	7
T*al	-	-	—	—	—	—	-	—

VIII.-DI3TEIBUT10N OF SEED.

THE f»lluwiofr »Ut«met»l *thaw** tin' iMUibuliiM of wwd -luring the year oodar rtport aad Uwpniwding yoar from th< —**1+Um* atUcbed to tbe Farm.

Statemrnt tivmrny distributi"«^f seed.

N.rr. {•seed.	Quantity distributed.	
	UHM,	U M
	lb.	lb.
W '..»••	12,008	MM
Cape oats	7.MD	11,853
Maize	40	14
Sorghum	M	M
Egyptian clover	n	
Bossia grass	10	I
Guinea	—	4
Lucerne		47
Paddy	—	525
Castor	—	62
Una (akita)	—	20

There WM a marked JwawT uwW • wheat" owing to * flaelwMd dentasd for it and partlr *Ui* lie fact that *\br* fijrnrH ot lfi»l-t»5 include an itota of 16 mattneb distrib,Ud Wt ywr tbroujh U« S«or»tary, AjrrimtUinl Show, Jannpur. anoty the cultinlon of ii>at daitriet. N« »»ch JiitribalMB could be made in Jiunpur dk«kf the i *ytmt* n*W report in wUah ti«re w»» n> »bow ia that dicLrici.

1X-SEEI CULTURE

T» > ir#tim««U kiUMtie trad in thi» Jsnvlh-o **sow lead,** wilisont donbt, fab Uw conclusion tiut it *m* **ajaMt** impotaiUe to mr silk worm* ia the bot olimate of tlue provinces.

It was reported last. « N (that a fra»h aupply of lire cocoons tiul U-n bdented from J U n , tb* eapply »» woeiwd n A % » at 1894 . »l «-o»Uin*d 100 cocoa*. Tbe worse prodaotd otly A. .«tod or hfcnury 189ft. Tbe fir* cjct was K fairly Mcm»»fot (vo*. UM MMOI m ft wry poor otw and UM thinl «i * total Uilunr owtatf to U* d*»tk ot »U UM wonM dat to aflcoU of lugb temperature.

In now of to* abow it t* BOW istaodtd togir* «p the experiment.

I -H0K8E-BEEEDIK0

ln tbe 7«r under raport tbt horw ftallina " K ," wttcw work had been

[illegible]

ttMtttCiotftrr, WM npW«l by fttwlbrr •UlltOD, - Utorft," wporUJ by U* < T«uriM<7 IS*nmeiit in bt a toon nccwrfol fukl-g^ut.

The *atw* •Utlinn amwl 37 DMIM donaff tbtryMr.of which 1 bM n br I ODO » raportcd to be in N i m l l l i A b»n> hem raKMMy MTwiig «t» sot y«t ktviwn in *» M M ,

TV t*,» brood mam kepi at ibe Farm wm told off, M thty bad paawd **># •«•

XI -CATTLE AND CATTLE BREDINO.

Tb» Koet trait tnaiatehwl at lbs F»nn Wi«nd i7 towi do nap tb* jwtf rtport, of wbieh 18 bate ealvad and eWnn in r*f«rt«d tn U in calf. Fi» c**«» •ftMDOMafd and th« KtalU of tb* oonrisff ta IS e»—• art not known. Tb* calr*J*» fftr obuwd an la »vrrv rr.j*rt l*U*r tban eftlvwt of th* pom looml brndl

Tbs com UMI <MM (or cormng w»re, M in iKr put r*ar. uwetly *fro** ta# of Cawapon and U* nltay** In UM B*«blw«rbood of UM Hilary //*«j. in UM Vrtennirj ll«|«l»l.

Tb* •nVjoiwt tobt* «bowi ib* d*taU of wprk UM Farm dariaf Ut* y«ar ander r*p

Tb* nomber of pattMU trfttUd KM *bon* W *to 1*1: 0» nam!«r ««nd w» « in ibe |«it y«r. The ramlla »r* Moow»ft»f tad * mid b«m bar* «t ill U*t#* bad it Urn pgambU f>vr UM «t<itn in cbir«« of UM bo*) ., «oalinu«II/ «' t!>* wbwb be eonld a*t do, at b* had to b# a«mi fr^awHly to pwrabaw ball* fr U utd al*> tn Babntob in extinction with UM iMrtbroak *t*t* disease in that district in the past cold weather.

Disease.	Number of patients treated.	Number of patients cured.	»*«aw	Number of patients found to be incurable.	Remarks.
Ulcer	•	t	—	—	
Dislocation	[illegible]	[illegible]	—	—	
Strangles	[illegible]	[illegible]	—	—	
[illegible]	[illegible]	[illegible]	—	—	
Catarrh	[illegible]	[illegible]	—	—	
Tympanitis	[illegible]	[illegible]	—	—	
Abscess	[illegible]	[illegible]	—	—	
Fever	[illegible]	[illegible]	1	—	
Diarrhoea	[illegible]	[illegible]	—	—	
Lameness	[illegible]	[illegible]	—	—	
Swelling of the legs and body	[illegible]	[illegible]	—	—	
Mange	[illegible]	[illegible]	—	—	
[illegible]	[illegible]	[illegible]	—	—	
Fracture	[illegible]	[illegible]	—	—	
Inflammation in the neck	[illegible]	[illegible]	—	1	
Colic	[illegible]	[illegible]	—		
[illegible]	[illegible]	[illegible]	—	—	
[illegible]	[illegible]	[illegible]	—	—	
Disorder of kidneys	[illegible]	[illegible]	—	—	
Constipation	[illegible]	[illegible]	—	—	
Distemper	[illegible]	[illegible]	—	—	
Total	n	[illegible]	1	>	

(c) Miscellaneous.

Different systems of housing cattle.—The object kept in ^ in these trials is two-fold, viz., (1) to determine the quantity of manure obtainable in a year from a pair of worling cattle, and |2) to utilise the nrinc, which contain, more nitrogen than dung, moat of which i* wasted in the ordinary practice of the cultivators. With " jocts two systems of housing have been under trial feu the last t wo years : Shed . which the tiling dropped during the night is spread and covered with litter at 5ib a every morning and tbe dung ami the litter arc removed together at the end of tbe month; Sbcd 11, from which tbe dnng is removed every morning but which al» receives tb# same quantity of titter as Shed A, for absorbing the u rioe. The manu the Shed A removed at the end of the month, (8) the dung removed daily from the 1 B and *S)* the litter soaked with the nriat removed at tbe cud of the month, are thrown into separate pits thatched over with *riiappat**. The foods used, the litter supplied, the manure* removed daily and monthly are all weighwl and the weight* carefully recorded. At the end of a year or other period according to need and convenience, the content* of the pit* we removed and weighed before carting to the Gelds.

Bcskle* these two abeds A and B, tbe trial of two mow methods ha. been com- nenoed during the year nnder report, n:, the boi system and the utUuung of urine without any litUr.

As U» box srsUm is being tried now for tbe first time at the Fnrro, it bat so far d*D« well and i* well known to be a most eJfcdeut method of utilizing the whole of the urine aa manure. It is deccribed here in detail. A pit 3| feet deep, 7 feet broad and 10 feet loog was dug. TUe bottom of tbe pit wa* plastered with eby, sprinkled over witbasbis and a tbin layer of straw ipwad tb<r»n. In front tbert is the manger ry morning when the cattle were removed from the boi, a man distribatrd the dung evenly on the ground underneath tbe old litter ami spread in addition &a of chaffed imgsrcan* leaves. The boi thus continued cl*n and free from smell ami tl» pair of bullock* that have hwn tied iiftt for thr last IB months nearly have been doing well without any tract of injury either to their hoofs or b their prtn-nl bsallk. The pit pot *IvV* in ab^t 8 month* and the manure in it was dag out y and immediately after weighing cartod to the field, direct About l.DiOtt at the turf** was fmh anJ the r«st 5,*&5tt> «« * porfeatly fermented rich looking soft

While dijfring out the manure ammonia smelt strongly and toe temperature n^ £, *wtface* wa* »b«nit U0 u> 130 degree* Kahrenlwt and at the bottom shout W decrees] i, erroneously arj{«l by son* native cultivators that the qua.' ^wuired i* too much to adi» "« •*•*"» l*"»K *vlopltd* by Owmi. Bnl at the Kann h** shown that. euttiwUr who grows sugarcane can easily tbe d.awtJty, as an act* of sngaroine dives more leave, taan an required for trring a pair of catll. throughout tb. *yW,* using Sib a day.

*.hotU titUr.-D** 4*™<* oE «««risJ Ior ****« " !l '* *
, *t,* good many cultivator., even supposing they p* to rerognw the uni* a* manure ar<l th# ..eertwty of litUring th«roattle abed* for absorb. „ the Ui»l of Ibis method IIM. The floor of the Aed U made even by . p-nl> slop-

eooked by

, and from tbe drain into tb* earthen

morning dunir of the shfd b removed, the uneven par; !, and ^ ~* - * earth raprd and

method the only trouble i* that the cultivator mnst bats a heap nd in a roofed plat* for use in tb* rainy wealbei.

The quantities of manure obtained from a *pair of working cattle in a year* from the several methods that are under trial are given below:—

	lb.
Shed A.—Dung, litter and urine removed at the end of the month ...	7,924
Shed B.—Dung removed every morning (the weight of dung alone) ...	7,328
Weight of litter	2,571
Weight of both litter and dung of shed B	9,899
Total weight of manure	10,547
[illegible] sprinkled—weight of manure	13,222

The litter of the shed B stored separately underwent little or no fermentation and the dung of the earth sprinkling shed had not properly fermented at the time of weighing as it was an accumulation of only five months. [illegible] mixed with it.

The farmyard manure of Shed A and the dung of Shed B have been twice or thrice analysed by Dr. Leather. The results of his analyses conducted in connection with manuring the sugarcane crops of this year are given below:—

		Percentage of nitrogen.
1.	Farmyard manure of shed A	·58
2.	Dung of shed B	·62
3.	Standard of English Farmyard manure	·65
4.	Poudrette of Cawnpore Municipality, 12 months old	·47
5.	Ditto ditto 6 months	·53

CAWNPORE,
The 14th October 1896,

SAIYID MUHAMMAD [illegible], M.R.A.C., M.R.A.S.,
Assistant Director,
Land Records and Agriculture.

APPENDIX A.

Extract from the inspection note by Dr J. W. Leather, Agricultural Chemist to the Government of India, on the Cawnpore Farm.

3. In the case of the varieties of cotton, I think it would be a great advantage if new seed could be procured for all the varieties, as the past history of many seems to be doubtful. It may not be possible to get new seed of all the varieties at once, but this might be done in the course of two or three seasons. In the case of the Americans, I would suggest that the United States Department of Agriculture should be asked to send seed of half a dozen of their best varieties.

4. In the case of the sugarcane experiments, I have suggested to Mr. Subbiah the following procedure:—

(a) *The manure series.*—One variety of sugarcane (the Madras pounda) will be manured on 10 plots as follows:—

(1) Cattle dung @ 125 lb nitrogen per acre.
(2) Cattle dung @ 250 lb ditto.
(3) Ditto @ 500 lb ditto.
(4) Poudrette @ 125 lb ditto.
(5) Ditto @ 250 lb ditto.
(6) Castor-cake @ 250 lb ditto.
(7) Ditto @ 500 lb ditto.
(8) Saltpetre @ 125, bone dust @ 125 = 250 lb nitrogen per acre.
(9) Ditto @ 125, superphosphate @ 125 = 250 lb nitrogen per acre.
(10) No manure.

These plots will be in fields 27, 28, 29 in one year and in Nos. 19 and 20 in the alternate year.

(b) *The varieties of sugarcane.*—The several varieties of sugarcane will be manured with poudrette, but in each case the cane will be grown on two plots, one of which will receive 250 lb of nitrogen per acre and the other 500 lb. These plots will be in fields Nos. 6, 8, 3, 4, 5, 6 and 12 and 13, 11, 10, all at the west side of the Farm, in one year, whilst in the alternate year they will be in fields Nos. 1, 2, 3, 4, 5, 6 at the east side of the Farm.

I have withdrawn my objection to the plots at the west side of the Farm. Mr. Subbiah seems satisfied that there will be no risk of waterlogging.

I have also discussed with Mr. Subbiah the question as to whether these sugarcane plots should lie fallow in the alternate year or whether other crops should be grown on the land. He points out that the cultivators about Cawnpore usually take an interim crop, and I am inclined to think that such a procedure may have some advantages. The amount of manure which will be applied to some of the plots will be much in excess of what the sugarcane crop will actually take out in any one year, and if an intermediate crop be grown without any *further addition of manure*, the manure "residue" unused by the sugarcane will be more or less utilised, and the land will be thus reduced again to a more uniform condition of richness in plant-food before the following crop of sugarcane. Mr. Subbiah's suggestion is to grow potatoes in the early cold weather, and I think it might for the present be acted upon. One cannot of course at present say whether it is the most desirable choice; experience only will decide this. The weights of these crops will of course be recorded. Thus in these experiments with sugarcane two principal objects will be kept in view, the one is to determine what sorts of sugarcane are the best, as judged by the weight of crop, proportion of juice expressed and the quality of the latter; the second is to determine the most economical manuring for the crop.

Regarding the analyses which I have made of this year's sugarcanes, I shall forward a separate report. I have asked Mr. Subbiah to kindly send me a copy of the weights of cane from the different plots when they are known.

5. *The potato experiments.*—These experiments may usefully be developed, and the two varieties which are now grown at the Farm manured as follows:—

(1) No manure.
(2) Poudrette @ 200 lb nitrogen per acre.
(3) Ditto @ 100 lb ditto.
(4) Cattle-dung @ 200 lb ditto.
(5) Ditto @ 100 lb ditto.
(6) Castor-cake @ 200 lb ditto.
(7) Ditto @ 100 lb ditto.
(8) Saltpetre @ 50, bone-meal @ 50 = 100 lb nitrogen per acre.
(9) Ditto @ 50, superphosphate @ 50 ditto.
(10) No manure.

These plots will be in fields Nos. 24, 25, 26a and 26b, each plot to be $\frac{1}{12}$ acre. In this case also, since the manuring [illegible] fairly heavy, an intermediate crop of maize (unmanured) might be taken in the kharif.

[illegible] t these manures in the different experiments may be applied in the [illegible] ill be necessary that they should be analysed before they are [illegible] uld ask that samples may be submitted to me at about the following dates:—

Manures for sugarcane, February 1st.
Manures for maize, April 15th.
Manures for wheat, August 15th.

APPENDIX B.

Note by Dr. J. W. Leather, Agricultural Chemist to the Government of India, on the composition of sugarcane and raw sugar made at the Cawnpore Farm during 1895 [illegible]

1. The [illegible] on the growth of sugarcane which are being carried out at Cawnpore, Dumraon and [illegible] have [illegible] objects in view. The one is to determine what quantity of manure can be most economically employed, and for this purpose different amounts of various manures are applied. The second is the comparative growth of different varieties of cane. The annual results of these experiments are published in the Reports of the several farms named and will not be referred to here.

2. In conjunction with these experiments I have this year, as last year, made a number of analyses and experiments with the object of determining several other points which are of importance. These may be summarized as follows:—

(1) The amounts of cane-sugar and of glucose in the juice.
(2) The amounts of cane-sugar and of glucose in the raw sugar obtained.
(3) The amount of "inversion" which occurs during the boiling process.
(4) The quality of the sugar prepared in the centrifugal machine.
(5) The loss of sugar which occurs during the boiling process.
(6) The total amount of sugar in the cane.
(7) The amount of juice and consequently of sugar which remains unexpressed from the cane.
(8) The amounts of nitrogen and of phosphoric acid in the sugarcane crop.

3. *The amounts of cane-sugar and of glucose in the juice.*—The cane-sugar and glucose were determined in the juice of six varieties of cane grown at Dumraon, in 6 varieties at Cawnpore and in three at Poona. The varieties grown at Dumraon were all manured equally with town sweepings and castor-cake. At Cawnpore five of the varieties were manured with about 1,000 maunds of poudrette, but the sixth ("matna") was grown on nine plots with different manures, containing very varying amounts of nitrogen or phosphoric acid, these being however, so far as the nitrogen is concerned, very much smaller than in any of the other experiments and they are in all probability too small to produce a really heavy crop.

At Poona the three varieties were all manured with poudrette, containing 500 lb of nitrogen per acre.

It is desirable to consider three points in connection with the results of the analyses of the juice of these varieties.

(1) The comparative quality of the juice of different varieties grown at the same place.

(2) The comparative quality of the juice of the same variety grown at different places.

(3) The comparative quality of the juice of the same variety grown with very different amounts of manure.

(1) *The amounts of cane-sugar and of glucose in varieties grown at the same place.*—In the two statements Nos. 1 and 2 are set out the amount of cane-sugar and of glucose found in the juice of the varieties of cane grown at Cawnpore and Dumraon.

STATEMENT No. 1.—*Six varieties grown at Cawnpore.*

Manure.	[illegible] Poudrette, 80,000lb.	Pikeha [illegible] 80,000lb.	Saharanpuri Poudrette, 80,000lb.	[illegible] Poudrette, 80,000lb.	Madras Poudrette, 80,000lb.	[illegible]
	%	%	%	%	%	%
Cane-sugar ...	12·74	[illegible]	[illegible]	[illegible]	13·90	10·30
Glucose ...	[illegible]	[illegible]	·98	1·77	[illegible]	·40

STATEMENT No. 2.—*Six varieties grown at Dumraon manured with 8,200lb. of city sweepings and 6,560lb. of [illegible] per acre.*

	Mango.	Daal	[illegible]	Nam	[illegible]	[illegible]
	%	%	%	%	%	%
Cane-sugar	[illegible]	11·55	13·70	[illegible]	13·51	[illegible]
Glucose	1·06	·99	[illegible]	[illegible]	1·18	·67

These analyses show at a glance how considerable are the variations in the proportion of cane-sugar and of glucose in the juice of different varieties of sugarcane, [illegible] of them containing only about [illegible]·6 per cent. of cane-sugar, whilst the juice of [illegible] variety as grows at Poona (to which reference will be made below) contains nearly 18·6 per cent. of cane-sugar.

The glucose will be referred to more particularly in another part of this note, but it may be here noticed that it also varies very greatly indeed, [illegible] varieties contain only about [illegible] per cent., whilst the juice of another contains [illegible] per cent. Now, bearing in mind that the cost of cultivation, of crushing and of boiling down the juice of different varieties may be taken as being equal in any particular locality, it will be at once apparent that if the varieties of cane which produce poor juice could be replaced by those producing rich juice, an enormous benefit would be conferred on the cultivator. The juice of the Poona variety is probably not quite so rich as some of the varieties grown in the Mauritius, but it is not much below their best; and it seems not unlikely that here as in more than one part of India varieties of cane which with little improvement, could become equal to any in the world.

Moreover, as will be shown presently (paragraph 6), the evidence which is to hand tends to show that the improvement of manure tends to [illegible] the quality; and it would seem that a search after the best varieties which [illegible] in one or other province is perhaps the most important matter to [illegible] up in order to [illegible] the sugar-producing power of [illegible] province.

5. *The juice of the same variety grown at different places.*—[illegible] at hand [illegible] to two [illegible]

The first is that of some cane which was sent from the Mauritius to the Director of Land Records and Agriculture, Bombay, two years ago. Two varieties were sent, one a white and the other a red variety. They were cultivated in 1894-95 and again in 1895-96 at Manjri (Poona) with very liberal amounts of manure. They were said to be varieties which produce juice containing some 18 per cent. of sugar. Whilst they grew [illegible] at Poona the juice has in neither year contained anything approaching the above. Several analyses of the red variety showed only about 10 per cent of cane-sugar 2·0 per cent of glucose, whilst that of the white variety contained about 12 per cent. of cane-sugar and 1·4 of glucose. The second case is that of the variety grown around Poona and which contains about [illegible] per cent. of cane-sugar and from 1·0 to 1·5 per cent. of glucose. This variety was sent to both Cawnpore and Dumraon last year, and, as shown in statements Nos. 1 and 2, it there contained considerably less, namely, [illegible] than 18 per cent. of [illegible].

The evidence at hand therefore goes to show that sugarcane may suffer materially in quality by transference to long distances, which entails a change of climate. It [illegible] varieties, after several years of acclimatization, will recover [illegible] original qualities; but the process is an expensive one, and if good varieties already exist in a province, it would probably be better to identify these and extend their cultivation, than to transfer varieties from long distances.

3. *The juice of the same variety grown with different manures and with different amounts of manure.*—At Poona one variety has been grown with a variety of manure. The list includes poudrette, cattle [illegible] various oil-seed cakes, bones, superphosphates and saltpetre. In 1894-95 the amount of nitrogen applied per acre varied from 200lb to nearly 1,000lb, whilst the phosphoric acid varied from 140 to 2,700lb.*

In neither year was there any relation observable between the quality of the juice [illegible] the amounts of manure applied. In 1894-95 the proportion of cane-sugar (*vide* Agricultural Ledger, Medical and Chemical series No. 1, page 5) varied, but it is probable that the variation was due to causes quite apart from the manuring. The analyses of the juice from the several plots for 1895-96 are set out in statement No. 3, and it becomes evident that in the case of this series of plots which received varying amounts of different manures, that the quantity of the juice is maintained almost uniformly throughout:—

STATEMENT No. 3.—*Composition of the juice from plots at Poona.*

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cane-sugar ...	16·46	15·21	14·80	[illegible]	16·08	15·58	16·03	14·28	15·02	12·00	11·06	16·31	17·20	13·72	16·52
Glucose ...	1·27	1·17	1·34	1·22	1·45	1·77	1·30	1·67	1·28	1·72	1·37	·93	1·10	1·54	1·91

At Cawnpore likewise the series of plots on which different quantities of manure were applied lead to a like conclusion. Statement No. 4 exhibits the amounts of manure applied and the quality of [illegible] obtained; and [illegible] again the proportions of cane-sugar and of glucose remain constant, while the amounts of manure not only varied considerably, but were very much smaller than in the case of the Poona plots.

* In 1895-96 the amount of nitrogen applied varied from [illegible]lb to 1,000lb, the phosphoric acid from [illegible] to [illegible]lb.

STATEMENT No. 4.—*CmfotUitn vftktjuictoftkt "mttna" varitlt* grown on plot* *at* Cam MM.

Manures per acre.	No manure.	Cattle dung 7 tons N = 94 lb.	Cattle dung 14 tons N = 188 lb.	Bone superphosphate 4 cwts. N = 17 lb.	Saltpetre (crude) 2 cwts. N = 14 lb.	Superphosphate 4 cwts. saltpetre 2 cwts. N = 31 lb.	Bone-meal 5 cwts. N = 31 lb.	Bone-meal 5 cwts. saltpetre 2 cwts. N = 33 lb.	Unmanured.
	%	%	%	%	%	%	%	%	%
Cane sugar ...	11·67	16·00	17·04	17·08	16·74	15·14	15·03	16·58	16·03
Glucose ...	·07	·50	·37	·31	·31	·51	·44	10	·32

Tbu* it appear* etidest tbat tiir ijuality of ihr juice of any particular variety w not *maUnaltj* affected by ttie amount or de*criptioii uf manure appliad. I tay • *>tlf,* btcauM 1 ahuuld not wi»b to imply that manuring can have *no* influenct.

On the cootrary, aod quite apart front the queition of tbc antuunt of cane grown per am or of other [ii\i|*rtiea of aagareanc to he liiaunesod later, which ia altopoil,.r rtittind from tbe point nndar diacuwwn, I believe tbat tht *fwmUtf <>(* (he juice of may be improved by good cultivation aod liberal manuring. I hare •eta > hi Debar whir.-b bad loat all tbe usual appearance of tbe arop and which I thought •ae reada; a condition brought about, I do not doubt, by the tcanty manuring •pplu-d, Hut 1 think kVa evidence above pet out goes to abow that the improvement in the quality of tbe juice of a cane will at llw l**t be a ilow proevw. It alw> Mem* evident tbat we may place fair reliance on tbe information offl •'-alftttcutii *S*»*. I and £ in which the quality uf the juice of different nriatiai tru TthiUtwi. U oan lianliy b> iuggcctedj for intUnw, tli»tlfi,j- «re aeckbrntalili aajr *av , it mu.l r»tiirr Id . <at the compontion of tfattf JMftHat there - v ith Dm ezeeption of tbe "Pogna variety" they wen not I rought from long duUocet ID the farm* in <|U««tiuo, but belut ..• nepoctivt prorinoea, and we may, I think, tafely conclude that, for namj tbe i than of (he North-Wettcrn » attd the tuuitg

»ad i . !!• • i'j{»l are poor and may etiily b* rcjtUceJ by better omi air atUwl.

Tit cewpouttei tm tftir ("fir " or "g»! ") tUmimmi.

the raw kugare, it will be well to find *et out ^ >r. So far ** tbe eultiralor'f p«l*i ned It m liter* cro'"> oUitii iiiui-U nolaiHe. she MOID value a« cue^ugkr, In tbe l»ua>, bow•rer. bu) er* u«ke a difference between ***f*r"* whwb u nice and firm and a (tood aolowr aitd cr> »Ul and *"gur"* of Ud colour and aof UWM. Tbo Bnttya who ither wfiniug *or* iwiwitneat-making or fir the lil of *gmr,* btn to ware. botut large uuafttitir* aud dn mau ia yery apt tu aU *adron. Tlwhi^her t acow, Uto gfwater will be ilw l«»(«,,) thu. .juiu- apart boa the wmpuitite value i.f raw iiigan to tbe larjre rcfiuer, tU bat]<• tui-m n all *Imrgm* tugt f •till grraUr moment. K*•!

nut «o ii(ual > v*ulli*it irtioa f gl«COM in the raw •ugar '• the amount j.rwent in liie jniec, n i» anxiuai wl rmrd dunng tbe U>tliu/-tluws prpceea. Aim

The amount of acidity* in those cane juices which were examined varied somewhat as will be seen from the accompanying statements, though it is in all cases very small. It is due to the presence of several different organic acids, and while the juice is being boiled down this acidity causes the inversion of a certain quantity of cane-sugar. This inversion may, at least in part, be prevented. I mentioned in my note on this subject last year that a little alkali (potash) was added to the juice at Cawnpore before boiling down.

This year I carried out several experiments with lime instead of potash. The latter has the disadvantage that it is itself a means of preventing cane-sugar from crystallizing, whilst lime in the small quantity used does no harm. The extent to which it prevented "inversion" will be seen presently. In order to determine the extent of inversion, it is necessary to compare the relative qualities of glucose in the juice and in the "*gur*" obtained, and the following statements Nos. 5, 6, 7, 8, are drawn up with this object. In each is set out first the percentage composition of the juice and of the *gur* respectively, and then in order to show at a glance the relative amount of the glucose in the juice and in the *gur*, its proportion per 100 parts of total sugar is printed in thick type. It will be seen that the proportion of glucose in the juice varies very greatly from about 2 parts for 100 of total sugar in the matna variety to no less than 17 in the dikchan variety (statements Nos. 6 and 7). In the *gurs*, there is on the whole much more uniformity, it is in the majority of cases about 10 to 14 parts per 100 of total sugar, though exceptions occur such as the dikchan *gur* which contained 22 of glucose per 100 of total sugar :—

STATEMENT No. 5.—*Composition of juice and gur from six varieties grown at Dumraon, 1895-96.*

	Mungo.	Khari.	Red Bombay.	Poona.	Samsara.	Bhurli.
Juice—	%	%	%	%	%	%
Cane-sugar	9·56	11·55	13·70	12·99	13·91	13·01
Glucose	1·06	·99	·95	1·15	1·18	·57
Total sugar ...	10·62	12·54	14·65	14·13	15·09	13·58
Ratio: 100 parts of total sugar contain of glucose.	**10·0**	**7·9**	**6·5**	**8·2**	**7·8**	**4·2**
Gur—						
Cane-sugar	71·85	68·07	73·99	69·30	70·62	77·46
Glucose	11·37	9·39	9·81	10·21	10·79	5·27
Total sugar ...	83·22	77·46	83·80	79·51	81·30	82·73
Ratio: 100 parts of total sugar contain of glucose.	**13·7**	**12·1**	**11·8**	**12·9**	**11·9**	**6·3**

STATEMENT No. 6.—*Composition of juice and gur from six varieties grown at Cawnpore, 1895-96.*

	Dhaul.	Dikchan.	Saharanpuri.	Poona.	Madrasi.	Matna.
	%	%	%	%	%	%
Juice acidity	·035	·040	·006	·128	·040	·074
Cane-sugar	12·74	9·08	11·69	12·48	13·90	16·36
Glucose	1·25	1·56	·98	1·77	1·63	·40
Total sugar ...	13·99	11·64	10·67	14·25	15·43	16·76
Ratio: 100 parts of total sugar contain of glucose.	**8·9**	**16·95**	**5·9**	**12·4**	**10·6**	**2·3**
Gur.						
Cane-sugar	68·67	62·99	70·92	69·72	69·06	71·73
Glucose	11·40	17·99	9·94	13·30	12·82	10·43
Total sugar ...	80·07	80·98	80·86	83·02	81·88	82·16
Ratio: 100 parts of total sugar contain of glucose.	**14·2**	**22·2**	**12·2**	**16·6**	**15·6**	**12·6**

* The acidity was determined by neutralising the juice with standard alkali, litmus paper being used as the indicator. The juice is too strongly coloured to allow of any indicator being used in the liquid and clearing agents are inadmissible. Cochineal gave too high results and phenolphthalein is inadmissible since the juice contains carbonic acid. The figures represent parts of K_2O required to neutralise the acidity of 100 parts of juice. Since the acidity is due to a variety of acids, this mode of expressing the results is preferable.

PTATKMKKT K 7.—Co wpontion nf j*uw and gur if the viatna variety grown at Caumftore tttik diftrmt nmnurtn. 1.V.:,.:H;

MID art ptr m .	£ i R	1 If I |1	h	t :-5 h jl	M g I t	p II1	1 c	Ii i i. P	1 A
JMML	%	X	%o	X	X	X	X	X	X
Cane-sugar OIMHM	IG07	·M>	•87	[illegible]	81	If-M 11	u	16H ID	10a -u
Tm»l Mfu	U -'»	1740	J7 4J	J7'an	i r m	i:. ..^	16*7	16-87	1'135
Bttio lOOparUcf loUJ »OfJf CO9-Hua tJ glucose.	34	26	21	in	1*	33	38	17	1 j
ri»i«(>r 0<MOM	7* 61 MM	n-m	7171	N N ifw	[illegible]	.•:»M ma	7*74 io-i«	71 hi	?•»
Total nf*r	ntt	[illegible]	HI'l!'	[illegible]	SMI	[illegible]	•MB	H n	B11.1
Ratio 100 p«rU of lOUl H''B«t «•• t»a of llnrow	105	ire	lit	137	12 8	16-7	12J!	in	90

Statement No. 8—Composition •f juice and gur from A< Poona sugarcane grown at Poona with diftrtnt manure*.

	[illegible]	ii	[illegible]	[illegible]	[illegible]	[illegible]	I*	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Juice •'•? Cane-sugar Glucose	[illegible]	·i'	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	•001
Total sugar	IT1	irw	17 M	17 »	ira	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	In-*:	[illegible]
Ratio: 100 parts of total sugar contain of glucose	748	S3	78	69	88	[illegible]	75	[illegible]	[illegible]	[illegible]	8 69	4 9J	[illegible]	[illegible]
Gur. Cane-sugar Glucose	[illegible]	[illegible]	[illegible]	7»1P	[illegible]	[illegible]	[illegible]	ts-ui	[illegible]	[illegible]	rra ii H	73 IT	[illegible]	7: H
Total sugar	[illegible]	[illegible]	[illegible]	[illegible]	M I	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	M t:.	• :!	[illegible]
Ratio: 100 parts of tet»t sugar contain of glucose	111	131	[illegible]	ISA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1437	182	[illegible]

There is, however, consiIvnbi* vuution in tho UHDUI of glucose formed during boiling down. The mice of U» uutns variety it C«wDpor« cunUuiwd *»nly abou- two parts of gliioow jvrr 1W of *uffu. wbcnM t t i ^ r p.nt»iii«J more than U oo *n »v.-r-, mtM NUQ|>IM (»1«triufut 7), 10 i«rU bmnff thui I formed during the boiling pr IXMa QD UM oU**r h»«I, th« Ihurli tfcnfty «l Domtmon U.i i j*rt» in the juice in<! only 0 in tht gur, thtiwiaff a v*n iiislil uaount of itivrmon, then Meow to U no cWr rcUtiun Utvetn tie tomunt of «cvlitjf wd tu« »mounl o(inveffwn

8. It is pMibk (•»] jwrlajt pnrtn-mMr), bnwever. to pnvent in • ^wat OMunrt tl«» gincoM fonnath.D A* »liwlv iwiir«(«], ripcnm.-nU with ij.ti. klinv wm nude «t Cairnjioi* »od I\xms to twt how far IUCOM* migltl be »tUin«l in tht* mitiBw MK! I mint b«M tlt*nk Mr. McGl•!*!), F.C 8 , of the CAwnpnn Su-jr Work*, Lift ited, for tiw inUTHt be took in the matter. In ortlcr to oliUin UM bot mulli it «u 4MI»U« to add U nach IIOM io Uw juie« bvfon tailing w would tMrl/ but not quiU stulnJuw all tb» »oOitr,

If an excess of lime be employed the resulting *gur* is black and would command no price in the bazârs, although as will be seen below, its quality is really not lower than that of ordinary *gur*. To do this, the lime was added in the form of "milk of lime," (*i. e.*, quicklime and water made into a thin cream and separated from all lumps, stones, &c.) to a definite proportion of the juice for each pan operated upon, until that portion was quite neutral or very slightly alkaline. The remaining portion of juice was then mixed with the neutral portion and the whole thus became slightly acid. Thus for example if it was desired to neutralise ⅞ths of the acidity, ⅞ths of the juice which was intended for one pan was separately neutralised with the milk of lime and then the remaining ⅛th was added, by which means a juice was prepared containing only ⅛th of the original amount of free acid; or again if it was desired to neutralise $\frac{11}{12}$ths of the acidity, $\frac{11}{12}$ths of the juice intended for the one boiling was neutralised and then the remaining $\frac{1}{12}$th of the juice was mixed with the neutral portion and a juice was obtained containing approximately only $\frac{1}{12}$th of the original acidity. The process is extremely simple, and [illegible]ugh litmus paper must be employed to determine when sufficient lime has been added (it is added by the spoonful), I believe that cultivators might [illegible] little practice to perform the operation perfectly well, assuming of course that [illegible] be worth their while to go to the trouble to do so.

They all know how many "ghurras" of juice go to a panful, and hence there is no difficulty in their measuring off the right amount for neutralising. The results of the experiments are set out in statement 9. It will be seen that in all cases the proportion of glucose formed during the boiling process was very muc[illegible] fter the addition of lime. In two cases, where only $\frac{1}{12}$th and $\frac{1}{16}$th respectively of [illegible] left unneutralised there was practically no inversion, also when a slight [illegible] was employed and all the acid neutralised, there was no increase in t[illegible] glucose. In the majority of cases there was some inversion, but much [illegible] n when no lime was added. In the case of the juice of the Matna variety at Cawnpore, the juice was all used up before I knew how much lime might safely be added.

When ⅞ths of the acidity was neutralised the inversion was still considerable, but it may fairly be assumed that if about [illegible] of the acidity had been neutralised there would have been very little inversion.

STATEMENT No. 9.—*Showing the effect of neutralizing juice with lime before boiling.*

	Cawnpore experiments.											Poona experiments.			
	Matna variety.						Saharanpur variety.			Madras variety.		Plot 7.		Plot 8.	
Juice — Cane-sugar …	16·74		16·58		16·08		15·69			14·10		15·96		15·02	
Glucose …	·31		·29		·32		·98			1·25		1·53		1·72	
Total sugar …	17·05		16·87		16·40		16·67			15·42		17·49		16·75	
Ratio: 100 parts of total sugar contain of glucose.	1·8		1·7		1·9		5·8			8·7		8·69		10·2	
Amount of acidity neutralised.	No lime.	Indefinite.	No lime.	Alkaline.	No lime.	[illegible]	No lime.	[illegible]	[illegible]	No lime.	[illegible]	No lime.	[illegible]	No lime.	[illegible]
Gur.															
Cane-sugar …	72·04	74·06	71·83	73·36	72·60	72·94	70·02	79·80	79·43	69·06	77·41	75·95	79·09	73·67	79·00
Glucose …	10·07	·606	9·21	1·62	7·25	5·21	9·94	5·05	5·06	12·93	7·27	11·90	9·00	12·47	9·49
Total sugar …	82·61	81·02	81·74	77·28	81·13	79·25	80·80	84·15	83·21	81·68	84·59	87·85	88·89	86·14	87·69
Ratio: 100 parts of total sugar contain of glucose.	12·2	9·16	12·1	2·03	9·0	6·70	12·3	6·36	6·08	15·6	8·9	13·5	10·1	14·4	1·09

Thus generally [illegible] ployed, a juice containing a low percentage of glucose may be valued much higher than one containing a high percentage, although, without the addition of lime or some other neutralising agent, this advantage is not necessarily maintained.

The matna r ^ t y contained a very low proportion of glace* in the jui W»« w« ;ex»pt.nir «rt*r addition of lime) of DO value ; for the *jar* nbUiood from this «w contain*! a fairly high proportion {.bout 12 per wnt., *vid«* ttabment Vo. 7) under Ordinary circa ran tan en,

.•ban inform* me that the Mm pie of *yur* which wat ? M M * *(vidt* a(atement) wu better than average "pulri "or ttrained rib coiling about EU. 5-5 p<r mat'nil.

9. Th rtfininy of jagptry* fcv *the hand centrifugal machine.*

Quit* apart from any mark,t wfaieh may win for raw aug.r required by t*6nen« there appear, to be a conyd.nl.la demand for awni-M-fined Mg,r by ,,,,,. *n.* To the poorer da*, of nfento, mob**, or a *jur* containing a high proportuaoichHw.i. jurt «B,wda find a. ordJnarr ffMr. The feeding value of the two may be Mid to be identical.

On the other hand, the refiner wanti ai littlo molaww (gluoo^) ,, po-juu m.. lea, it, amou^thM^ trouble will fa ha« in hi. manufacto™. It f o C therefore that if, isatead of *f*r* being awt to refioen, eemi-reSned augar be *went* «,d tbe molaaeee reUioed by tbe grower, a diiti&ot economy will be effected.

Tfcbktoagieaty tb# tuteof thing* wtU I *tmai* around B^hea. The V in*t«id of being boiled .Iowa hard to the form of *yur,* ii largely oonrorted into a lemT liquid jaggery from wbiob, by the aid or Me#*». Tbomaon and Mylne'a hand oeotri! fogal. mort of tbe moitmee uaeparaUd from tbe tugar crytUl and retained for loeat fttion. whiltt tbe eemi-nfioed mgar it aold. I have Ui thank Mr. *MAathr* I n» eomeof UMM maohinee at work and for tome valuable information on the D»nUle« the proportion of eugarcrytUl obtained will rary and depend on i awl of joim and oa the method of boiling employed. But from what 1 could Urn n* ««ar obtained amount, to about one-half of the »jaggery operated upon* rhalfooiifiiling of a liquid moUat«>, wbuh, on boiling down furnuacfor 1l» parnetly good for human ooMtimption.

Tbe market valca* of the different materiata were aa fdlowa at the time of my ifiait i Ordinary *ffmr* 12 .err. tbe moee , *emi-refin«d wgar 0 «,,,,. *g»it* m d o friJm ^ laeaa. |« teem. Tho* a maund of ordinary *>j<w* would have .old for fl(. 8·5,0) *wUUt* lf ' Uteaamequaotity of juice had been ooanrtal into jaggery and refined in the OtothfoM] Uww would be obtained *tQ* m r > of wtgar worth *R*.* W4» and 20 tMr. of 2nd aw*r fi>r or value KJ. 1-9-0.

TU profit would not be quiU M large H UMM figure. imlic.Ui, beeauM of the wet of boiling the aolaewe dowa again, but. the above example will ibow that it may * raadily pay a cultivator to convert a part of hii juioe into jaggery and p—- refined mgar from it, inelead of eelling it all at *>jur.*

The following aaatywa of aunplee of Mmi^tfintd tugar will illu.t rate their oo poaitMB. There ii in adJitMn, oneaualy«i« *at* a sample of *-jar mmdt* from lite molasses.

Statement No. lit.

	Sugar obtained by the centrifugal.	Gur from the molasses of the same.	Sugar obtained by the centrifugal.	Sugar refined by wet wood.
Cane-sugar	[illegible]	[illegible]	[illegible]	[illegible]
Glucose	[illegible]	[illegible]	[illegible]	[illegible]
Ash	[illegible]	[illegible]	[illegible]	—
Total sugar	[illegible]	[illegible]	[illegible]	[illegible]
Ratio 100 pi.-i of |aW iu,« contain of glucose	[illegible]	IM	[illegible]	[illegible]

It will be M that Ik* *gmr* ntucb we* prepatwl from tbe molasses was of not all rtry peer quality, wdead it wa» neariy »jrood «• eomtof the gurs which were prepared fiww jutcr direct at tbe farm*.

* I apply the term "jaggery" to the semi-solid mass •Wat « prepared by staying the boiling process at an earlier stage than is the case when "gur" is prepared.

10. *The loss of sugar which occurs during the boiling-down process.*—The loss of cane-sugar caused by inversion has already been dealt with. There is, however, another source of loss during the boiling process which I have attempted to estimate. Assuming that we have determined by analysis the percentage amount of sugar in any particular quantity of juice and that we know the weight of the juice; and, secondly, if we similarly determine the percentage amount of sugar in the gur obtained and that we likewise know its weight, the weight of sugar in the juice employed and in the gur obtained may be readily calculated. If no loss (excepting inversion, which is not a loss in the sense in which the word is applied in this paragraph, for if cane-sugar become inverted its form is only changed) occurred, the total amount of sugar found in the gur should be equal to that in the juice.

In making such calculations, however, it becomes necessary to bear in mind what the errors of experiment may be. In the analysis of the juice the error may be 1 per cent. of total sugar, in the analysis of the gur it may amount to [illegible] per cent. of total sugar. [illegible] Further a sample was taken from the cane at each mill which was done [illegible] of cane, the bottle was filled (as at Poona) from the big [illegible] of the juice for one hour [illegible] sample represented about [illegible] juice. [illegible] were frequently found between the composition of the juice of [illegible] sugar, though [illegible] cent. of total [illegible] between two samples would be equivalent to [illegible] however, fairly assume that the mean of the two analyses would really represent the average composition of the juice of a plot of cane, [illegible] the error would not be greater than 2·5 per cent. of the total sugar.

In the [illegible] of cases, however, the difference between the composition of two samples of juice from [illegible] plot of [illegible] this figure. In the case of the gur the sample could be very perfectly obtained.* A long iron instrument [illegible] semi-circular form like the one employed for sampling cheese, though much longer, was driven into the blocks of gur and on withdrawing it, a circular slice of gur, the whole length of the cut, adhered to the instrument. A portion from the centre of this slice was taken from each block (or from one-half of the blocks if the number be large), and these portions on being mixed together give a very perfect average sample of the gur of the whole plot. It may be mentioned here that although gur is quite solid in the ordinary sense, still the molasses do pass gradually downwards, and a piece chipped from the top of a block might contain less glucose than a piece taken from the bottom. The advantage of obtaining the sample from the very centre [illegible] thus be apparent. Only one sample of gur was analysed from any one plot, but the error of sampling when done in the manner above described cannot be supposed to be anything appreciable. In the accompanying statement No. 11, the weight of juice, the percentage of total sugar and the calculated weight of total sugar in the juice is placed in the upper portion; in the middle portion is stated the weight of gur obtained, the percentage of total sugar in the gur and the calculated weight of total sugar in it. Finally we have the difference between the weight of sugar in the juice and in the gur, and consequently the percentage of loss. This has been calculated for four plots at Cawnpore and for three plots at Poona; in addition to which there is the result of a careful experiment on one pan of juice made at Poona. It will be seen that usually the loss amounts to more than 10 per cent. of the sugar; the figures obtained from the Cawnpore experiments agreeing closely with those at Poona. There are two reasons for this loss, the one being due to juice which is unavoidably carried off with the scum, whilst the second one is due to sugar which adheres to the cloth lining of the mould into which the gur, whilst still warm and soft, is put.

STITUCEKTNO. 11—*Showing ton vrhieh ocev.rn when boding down juice.*

		Cawnpore experiments.				Poona experiments.			
		Mairna variety.	Poona variety.	Madrasi variety.	Sabhrana-puri variety.	Plot 18.	Plot 19.	Plot 20.	Plot 21 (boiling).
Juice ...	lb	1,807	3,452	2,833	1,526	11,400	13,284	12,833	900
Total sugar per cent.	...	16·24	14·25	15·45	16·67	17·2	16·75	17·17	16·14
" "	lb	293	498	437	290	1,958	2,224	2,203	145·3
Gur ...	lb	316	534	465	302	1,522	2,338	2,210	151
Total sugar per cent.	...	82·06	83·02	81·88	80·96	88·1	80·69	87·92	87·26
" "	lb	256	446	376	254	1,683	2,008	1,943	131·7
Loss ...	lb	37	52	61	36	275	216	260	13·6
" per cent. ...	...	12·7	10·4	13·9	12·4	13·05	9·76	11·80	9·3

The experiment on one pan of juice a I Poona wat made to determine how much • i* carried off by the icum. InUu*ca« the total loaf amounted to 93 per «nt. It wae intended to collect all the team, wrigh it and atulyw it. But It n difficult to do thu, aa the " drainer " with which the ecum it itparated it paaaed from ti* pan to Uw weel in which ihe acum it put, aonu dript on the ground, ami again the «g»r Imlcr ha* to (five U» drainer each time a violent nhake to detach tome of the ecu in, Md it thu* happeni that all Uw ecum wa« not actually collected. In the vxprimraU under DOticaUweram weighed 1*11. It contained £7'i5 per cent, of *tugtr,* and tliii amount* w flOIbof Mgar. Of the 03 percent, of I »«t 4' 6 per cent- wu thut accounted Hut wnc* *om* part of Uw acum wu i«t the amount of augur in the «cum may be mfcly larointd to be greater than iht*; probably MI j«r *oral,* of UK IUM would •wre »u. uratcty repraeal it, The remainder mutt be amimed to he attached to the cloth. -b H i» tbut »een that a !«e of more than 10 per cent of U» •ttgmr in the juioe i> wtaincd, it happen* that that portico which goc« with Uw u taefully employed. At Cawnpore the *cum waa fed to cattle : at Poona an ami '. «xi*U with Uw nan who »uppH« all the rope* that be •hall b»vo the ecum He takaa it and prcjarae *ffur* from it, and concidrring tint it oon a bijfb paneatage of lUjrar, it will be cvulrut that altliocgh tlie preparation : will vntail HHIK iittle troable, *ttll it cut L* pt^Hubly done. 1 ' of eatiafactiaa to find lh»t Utia sugar w not watted, and afford* another example vcnomteal Uw cultivator M, whrn by mean* of |«tin)ce he can be *to.*

11. *Tht total amount of *ugar in the can-* —

\. u. I ktMwn, Uw amount of eugar which actually exwta in Uw cane it far greater thanibat whuh uaprveaad by any mill. It appeared nereitbelav U> make aome deWrminattoo* of Uw total «qgar in diJTereot aorta of cane, partly bMejueioeadatermiiMUoii* have nut been prcviou»ly made M far n thr trriur it aware) for Indian •au'», bat more pAiticuUrly beoauae frum Jifforvnt aurta of cut tery ujjereol amoonU of juice are eipM**!, «»d Uu* independently or the exact dteorip. twn of will empwyd- I*» J « " •» •**"»P *" """^ *• *l»»mi«» **• toUl aogar in Uw owe and at» (aim* we can oakwlate ih« amount in Uw juice expteaied) Uie tn Uw retoa* »•»«*; lite mm of the two latter would form a check on Lbt i of Uw former. It ba* been fonnd impuoable, for »ev«nil reawnt, to deter- Uw aufKT tn Uw croabed ea»e directly with any dvgtea of rt** tueea, aad *A* be placed oa the «VUrmi»atii>n« of Uw toUl mgar in Uw cane aad taUw joiee, *• will be at**, Jwterer. lli«« are pwbably very aear the truth and earna inier«MiB« iwUta an ofeuuied. It will U well in Uw firtt plaoe toexpuii U» procea* Mpw/edforUwpttrpee*. A ea«mwnt pUnlrt*m may be mid to <xnmt of Uw prineipal parta, Uwove ta jniee aad Uw«Uwr » " <m(te Hbw," *bich ooouaU pi IBCIpally ef eeHuluae •ad oUwr iBMtnbw carUhydratra, Th" former, the juioe, it a wiiery lioutd, whiltt UM «wl» fibre • praetically intolnbte *a* cold waUr. If Uirnfore Uw eUm (after ban been atuiably e»t up M U to admit Wftuwr to pa» among the Sim) be treated with

the latter will with iwijr the juice entirely, baring tbe erode fibrt behind and the Utter nwy be dried and weighed, la the analyse of cMUe-foddere ebemiit* b»« nnially found it mot* exact to empliy bit water in withiny the jute* or foMite portion from the erode fibre. In tbe ease of augntM* 1 bars employed (for the pur-jwai uniUr ditctwfWw, namely, tbrcmimali'o of the jtiwe and eagarl only cold nM ; for our object ta to enpante only tbote m*t ten from the erude fibra which are dwwlwd » tbe juice, i. e\, in a cold watery fluid. If, tben.w<>thae*epetate tbe erode film and weifcb it, the other portion U eontidered to be juice. Ilaring deUrmioed the proportion of iatet, we can from iU anaiyus oalcotate the amount of *ui^ar or any other of it* coasliuents whi.li tre prewnt from tbe parentage of jin * fo«nd hi any oaae. Thus if we found 10 per cent, of erode fibre in a eane, the different* or P0 per teat, would be juice; and if that juice contained I & per ornt. of sugar, the proportion of sugar in tbe caoe wouldU (OOxls^lUO) la-sper cent. A« a cbrtk on thw method we bave ottwr evi-dence. A eoeonlent ttem if dried at a temperature not exceeding UM boiling point of water, will lota it* water entirely, and wa nave remaining what» commonly termed by eberoi.tt tl.e " dry matter." Now it will be erideat that tbit dry matter contain* tbe erode fibre *nd the logar and other *>tU instance* whicb rxift in tbe juice. If therefore to the erode fibre we add tbe amount of lugar, mineral matter and slbomtnoid) f>und ia the juice, the MUD thoald equal approximately the amount of " dry matter." In tbe cate of mgareane juiee, the gMater part of the solid matter* dtaaolnd in it tvnstot of tagar; the amount of mineral matter* and alt'iuninoitt* an very tmall, ae will be eeen when axammfag UM (UtemenU. In the example above quoted the dry matter thould * a liule more than the erode fibrt 4- the eager, or rather nor* thin S3 5 per tani. Thui a ohx* ia placed <m the determination, of the l-Ul »ugar in the «aM which, would ihow what error* might exut in UM proceai of auaUii*. The weak patal in tbe tnrthod tin in tbe fact that only .null uuanttliee of eane (about C to 3 ox. tu t from 3 or * canmi oould be operated upon, and although average naad case* were choera for UM parpoat, (till tbe temple thne obtabed » mtteh more open to doubt Una the *an>plat of juice. The method ia aot psppoeed b> be quite aecurate, bat the malts obtained an inffioient for the pnrpnee. Tbe acrompanytng atatenMmt No. If will now be readily ttnderttood. All the figure* repreeent parts |<er 100 parti of fmh ««garcaac. tn ilw fint two Golnmita of the atatemeat are the remits obtained by UM ttalraif of ampin of cane from two parta at Pooua, both or whi. h *m of the ease variety and UM mult will indksta that tbe m«Uwd employed may I* relied upon Ia the other five eolnmn* are tbereeulU of the analytt* of 6»e varietinof caae growDat Cawnpof*-ID the upper part of the italctamt i* eihilii*-! the proportion of water and of dry matter in each tort of cane. The ercood eretion oftbe lUtcownttbewe the prof eretion of erud* fibre and of juice, la the third eretion are fuund UM proportion* of eraie fibre and of »ugaT, a>h and •lbuB>inc>id» which vkiiUd in tbe juice, itxl UM MUD of UMM may be conparcd witb the dry matter. Ia two ca» tbe total of UM determined cwoati-tasats ia aomewbat too high and in - third it • a Lltle tow, in UM other four «a*ee the remits Mtaode apftraxiauWly viUt UM dIy null'r. It will be aeea that the pro-portion ol erode film vaha* very WBMdemUy. Boat* wWUeacoataiBiag nearly lwKea» much u uiUrn. The pfr««nUg« »f juice, on UM ulhrr b*oJ, varira fm« 84 prrceot i» about tl per ccat. The percaatag* of total togar rarwa fr^m 10 per em I. l« mow than 10 per teat. It may U uwnn ncJ htre that Ue Leat caa« pr»i«c«d »U'-*1 doe* not contain more tUan IS par oant. «T ngar, and «onM<|oeatly it may be a».»it<J that wr have ta the variety grown at Pooe* a caae whith is nearly aqutl to any in UM world. It naoJaiaa, naomonr, a low proporUia of crade fibre, a quaLty whirb, ae will appear from tbr o>nUiera4mM duwkved m the o*»t paragraph, M of aome moment. Of tbe varietMa gmn in u.« North-Wettern Profiaee*. UM Sahlraanjri eaataias about la per oawt. el a*gar, wbcb W Iigh ; but the proportion of crude fibre is . higher tbao is tbe Po<na>o>aa, The ttnaty "uuloa" oool.it- a fairly bi«h proportion of M«*r, bat it also eoaUins a vary high proportwtt of erode fibr*. TU timt «s d.kcJun and dhaul rank far Utow, (vr timy aoavtaia ww propMUvaa of i«gw aad h>gh proportions of crude fibre.

STATEJIWT NO. 12— *The eompcmtion of tugarca*

	ft*»am«nfc		Cairapon ri jw ri *m*«• u.				
	Mot!	I'.t II	DawaL	IHek-chut.	Uatn. 1		KtaVaal
Dry aitwr	it .1	Mi 7G-S1	• M I 76ns	mg 9074	KHM ;.. (l	a»M 74-06	
Cni, flbrt Jult»	M I	"6*	ii;: *m* •	ii no	I4« ss-io	10 Si KM;..	H»00 Bfrog
CTWU An Total • ! « AllmmuMidl in Met	1611 ..	10 11 •at	(MB • «	11 00 HI3h IS • i	U*I 1 1 -T 10	10,14 •w •so	n ...),y >i 14 «
			•HI	tl til	aM4	MM	MM

12. *The amount of* ;iww o»d con*«7U«»% o/ »i»gnr tc*irA *remain** «>,/j-. *pressed from the cane.* — Muring driarmined the amount of juice ntri from lint th« amount of sugar w•"•" iliffrtwtotaoiconliiiwrf, w«0»v now «nnfi»n> fhu informmtion with th* amount of jnit* and Mgw «p*w». In the -tUtem^Dt No.] 3 w net oat for the Mtne mM awnplwof m w u w«e referwd to in Uic fowgomg i»«^raph tlte t•((a juice in t iceanr, U» proportion wt.rwted I>y ih# mflli, and the diffen?ne« or that remain in - In UM rcfu»f c»oc ; thtii nmilarlj the total miffnr in the cane, the ammint exprvniod in the juice and Uavt jhirt remaimnffin the cmohed eane; finally ir> ttip iliirl Motion of tba statement the relative proportions ,,,cnllJ,, filiw ,,^ i aico in I0ft V*ati** <sf eru»h«I C*DO. A glarx» at tbo fiirurw in ih* fir#t P««U(MI of tbe rt*lonH!iit ahotrc (Jiat whilut Ibere u no »ery great Jiffvren*.« in tli proportion of jui«* wiiit-h Hie vnriptiw! oontain, lhe amounU «ptwa»*l vary •nortnou«ly; from tlw cane at Poona more than 70 out of ttl |*r cent t>f juiee tu obtained, wliil«t fr..m the matn* Turirtr at Carnip-ire only •Utt* 45 out of 85 per cent wa* reatin-d. The o0i«- rar ipv M intertnediata po*it;-n At tint «iebl it woaid Uw»|«-el«U that tbe ailli were at fault und that ilw high proportion of juiee *txpntmi* at Poow indiratca that tin* mi!* emp]«y! tht-re wcr» beiltr than tlm«e employed at Cawnpore. So far a* Uiii point i« caneerned, I Ulure tfcal tie tnUU «nj>lojrBd at Cawnpow *m in *evwal ca^, (8 ,tl.IN a used l«d one! ami ptiwubl/ Utter milt* would lia« expreiaod rallier m»ro. But thin will ool in any caao arcount for the gwart dtfleremw which MM found. From the Pooi.a variety *{grown* at Cawnpor*) 86 jier «nt. wat expmawd, whi^-h «• dintirtctJv *lem* tian irltat WM «U*in«d fr<»m UJI» «rietj at Poona, Bot a comj-ariton or thv mrnlU of rni»f]jng tbe acreral varietiea at CaWDpore abowa that wlnirt 04 ooi of 90 per cent, of juice wa. obtain*! from tbe Madras rwSHr, »nly 45 out of 86 percent, wa* got from the matna, and thii owler perftcttj aimilar cooditiniti ai rogarli miili. If, however, inatead of making wmpan*Mi» *»f* the atnounU of juiae, the cmJ« 6liro and Ui» j.art it playi t« to eoBiidered, an explanation offer* or fcnelf. Aa anon aa (lie oane it brokoti and wliiU still a tbe mill, the crude 6bh» may b* 1iltM»d aimpljr to a *tpoagt.* Tht cell* * hich cneloM tht joiw i" ^** ""P**' cttl<> mrp l*»lf«> «nd there i« nothing to prevt-nt the jnet fron Ua«»g *•>• <«».«w»ptia|r <i« p*»y»e«l property ofadhen'oo. Tlit» !• wiot) baia« the ««*, >k* «"«»nl »f J oi « wlli<* will remain with anjr refnar cane u it Uam UM mill, *fl •I'p'n'l pnnd|»lly on the amount of ipongr materUl, in other «orfl,»ita*eTKA/tt«pr»etlt, Tbo lower portion of the Hatemenl eihihitothi. wry okwrty, f<* th« refnw ca« of all U>e Bw varwtie. at Cawnj^re c-nwi,tod of 2& to 17 par «»»t. ot crod* flbte ami "» to 7» per tent, of joke, abow.ng tUt tlw milli faaU workatt »«/ uniformly indeed in eac i case.

S-rmmwr No. 13—Amount of j *ict and ntgar r*maining in ">* *«

	Dumraon.		Cawnpore experiment.				
	Plot 2.	Plot 11.	Dhaul.	Dikchan.	Matna.	Saharanpuri.	Madrasi.
Juice in cane ...	91.6	91.5	87.3	89.0	85.2	89.6	90.0
„ expressed ...	71.6	72.2	51.2	50.0	45.4	57.4	64.1
„ ta rrfw*c»M ...	20.0	19.3	36.1	39.0	39.8	32.2	25.9
To(*t .tic*' in MM ...	10.11	10.21	12.21	10.38	14.27	14.25	12.90
Sucrose, juice expressed,	12.39	12.87	7.15	6.52	7.00	9.50	9.00
Dilta i»fw<cane ...	2.52	2.44	5.06	3.82	6.62	3.39	4.00
Composition of refuse cane crude	29.4	30.7	26.1	23.0	27.1	26.3	27.8
Juice ...	70.6	69.3	73.9	77.0	72.9	73.7	72.2
	100.0	100.0	100.0	100.0	100.0	100.0	100.0

At Pontw tW refn«e cane nu»t have been un>itt*tttanab)y better ont*h+l for the refute cane coatitted of 30 par *nsttt.* of erode film and TO per cent, of juice. It that Iwimw apparent tint the proportion of crude fibre in any cane it a my important factor, ftnr *i** may be tUtrd at approximately correct that the amontr of juice remain-ing in th« entthed MM vmhet directly with the proportion of crude fibre in the caw. The main* variety contain* about 15 par wnt. of crude fibre and held 40 per oent. of juice I within itf IUUUMB when truabrd; the Pooea variety (crutbed with an entirely different mill at Pcx>na> containad 8 per cent, of crude fibre and retained £<> per «"'• of jam. It will ihui becoei* apparent why it it that although ibo malna va>iety contlinoJ S6 per rent, of • juioe containing nearly 17 per cent, of uigar, it U but a very pour tiane fir rntnluni; pqrpaeea. Of the 14 per cent, of tugmr in tbe oanr only a L;tle more than half wa« expe«ca«d, wbetaaa in tbe ca-e of the S..!iir*n|>uri and Mad-tati varietiee]rd* of the eugar they cootainnt m expreM«d, and from the Puon* variety (grown at foona] th> proportion nrueeto |tha. It maybt taid tnenforethal it ii !'»!• goodgrowittg acane with v«r> rich juice if tbe prnportbn of erode fibre i* likowito bitfli; a low proportion of t rude fibre ia indeed of grraUr unportanee than the {*»••»-•ion of a good null.

14. The amo•int of nitrogen awl jAotpkorie add ta tit tuffanonr eroy — La«t year an appro&im«te etttoute of the amount of nitrogen and of pbot}>Oori« acid in tbe lugmrcant ;Mp wu made, but it a|i)*anrd to h» worth wbit« to mak« awunte dVtermiwiiont of tbeae two coMtiUwoU, Tor Una crop M oooaidered guii-rtlly to be a very exlianating one. Stroj.U wtra tberefote. taken of the tagarainc. of the p e n tram and tops of the cane which are not paated through the mill, and of the dry U*Tve, which are stri ppad oil the ouw when it i» harveated. Tbe wotgbti of three were also recorded, and from thttand the pttsenlag* (uund by cbtmkal aaalyew, tbe weight «[nitrogra and pboepbonc acid Okay be rtadity cakub>t«d. Tbe accuwpatiy ing •Ulomcnt Nu. \i eshiUt* the rtnlu for two varWtte> grown at Uumraon and two .it C^irnport. The largi^tamout *jya* waa takes -up by the "Madrasi" crop at Cawnpore•ic and thi' ut^•.-•t anotiat of |JJ-phoric acid I by tlw mat ta crop. Tb* ii,,.ount of nit•','•"> in tl»; Matlran OTOf ie iadred far higher than in tbe other*; too propurtiuu *ot* Mtn>g«n in Uie •event j art* of tbe |'lant ta high and to alto m tbe rrla-ttvo weight of green ual dry Uavee. In none of tbt four c*ea» were tbe oropt to heavy a* at Poout. Tbe crop of tbe Poana vanity at Dauraun wat only aU>ul half a* heavy a* a good ono at Pogna, and the atsoante of nitrogen and pboapborw attl in a good crop of oane at Poana ouy he aaiJ to approximate lo at leu* lOOft per acre aaek

STATEMENT No. 14.—The amount of nitrogen ... sugarcane crop.

	Dumraon experiments.				Cawnpore experiments.			
	Poona variety.		Red Bombay variety.		Madrasi variety.		Matna variety.	
	Nitrogen.	Phosphoric acid.	Nitrogen.	Phosphoric acid.	Nitrogen.	Phosphoric acid.	Nitrogen.	Phosphoric acid.
	%	%	%	%	%	%	%	%
In fresh cane,	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
In green tops and leaves,	·133	[illegible]	·28	·121	[illegible]	·117	·107	·177
In dry leaves,	·425	·213	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

STATWIJST N • U,—*The amount 0/nitrogen and phosphoric acid in the sugar-cane crop.*

	Dm • experiments.				Cumpora Mporlswnto.			
	Poo•a twirtj.		Bod Bnnfatj m M f.		UMIIMI wittjr.		Madras variety.	
	Xilrofro,	FaweJ wi acid.	Nitrogen.	Ft ajharii •«id.	Kitn^tn.	Phosphoric tat.	Nitrogtn.	("'"ft[1]'
	l.		ft.		ft.			
Wtiefat* of fr..!. <»t.-	46,000		*9,0tt>		•MM		lino	
Or/ IMM...	«J»40 MM		MM i....		10.TM MM		'.79 M7J	
	ft, si'i pa	ft. I[1]' •ak	ft. Bhaa*		ft, nkvjea.	ft. •aoanbari* Kill.	lt. Mtaoai a.	'' ^
In ran* ... Onn top*... Orylr. ...	IM ill MM	s-s IO-l	13-4	MM 101 7fl	US £34 MM	KM 11)6 H."	1*0 n-o MM	IM MM »O
	4M	41J	MM	411	US'!	SJ-8	MM	MI ^

Conclusion.

16. We may now rammariie briefly toe retulta obUined up to the present on tie (object of togaroano.

(1) It ii evident that the juice of riiuVrrnt nrietie* of cane contain very different proportions of eqgar : further, that thte projKjrtioti of togw is not materially »ff<cted in any one year by any doeeription of manure or its amount Thi» proportion of angar in a tmni- *mmg* be alhcUd Mrioutly by a change of climaU.

W 'The proportio of Blucw in tbe juioo of different varietie. nrie* contidCTaUy • thi. proportion it iwnrfMd, in tone ca*e» largely, during the boiling proMt*; but tfaat tHi rt inwmon " may be pmented in a great meaiare by the addition of lime. It i. «k probable that cultivaUra could eaaily be taught to " lim* " their juice if there wen am rail *tot* it.

(f) That doriDt the boiling-down prooeae there « a lea of about 10 per rent of the «ug,.r which i* in Uwjniee operated ttpon, tnoet of which beamed away in the fc-um. Thi* augar need not, however, U lo»t in the eoonomio Mttee.

It may be fed to cattle or (aa at Poona) •ome at least of tb« sugar in it tn»v be rec

<+) The amount o(JUK», and eouequently *nt* tngar o)«o. wftfeh remain* unexpressed frooi thecaae dependa on th« proportion of crude fibre b the cane. That therefore it is dniralJe to grow r.rwtwn of cane containtag a low proportion of crude fibre. Th,- BIO—I of «ug»r reauunintf in the crm«b«d MM may he a* mm:h ai nearly cne-half of that in the «»(•, or it n»y fall to a* low a proportion as 1th

(6) The awoitnU of nitn>grn and of pbo*pboric acid taken op *by* the sugarcane crop will wyfrom ann» *0I6 aach *(o€ l*m* in pocreropp) to alout iOott in such heavy crops as those grown at Poona.


MAP
EXPLANATIONS

REPORT

ON THE

Cawnpore Experimental Farm

FOR THE

Kharif and Rabi Seasons, 1896-97.

ALLAHABAD:
North-Western Provinces and Oudh Government Press,
1898.

Xo. 143.

DEPARTMENT OF LAND RECORDS AND AGRICULTURE.
IM.-W. P. AND OUDH.

Dated, Caumpore, th^Sth January 188

FBOJI

J. S. MESTO V, *Esq., C.* 6.,

DIBBCTOK or LAND RECORDS I ICULTUBE,

-Wisn: <•* Onus

To

Tut CHIEi :TABY TO QOVEBNUEK

:ni- A*D

SIR,

1 HAVE the honour In submit a report on the working of tie Cawnpore Eiperimenlal Farm for the Agricultural year 1800-97.

Thi report in written by the Aiwtfant DimcioT, Saivii Ifiinnaajiml Hodi, M. It.A.C, who ha* generally sitpTviv*! and d oxperimentti Uuroughoot the Before b> -rt wu forwarded lo r the Government of India, in n-fordauoo with whowcriticiwnu certain modifloaiions tbe •tatement of mult* have been introduced. The Farm baa been under the itfrefihargnof Mr. I'. V. Suhhiah, Principal of tin• Av'ri^uIiuraJ School, the special if Farm Supen laving boon abolished from *hi* May Iwt.

2. The Form land* art efficiently protected from dron^ht by a canal dutribut-ary which paaaai throngh them, and tbe exceptional •evtriljr of the year made com-liTi'ly lit lll* impreaiion on their fertil •y.

3. *Ma>.* /nWiid law u uma] Ur- .,1 on a somewhat i«-teniive Kale, both after if» «ible lo the urdinory cultivator and otherwise, •valwof highly nitroK*-n>'>i- manuru* for maixe and wl.-H ha* been nfrsiu drmon*-[; and on the whole «hwp*<fUBg, »lo(>' will. *fy\mxm* aud bone , *mma* to have given the be- !1O0a0 batween •land jMii.ln.-ltc ot The eomj*aralivo merit! of dilTerrtil manorm Bpi «Uloe», imliKo, k-#m and pnM ha hicxperim. CM ymr* nn>r .Dv have been eaatorrake inumiaM to give *r<«A* ran It* M it luu nlrettdy done csbwwbere, iK for wheat, by ploughing innj Jnooa plant forma otto *ot* la- ,i,cnU Farm. Al-mgakle tl» uminottn cropa an grown in alternation with wheat and not pluughnd in.

Prom a eom'iaruon of tl» rwult* it may be hojied lhat' in time w<> ituUl !» nLU-prow d. nml.-ly wt.rlh.-r the proceat of gram maniiriuK in any fom can or cannot [1] profitably ajajdbrulurn by the onllii

4. I f«w t«u of *fovtytrattw m«th-l» of working* m^nrniW suple* wi-« L moat naeful neld of isvaatigation ii nocaamrily mlrictod at the Farm, a* oom-MtBodaorttllagfioan bi»t be jnd^i diffenml The Farm uxfwri steal* have CM Mn i^j^ and not after tU break of ine monwon: they ahn lend lo «Low ibal mai* aowit bvfon *the* «r*t fait or rain givta brtter «>W lw ^wnaftT *t\m* rain* open 4bul both oondwiom ahouhl bt qtinI „ ^*r* Mrij n,,^,. and cuttotM w all *«n<«ibU to OUMJ wafcrr. The rxperrmento with mixed *cra\»* (pagw 13 and 14 of the R*r»rt) go to abow tbal arharaud juar (frown together pay

btu*r thin certain other eomtnnationi; bttl the figure* are iocoaclaiivr. Trtat-plauUtion of wbmi ha* been cooductoj wtlb *mteemt,* bat tbc pncticsJ financial v»lu# of tbe operation mnaiM to be total.

6. No *vw.%mpUm**U* bar* be*n tmd during tb* year. English plough* ham HDiMlbtta worked ftgftiMttlwooaiitfjr plough«ad «•*« *bown tb«r Mperiority: bat tb. diffmne. in raulu b«v» Ml btm wry a»t«rwl in tb* U*t two nbi MMOU- Tb* gmtar Mntion of ihe wi) MCB»J| by dt»p ploogbiog ww *toon* Y*1U*W« in w«t ytsn than in dry *oum.*

6. I i«tU« of tuple crop* have dwrwdly nodnd tnucb .ttentiou. Colloo and Mgmxam* w*r* tbe inbjecl or intemtiag ud cxbanttin «xfwfia>ebi. A number of Awerir*.n aod Indian eottoiw wan gre* fint timiid* by nd* under similar conditions. The local Cawnpore variety ud tbr JljdraUI twiety did better than any of ih* fcwhu -•• k«. ik.__________.:_________i:._ ..*• ^ 6om bM Mill *u* bo de*rml»*d by txptrta, UKl Uw hM. is thrir [mat form a» loo Mw ta joMify any gnml cowJuMon*. Bmral vsrhtw* wtn alluwf to r-oain in tb* ground for two yean j tbe crop tbey ytrlded in tbe mood y«w w*» •omewbat more luxuriant (b*$_0$ »$_t$ *t^U inA* picking*, Lot tbe fltir* ww iwiiff^root. EiperimenU wiOi sngarouw aad tb* treatment of yur eontiuu* t> vi«M ralu*W« f«il^ wfcicb ar-, bowmr, a*y*4 in a highly t«rbsk*l tog* and atu* U -obu t» further investigation.

7. The report (in*, tuwtnU fit doM$_t$ drUiU of tbt iapkmtsto ud MM) « wm dktrtboted (row tb* godowa* .u* U»l to tb* F«m. A brl*f not* U >IM |ir*n of »b*t nt don* in wp^lng balk to tb* poUic. Tt«* btmncjM* of oar working a» frvwiof »v«7 y*v in inportiM* ; >nU I *waMm* tUt tbty tn*ril lb» brt •tlttbon w* c«o gii« tb«n. Ta pqt good oku Md witbis tb* Mob of tb* cot *.«J to L.tp him i,, improYing ib. MnIn of ntIlt b. ^ ^ ^ . r t m . , 1 . Ti«y U». di«»t ud pr*ti<»l « Wf.»orU* gantry, ud go ftr to briDg U» dqwtewil into •y.p.tkw t b b

8. In paragraph 9 of the report a reference is again made to the failure of silk-worm experiments some years ago. Interesting results, and some measure of success, have been obtained outside the department by Raja Rampal Sinh of Kala Kankar; and an early opportunity will be taken (with his consent) of studying his methods.

9. The general management of the Farm during the year has, I consider, been very creditable to Mr. Subbiah, who has his heart in the work.

I have the honour to be,

Sim,

Your motf oMkat servant,

J. S. MESTON,

Director.

The maize is sown three months after the removal of the wheat crop and harvested in September, and the land then kept fallow for nearly thirteen months until it can be sown again with wheat. This treatment goes on alternately in case of the two sets of plots in the "duplicate series." The manure applied to one plot of the "standard series" is also applied to the corresponding plot of the "duplicate series" in case of maize as well as wheat.

The kharif standard and duplicate series.

The cultivation of the ground consisted in ploughing the fields once with the Howard 1 pony plough, cultivating them twice with the Planet Jr. horse hoe, rolling the land with a small stone roller and levelling it three times with the *patela* (wooden flat beam). The fields were irrigated with canal water about a week before sowing and were sown with Jaunpur maize on the [illegible] of July at the rate of 30 lbs of [illegible] per acre. The weather being dry it was found necessary to artificially irrigate the fields which was done between the [illegible] and [illegible] July. The crop was weeded and partially earthed up about the 20th of July. The plants in some of the fields in high manurial condition, *e.g.*, the cowdung and sheep-dung plots, were knocked down in greater or less degree by the high westerly wind which prevailed in the middle of July, but the immediate earthing up enabled them to recover their vigour and to resist further damage from the wind. The crop was harvested towards the end of the first week of September. The following statements show the respective out-turn of the two series:—

NO. I.

[illegible] series—maize.

Plot number.	Plot area.	Treatment with manure per acre.		Average outturn [illegible]	Average for four years [illegible]	[illegible]	[illegible]	1895-96.	1896-97.
K. 3	[illegible]	Cow-dung, 150 maunds	Grain Straw	1,130 4,037	909 [illegible]	1,206 [illegible]	708 6,499	2,018 8,107	2,541 14,224
K. 1		Cow-dung, 150 maunds + bone-dust, 4½ maunds.	Grain Straw	1,500 3,322	1,010 6,212	2,383 10,176	1,101 6,836	1,800 9,556	1,700 12,075
K. 2		Cow-dung, 150 maunds + gypsum, 2 maunds.	Grain Straw	1,280 3,900	[illegible] 2,219	[illegible] 10,781	1,077 [illegible]	[illegible] [illegible]	1,706 12,237
K. 10		Sheep-dung, 150 maunds	Grain Straw	739 4,403	[illegible] 6,200	3,033 10,466	[illegible] 7,671	2,005 [illegible]	2,813 13,401
K. 7		Sheep-dung, 150 maunds + bone dust, 4½ maunds.	Grain Straw	1,149 3,049	1,352 3,033	[illegible] [illegible]	1,149 7,869	[illegible] [illegible]	2,379 13,721
K. 12		Sheep-dung, 150 maunds + gypsum, 2 maunds.	Grain Straw	1,003 4,251	[illegible] 4,070	2,019 [illegible]	[illegible] 8,046	2,272 7,279	2,085 [illegible]
K. 9		Poudrette, 150 maunds	Grain Straw	1,040 6,144	1,071 4,032	[illegible] 8,494	472 6,244	1,048 8,001	[illegible] [illegible]
K. 5		Saltpetre, 2 maunds	Grain Straw	1,113 3,650	733 2,777	1,646 [illegible]	423 4,378	850 2,873	1,119 8,500
K. 11		Saltpetre, 2 maunds + bone-dust, 4½ maunds.	Grain Straw	1,180 3,273	835 2,341	[illegible] 3,111	220 453	1,457 6,450	1,068 8,047
K. 6		Saltpetre, 2 maunds + superphosphate, 2 maunds.	Grain Straw	2,003 3,924	1,025 2,081	[illegible] [illegible]	798 4,013	1,024 [illegible]	877 8,137
K. 4		Ashes of cowdung, 150 maunds.	Grain Straw	802 4,037	590 2,009	[illegible] [illegible]	278 3,723	595 4,158	1,819 9,263
K. 8		Ashes of cowdung, 150 maunds + saltpetre, 2 maunds.	Grain Straw	[illegible] 4,904	593 2,141	3,122 [illegible]	403 4,308	[illegible] [illegible]	310 9,063
K. [illegible]		No manure	Grain Straw	708 4,377	479 3,092	[illegible] [illegible]	194 3,237	[illegible] [illegible]	478 7,139

NOTE.—In 1887-88 and 1888-89 the crop of maize was destroyed by rain and no produce was obtained, hence no outturn for these years [illegible] in this statement. For individual outturns of the [illegible] for which averages have [illegible]

REPORT

ON THE

CAWNPORE EXPlvll I MENTAL FARM

FOB THE

Kharif and Rabi Seasons, 1893-97.

I.-HISTOBY OF THE FAEM.

TUB Government Farm, Cawnporv, in fttaiteri inftrillags Gotaiya about tluM miles eoulh-west of the Cawnpow cilr. It in Mar tbe Ktwatpiir Station of the Cawnpore-Achnera Railwaj, and it* distance from the Civrnporo East ln<liati Railway station t* ai about four miles. The laurl o<vui)k-d was originally rented from tbe aamlodireof (Jolaitn in Mar 1SSI, and in that year tl c imjrortani mauuriaJ expe-rinento Hill carried on in the "standard" and "duplicate" aeritt, which will be described praenUy, wrre rtarted by Mr. J.B. Fuller. Within a ibort diatanoe of tbe Farm pmniM • amall work«bo;> for making and repairing agricultural implements and aaeed atore wen erected tnuwqatntly.

Puringtbc firtt y««r* of managWMnt I be area of tbe^Farm underwent frequent changes, but of late it hai aut rariod. Tlie Farm propnr, of which a map u attached, extand* over 51"33 acrt* exclnding tbe land covered by the caiml diatribatary. It enjoyi fpecuil iVilitK's for irrigation, being Uavened by a dUtributory from thu Uange* Canal.

Tbe toil of tlie F*rm uar be aoeepted u a fiur sample of tbe lifflit reddish loam which occurs over a large portion of the Gangas-Jumna Doab. It WM cbemirallr analyted aotne tuno before 1882 by Mr. S. A. Hill, U. S[1]. Me(«oralu^ii«l Reporter to the Government of the Kortli-Weatora Provinoat, and tbo aoalyui is given below (-

Constituents.								Composition per cent.
Combined water	...	...	...	...	...	...	...	2·04
Organic matter	...	...	...	...	...	...	...	0·10
Carbon dioxide	...	...	...	...	...	...	...	0·10
Ammonia	...	...	...	...	...	...	...	None.
Nitric pentoxide	...	...	...	...	...	...	...	0·11
Chlorine	...	...	...	...	...	...	...	Trace.
Sulphur trioxide	...	...	...	...	...	...	...	Do.
Phosphoric pentoxide	...	...	...	...	...	...	...	0·21
Silica and tungstic acids	...	...	...	...	...	...	...	0·13
Alumina	...	...	...	...	...	...	...	4·29
Oxides of iron and manganese	...	...	...	...	...	...	...	5·33
Lime	...	...	...	...	...	...	...	0·50
Magnesia	...	...	...	...	...	...	...	0·34
Potash	...	...	...	...	...	...	...	0·32
Soda	...	...	...	...	...	...	...	0·08
Clay decomposed by H_2SO_4	{ Alumina and iron	...	...	...	...	...	...	2·34
	{ Silica	...	...	...	...	...	...	3·37
Insoluble sand, &c.	...	...	...	...	...	...	...	79·06

Dr. VotJdiirr in hw rrport on tbc "Improvement of Indian Agriculture," ncord* tbe foUowio|[optoluu hording ibe Farm ;—

"In fart, 1 «a> BIIKU pl«m«d with ibe Cawniwre Farm, and w nut prrpMwl to iad In In<h» any thing which to nearly OUH up to *my* ides of what an wj^rimoaul station should ba."

S«mlfltldi had ——————, _, ————————————————————mmr^f ——
much rain fell within a limited period. T!» Urd of «JiDetd«,*i^pJol< Noa. 4,5,9-10, uxl 11 of tht "kli»rtr **tj*rd *ri« " and ploto 1, 2 mwl 3, all of tht "Uupli«W • erioi" wai raJatd in 1894 by aaaas af tpnadiaf awth dag oat froat aocuitivmtod Uripa of land adjoining, in oritr to iaprova llit Ununag*. Lafgt no*ntitia» of i«'L Ukaa from Un canal dwtribatary warn •pratd for liaiUr porpoot on a plot (fit No, 9 on tba tn*p) which urnl to U «adtr water ia tho greater part of tba rainy

11-GEHEEAL CHARACTER 07 THE S1A80V.

TOE year under nport ww oat of neogalaad agrkaJtanl atareity. E*«1 in • law, of UM wtatrra diatri khutf crop f*U«l |*s«nUr. »n-l itw r»W od ajNaM ia uairrtgalml tncU t» remarkably poor. Ia O»wapot« tbt toutniaf«tl dwinff tl,e yaar nodn rrp-.n atwmntrd to* I7T8 inehaa whieh «at ratuidtrblr below aonui, KJ., 31)3. Tb»»nina practkaUy caatad aboot tba atkUU of Aagaot, aad ytmtij Uw crops b UM Drighbovrhood of UM Faim, a«c«pt thaw whkn ooakl faaJly tmgated, wan itrioaaty daamgaj or aMirol, loaL Tbt winter rains prond, baavftaial to tht Maadiag crop bat «m taOTSctoat to m*i«—, benefit tht ttnirhgalnl ana*. OB irrtgatad LUKU tbt osttara of nbf waa aaoraally heavy but oa murrtgai«I lamia U ww ootiaidctabl; poor. Tba droofhl ww not, however, so keenly Ml at tba Pana bosom osna) waur ww araiUbk lor tmgalioo whan waat«); aod OB tbia MCMUI th« yield both of tbt kbafff aad tht i»bf crop* ww good to gtatraL Tbt followtsg «ut«otet aLov» tho aawaat of niafall during tht jmr «adcr report and Uw praeadiag y«ar :—

Month.	Rainfall. 1895-96.	Rainfall. 1896-97.	Rainy days. 1895-96.	UM-tr.	lu.-.f* :	I-tTO^	l.t wi Btwaai
Aftti itn -	aao	—	—	—	•11	1	
Hay	M	·22	—	i	•a	1	
JMM a -	Ha	WO <	(	M	MI	a	
j-ir .	MI	t:.<	• »	n	J :	d	
an ,.	7·24	MI	11	IT	10,*	12	
r n i .	• «	·20	»	1	*»	7	
OtMaw • —	MM	—	—	—	I'M	2	
M. ..li ,	—	·43	—	1	m	-	
December ,.	0·02	f»	1	t	•u	i	
Jtaawrtan	—	It*	m	t	...	i	
»*«I -	tm	—	-	-	·28	t	
- • -	—	m	>•	MI	•m	i	
Total	MM	17·21	22	52	IIU	«	

III—TRIAL OP MAHURE8.

(a) Permanent manure experiments with

These are the oldest experiments u gotag aa at Uw farm, having bam it initiated by Mi. K«ll in 1881. Tb«y at* <*rrWd on la fouracrk* of ibirtwa plots each. In the K pi ,«,, aitarbMl), ralbeiivaly «alUd tht « kharf f Mandaid series," maize is grown year after y Mr. HtmiWI.T tha It plots, called the " rabi standard series", are cropped I ntrjr T«lM with wheat. In tbt other two wav* *«» AJ • •** AH, whi-h at* «IU tht"<iapiia«*"(or-aJi«nartt-awia«taMia»itgwwo J*r-aateljr with w!u»i, iU *bjaal btiag patty to *wfy (ho ia*Ua oftho standard •crkwr aad partly to d< Wrtaioe tht atoaoaiy of growing DM!« is rotattaa mill wbaal>

Statement showing the outturn [illegible] alternate series—[illegible]ist.

Plot number.	Plot area.	Treatment [illegible] manure		Outturn per acre [illegible] pounds.					
				Average outturn for four years, 1883-84 to 1886-87.	Average outturn for four years, 1889-90 to 1892-93.	1893-94.	[illegible]	1895-96.	1896-97.
6	Each plot = 400 square yards.	[illegible]	{ Grain / Straw	1,006 / 4,531	862 / 4,552	1,543 / 6,933	202 / 4,223	[illegible]	1,150 / 9,976
7		20 maunds manure.	{ Grain / Straw	1,000 / [illegible]	1,096 / 6,204	877 / 4,640	[illegible]	[illegible]	1,292 / 9,733
8		150 maunds + soda.	{ Grain / Straw	[illegible]	971 / 6,402	[illegible]	[illegible]	[illegible]	1,219 / 10,548
[illegible]		180 maunds	{ Grain / Straw	[illegible]	1,201 / 5,330	[illegible]	[illegible]	[illegible]	1,[illegible] / 10,759
[illegible]		[illegible]	{ Grain / Straw	[illegible]	1,110 / 8,400	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	{ Grain / Straw	[illegible]	1,142 / 6,424	[illegible]	[illegible]	[illegible]	[illegible]
2		3 maunds	{ Grain / Straw	[illegible]	1,406 / 6,479	12,111 / 12,01[illegible]	[illegible]	[illegible]	[illegible]
4		maunds	{ Grain / Straw	[illegible]	694 / 4,374	[illegible]	[illegible]	[illegible]	[illegible]
5		maunds + b soda.	{ Grain / Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11		maunds + b ts, 3 cwts.	{ Grain / Straw	[illegible]	[illegible]	3,[illegible]	[illegible]	[illegible]	[illegible]
9		f manuring.	{ Grain / Straw	[illegible]	893 / 8,276	[illegible]	353 / 4,707	[illegible]	[illegible]
3		[illegible]	{ Grain / Straw	1,042 / 5,224	1,073 / 10,021	[illegible]	690 / 7,199	[illegible]	[illegible]
12		[illegible]	{ Grain / Straw	317 / 8,020	790 / 6,062	[illegible]	226 / 8,4[illegible]	[illegible]	[illegible]

N.B.—*Fodder* [illegible] preceding statement,
[illegible] during [illegible] repor[illegible]
[illegible] ith sheep-dun[illegible]
[illegible] anured with
[illegible] marked beneficial effect of [illegible]
[illegible] manures containing less quanti[illegible]

The rabi standard and duplicate series.

[illegible] tillage operations carried on in plots of the two series are described below :—
[illegible] ploughings were done, one with the Howard's pony plough and three [illegible] tt's plough. The land was then cultivated with the Planet, J. R., horse-hoe [illegible] nd once stirred about seven inches deep by working two Watt's ploughs [illegible] the other in the same furrow, the mould boards having been previously [illegible] The dry grass was then picked out. The plots were levelled with the [illegible] ight times altogether and harrowed once. The several manures were applied [illegible] October and specially selected wheat seed, of the white Muzaffarnagar [illegible] the 15th Oc[illegible] the rate of 120 lbs. per acre, the soil having [illegible] sowing. About the end of November the [illegible] plants grew too close. Where the germina[illegible] filled up by putting in the superfluous [illegible] Two waterings were given during the [illegible] d the other on the 18th and 19th of [illegible] the end of March. The results of these [illegible] following statements :—

[illegible] ded and [illegible] m indiff[illegible] ved from [illegible] o thickly [illegible] owth, so [illegible] The cro[illegible] are tab[illegible]

No. III.

Statement showing the outturn of the rabi manure series—wheat.

Plot	Plot area	Treatment with reference to manure per acre.	Average outturn for five years, 1883-84 to 1887-88.	Average outturn for five years, 1888-89 to 1891-92.	1893-94	1894-95	1895-96	1896-97
		[illegible]	1,(74	1,591	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	1,477	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	1,700	1,113	1,910	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	1,439	[illegible]	1,904	[illegible]
		[illegible]	[illegible]	[illegible]	3,133	1,440	[illegible]	4,974
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3,001	[illegible]
		[illegible]	[illegible]	3,431	[illegible]	[illegible]	[illegible]	6,131
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,111
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	3,171	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	4,704	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	1,411	[illegible]	[illegible]
		[illegible]	[illegible]	1,770	[illegible]	1,130	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	1,004	1,003	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	1,411	730	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	1,441	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	1,741	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	1,181	[illegible]	[illegible]	[illegible]

No. IV.

Statement showing the outturn of the rabi alternating manure series—wheat.

Plot	Plot area	Treatment	Average outturn	Average outturn	1893-94	1894-95	1895-96	1896-97
	Each plot 400 square yards.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Here again, as in the case of the kharif standard and duplicate series, the effect of highly nitrogenous manures is especially noticeable, sheep-dung and poudrette having given the best results in the two sets of plots; cow-dung and [illegible] sheep-dung with [illegible] (and cultures as in former years, [illegible] the conditions that [illegible] in the same rotation [illegible] manure [illegible] for wheat.

(b) Manurial experiment with potatoes.

This was started in 1893, but under the directions of Dr. Leather it has been, during the year under report, so materially modified [illegible] of manures that the experiment in its present form [illegible] practically new. The experiment was tried, as in the previous year, on two sets of plots, one grown with the white [illegible] variety known as Farrukhabad or *the Madrasi* and the other with the hill variety (or Naini Tal).

Details of cultivation for the country variety.

Tillage.—[illegible] ploughed twice, cultivating with the Planet, Jr. [illegible] four times and levelling after [illegible].

Sowing.—After applying the manures, whole tubers were planted from the 25th to 27th October at the rate of 1,215 lb per acre.

Weeding.—Twice, and earthing up four times.

Irrigation.—Four times.

Harvesting.—12th to 14th February.

The following statement gives the results of the country variety for the year under report:—

Statement showing the effects of certain manures on country potatoes.

Plot number.	Plot area.	Manure applied per acre.	Actual quantity of manure applied per acre.	Outturn per acre in lbs. for 1896-97.	Remarks.
			In lbs.	lbs.	
[illegible]	Each plot—484 square yards.	Unmanured	—	9,630	
[illegible]		Poudrette at 200 lbs. nitrogen per acre	62,500	7,720	
[illegible]		Do. at 100 lbs. ditto	31,250	3,700	
[illegible]		Cow-dung at 200 lbs. ditto	45,460	5,730	
[illegible]		Do. at 100 lbs. ditto	22,730	3,200	
[illegible]		Castor cake at 200 lbs. nitrogen per acre	2,824	4,740	
[illegible]		Ditto at 100 lbs. ditto	1,412	6,430	
[illegible]		Saltpetre at 20 lbs. nitrogen per acre *plus* bone-meal at 20 lbs. nitrogen per acre	151 2,001	7,360	
[illegible]		Saltpetre at 20 lbs. nitrogen per acre and bone superphosphate at 20 lbs. nitrogen per acre	151 8,165	4,780	
[illegible]		Unmanured	—	4,060	

It is too early to attempt at drawing any conclusion just now, this being the [illegible] of the experiment; and apparently the plots though adjacent to each other differ a [illegible] point of natural fertility as is evident from the fact that one unmanured plot gave a very much higher outturn than the other. It is, however, clear that where greater quantities of nitrogen had been used in the shape of cow-dung or poudrette the yield has been comparatively high. In the case of castor cake, the manure was put in the lines in which the tubers were planted, and it appeared subsequently on the 200 lbs. nitrogen plot, viz. 24/6, that the germination was very uneven. When dug out and examined the seed tubers were found to have rotted probably owing to the "over-heating" nature of the highly nitrogenous castor cake. Possibly with reference to the quantities that have been prescribed, spreading the cake on the whole surface, instead of using it only in the seed furrows, may prevent such an action on the seed.

Detailt of cultivation for the AVini *Tal potatott.*

The plot* wn ploughed twice, cultivated four times with the Pknet, J. R., haws-hoe, twb>ailrd three tim« ami levelled with the *ptlela* fiv ttniM. The manure* *er*ili>-n ^j.rwid and "it tiil>er» or "sets " planted lietween the 15th and 16tb. of November, the weight of tab«n nte.1 t for seed being 1,19 : |1>, |»r *TO. Weeding was doue twice and the pbuits were earthed up also twice. Six watering* wore given in all.

The outturn of t!« plots uuder experiment are tabulated iu tbu staleuietit given bdow.

Slatf-ment ihouring fAc *tfftrt ofeertain manure* on tl.e Hill potato.*

n ..number.	rwi area.	Treatment.	\\H	Outturn	Remarks.
		Unmanured	...	13,550	
		I'mdiwU* •,* SKA sltngers per acre ...	67,500	15,000	
		HilU .. IM'ft ditto ...	31,250	13,250	
		C»»fca| @ .•• i ditto ...	45,450	15,410	
		I»itt» .«• 100ft ditto ...	22,730	13,540	
		CM r Mhi • MM ditto ...	2,824	6,100	
		DUto » 10 * ditto ...	1,412	9,070	
		Httt)N(M ^ K* Md / Bone meal @ 50lb d.tb> ...	631 / 2,601		r, |...
		DIM fftnb«^li*« 0 BOB ...	631 / 3,165	9,850	
		Unmanured	...	9,000	

The rwnJto an) not aoconling to expevtati^n, aixl the diffonaow in (be oatiurn of the ('!•'i" tnalcd witli the Mn» mnniire but in difFsr«»l quantititw are obvjounly due not to i the »§oot» of ibe matin*n**. but appnrently *In* want *aC* uuifonnitr in the qu^itj- of the mil, tufVi. niiy indicated by the *ttat* thai one unnunurwl plot pivci v<ery much l,4tter outturn Umn Ibe otber. Nesl rear will, it in bo^l, wit • better results.

<r) Manured tjjwrimeti I *for indigo.*

Thi" wa* itaiivd in lt&M, hjvin^ for itK object- the deter rtuiuaiion of the effect* of B7P*''m '''' I''''''''*1''*1 »* oumpaml with r<»w-diinL.- on the yield of indigo. Ao unm •anured pl•* i»»l»o included in the experiment"*•

The following statement gives the outturn, A&, of flacb plot!—

Statement shot,»n<; (JU comparative effect' offfypmm and other manura on indigo,

n>%mmkm	Plot area.	Wmmm applied per acre.	((•iinra of |T*M (talk* pM an*.				
			MM	1894.	IMS,	1896.	16W.
			i.	ft.	». .	ft.	ft.
It*		Cow-dung, 180 maunds ...	It, M	Kit	n.uo	11,250	9,242
		O; !*•m, 3 maunds ...	tMM	3,604	9,400	13,516	8,764
		Bone dust, 5 maunds ...	10,020	ut•	MUM	am*	M>
		Unmanured ...	MM	•*«	MM	U.104	fcycn

It will | U> <>)«- rv«.l tlnU th e results four years been so varying that no definite conclusions can !* drawn with nyatd l« the comparative effects of cow-dung, gypsum and boB^diwl iu iU <jtiaaUlJ« in *!which they ar« prescribed. TakioK iolo ^consideration, bow, v. r. the a m p wliern of ibe Ut /our

years, it appears that bone-dim hu given •lightly hethr reault than <•<>w-Jump and that gTpasm bu INCH interior to both in effect.

TIH diflttftooca are, however, nut eo aulfrul u to warrant sity practi-al iufatwwe.

(d) £xj#r\vmt cm immuring jpram a*<* *yea*.*

Tbe object of tbaa» MperitDMU u to deirrauiw tbe relative manorial nine of (a) gypuwi (&) ground JUiniar (and* carbonx e of lime), (c farm-van! manure, and (4 bosc *op«i»liu»|dwte on tbe jkld ortbe two Irpunjinou* i-rtiju. Thrtv i» aJ«o ao unmanured plot in • •%» experime til to oompar* tbe mwlt* with.

TV outturn of tU diSenat |>lou osder tltit cxptriiueut u «l»o*n in lite following staMMBlx-

StaUmeiU akovint tht e&mparatir *j feet of certain manures on gram and peas.*

Plot number. Gram.	Plot number. Peas.	Plot area.	Manure applied per acre.		Outturn per acre of gram in lbs. 1893-94.	1894-95.	1895-96.	1896-97.	Outturn per acre of peas in lbs. 1894-95.	1895-96.	1896-97.	Average outturn of gram for four years.	Average outturn of peas for three years.
[illegible]	[illegible]	Each plot = 1/20 square yards.	Farm-yard manure, 200 maunds.	Grain	1,543	354	1,519	590	530	272	434	917	472
				Straw	1,592	445	678	399	1,783	810	1,312	653	1,301
[illegible]	[illegible]		Gypsum, 3 maunds	Grain	1,730	324	1,512	620	293	303	247	1,048	279
				Straw	1,470	203	387	539	411	212	263	627	318
[illegible]	[illegible]		Ground kankar, 2½ maunds	Grain	1,183	39	1,300	514	237	201	300	759	263
				Straw	1,031	137	1,204	553	625	550	944	749	663
[illegible]	[illegible]		Bone superphosphate, 3 maunds	Grain	1,126	61	790	411	215	430	594	596	473
				Straw	329	182	320	494	430	505	1,814	625	148
[illegible]	[illegible]		Unmanured ...	Grain	858	21	726	408	184	315	251	502	250
				Straw	595	85	641	644	254	641	550	488	617

Cosaidrring ike anragt outturn of aaon plot in tbe !«•> c ij. rim.-uU no definite cqartnaioaa *tan,* ao far, bt draws. The effect of grp*ui&. tbovfb wry marked oo the yield *(gnat,* baa proved anything bol aMtafantofy is lite ca«t of poa«. Farm-yard manure baa doae fairly well in both ojaaa. Tbe experimeata moat ba aooUotwd •till further in ordn 10 obtain definite nanltt.

(e) Mmurial expirimntrU wiUk ntggrmmt,

TUe WM atartad in IWI-W, bt>t the askant of tbt oxptriamt bat ban fr**lr alreml ditriaf. tbe *ytr* under report, udaT laatraotbaa from tbe A(rWntt«r»l Cbnniat to tbr Qomntwni »f Ibdia. Tba rarietj npvrimealad *iih i< now tb» pounds eao« known a* • Uattran " taetaad of Ike « U / M triad i> the pre> >w rear*-The quantities of *mumrm* hatre bceo much intnaaed ao aa to bring tbem up to lW atandard in aae a toon* the ealtivator* laat gtvw tbe M*lrv al variety nmr larger town*, HKb a Cawnpore and Lucknow, a&d to eoppiy tbr fWater deawad ftf this variety Tor plant *f* «J ia th* tail. Taa utaaiai aobaajm *of* manuri; ng is similar to >** one follo i«ti at the rooaa Kiparunaatal Kara, ami will tliua admit uf tbc M«ll« obtai i<at)attbea» I ers farms baiag Mmpand wita «aah oiaar- As explained uord <> Mr. LaMbar[1]* note pabtiahed M aa appaodix to law Uat raar*a rvpon, tb» aufaniav* will be followed by a «rop of foaniry potatoee and rbat lit* auuiataa appjtnl an[1] J»t»dad la t«nt-Ct l»o cropi». *., i«gar>-sae and paiatuea.

Two Mtpanu «H* of l'ni<Ja ban baaa ptvrtded for tbia eiprriaeat *U>* bear aoftfvaaa la alta*»te *jmr*.* one afi*r aaoli er.

Dat<aUe <>/ rw • I

" P"[1]** **** ptovK^Jn I ave i w, wbcoibd Iwwr, u»aeb«plauga>d oo<» and culti- e with c . R., hor. manures the cuttings were planted on the 24th and 25th February 1896, in the e centre. 14 waterings

•»*«d tataj iba* witk lae Iiaaat, J .-Uo,. A(Vr apraadit«t^ na> «ad furrow erajaai, tba rldpa bttaf tbrat faai apart fro* «a»tre i l**»jiM*li ,fi*t pi***! tbe |4«u wm wrf.r»d » waaJ. la all.

•were given during the ierjon. The crop wu *mxicd* and howl five tuna and d ip me* Tbe Mitlo dang and poodretta in pfcrta 2, 3, m l, tIV to UM |>lutn in two iosUlmntt, onoe before plwiting ami *tb» m* ''' .lt''''' The plunfi wen; InwliwI ami lied Ulg|• I) August *mi* •boot tin- Inclining of St'pi*ml»r, tl|(! vw Kbuoti wort cttt off and removed. The catling and crushing of cwnw from fli*''1 p'0'* I**1''1 un t''' laT> B^nt two o* tlirw wc*'ffl e^l^r tl . ,<I dry wi-itli.T tluU genanllj pmvftOad io ,. [| wan foil ml that the plants on t)u> poorer plo(» *vrvn>* fit for ratting and ,1 hiivc Uvci injuml bj <Ulav, b»m th.m- on I he botr«r ploiK, c.;;., niini?H'M 1, 8 i have given digbtf; -erccntage ofjur if tmrvwted about a fort- liitllit later.

Tb« following slaleroent »howi tbo rwnlu ttf HM tit lor 1S06-97:-

Mwinir *the* etwnjionrttw «/«rf o/ wr-fc«n *manuru on Madraai paunda.*

			JU1U.I IMMitgraf »«w« •pptodp»r				IV mataicof—			Wrtrtt of dry Uana,
				WrifMuf MB*.	WrlrbLt 1*.	ITaltM	Jotwto MM	Our to	Oar to	Of | M top*.	
			* U »	4MK>	»M»n		f M	Ifrl	11 4	lo.iw	G,7S0
			« M	MJK		4:117 1	» /	ItT	lit	&0M	a,i<a
			r-..(--..	i7.nw»	11.740	LMM	•01		114	SMI	,-, 1-•
			47, I »		H.:–.J	IJSO	04fl	It-7	104	0J>W	e,0*S
			HMO	HUM	13.1H71		M I			WHM	0.1 *J
					how	H i -'->		U 4	r«	*7W	MH
			/ 1.TIH	M M	U.r.'S-	i.»7a-6	«*•?	ITfl	118	*tfiK*	*7M
			MTO	MtUM	)o,loTi	I.4M-J&		17-OS	it		MM
				•MM	• M »	UUfl		*U**	in	*mm*	7,000
				:'·:.;.<·	IM»MI	MM 71	« g		H I	MM	•J85

· .th—vrndn^

Ifa. diffe«a« in the nmariait, b«t .1 veral pi I iullT. Tl.. pr- •«> l'« I— Mar.«I on tho«field-only . t, ^ . few jr-r. Of VOppbC .....T h.« Jo iUp tiwlu)ri.l aU.l J.ow fkithfully HK> nliliv, ,k« an a uwnure for n^U , r untui«ukably »lia«-n bj U>« W^wtoi Bt, *mt*<\ AtlMMll i« EaaooMrdMM i Aperiowi.ul Karm, In ttic oeighlwurh.. n for cane ••• ihad UK cwUor rake lar rbapl mar otln-r lnnff Wwtw *liw tawtor caLe U Iwgitming to i t a 14M* H a r*i[ular manuro Tor augawwe a b«H »ud drr owtrtl^u- l»v, a.Kl .1.......*• u>m»»«r«l plut (num^r B) and lit* Nitjv ^tw l^^J^, '''»»« ««n(plot* nun |>d 5 «(? i hc*t .ml tool monwoi, «i •liwtl tlic Lncinnfnf of Juir, (•r»«tl v aa twwl aod tit* poudrrttr ll)l,,f,l p| <»d »U>w and it*

A »ot* oa lh» r««po«i "* *nd TMw »ulf»" f <Vi . I«li. «ho Maywl at ti.r Farm dorm*

t r:-:

(f) Permanent experiment with green manuring.

Series A.

This experiment was started in 1883-84 with the object of determining the manurial effect on wheat of—

(a) the ploughing in of green leguminous crop [illegible] the cultivati[illegible];

(b) the root residue of a leguminous crop taken immediately before wheat;

(c) [illegible] manure.

The present treatment of plots Nos. [illegible] 11 was adopted [illegible] accordance with the instructions received [illegible] Dr. Leather, Agricultural [illegible] to Government of India. All the plots were [illegible] ploughed four times, cultivat[illegible] with the [illegible] twice and levelled with *patela* six times. The seed of Muzaffarnagar wheat was selected carefully and sown on the 19th October at the rate of 1½ maunds per acre. The crop [illegible] weeded, thinned out, and blank places filled in with seedlings raised [illegible] of November. Three waterings were given during the seas[illegible] of March.

As in the previous year the weights of the green plants that were ploughed in or removed from the different plots were taken down and are noted below:—

Plot No. 6	Hemp removed	...	...	... 15,270 lb per acre.
Do. No. 7	Do. ploughed in	...	...	... 15,879 lb ditto.
Do. No. 8	Indigo ditto	...	...	... 13,180 lb ditto.
Do. No. 9	Do. removed	...	...	... 14,926 lb ditto.
Do. No. 10	Urd ploughed in	...	...	... 11,531 lb ditto.
Do. No. 1	Rape ditto ...	...	...	... 248 lb ditto.

Series B.

Temporary green manuring experiment on wheat.

Another experiment underlying the same principle as the one just mentioned was started in 1893 in a separate field, viz., 27a, in order to test the effect on wheat of ploughing in certain leguminous crops, viz., hemp (*crotalaria juncea*), khurti (*Dolichos biflorus*), and urd (*Phaseolus radiatus*). The three leguminous crops were sown in June 1896, and the following quantities of green plants were ploughed in on the 10th and 11th of August 1896:—

Plot No. $\frac{27a}{1}$	Hemp ploughed in	...	...	... 15,198 lb per acre.
Do. No. $\frac{27a}{2}$	Khurti ditto	...	...	... 13,603 lb ditto.
Do. No. $\frac{27a}{3}$	[illegible]	...	...	... 13,400 lb ditto.

The wheat was sown on the 20th October 1896, and the plots received only one watering during the growth of the crop. This experiment has been denominated as "temporary," in order to distinguish it from the "permanent" experiment tried on plots of series A.

The outturns of the plots of Series A and B under the 'permanent' and the 'temporary' experiments with green manuring [illegible] in [illegible] statement (Table A) and the yield of the plots (of Series A) in which wheat is grown in alternation with leguminous crops is shown in Table B below. The outturns have been so arranged this year, in order to show separately in [illegible] the produce from (a) all plots treated with green manures and (b) all plots in which wheat is grown in rotation with leguminous crops.

1888.

TABLE A.

Showing the results of experiments to determine the effect of green manure on wheat.

Plot no.	Area.	Manure applied per acre.		Average outturn for 1883-84 to 1887-88.	Average outturn for five years 1888-89 to 1892-93.	1893-94.	1894-95.	1895-96.	1896-97.
		Permanent experiment.							
01		OU Iwllro T*I«M, 13u MQBJ. t Unlit .	Grain...	[illegible]	l.fi+t	[illegible]	117	t7»	t«74
			Straw...	1,1'SI	S.SOJ	[illegible]	U7I	t,Ml	MH
01		Fnr.h ii»llr> "•'». 1«> mined, f Drain .. ploacbal Is.	Grain...	[illegible]	1.044	[illegible]	M	MM	!..!» 4
			Straw...	[illegible]	>,4X7	MM	77*	4.438	[illegible]
01		Green indigo ploughed in	Grain...	[illegible]	1.441	7B0	181	7W	1.4M
			Straw...	9.HI1	[illegible]	[illegible]		1.IC3	3.31S
07		QIIM fat ma L>t*Hb*d f«	Grain...	1.079	1,K«	MM	MO	1.401	1,407
			Straw...	AIM	M l	[illegible]	] OH	i.4S»	
as		H*|« r N ^ '• < lnlil IMi tb> |.M •« tt«Uj >Ub J !»4«t, MM).	(OraiB...	1,417	Ml	*m*	MO	419	
			(iM*..	—	—	Mtf	7(0	*m*	[illegible]
OS			(O»ln...	I.I er	1.W4	ST7	K7	1.74S	[illegible]
				MM	UMs	1,730	[illegible]		[illegible]
		Temporary experiment.							
»A1	7*			—	—	tST	MM	P7S	[illegible]
				—	—	M«	US,	[illegible]	[illegible]
»Aj	no	Ort«ifc^^,wb	{^;:	—	—	Ml		I.0U	
				Ma	—	MM	HI	WI7	
»7Ai	[illegible]	0r«« «rt pWtad t.	{ ^	•«•	Mi	no	•TO	7U1	
				•M	—	UM	[illegible]	Lni	
I7A4	MO	U"•"iwd •"	((Infi...	•H	—	HI	[illegible]	I4M	
			[llusw...		•	UM	UM	1,141	UM

TABLE B.

Showing the effect of growing leguminous crops in alternation with wheat (permanent experiment tried in Series A).

Plot number.	Plot area.	Manure applied per acre.		Average outturn for 1883-84 to 1887-88.	Average outturn for 1888-89 to 1892-93.	1893-94.	1894-95.	1895-96.	1896-97.
						Grain.	Wheat.	Grain.	Wheat.
G. 4		IOMBMJ •»-*» »"•"•' Until 1888 this plot was treated with hemp water.	Grain...	UTI	[illegible]	MU	•OS	1<W7	IJW
			Straw...	—	—	1 : i	no	*,6t7	[illegible]
G. 6		San hemp and wheat alternately.	Grain...	[illegible]	[illegible]	1,'i.H	[illegible]	l.«UU	[illegible]
			Straw...	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
G. 9		Indigo and wheat alternately	Grain...	[illegible]	I MM	MM	[illegible]	[illegible]	[illegible]
			Straw...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
G. 10		Urd and wheat alternately. Until 1888 this plot was manured with green indigo and gypsum.	Grain...	*vm*	[illegible]	MS	Ml	J»l	[illegible]
			Straw...	—	—	UM	Ml	[illegible]	UM
G. 11		Arhar and wheat alternately. Until 1888 this plot was manured with green hemp and gypsum.	Grain...	[illegible]	[illegible]	*ym*	AiW. Ml	WMUV UM	ArUr. •M
			Straw...	—	—	*s.irt*	uu	i.tt>7	M18
G. 13		Lucerne and wheat alternately.	Grain...	—	—	[illegible]	—	[illegible]	—
			Straw...	—	—	LMU			—
G. 12		Lucerne and wheat alternately.	Grain...	—	—	—	—	—	[illegible]
			Straw...	—	—	—	[illegible]	—	i,m
G. 5		Unmanured	Grain...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Straw...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1/44

Remarks on plots of

SERIES A.

It will be seen that the [illegible] with [illegible] same. Green [illegible] up [illegible] in [illegible] next [illegible] results, and fresh indigo [illegible] next in respect of yield. The outturn [illegible] from the rape plot [illegible] of the two [illegible] plots.

This [illegible] the fact, [illegible] out in [illegible] rape being a rabi crop could not be [illegible] only a small number of imperfectly developed [illegible] in; the quantity of organic matter they were capable of supplying [illegible] insignificant, and therefore the [illegible] of wheat was low. The attempt to grow rape as a [illegible] crop so that it [illegible] total failure.

Among leguminous crops grown alternately with wheat, gram did better than other crops, the reason for which [illegible] and wheat alternately gets a longer period of rest (6 months) than those sown with wheat and other crops in alternation (*i.e.* 1½ month). The outturns of the rotation plots also show that there is [illegible] advantage in growing wheat alternately with leguminous crops as compared with growing it without manure.

SERIES B.

In this series the plot [illegible] under [illegible] which [illegible] not [illegible] given [illegible] smaller outturn of wheat than the unmanured plot, [illegible] inferior [illegible] as regards natural fertility. The experiment shows [illegible] of the crops for the purposes of green manuring.

IV.—METHODS OF CULTIVATION.

(a) Early and late sowing of maize.

The experiment [illegible] in 1887 with a [illegible] more profitable [illegible]. The "early sown" plot [illegible] on the 20th June and harvested on the [illegible] August. The "late sown" plot [illegible] on the 1st July, and harvested on the [illegible] September.

The results obtained in 1896-97 and in the previous years are given in the [illegible] statement.

During the year under report the [illegible] the early [illegible] contrary to the experience of the previous years. The outturn of the early [illegible] account of particularly poor and uneven germination.

Early [illegible] maize.

Plot number.	Plot area.	Quantity of manure per acre.	Description of sowing.		Outturn [illegible] in lb.									
					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Field No. [illegible]	[illegible]	[illegible]	Early sown	grain	734	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	213	[illegible]	[illegible]
				stalk	[illegible]	2,467	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			Late sown	grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
				stalk	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

(b) Experiment in early and late sowing of cotton.

This was started in 1891.

The "early sown" plots were sown on 28th May and [illegible] sown" on 17th June. The results of the experiment in 1896-97 and in the previous [illegible] are given in the following statement, and it will be seen [illegible] sown [illegible] did [illegible] plots. [illegible]

Statement showing the result of experiment with mixed crops.

Plot number.	Plot area.	Crops.	Quantity of seed sown in pounds.	Yield [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Cost of cultivation including manure, &c.	Value of outturn.	Net profit or loss.	Remarks.
M.C.1	Each plot—1,200 square [illegible]	Cotton, Til, [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
M.C.2		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
M.C.3		[illegible], Jute	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
M.C.4		Castor, Cotton, [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

(ii) Experiment with Lucerne.

This was started in 1893-94 with the object of determining the relative merits of sowing lucerne [illegible] in [illegible], on the flat, and on ridges. As stated in last year's report no fresh sowings were made in 1896-97, but the crops of the previous year were kept on and cuttings taken from them. It will be seen from the following statement that the total quantities obtained from the several cuttings during the year fell off considerably as compared with the previous years. During the rains a number of plants sicken and die. The rainy weather appears to be the chief difficulty at [illegible] in keeping lucerne on the land for more than a year. The plot in which the lucerne was sown on ridges again yielded the largest amount of green fodder.

Statement showing the results of the experiment with Lucerne.

STATEMENT

Plot number.	Area.	Manure applied.	Treatment.	Outturn per acre in lb. 1893-94.	1894-95.	1895-96.	1896-97.	Remarks.
A.	Each plot=200 square yards.	[illegible]	Sown on ridges ...	3,709	[illegible]	[illegible]	[illegible]	
B.			Sown in furrows ...	1,771	[illegible]	10,370	11,180	
C.			Sown broadcast	[illegible]	6,008	[illegible]	11,677	

(c) Transplanting wheat.—As stated in the last year's report [illegible] trial was given, during the year under report, to transplanting wheat with the [illegible]. Acting on last year's experience the blank spaces in the crop [illegible] were filled in by transplanting [illegible]. The experiment has so far shown that transplanting wheat is [illegible] and that very good outturns may be obtained under favorable circumstances with this method of cultivation, but our data for forming an opinion as to whether this method will, after paying the cost, leave a margin of profit in its favour over the ordinary method of sowing, and how far it can be adopted where labour is available, are at present insufficient and may be expected to be [illegible] in one or two years. It may be noted here that barley and oats have also been found in the [illegible].

Statement showing the results of transplanted Muzaffarnagar wheat.

Plot number.	Plot area in square yards.	Treatment. Manure.	Treatment. Distance.	Outturn per acre. Grain.	Outturn per acre. Straw.	Remarks.
				lb.	lb.	
A.B. / 1	200	Castor cake containing 25 lb nitrogen or 4.5 mds. cake *plus* nitre containing 25 lb nitrogen or 171 lb per acre.	Sown in the ordinary way, *i.e.*, dropped behind the plough.	2,552	5,058	
A.B. / 2	200	Castor cake containing 25 lb nitrogen or 4.5 mds. cake *plus* nitre containing 25 lb nitrogen or 171 lb per acre.	Transplanted at the distance of nine inches from row to row and six inches in the row.	2,752	5,629	
A.D. / 1	722	Castor cake containing 50 lb nitrogen or 8.6 mds. of cake per acre.	Fourteen inches from row to row and four inches in the row.	2,936	9,313	
A.D. / 2	780	Castor cake containing 50 lb nitrogen or 8.6 mds. of cake per acre.	Twenty inches and four inches from row to row alternately and six inches in the row in each case.	2,206	4,300	

V.—TRIAL OF IMPLEMENTS.

(a) *Permanent experiment with deep and shallow ploughing.*—This experiment was started in 1888, having for its object the determination of the effect of deep and shallow ploughing on the yield of wheat. Of the three plots devoted to this experiment, No. 1 in the statement given below is ploughed nine inches deep, with an English plough (Howard's) No. [illegible] [illegible] with the Watt's plough, while No. 3 is ploughed [illegible] deep with the country [illegible] being similar in all other respects, [illegible] in this experiment is to ascertain [illegible]

All the three plots were [illegible] night before sowing, which [illegible] on [illegible] on 1st April 1897. The subjoined [illegible] previous years:—

Statement showing the results of the experiment with deep and shallow ploughing.

Plot number.	Plot size.	Treatment.		Outturn per acre in lb. Average outturns for four years. 1882-83 to 1885-86.	[illegible]	[illegible]	Individual outturns for— [illegible]	1895-96.	1896-97.	Remarks.
P1	Each plot = [illegible] square yards.	Ploughed nine inches deep with improved plough.	Grain ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
			Straw ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
P2		Ploughed five inches deep with improved plough.	Grain ...	[illegible]	[illegible]	[illegible]	[illegible]	1,250	1,230	
			Straw ...	1,222·71	[illegible]	[illegible]	464	[illegible]	[illegible]	
P3		Ploughed three inches deep [illegible]	Grain ...	[illegible]	[illegible]	[illegible]	[illegible]	1,434	1,104	
			Straw ...	[illegible]	[illegible]	[illegible]	[illegible]	2,077	[illegible]	

The [illegible] the two plots ploughed with the improved ploughs has [illegible] greater than [illegible] with the native plough as [illegible] of the previous years, a fact sufficiently indicative of the advantage of deep ploughing in the particular [illegible] soil [illegible] The undoubted saving of time and labour [illegible] preparing the ground with the improved ploughs, especially the Watt's, is another [illegible] improved plough. It is to be noted that the same kind [illegible] improved [illegible] plough.

(b) Testing of new or improved implements.

(1) *The wooden country seed drill.*—This implement has been referred to in the past year's report as having been received from the Central Provinces. The results of its trial side by side with the ordinary method of sowing, namely, dropping the seed behind the native plough, are given [illegible] the accompanying statement for the year under report and the previous year.

The only manure used was a top dressing of the saline earth known as *luna* which contains a certain percentage [illegible] crude [illegible] to in last year's report, namely, that the central tine [illegible] the lateral ones, was easily got over by substituting the central [illegible] It was expected [illegible] one advantage of the drill would be in the capability of the drilled crop for being hoed with bullock power at a smaller cost than by manual labour, but the damage done to the crop by the feet of the cattle and to a certain extent by the unavoidable irregular course of the tines of the hoe, appears to more than counterbalance [illegible] saving that may be effected in the cost of hoeing by cattle power as compared with manual labour.

11 roar, however, be noted ben Hint the drill hu only been ttiwd tor wheat. If j wow wed for tall crops «^. cotton or arhar, tho rows would bf. mool further apart and «ont«Hwnl]y it would I* much easier to use a bullock hoe. At any rate in Central India the crops an hoed by bullocks.

StaUmnU tkowivo the rtmiti of the different mtthodt of awing wheat.

I		iMfcMat		Outturn p*T ten in ft.		
				1HM-1W.	1*1* -'7.	
V	1,210 / 936	S*WT> wlti U. drill	Grain / Straw	2,022 / 3,302	2,270 / 4,068	
V	1,210 / 936	Sown in the ordinary way.	Grain / Straw	t.104 / 3,328	1.607 / Ma	

2. Tin- pbtK-t J. *IL* Jlonw hoe, the small lurrowand the Howard's Pony plough refern.fl to in hut year's report have continual lo give satisfaction and arc now more commonly naed at the farm and on the student*' plots. It has heen found that where tlit planet J. K. Hone hoe is in constant use, tho harrow ia lew needed and may even be dispensed with.

VI.—VARIETIES OF CHOPS.

(a) Experiment with vatiitiu of cotton.

Tbe experiment with tue foreign varieties of cotton was started in 1888; its object being to compare the yield of the different imported varieties mi-1 to lkttnrrflW which, if any, onbem went must mutable for cultivation in the toil ami . limate of the Doab.

Certain Indian vurwliw were al»added (o this experiment in 1894. In pru-vious years the Itulmn and foreign varieties were grown in different fluid.* under somewhat different condition*, but during the year under report th* native and tho foreign varieties were all grown in the *ai>* fold and received a uniform nyslem of treatment with regard to cultivation and manuring. Some new Indian varitfie* won aJao introduced, and tbe outturn of tuoii of tbeap a» were sown in good time, and gave a produce, have been included fc the statement given below, while the ntadoM of those which were received and sown late or which failed to give a produoe owing to the I rhangr of climate have not bren shown in the statement and wilt, ff they do better, be reported on in the naxt year.

DttaiU of cuitivai'um.

Tillage.—Ploughed I OIK*, mbeoilsd once, tmwb-ploughed once and cultivated with P. J. B. horse boe once.

*Ma**ring.*—tittle dung applied at the f»t<- of 300 rnanndi per aore.

SwutQ.—Thi* was done on the 24th June with careful[il]7 elected aeed. The Mods were dibUed with hand, 3 feet by 2 feet >Dart in tho *emm* of *the* foreign varieties and 3 foci by 1 feel apart in the oast of the Indian \-mriuti0s.

Thinning.—Wht>n Ilic *imp* was about three wtflts old, tho •nperfluoni pUnte ««re uulW out, l-avingooe good plant in tho *ntm* of the foreign varieties and two good plant* in the *am* of the Indian varietisft. Thus *mnh* plant of the fotvign variely gw« •!« •I"" **»* lo Rf°w **& »P l<td OB. *wl that of Ibe Iodbn variety 1j *!«•« •* This difference ,,l llw *\ pace for bdivklaal plant-w» allow"! in I iew of t bail dQfcsnd liahiu of growth ivfernd to In last year'* rrpurt, naroclv, that lx< Indian varieties grow Uil and trot with comparatively few *ioVI i branches, where w tbe An»erinn and Ibe Kg> plian varictini p»l f"^0 " "umU r of rtde-liranchw aod are Men spreadiag to tbair nature. While thinn ing tbe pbaili, the Wank •pMM Wtre filled ia by fresh sowuig.

Wmting and *o«»ff.-Tbs crop w* bullock boed lwi« *uA* b«d weetW once.

Watering.—Was done once before sowing to soften the soil and three times during the growth of the crop.

Diseases and injuries.—The insect curculionid beetle referred to in the last year's report attacked the crop again [illegible] frost in winter however affected [illegible] plants and [illegible] more injuriously this year than [illegible] years.

Picking.—Commenced at the beginning of October in the case of the local variety, [illegible] the rest of the varieties about the middle of that month, and came to a close practically with all the varieties about the middle of December.

The accompanying statement gives the results obtained in the year under report and in the previous years. It will be seen that no Indian or foreign variety came up to the local variety in point of yield both of fibre and seed.

Statement showing the outturn of different varieties of cotton (Foreign and Indian).

Field numbers in 1896-97.	Plot area, 1896-97.	Name of cotton.		1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	1895-96.	1896-97.	[illegible]
No. 12 and 23.	[illegible] yards each.	[illegible]	Fibre / Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Louisiana	Fibre / Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Gaos Hill	Fibre / Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Fibre / Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Sea Island	Fibre / Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Fibre / Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Hinganghat	Fibre / Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Nankin	Fibre / Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Fibre / Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Fibre / Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Fibre / Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Fibre / Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Fibre / Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Hyderabadi	Fibre / Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Experiment in allowing cotton to stand on the field a second year.

In this Department's letter No. 1793, dated 19th October 1893, forwarding the past year's report on the Farm to Government, it was pointed out that several varieties under trial at the Farm were capable of yielding successive outturns of fibre and seed, if the plants were, instead of being cut down at the end of the first picking, allowed to stand in the field. The experiment described in this connection in the past year was continued during the year under report, with a view to determining the economy of this method of cultivating cotton. Noticing briefly the plot under report, the varieties (shown in the following table of outturn) were sown on the 23rd of June 1895. The first picking was made from the middle of October 1895 to the middle of January 1896. The second crop was gathered in May and June 1896. The plants again bore a crop in the rains of 1896 and the third picking was made in October, November and December 1896. The outturn obtained in the three pickings is given in the accompanying statement.

Though the quantity of the produce gathered in the third picking was good, the quality of the staple was inferior in colour and in other respects to that produced by the same plants in the previous year, *i. e.*, as an ordinary (first year) crop. This was apparently due to the fact that the plants grew too luxuriantly on the commencement of the monsoon rains and subsequently bore a considerable number of inferior bolls, unusually small in size, which again were injuriously affected by the rains, attacked by insects and otherwise damaged. The general aspect of the experiment does not therefore seem to be hopeful.

Statement showing the results obtained when plants of different varieties of cotton were allowed to stand a second year.

Field number.	Plot area.	Names of cotton.		Outturn per acre in lb. 1895-96 (first crop).	Second crop in 1896.	Third crop in 1896-97.	Remarks.
41	340 square yards	Tree cotton	Fibre	260	141	305	
			Seed	628	285	606	
		Louisiana	Fibre	310	223	427	
			Seed	718	403	806	
13	300 square yards.	Garo Hill	Fibre	220	108	128	
			Seed	415	197	249	
42	340 square yards each.	Hybrid	Fibre	280	105	334	
			Seed	773	209	805	
		Sea Island	Fibre	330	180	352	
			Seed	865	300	814	
		Egyptian	Fibre	314	154	328	
			Seed	869	322	821	
		Hinganghat	Fibre	337	118	250	
			Seed	640	232	618	
15	300 square yards	Jari (Khandesh)	Fibre	221	133	403	
			Seed	616	279	200	
		Bani Ditto	Fibre	118	97	147	
			Seed	294	208	373	
		Jaotiya	Fibre	230	207	362	
			Seed	430	344	623	

Experiment with Canadian oats.

This was started in 1890 and has continued ever since. The seed this year was sown on the 18th October, earlier than usual, with a view to allow more time for the growth of the crop. The outturns of grain, probably on this account, were better than in the previous years generally.

Before sowing, the field was watered once in September, and the seed was sown at the rate of 120 lb. per acre. The harvesting was done on the 5th of April 1897. The high outturn of straw in the case of each variety again goes to establish the value of Canadian oats as a particularly good crop for fodder purposes.

Statement showing the outturn of Canadian oats.

Plot number.	Plot area.	Variety of oats.		1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	Average from 1890-91 to 1894-95.	1895-96.	1896-97.	Remarks.
	Each plot = 400 square yards.	Prize Cluster	Grain	520	240	344	178	143	280	217	575	
			Straw	3,142	1,128	10,220	5,456	3,003	4,400	5,307	7,230	
		Canadian triumph	Grain	787	240	316	100	71	316	135	530	
			Straw	3,327	1,050	9,070	3,230	2,917	4,320	6,730	6,474	
		Rennie's prize	Grain	472	158	300	544	184	330	167	267	
			Straw	1,090	942	8,712	13,080	3,300	5,739	8,727	8,645	
		Welcome	Grain	709	240	435	300	71	318	179	573	
			Straw	2,308	730	8,730	3,030	2,806	4,834	7,827	6,473	
		Bonanza	Grain	787	332	277	330	140	300	175	472	
			Straw	2,573	912	10,578	13,003	3,080	6,221	7,720	6,461	
		White Egyptian,	Grain	847	300	254	132	64	281	133	345	
			Straw	2,049	390	7,110	4,500	2,308	3,711	6,091	5,729	

Experiment' v%tk American wktat.

Th» variety TO ir«iv*l from the Political Ageat, Bandelkhud, who aaw U growing U, the ganl« of. AUUrfj. fr» from mat, whlU iht neighbouring Mdt were attacked by the disease. He was told it was an A
is hard, semi-transparent, nJdUfa wd bmgir tku that of tbeunlitwi?cwiqtry wheal.

r r ^ ^ wso n lh- Mrd Oelfflb* J«««J th««op hmw.lo.tbi

3rd W. Th. whmt W AOWB ao .igo, o(nwl during tb* two rwn it bM b«en imd* trid t bat it .boold b, M(«1 ti^i in tb ^ T ^ •n tinu7 wbttf cnp. were " " with n« eiU«; Tb. K^p^yi,, •.to h * JE obtained in tlw r«r under report and in tbo pftviwu y«r t—

Statement showing the results of the experiment with American wheat.

Plot number.	Plot area.	Name of variety.		1895-96. Grain.	1895-96. Straw.	1896-97. Grain.	1896-97. Straw.	Remarks.
V	605 sq. yards.	American wheat ...	...	2,256	Mn	—	—	
28(a)	1,210 sq. yards,	Ditto ...	...	—	—	2,456	6,450	

(c) Experiment with varieties

Tilt* WM oriciwllv atvtod in 1KM, »D<1 detail; of the amner in whi'li it ni < carried on until Uw put r«r haw* *hem* fully dMeribod in pnrviow *ymi>» twfort* *T\f* •obMM of manuring ha* bwa, (n Kwordwc* with tba anggirtliiiw from lite Agricultnnl Cbemiat to UM Oorvratn«ol of Indat, au *amtmiMf* sltenrf in Iba *ftmtmtdm* rfiwrtthatUi*- eipenawnt may l» if^irdwl a* a practUlly ww one. TV varieties —tiunt to *h** iba *mam-* a* wrr» tnajtwawl in Iba bat *jmkt't* npotto.

Details of cultivation.

Tillage.—Commenced oa the Id of January and consisted in ail of two ploughings with UK. improvwl plough, two aabtoilings, one trench ploughing, one cultivating rlth tba J. K. hot and oot rolling, *Manuring.*—Manures were applied as detailed in the two statements which [illegible] fallow.

Planting.—This was done on the 22nd and 23rd February 1890, on the ridge and furrow system. The Arrows for the [illegible], *i.e.*, the *Madrati*, *Suh&ran* [illegible] and *Poona* canes were 2½ feet apart from centre to centre and for the other varieties 2 feet apart.

Irrigation.—Fifteen waterings were given in all from time of planting to that of cutting.

After-cultivation.—Weeding and hoeing five times for the plots in which manures containing 500 lb of nitrogen were applied and three times for those in which manures equivalent to [illegible] of nitrogen were used. [illegible] once, [illegible] and trashing and cutting shoots once for each plot. But the " [illegible] " (the [illegible] varieties shown last in the statements below) on all the six plots [illegible] in their growth and fell down by their own weight than as a result of winds and [illegible] attention in tying and lifting up. In spite of all attention a large number of canes in the [illegible] crops were "laid" or fallen at the time of cutting and consequently yielded gur poorer in quality and quantity. This rank growth of the " [illegible] " varieties was due to their receiving a quantity of manure much higher than is ordinarily given to them by cultivators.

The two accompanying statements give the results of the experiment in the year under report. As was anticipated the Madras Paunda has yielded the highest outturn of gur on both [illegible] the series, but for deciding the relative merits of the other varieties the continuance of the experiment for a few years will be necessary.

Questions relating to the [illegible] of juice to cane, making *gur* from [illegible] and liming the juice previous to boiling it with a view to preventing the conversion of canesugar into glucose, have been entered into fully in the last year's report and do not require any detailed notice here. It was [illegible] that excess of lime had a bad effect on the colour of the *gur*, but during the year under report it has been found that by liming two-third of the juice so as to make it somewhat alkaline to litmus and then adding one-third of the juice not treated with lime to the [illegible] before boiling it, the colour of the *gur* can be maintained. In the [illegible], however, the inversion is prevented to a smaller degree only, and the question [illegible] been discussed at length by Dr. Leather in his note on the chemical composition of sugarcane and raw sugar published as a bulletin in the India Government [illegible]. The following are the analyses and valuation by Mr. McGlashan, chemist to the sugar works at Cawnpore, of the *gur* prepared with limed and unlimed juice and sent to the factory :—

	Limed gur.	Untreated.
Sucrose	[illegible]	[illegible]
Invert sugar	[illegible]	[illegible]
Organic matter	[illegible]	[illegible]
Ash { Soluble	[illegible]	[illegible]
Ash { Insoluble	[illegible]	[illegible]
Water	[illegible]	[illegible]
	100.00	100.00

Mr. McGlashan remarks :—

"In fixing the value I took a fair sample, as it was much cleaner than the ordinary run of *gur*, and came to the conclusion that the limed sample was worth Rs. [illegible] per maund of 40 seers [illegible] worth Rs. [illegible] per maund of 40 seers. The limed gur has a lower analysis than I expected it would have. The invert sugar is high.

"I see on looking back [illegible] of two of your last year's [illegible] :—

Sucrose	[illegible]	per cent.
[illegible] sugar	[illegible]	ditto.
(Saharanpur [illegible])		

It may be observed that the last year's gur referred to by Mr. McGlashan was made with juice [illegible] had been [illegible] with lime, while this year [illegible] made with [illegible] two-thirds of which was neutralized in order to [illegible] rain or crystals.

It may be noted here that the unlimul jw supplied to the rogir work* and v»Ju«J Lv Mr. MCGIMDSII at I^tS-12-0 would I » n MO y fetched Rs. 3 » mauod ta llw Cawnpore market «L,1 the linad jur not 1CM (Laa I: the price r,«d by him.

It might be noticed lure tint Doctor Lathor Iried to put the limit* proem on «uch. footing thi- year M . caltiwtor could work on. H teemed to him rli»t b» could not «p,ct 0» cltiv-tor to strain* ^cwfollr thai hr^Id mMy «W IIIM lo tlwwboU pdn of th» ju^. But ^ m ^ h t rt ttft·, y a d Jtog lo two-thirfi and g«t * prtrti.rally good fwnlt.

State ... cane.

Field number.	Plot area.	Manure applied per acre in 1896-97.	ihnit mwljr	Outturn per acre.			Percentage of—		
				Weight of cane.	Weight of ...	Weight of gur.	... to cane.	Gur to juice.	Gur to cane.
10 and 11	Each plot = 605 square yards.	Poudrette 250 lb nitrogen per acre.	Madras paunda	[illegible]	[illegible]	[illegible]	[illegible]	in	ID-
		Ditto ...	Saharanpur ...	[illegible]	UI7II		a -	a	9-S
		Ditto ...	Poona ...	[illegible]	10.700*		[illegible]		es
		Ditto ...	Dikhlan ukh ...	[illegible]	HMH		« :	[illegible]	
		Ditto ...	Dhaul ...	[illegible]	[illegible]	umi	[illegible]	[illegible]	
		Ditto ...	Matna ...	[illegible]	[illegible]		"1	[illegible]	61
A. B. Plots ... KM No. 12	Each plot = 400 square yards.	Poudrette 500 lb nitrogen per acre.	Madras paunda	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
		Ditto ...	Saharanpur ...	[illegible]	[illegible]	[illegible]	[illegible]		
		Ditto ...	Poona ...	[illegible]	[illegible]	[illegible]	[illegible]	is:	
		Ditto ...	Dikhlan ...	[illegible]	[illegible]	[illegible]	[illegible]	io«	[illegible]
		Ditto ...	W-i , -	[illegible]	r [illegible]	[illegible]	M	I*«	·OS
		t› -:· ...	Matna ...	[illegible]	[illegible]	[illegible]	[illegible]	14 ·	

(f) A'fjvrimmt. uria impart*./ carrot seed.

Over one hundred 4 ton. of diffrr«t »rU of Earopw, «,„,, ^1 ww w< received during the year und tf report from Eoguuid for «hiv. tion in di (m, p,^ 0* these provinces as an emergent crop, and several fal ·zpgriaKrnU wvre trM with tlw »*d at the Experimental Farm. An e·· bMHtiw note on the r»utt> of UMM «prrin«nt« W bt« submitted to Government separately and d ·.», il i. ejp^t.rf, >pII<B: in extenso in a ·*I*f ate publication. Only a ftw general >r»I rwiwrk* oa IIM vwioa experiments are, therefore, embodied in tab rrrv»ri. When the first consignment of the seed reached Cawnpore, it was not known that the seed despatched from England was of different sorts, and two plots which had been set apart for the carrot seed experiment were, therefore, thought quite sufficient for the purpose. One of them was sown on the 30th November 1896. Subsequently when it was discovered that the supply consisted of three varieties of seed, viz., red, white and yellow "Mediterranean" and that for each variety there were two kinds of seed, cleaned and uncleaned, several other plots were added to the experiment with the object of determining the following points:—

(a) The relative merits of the six sorts of seed.

(b) The effects of sowing the seed on different dates so as to find out how the outturn was affected by later sowings.

(c) The economy of different methods of cultivation.

(d) The effect of different treatments of land as regards tillage, manure, and irrigation.

JUtOgOthw -10 |i]cita of land were «own with the various kindsofsced. It i^ treatment of the (lifFurcn: under lliu **nrioMtzptrioMata** *a-* it **baa** b «n fully described in tlic rnport on this subject referred lo al- . . J'.riefly speaking **M»ne ptotawm** ploug'icd willi **the, oouotry** mid **gAm** witb improved pl.Kighc wM **nrodogup** wirli the pattern <. M.-inure was applied to *oni<* df tlicni wlii! remained **Dnmcotmd** AH rcf^inU irrigation, .tome fields revived copiou* **while** otii r-i only a limitml numlwr of them sm:li as the ordinary ruliivjitiTi **oould** afl'ord lo givo in » year of drmi[»U- Tlia *neeA vrn* *>wn on **diffiutntdatH** *n[m* and 12th January under different nw-t broidcnol, inj'urmwa and on ridges. TLo **atop** «tt frnjiii'iitlv w« **ded** during t | of growUi »nd h Inr-nt .! n l£)th April ami fitb I "• In tone plots asthe* were Pftrinklcd a- a prcvoiitivo mauniro for rbe ottn **t** of inw:s. Tbo following rcmarkt will give * general ides of tbu ntiulu obtaincnl :—

(a) *Gtrmination and qwtlity of tee J.*—All tlic ctain«l noodgcrtnioitod v well, but il» germitwii' ***tat*** **bued Mtd of** t!ie wliit<- and ***jttiom vmrk/6m*** v*rv poor indi.«d. <J •nrr.Jl.v fpp>kingtb<: **red** • ! ,'n.l - • nnin i!- I iK^Uinong the three kind* of cleftnvd MeadiL **Tbf (Brmiiwdofl** of i!i<' r< 1 iMiftlttirH **M6d** M ijttitii *cut* good a*, **ftnd** in como CUM t> -tti-r than that - 1 **ntt>iwrt** Tin* (^miinatirc |M>W<T of *m* **and** white cleaned **wed appeared** to be almost equal. When tiic land was too Jiurrkntly iirvparai] and muM not be,thor*v*ugLly •'lwiit.il of **lb«VOO*i** of lroubl«omfl \ before fowio^, all **kiadi of md** Isilwl lo g Tminni'- **preptriy**$_t$ owing to tbo fat von Mi! ,-jirMtit* were entirely aubduoJ lit* thn mure viguroDH and <juick- **weed*.**

There u no rnuo to admit thai late sowing bad any materially injurious e0uct on tiio g[1]nnin*(ion; tho rleined swd »*« as late as I2th January 1S97, having in two plot.- out of ill • tbfwe prndu -<l piiti:* &» numiro B« US can be expected in an on by timely sowing.

(6) *Tk» amount oft/ulJ.*— **doarrot** Milt were sown in **•mail** pate be* at tho **Farm,** without manure elr. **>bar,** and tho crop* gall: in ilte behind' T.ic oaluulalod outturn of the different **plofJ variad** from ; **maoadl** pr acre, and in unecaw wber .1 **waa** lowest it amounted to tieirly lOJi mipud- j*r acre.

But in no <m*« did I lie ottltura obtainod from ttio imported Mod approach even the low.ot outturu-. (be crop Mwn itt **Ootobar,** nliuwiug clearly that *m* low yield lay in tb« ItttteneM of sowing, outturn* obtain*! from *Cw* diB i* ui" Europoan carrot *i:v&* are shown tba tubjoioad ublo t—

Kinds of seed.	Highest outturn.	
	o« m m] **bat.**	**O« Muawwe4 laad.**
	MiU. fca r:-.	**Maa, Sr», Cfc**
Yellow cleaned	**1M I 0**	**71 St 0**
Red cleaned	**90 3* 10**	**IT S 0**
White cleaned	**10* n o**	**01 I) S**
Yellow uncleaned	M • «	**I• * 0**
Red uncleaned	$ i	**tl a D**
White uncleaned	» *: 1	**tt**

The average outturn per acre from the different kinds of seed was as follows:—

Kinds of seed.	Average outturn. On manured land. Mds.	Srs.	Ch.	On unmanured land. Mds.	Srs.	Ch.	On the whole. Mds.	Srs.	Ch.
White cleaned	51	22	0	49	0	0	51	30	11
White uncleaned	10	19	2	23	22	0	12	11	7
Yellow cleaned	51	7	4	74*	25	0	54	24	14
Yellow uncleaned	9	18	1	20	9	0	14	19	9
Red cleaned	42	11	7	37	5	4	41	30	13
Red uncleaned	58	8	4	23	22	0	53	30	5

The figures of average outturn on unmanured land represent the outturn of only one plot except in regard to the white cleaned and, in the case of which the average is based on the outturn of two plots.

It is believed that if seed had been sown on unmanured land later than on [illegible], simultaneously with the sowings on the manured land, the average outturn from the unmanured land would have fallen very considerably. Speaking generally about the results obtained with the cleaned seed, the outturn of the yellow variety was the [illegible] of the white variety higher than that of the red. The outturn of the plots cropped with uncleaned seed was very [illegible], except [illegible] of the red [illegible] which was as high as [illegible] in some cases [illegible] yield than the different kinds of cleaned seed). [illegible] cannot be [illegible] either in [illegible] or in [illegible] without [illegible] and it [illegible] not [illegible] which the [illegible] is most marked. One might, therefore, have expected to get better outturns from the manured than from the unmanured lands in [illegible] experiments; but the [illegible] not. [illegible] altogether [illegible] unmanured plots. The former were all sown later than the latter. Of the former only [illegible] plots give a higher yield than the highest outturn obtained from the unmanured land. It is only possible to conclude that the lower outturn obtained in a large number of [illegible] from the manured plots was due to comparatively late sowing.

(c) The quality of the [illegible] was very [illegible] and the crop was not sufficiently thinned out [illegible] very few. The roots produced were very thin. [illegible] plots were sown with uncleaned seed of the white and yellow varieties, the germination was very poor but the [illegible]. [illegible] to the fact that the few isolated plants in each plot had [illegible] to grow in-[illegible]. [illegible] roots were [illegible] longer than the thicker [illegible] thick roots in the plots prepared with the native [illegible] were smaller than [illegible] roots in the plots ploughed with the [illegible].

The roots in the manured plots were generally heavier than in the unmanured plots and also of more uniform thickness.

The largest portion of the produce [illegible] of roots from 6 to 9 inches in length. About 30 per cent. of these had a girth of 3" to 4" at the top and 2 to [illegible] inches in the middle, and the remainder, about 70 per cent., were 2 to [illegible] inches in circumference at the top and not more than one inch in the middle. Some of the best carrots were 12 to 15 inches long having a circumference of 5 to 6 inches at the top, but these were far from numerous and were found only in the unmanured [illegible] and [illegible] manured lands sown in the middle of December. No carrots were smaller than 4 inches in length or thinner than the smallest finger. All the carrots when harvested appeared to possess a more or less disagreeable taste, which was particularly marked in the produce of too ptoti which root-mil less than nix watering*. Thin unpleas*atnum* of the Ufrte existed in tlw laatt degree in the red v.iriuiv, wUok remained fairly {tab table up to the *<ud* of the Imrvvst.

Until Murnh »U the uurots wen sufficiently nine to rat, 1ml ihe eBV'ot *of* increasing heat in April on the flavour WM very injtirious and brought about • degree of bitterMM in the gnrroti which rendered them almost uaelew for human ooMomptloa.

The white and yillow carrot* wen hard, and the red though not quite so hard were lurdcr tlmn uittivc c«rr>ts. The roots of the white variety appeared to be tho coarsest[of all. No duformitiw were nolkwd in any kind of carrot*.

In the majority of carrot* th« flrahy sii< iilmt]t..rii<m was only about one-epiarter of the bulk of the root, ibe remaining; thrcftHpiarter* IH-JIIJ; the inner hard portion known in vernacular as *kadda* (bone). The carrot* from the manured land were Invariably better to cat llwn tbo« fan the nnmanured.

(dj Method of cull ivation*—Of all tin- im<tmxl» triad, (hut of M wing with manure on ridgm not more than 1 foot apart and *5* inches high proved moat economical. It cannot be affirmed with certainty after one trial only thnt tlii- natbod i* tlw best. It is. however, iiol fitlloww) by ilie iiiltivntor ami U wwrlhy ol hi« attention *AH* well a. Of the further trial* at ibe *t"mna.*

(i) Tke harvesting opcntlu>n.—hi* April ihe ground becamo *to* hard tint tlie root* could not be dug «iwpt with *phaura* awl at a high cxpeoM on manual labour. The crop* had therefore to be watered once, nimply in order to faoiliL-m; the iligging.

(j) Dixutt and injuries.*—The crop was rem&rkably free from the*.

(g) Tht proportion of leaw to roots.*—The outturn of leari« WM lowor than tb.ili.>fr>'ots in 32 >ni of I'J pint*. In 13 plot* it waft higher and of them, 8 were nndrr i w l w ed seed. In ot>r pl<>(milr whtnh »«. -dw. iinder unrelained *«i, *t\»* weight of ,,,AU«M 4>|U») t> that of leaves. In one a plot wW- the crop failed entirely the proportion uf Imvfr. <n rn>t was the highest. It wn generally higher in the maniiml liian In llw tinuumur-d |>lots. In the Lite nown pint- lie crops (pmrr*]lx showed a tend-ency to develop more foliage :h«» rwl*. Tin- pfppwtion of |,«v«-* I" root* wa» highw in all un-l-tuied wtd jdot-, *txnft* thnv, a» (Vimptred with plots •own with olraoed *MH*L*

VII—DISTRIBUTION OP IKPLEHENT8.

The f.-11-iwiiit: »l»i' ment ahowa lh« dirfnbulion of impt?m TI!- iltin ng the year under report, compand with Iba pa*t year. The docrea«o,uf).:er ploughs, kibble n .ud chaffcut i«r» ia du« to the (act that mo«t of the Afri ttltan] atiown in w!> ich these Impfc)-j *Q^A lo* K,]) trera abaodonwl during the ye*r «n art* nnt of scirrity. Then* has, however, b«M» a markwJ imreww under < Inin *\mtnps* Ba!dw> watr-rlift tad lairing tooW—tmpltmwit* «>nn»'<ed «wltwiwly with irri^iinu, a nutter of upeoud importance uwina rear of dromrbt, A» r«jrard» chain pnrujM it in woteworthy tliat ttMOtwaa double '.oin pn«p#ork«l will cattle gear, which on account of its ^peww waj not hitherto adopted by, i«mln<Undiditotfaittoatlr-ect their special notice this year. Three wealthy landholders, one from Aligirh and lb* othor two from Unao am] KM lUwli. came j istly Li M« Itw working of tint doubl- jiimp at th« K»rm. On being satisfied -•«* pv* an order for one d «**• !"'"'p. Th«e wen oonatrunttl and wld to lien at sort priot Taryinir frnn) R«. 225 to Rft. 255. Th# inonaae nnd#tr borimt tool* !• owiof I" •« ottr*ordinarily lt«»7 demand from Hie *l^Tim.* ut for the atr-rtova of well—«nke« in rosn*-li<>n wiihtb»i-on»tr action of .«lldi«rrif<donMext^ Mvaly Urh f«r. Tlw BaW» (k>r mill ref• «*• lu in ibl> *m*t* year[1]! report IIM *m* ciwa full •ati.ilM'Uun. Tl." impro«><l •• blue plou-1> «H»«and«d the largeat «lr, M (I lU ,..4 r«r, and it* *am* anwaf aatiw enlUvaton. *i** gndoaily iarteaainf in parts r Hanlvi aod FanikbabaJ dwtrida, *Statement showing the distribution of implements during the year ending 31st March 1897 with that of previous year.*

Name.	1895-96.				1896-97.					
	[illegible]	Total.	Hire.	Total.	[illegible]	Total.	Hire.	Total.	[illegible]	[illegible]
Ploughs	[illegible]	30	27	250	99	8	[illegible]	121	—	
Chain pumps	[illegible]	4	4	22	24	5	—	35	—	—
[illegible]	[illegible]	—	—	1	3	1	—	4	[illegible]	—
[illegible]	[illegible]	—	—	3	—	—	—	—	—	—
B. Hunt's kibblers	[illegible]	1	—	22	3	—	—	3	—	19
Nalan ditto	[illegible]	—	—	[illegible]	2	—	—	2	—	2
Chaffcutter	[illegible]	1	—	[illegible]	4	1	—	5	—	11
Sugar pan	—	—	1	[illegible]	—	—	—	—	—	—
Harrow	1	—	—	[illegible]	2	—	—	2	1	—
Steel-press	1	—	—	[illegible]	1	—	—	1	—	—
Dredgers	—	2	8	10	—	2	5	7	—	3
[illegible]	—	6	1	7	—	13	—	13	6	—
[illegible] Bill	—	—	—	—	2	—	—	2	—	—
	—	—	—	—	—	—	—	—	—	—

VIII.—DISTRIBUTION OF SEED.

Distribution of [illegible] seed was [illegible]. The increase under [illegible] is due chiefly to the heavy supply of 150,000 lb. of soft white wheat to the Director of [illegible] for experimental cultivation in the [illegible]. The [illegible] of the [illegible] very [illegible]. The seed distributed was imported from Europe and a very small portion of it procured from India. The distribution of this seed has [illegible] separate report to Government. The farm stock was insufficient to meet fully the indents for Cape oat, hence the decrease under that head. The paddy was supplied to the Superintendent of Agricultural School, Columbo, for experimental purposes, having been procured from the best paddy districts of the [illegible] provinces.

Statement showing distribution of seed during the year ending 31st March 1897 with that of previous year.

Seed.	Lbs. 1895-96.	Lbs. 1896-97.	Remarks.
Wheat	3,006	1,56,396½	
Cape oats	11,855	9,976	
Maize	3	40	
Sorghum	26	129½	
Lucerne	47	12	
Paddy	525	112	
Cotton seed	—	50.5	
Ingadalda	—	24	
Bajra	—	420	
Belal	—	120	
Hill potatoes	—	920	
Indigo	—	8	
Carrot seed	—	160,448	

IX.—SERICULTURE.

The experiments in rearing the *eri* silkworms, having failed in previous years, were not resumed during the year under report.

X.—HORSE-BREEDING.

[illegible] Arab [illegible] year. His [illegible] has been good and he has so far done [illegible]isfactorily. He [illegible] been put to the plough but is given riding exercise every morning and even[illegible]. The Superintendent and the Inspecto[illegible] Civil Veterinary Department, who visited the Farm during the year, were fully satisfied with the general management of the stallion.

The mares received for covering, however, are not generally of good breeding class as reported in previous years, and this fact mainly accounts for want of more successful results in our horse breeding operations. The results of the past year's covering were not known in 29 cases when the last report was submitted. Since then six of these mam have fouled, one died, and the remaining were either failures or not reported on by the owners, During the year tinder iv|ort the stallion nerved 35 mares of which i ii-IT have hitherto foaled, fan are reports] !<• be In fool or "Jio/nr/iil" mid four (o have been Mnwd lllir""—*Mty*. The results of covering have not yet been reported by fJie owtwn it) ill" ntnaining cans.

IX-CATTLE AND CATTLE BREEDING.

(n) Cattle brttdinfl-—During the year ante npori • nil MM *mppStA* to Jfr< Ai] <i Tal, one Parolinr bull to the HliShjalianpur Miinii-ijwdity, Kliairiearhbullto the Court of Wards, Babraicli, and five bulls of different Klieri breeds to tbe Director of Land Records, Aatua. All then wen procured by the Deput-tn< nt.

Two more Pan'har hull* liave been pun-hasr*! and are kept at iho Farm for bread-iiip purpow*. The *K<m* bull referred to in I he past year's report has wntinwid to give and bil pr»tf'ny in general » of remarkably good finality. H« served iWt during the yew under report of whi'h noven have calved NO far, two are .live died, uine covering* proved umueowiful and tlie results of *eo*\- are not yet known in th« remaining m u .

Oi ' ug» done in the put year rwulta were not known in 24 UMM »hen lie report for (hat year wx* drawn up. Of thtse seven have stnoe oalved, 15 have *am* and iwn arc reported to have

TbciKoti bull *of* the Farm i« very mtifih fari'i^l bj tbflvisjtonaiid bappnektad N^n randenU of Cawn]iore an wrll at) by tho native breeder, in tin

Pan-liar bull* iventtly aildol liavo not yet been freely p,,t t0 „ i bey «rvod five town during the yuor, an.l tl». n-wlts will I* t. • >r.

The VtUrinary UotpitaL

A report on d attachi-d lo lh« I pNW « p r • tin- fivi[1] I" IB 75oowi w«: „ , J <iiiring Ihe j >ar under roiwrt, »ffaiu-i *Tl* in thr p«.-t year. Tlje Bomber of pati«nt» would liavi- hirgely itwre: iug to thu Dtf nmtd ha vi' »tt«nd"d th<? Hi-pi tal fontinumt-lv during lli" *jmt.* Ht *h**<\ b be depuled I < pl»<x« for |KI "all* ami had also to lr.« rtaiu in AMMID, in diarj- ' i r *of* Afrkadi bil ab«e»i« the di^»'it"an' wan practically doaed. Of tbe 75 *ti>*\ ami 'uer 12 suff-r • from slota nd t!t» nwt *km* >rrul om>wa*dm)lopn«vRi««Uandth«otIi> tattoo is'• •piiiwiated by the cultivator* of tin? wigl' (•*

(e) IfsKKLUraO

f+rimenU in diferent «y«f«ww *o/%ouring cattl**.

The two oh)' in vi<-w in ihew* **xrwriment« are to determine (1) tha qoantity of manure that can lie oblaine* In a yoar from a [wir of work. o bent roethonl of utilising tbe ur b ountains more *xi>-* m but ma* of wltioh *m* allied by l< atdfaM • go an waste.

li Ihea* oblecta different tjnUBM *ttt* tried in diJTi-rrnt «hedi M per detail below:—

*Sh,*JA.—ln* tlii. aim) tli- dung •lm|i|*-il during iti- nighl U -;in:i! tal «<»veml witii :» B>, lilt Eqg and tin- dung and • are reman*] tl the end of the month.

,SW *B.—Tlir* MM »W1 u in Shod A, for absorbing tbe uriue hut UM< dung i* rwoovol ewry mormi

Thaw two witwu have benn un*ler (rial for tbe hu4 throe ye*r».

M,j r.—Tltc bos tyvtrm ileaerilwl in deteil in diu lart year[1]* report U tried la Uifc shod aod lu» Dow had aboul two yean* that

Shed D.—No litter is used in Ini. shed but simple dr absorb the urine and keep the shed clean and free from smell. TfceuriB.Brt«.Uwfc-ed flows down a drain into a pot sunk into the ground for collecting it. The cattle of this concentrated food such as cotton seed, &c. This system has been under trial for about a year and a half.

. ^ ' J f-TJ.. *mwm* ^tom k follpwH in tin. a. in Bb«I p, (,„, *xU* the cattle kept in .t colder and n«»ivC no .«,«,,»».«) food. n . a | ^ o f U l f c experiment is to see how & f o o d «,»»«fct,«%.f ifc,*,•» «d d*.r1- as a manure, especially as regards percentage of nitrogen. This fc« been started during lfc. year under report.

These several systems have been described in detail in the last year's report on the Farm. For Sheds D and E about 4lb of dry earth in the hot weather and cold weather months, *i.e.*, from October to June, and about 10lb of dry earth for the rainy months are sufficient for a pair of cattle for a day.

The quantities of manure obtained under these several methods from a pair of working cattle in a year are :—

	lb.
Shed A.—Dung and urine ...	9,449
Shed B.—Dung alone ...	5,302
Shed B.—Litter and urine ...	3,526
Shed C.—The box manure ...	7,342
Shed D.—Dung alone ...	5,113
Shed E.— ...	-.747

The following statement of analyses made by Dr. Leather shows UM V>JUC of urine as a manurial agent :—

Statement showing analyses made by Dr. J. W. Leather, Agricultural Chemist to the Government of India.

		Percentage of moisture.	Percentage of Nitrogen.
(a)	Fresh dry earth before using in the shed ...	9·72	·MI
(b)	The above earth after using once in the shed of cattle receiving no concentrated food ...	13·08	·169
(c)	The earth after using once in the shed of cattle getting concentrated food ...	2·20	·224
(d)	When the earth was used twice in (b) i. e., shed of cattle getting no concentrated food ...	8.88	·303
(e)	Earth used twice in shed of cattle getting concentrated food ...	4.02	·295
(f)	Poudrette of Cawnpore Municipality sold at Rs. 1 a cart load ...	2.19	·42
(g)	Cattle dung bought in the Cawnpore bazar ...	Not known	·26

It will be seen that in the case of cattle getting concentrated food, the percentage of nitrogen in the earth, increased about ten times wd tvica; particularly in the case of cattle getting concentrated food when used twice, and about three times when used once. The earth, *i.e.*, used twice in the shed of cattle getting concentrated food, contains a proportion of nitrogen not much lower than that of poudrette and higher than that of ordinary cattle dung. It may also be remarked that the nitrogen in the earth is more valuable than that of dung or poudrette in being available and more readily available to a growing crop.

CAWNPORE:
25th September 1897.

S. It HADI, M.R.A.C.,
Assistant Director.

APPE.VPIX I.

Third not on tkt eomjmition of tugarcani and raw »ugar$.*

Objtetscftkttxperiwuntt.—The principal obJMh of the ex|wrin>ents on ."gor-*Q*M,* winch am being carrlnt ottl •(Die KxporitaenUl Furm* at Pooia, Cawnpore, I>ooira<in and Hurdwae, wi>jv briefly detailod i'i tin; firxi paragraph of my 2nd Note on •Wcoinposition of sugar-uie and raw Migars *{vide* the Agrijuliur.il Le.lgor I o. 1 of 18

They ar<(l) to determine whit qnnatity of manure may b> most eeonomial'y applied to ibn <rop, and (i) wlial varietica are the best aug.ir pr<iucers. Forth nmlta of the field experiments refereooe miwt be *mvh* to the Annail Reports of the farm* concerned.

2. The investigation* into the dwrnk-al composition of the sngareane and its products, which I commenced in the told weather of 1SU4-W1 and continued iu that of 18•Tt-yo, have again ooouj iiod my attention during the patt aeaaon.

3. Of the several subjects mentioned in paragraph 2 of 1 .I HIM I I,.alger No. *IV* of lctW, nome I aoimdertd did not call for further attention at pnesent.

1 bo amount* of Nitrogen and Phosphoric Acid, whi^li arc removed by the crop, must naturally vary according to the weight of crop, and consequently the approxi-mate ectiuutte given on pagtt20-21 will be sufficient for t!ie purpose of giving ua idea of tin- I'PUI amounts of these plant foods nmoted in ihi? crop.

Again, the amount of mgar which it removed in the scum during the boiling down of Ithe juice is a matter which I haw not further enquired into, beoaune, in the Aral place, it U tmpoMibte under the <onditions Ea irbiok lit • cullivutor workl to tiavid taking wigsr witii tho aeum, and, secondly, tbit augar it not waated, but i- put to one uacful purjKMF or another.

Bearding thin matter, however, I atay here point to the desirability of takiig off the scum M qoloklj at po»>i!'!-. It will be cloar that the long»r tli« anum fnaaioM floating on the pan ol boiling juice, the more concent rated the juiou become*, and -imv approii m*tely the *auu** union ut of liquid will be carried with tbo * *mm* whencn-r it u mnoved, tlint li'iuiil will cuulii more UBf ifthi jui<c has been allowed to concentrate first, than if the KUIO b« removed whilst the jukxt *in* atlll dilute.

The acorn rtaea rapidly a* soon *m* the liquid boils and the skimming should be ji-rformed quickly aad iburooglily at OK*.

Tlirn a small quantity of milk [olmt *i* oi.) may be Mvantageonslj added, which will nun a little more scum to form and thia should again be got rid of at soon a* may be.

Tin- utlur tdl'jf i- mrniiontd, *le.)* have again formed thetobjeot of expert nent.

In •'Iddition, ho*twr, 11 t'-t experiments whioh have been made on calws gri>wn at the farms, a mnudf raL>l number of experiments have bc*u made on cane gruwu by cultivators.

The investigatiaa of previous years Lad thnwn thnt it wa« most important to determine, as far as possible, two items in relation tI tU diff*erent varieties commonly grown, one being the amount of juice obtainable, an•I the otto Utr prr.centage of sugar in the juice. A further matter eng• ip-1 my rttwUon, naiwly, tl>c idintification of var-ieties. The cultivators know their own varietisjg ptffsotly wHl aii'i hav« Dames for them, but unfortunately theonsuMsrc freqai-nlly of uo saxvioe at alUnfi.idIn' out whether one is dealing in two different districts, with the same or different varieties. Consequently it seemed desirable to decide on a system of describing varieties, their appearances, &c., so that a variety grown, say, in places far apart might be identified by different observers.

The descriptions of the varieties met with will be submitted in a separate paper, together with such information as has been collected relative to the percentage of juice and its quality. Another matter on which some additional information was obtained this season was the effect produced on the juice by the cane being "laid." In the case of the crop of "Mo[illegible]" variety grown at Cawnpore in 1894-95, a good deal of the crop was laid b[illegible]n, and it [illegible]ed that the juice of such cane contained less sugar than that of [illegible]ing cane.

The crop of 1895-96 was not "laid" at all, but this year, owing to [illegible] the [illegible]ight [illegible] which many of the varieties [illegible] down, [illegible] and the [illegible] separately.

A third s[illegible] [illegible]mparative quantity and quality of the [illegible] of the [illegible] portions of the cane. [illegible] Burdwan district the cro[illegible] from the "tops" of cane, whilst in most other parts the whole cane is cut up for seed. [illegible] (*vide* paragraph 8) the Burdwan practice is an economical one.

A further subject which has been studied is the relationship between the specific gravity or density of the juice and the percentage of total sugar. Information on this point will be of service to those who may wish to know the amount of sugar in juice, but who have not the means at hand to determine it chemically.

The subject matter of the present note may conveniently be dealt with under the following heads:—

1. The amounts of cane-sugar and glucose in sugarcane juice.

2. The relative composition of the top and the main part of sugarcanes.

3. The relationship between the specific gravity of juice and the percentage of total sugar.

4. The composition of raw sugar ("*gur*" or "[illegible]").

5. The amount of sucrose destroyed in the boiling process and the effect of liming.

6. Hand Centrifugal made sugar.

4. *The amounts of Cane Sugar and of Glucose in the Juice.*—The quality of the juice may be conveniently dealt with under three heads ([illegible] p. 2), namely:—

(1) the comparative quality of the juice of different varieties grown at the same place;

(2) the effect on the quality of the juice of [illegible] cane being [illegible];

(3) the comparative quality of the juice of the same variety grown with different amounts of manure.

5. *The amounts of Cane Sugar and Glucose in the juice of different varieties grown at the same place.*—Cawnpore. At this farm the same six varieties were again cultivated as in 1895-96 and the Statement No. 1 exhibits the results. Each variety was grown on two plots, all of which were manured with poudrette, the one set of plots receiving about 250 lb of nitrogen per acre in the manure, the other set about 500 lb nitrogen. Although the cultivation was very good indeed, the crops grew so tall that they fell down a good deal [illegible] attempt

was made to tie them up with the dry leaves, a method commonly practised in the Burdwan district of Bengal, but this was not altogether effective. This method of keeping the crop erect is very successful if properly done, but no one at Cawnpore had seen it done, and it is probable that the tying up commenced too late. At Burdwan the tying commences when the crop is only 4 to 5 feet high. It is necessary to mention this because, even when 14 and 16 feet high, will remain erect if properly supported in this manner.

STATEMENT No. I.

Composition of juice of varieties of Cane, Cawnpore, 1896-97.

	[illegible]											
Variety.	Madrasi.		Saharanpuri.		Poona.		Dikchan.		Dhaul.		[illegible]	
Quality of cane.	Standing.	Fallen.	Standing.	Fallen.	Standing.	Fallen.	Standing.	Fallen.	Standing.	Fallen.	Standing.	Fallen.
Cane Sugar	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7·81	[illegible]	[illegible]	[illegible]	[illegible]
Glucose	1·44	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
Total Sugar ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ratio: Total Sugar to Glucose ...	[illegible]	[illegible]	4·72	[illegible]	[illegible]	4·41	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Manured with poudrette = 250 lb nitrogen per acre.											
Variety.	[illegible]		Saharanpuri.		Poona.		[illegible]		Dhaul.		[illegible]	
Quality of cane.	Standing.	Fallen.	Standing.	Fallen.	Standing.	Fallen.	Standing.	Fallen.	Standing.	Fallen.	Standing.	Fallen.
Cane Sugar	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Glucose	[illegible]	1·56	[illegible]	[illegible]	1·14	1·57	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1·54
Total Sugar ...	14·44	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8·07	[illegible]	[illegible]	[illegible]	[illegible]
Ratio: Total Sugar to Glucose...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Statement No. 1 exhibits the analysis of the juice of the varieties grown, each on two plots, [illegible] the juice of [illegible] which remained [illegible], the other from the juice of the cane which fell. [illegible] difference [illegible] in each case, the juice of the fallen cane containing a somewhat lower proportion of sugars. The loss is not, however, [illegible] in the case of the crop of "[illegible]" in 1894-95, which [illegible] by rain (*vide* page 8, Agricultural Ledger No. 13 of 1895).

Generally it may be said that the percentage of sugar is much the same in each of the varieties, with the exception of [illegible] range [illegible] which [illegible] will be the subject of remark in a later paragraph.

Dumraon Farm.—All the [illegible] varieties were again grown at Dumraon in [illegible] but with different manures. In 1896-97 [illegible] was grown on two plots, one being manured with Castor Cake containing 250 lb nitrogen (N) per acre, the other receiving Cattle Dung containing 250 lb nitrogen per acre.

At this farm the water-supply broke down [illegible] after [illegible] and the crops, especially the "Poona" and "Red Bombay" [illegible] to a large extent and were attacked by white ants.

At this farm the tying up was done well by a man from Burdwan, otherwise it is probable that all the [illegible] cane would have fallen.

Before crushing, the [illegible] completely as possible from the sound cane and the analyses in Statement No. 2 are those of the [illegible] cane only.

[illegible], it will be [illegible] the amount of sugar in the juice of the cane from plots manured with Castor Cake was poorer than in that from the plots manured with Cattle Dung. This is [illegible] point which will be referred to in subsequent paragraph (no. 7). [illegible]

Generally the [illegible] greater than in the [illegible] proportion of glucose has increased in several cases.

Burdwan [illegible] first occasion on which analyses of varieties of sugar-cane have been made at this farm. Only two varieties were grown there and the composition of the juice is exhibited in [illegible] No. 3.

STATEMENT No. 2.

[illegible] of Juice and Gur of varieties. Dumraon, 1897.

Variety.	Mungo.		[illegible]		Samsara.		Red Bombay.		[illegible]		Khari	
Treatment—[illegible] 250 lb. [illegible] per acre.	Castor cake.	Cattle dung.	Castor cake.	Cattle dung.	Castor cake.	Cattle dung.	Castor cake.	Cattle dung.	Castor cake.	Cattle dung.	[illegible]	Cattle dung.
Cane Sugar ...	[illegible]	[illegible]	[illegible]	10·3?	12·85?	13·36?	[illegible]	[illegible]	[illegible]	[illegible]	10·90?	15·42?
Glucose ...	[illegible]	[illegible]	[illegible]	·23?	1·34?	·72?	1·00?	·65?	·41?	[illegible]	·71?	·32?
Total Sugar ...	12·95?	[illegible]	14·40?	10·39?	13·68?	16·08	14·31?	12·28?	13·58?	[illegible]	11·62?	15·73?
Ratio: Total Sugar to Glucose ...	9·14?	9·23?	4·64?	1·40?	2·79?	[illegible]	9·92?	5·60?	[illegible]	9·23?	[illegible]	[illegible]

STATEMENT No. 3.

Analyses of [illegible] juice of varieties grown [illegible] Burdwan Farm.

Variety.	[illegible]	[illegible]
[illegible]	Castor cake N = 250	Cattle Dung N = 250 lb. per acre.
[illegible]	[illegible]	[illegible]
Total Sugar ...	[illegible]	17·62?
Ratio: Total Sugar to Glucose ...	[illegible]	[illegible]

STATEMENT No. 4.

Showing the amount of Sugar in the Juice of varieties grown at various places in the Bombay Presidency. 1897.

Variety.	Where grown.	% Cane sugar.	% Glucose.	Where grown.	% Cane sugar.	% Glucose.
Pundia ...	Khanapur ...	16·50?	·95?	Poona.	12·00?	1·48
[illegible] kabba ...	Ditto ...	13·51?	1·59?	Do.	17·08?	·48?
[illegible] kabba ...	Belgaum ...	11·47	1·67	Do.	11·47?	1·34
Ditto ...	Khanapur ...	10·62?	1·11	Do.	[illegible]	2·57?
[illegible] kabba ...	Belgaum ...	14·3?	·77	Do.	9·10	1·19
[illegible] kabba ...	Ditto ...	14·08?	·43?	Do.	16·00?	Very little.

The "Samsara" cane was grown on a [illegible] plot manured with Castor Cake; the juice of this plot [illegible] the same [illegible] that analysed.

6. *The effect on the juice of transferring cane to long distances.*—At the time of writing my last report on this subject, there were only two cases which could be quoted in evidence of the effects produced on cane by transference to long distances. The one was the case of the two varieties of Mauritius Cane, imported in 1894. These two varieties were supposed to be very rich in sugar when they were first obtained, and it was surprising to find that both in the crop of 1894-95, as also in that of 1895-96, the juice contained comparatively [illegible]. They were grown again in 1896-97 at Poona and it is satisfactory [illegible] in both cases the percentage of sugar has risen. [illegible] the Mauritius," which contained about 12 per cent. cane sugar and 1·4 glucose in 1895, produced a juice containing 14·71 *per* cent. [illegible] the past year's crop; [illegible] the "Red Mauritius", which had only about 10 per cent. [illegible] 2 per cent. [illegible] crop of 1895-96, [illegible] 12·7 per cent. [illegible] sugar and 1·[illegible] per cent. glucose in the past year's crop. Thus in both cases there has been a very [illegible] improvement.

The second case quoted in my last year's [illegible] of the "Poona Pundia" variety, which had been grown in 1895-96 at Cawnpore and Dumraon. It was then found that instead of containing about 17 to 18 per cent. of total sugar [illegible] crop, at the Farm, contained only [illegible] per cent. of total sugar (L [illegible], p. 8).

[illegible] variety was again grown at the two farms last year, and [illegible] will be seen [illegible] comparison of the quality of the juice of the "Poona" variety, as exhibited in Statements Nos. 1 and 2 of Agricultu[illegible] corresponding figures in Statements Nos. 1 and 2 of this note, the per[illegible] remains about the same [illegible] improvement has yet taken place.

[illegible] further evidence on this [illegible] was obtained during the past season. A [illegible] of cane [illegible] grown in the Bombay [illegible] were collected at the close of 189[illegible] during the past cold weather. These were all analysed. Later I visited villages in [illegible] neighbourhood of Belgaum and Dharwar and analysed [illegible] of these varieties grown by the cultivators, and the results may here be [illegible]. It will be seen from the Statement [illegible] that [illegible] at the place [illegible] the quality remained [illegible].

7. *The juice of [illegible] variety grown with different manures.*—When reporting [illegible] year on the effect which manuring has on the quality of sugar [illegible] in neither of which had th[illegible] manuring [illegible] the quality natural [illegible] therefore drawn that manuring had no effect on [illegible] of canes. The one was the "Poona Pundia" grown at Poona, and the other was the "Matna" variety grown at Cawnpore.

This year another variety, the "Madrasi Pounda", a [illegible] grown in the North-Western Provinces and Oudh, was grown at Cawnpore with [illegible] amounts of manure, and the composition of the juice [illegible] in Statement [illegible].

In this case likewise [illegible] the manuring, neither in amount nor kind, has produced any [illegible] on the quality of the juice, and I may also add that the percentage of juice expressed in the mills was also apparently unaffected.

Statement No. 5.

Cawnpore sugarcane experiments 1896-97, *Madrasi Pounda, Manure series.*

Plot.	Plot 1. Dung = [illegible]	Plot 2. Dung = [illegible]	Plot 3. Poudrette = [illegible]	Plot 4. Poudrette = [illegible]	Plot 5. No manure.	Plot 7. [illegible]	Plot 8. Castor cake = [illegible]
Quality of cane.	1	1	1	1	1	1	1
Cane sugar ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Glucose ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ratio : Glucose per 100 of Total Sugar.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Tbe " Poona Pundia " is one of tbe largest varwl w* grown in India, it h n lively cultivated in tbe Dcocwn and R<mtlnrn Mah rafts oounlry and » generally, if not alwny-i, nmitur>d hiavjly. It WM at**i grown with large amount* of manaro at the lVrna Kami. I >i" iaa MIUII iliin am extensively pawn in aont* pan- inom and Oudh and in usually tumurcd but li'. it WM grown with oompir —— V quautitii* of manure.

It lliB* #o lutppriml that in eaoh eate the partionUr varirtv, oo w! . evj*Ietiw ofttio rffrct of manuring n*fod, WM mantimd in tnoea tbvaune manner they wereaoouatoaMxl to. The cue of Inn "Madra rml to wtwU Ukewine afford evidence that manuring h»N no raVt oa t04 j,. | . orou of nwPundia" Rriinn.ilVi.m n aaalymj thift ymr. T tobeno obj,x.i in reneiitiiig the wtprr HIM the quality f id jui^ nauuml ooiwtant for two you* (vitb Agrioaltnral Udgmr* N««. 13 of 1SW, pag« 2 and HI of lSytf, page 6).

I). tbe O H M : Uaa • variety, it WM grown at Cawnpon in 18864)7 on two plots, bo td adremngof pundreUe in one OMB conlai ninnil-rogen «^nal to 60u* i»er acre, in tbe oi .Cen rqual to 250B> per a. Luih aaioanf* of uurnurv being far more tli«n in usually given Hie grew about t* ice a* high a* muaL But in Ibu cue manuring Mnn> lo h*vo b»d auUrial effoct upon tbe cane. In 1804-86 thi* variety grown with -null tiianure yielded on an avenge of it \>ln ideal tbe h a-bao it WM again grown with email amoonln of mannrv on 9 I«rwniageof }< ted wa» 1>S96>97 when it was grown witb large snwunr* of mauiirc the ptrorotag- .iainol WM 60*3. On the oth*r bawl, , -raontage of ane sugar in tbe jute* of tb«M crop* WM HO, 10% ll-'J for tlio corn-: tan and of glmoee 0-1 and 1-0 per oenL in il.<- lu.-t two Tin <ge of juioc ha» inertawd very ottnatderaltly witb tbe suiF[,ly of owuun , il.e percentage of Mtgar bufitilcn very Mtioualy.

At t);c «me lime, although Ibu nsull muat b* attributed to tbe heavy manuring, it would not be at all profier to infer that heavy manuring is lo be deprecated generally nully a caa« of having grown a certain variety of oaoa uotler tit wudtliotu to (l..-c to wht-'li it m vJnaUy mecwtonal,

Auotlieram of a ajmilar nature may l» qtJotoJ. TIM Bin. "•IUHJ;» IM* oj' Ittiir Juvf Iv4'ii gm r- at Duuraon with Urgi amount* of manure. (Vitk • of 18My page S ami 8uiea> of ; j The peroealage of loUl »agar in I he jnioa of tbe Uunfu i 1886 wa« •mill -ntage of mgir in lh*l in I sy»; awl 1-1-5 an.1 Ma I b*ppcn< analyet a Mmplc of tbe mixn) Jnin of th«M I wo variHia* i ihr-y an> commonly grown them a* nth liitlnur »•• ma -nt. of julc« WM «xpriH«il and it coniai; • r rert nuw> mgar awl "23 of gtoooM; an amount much in e»Mt«r that foiiml »l Damrmoa, and owe m» *t tbe bfnvy maimrintc at Dumraos W rv.Ii <«ge of *u|pir. Tbo caw m ••rnlM I" ibat of Ibe Matna varv-ir al fawnjvirF' ; in mrJi, varietie* hav« Iweo (tro wn BDt l*>r B—nlMf diff'. tuvaeewtomeJ, and Cbb apjxan U> bave bail adifrfurbtrx

Wo bav> l«aoe not only that can* may nnVr from a ebang* of dunate but abo il. M taatorially ebaogril from tli..-> under which id. plan< h*i bn»n t" "" <]tu!ll> may Iw lowrn*!. Wb» i t!»- (|«MuMy) 1>. jiro-du(vd<>n<vrf ,.*vy manuring, il n«4 not \- a*.itm-d Ibal r.vt. On ta« contrary, jwflfng by ill- Bhttrii aad Mnngo varie-Itea grown at Dumrnun, one may • r (be normal proportfo*

Moreover, and it ia a (till mom important factor, with an increased supply «f tnaniiTv. a much heavier crop is obtained for outbalancing such jquxiaUag tfl.effects on the jniw M h«vo bwn quoted.

8. *Th* composition of the top end and tki main portion of wgarcant*.*—As alrntoly explained in paragraph 3, it " of interest to know the comparative qualify of different pirla of OAK* became in some places, naoh a» Burdwan district in Bengal, it is the practice to i grow tin- nr*p -viu-ivtly from §et« cut from the top end of canes, whilst in most jmri' of India the whole It cane is cut Up for plunting.

I therefore made five experiment! at Burdwan in whioh a baadk of whole <*n*a wa» Uketi in each *am,* tlw top* eut off and I be two portions weighed. They wwe thrn pa**d (hr.d^b ibft mill gepunrtalj, and the juice analysed in tbreecasea, Cheip<.Tifiogravity alunc l«i»j; dateminwi in the other two.

The n«utii of these experimenuj are let out in Statement No. 6. in the nppr part ofwWhiigitentlie weigh! of caoeopwated upon and the percentage of juice obtained whilst in the lower part ia given the analysis of ihejuica.

In the first place, it will be nutiwl 11,it tbo amount *otjmm* obtainable from the top end of eaoe u verr much le«a titan from the main portion of the rtna, the percenUf« in the former eM varying between *46** and 66-1, whilst in the tatter it wai between 91 and 74-1,

Then, secondly, it *ill b« rr«n lt»t tlw troounl of ciw rognr and of Wai atgar tt moqL hi^>r in U»e jui«e of tbo main part of the men than in that of th« top*, but the amount of (rfuco* i« mu< h town in Ihi furmfr tban b the btler. That tbia ia not ia any way exceptional to the MM grown at ltnnlwan vtiU be evident from an inspection of the an»Jy«i detailed in Statement No. 7.

STATEMKNT No. 7.

Compowititm of juice of difertnt parU of tugargint. Paona, 1895.

	Medium sized cane. %	Large cane. %	Small cane. %	Small cane. %
	Cane sugar.	Cane sugar.	Cane sugar.	Ca[illegible] ST
Top end	13·38	10·41	12·24	in-,
Middle	20·21	18·07	17·70	[illegible]
Bottom end	11·65	19·36	19·13	. j

w!, en at Poo n»tnI8'.'3, I determ lined the perwnUgo of oaoeaigar in difltrcnt larif of foor «w»'« <*«• »' the " Poo m Pui*di*'"

In this l aw the analyst an of tint jok« of tingk cane*, but the evidence u quite uniform and counm* lU» obtained thii y«ar at Burdwan.

8TATEMEK T No. 8.

Showing the comparative compo*tition of the tap and main portion* of tuffarmnr. liur.hran,* 1807.

Variety.	Samsara cattle dung plot.		Samsara cattle dung plot.		Samsara outer <*k. plot.		Sumnmi.t(ib		Khari cattle dung plot.	
	ItilfUt of cane.	ftp	Main part of cane.	Tops.	Rail !•«•' of cane.	I[illegible].	Main , - t ..(cane.	Tops.	Main part of cane.	Tops.
	lb. oz.	lb. oz.	ft. «•.	lb. oz.	a «.	lb. oz.	ft. M.	ft. M-	lb. oz.	lb. oz.
Weight of cane or tops ...	47 0	4 3	M •	• 4	w •	1 14		I 1	19 0	2 6
" juice ...	34 8	2 2	n i	1 9	14 0	1 0	U 4	S 14	11 12	1 2
Percentage of juice ...	73·4	51·6	BIO	[illegible]	I'*!	Ol	74-1	HI	[illegible]	[illegible]
Mean weight of canes or tops.	8·9	·23	—	—	—	—	JC	[illegible]	II	ii
Specific gravity ...	1,073	1,050	[illegible]	[illegible]	[illegible]	UMI	[illegible]	[illegible]	[illegible]	1,071
Composition of juice cane sugar.	14·65	7·00	Approximately, equal to	Approximately, equal to	Approximately, equal to	[illegible]mal-	[illegible]	n-ao	[illegible]	IMI
Glucose	1·66	MI				r.(.»: t l	[illegible]	t-M	[illegible]	t :
Total sugar ...	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1 4 •
Ratio: Total sugar to glucose.	[illegible]	•ni	—	—	—	—	[illegible]	10 71	I'M	Ni

At just at good a crop will be obtained from plan tine with iba only iu»teaU of cutting tip tbe whole MM, and further that cane will | from being thus propagated, it will be rvidrnl that it ii mnoh more eeoontntfal >° grow from • top> " only. It la iliffi tilt to wtimate ibo *g* .in from the adoption of the Rtmlwan ru-i.-.m. bir -almlajion baasd <m the figure* quoted in SUle-mmt No. 6 will pirliap* exemplify tbo differ A •miming thai 1*2,000 «ct* of Sanuara variety am planted p> I that r*!i " *ct " from tbe main part of the cauo wi-igii* •Cilfc. then tbe wtright of cane required for mwing one acre wotiM bo 4,200 !b. If thia were cntabed for ngar pro I • weight of gur obtainable may be cak-nlalod, thiio it may be aantmed that 70 pef oenl. of juice will that tbe parentage of total •og-.r will I- 17; tha 10 per crnl. of the sugar would be taken off with tbe »<nm, an.I that tbe gnrw<> •> 80 per cent, of total augar. Then from tb» -t.AMIb of oane, 2,!MOlh of would be obtained, containing 5001b of pnreangar ; 1 wt in tbe wum aod tbc remaining 450ft of pan tup roduee about 500m of gur.

OB amount of gur obtun id «aoaf may be ealeulated ihu*. K*»h eat will weigh *mf* '. aod the weight of cane planted would that be 3,3001b. Ifrnuhed, tbi* eaiie I yield, say, J Mgar. Tbu the 3,3W)tt> of cane, l.fWIlb of jut, e would be ulKaincd, oont. 'Ib *at* pnre eugar. DtJu-1 10 per mil. loal in the tcutn. or *t* Ib and tbe rtmaiu> give about 236m of gur.

Thna, ajaoming that thtt ctea fairly tllurtnUi tbe different imrnii"* of g»r obtainable from the lop end* and tbe main portion of tha Samaua variety, planting the whole rane mount a *km* of torn 3301b of gnr per aore planted.

A einuUc caicnlation for tbe other variety, namely, Khan, wbk-h wa» npnf> manted upon, abowia loea of about I tUBb of gttr by planting from tbe *aw* I of the cane. Thia variety w a thin ODD and the »U weigh ootMaqatatly rnuon lee* than do thote of the thick "Sanwara " cane.

la any MM, tbe robject i* worth experimetiting upon, and MMM cane will he grown from the top end* and main portion* of rane at one or twu of the Farm*.

Tbe evidence at hand certainly doe* not indmte that oaae depteeiatei fi bring contiunowly propagated from tbe lop ead«. The " Hamtara " <»oe at wan u an exceptionally good cart- g about70 ptr<«ni »t the milk and aome 15 to 18 per cent to total Mgar in the jaioi: and apparently the method ba» b»eo*ui vogue for a long time tbnv.

9, *T'M rtlaiion* Iwwn *th** epaei^c *gravity of mtgarcam* juic* and tkt amount a/ Mat* M£ar *frtmtf in it*—Tbe value of a cane may be «id to depeod in a gnat meaeure on the percentage of juii* oUainable fram it and the peraalage of Mgar in that jti

Tbe former may be readily detarmlaad by onufalaf 80 off lOOJb of any partieular variety and weighing the Juice expreawd. Iron mill* are to be bv) al anywhere. BOW, aod the nprratioa caa be earrknl oat by any on* who poateaMa ; baJaaea.

The pamalage of eagari in tbe juir can only be aoewatalj detenaiaed by f eertaia tihaaiwej oixraliou*. for the j«r f-rnun-* in Iba vpprr part of which a rial training ia wraatary. In the <w oi Haul* pnre aolnliona of Mo gravity baui a deiii aalagi of pagans and they may iipvnV together vi >K»I tlir titiv i In the OMD *nt* oaae JaMv b»*' r wtnrtaaew ate *ymm* ut wl lb» aui*v rrlalioo aal Ktarml #>, |)u». v, r, thai thtt pmpoetioa of tUe<c other enhetaama might ba, tolerably MM.! A oane jm *. Reaanlly, aad in thai oeje table* ejighl .aaijy be pt^auW K tbr ptnrutag* of total aapn which wrm^ood ^ tbe i

STATEMENT No. 5.

Showing specific gravity of juice at 15·5° centigrade with calculated percentage, total sugar and percentage, total sugar found.

Sample.	Specific gravity at 15·5° Centigrade.	Total sugar calculated.	Percentage total sugar found.	Difference.
[illegible]				
[illegible]	[illegible]	[illegible]	17·9	
[illegible]	[illegible]	[illegible]	17·4	1·1
[illegible]	[illegible]	[illegible]	18·[illegible]	1·5
[illegible]	[illegible]	[illegible]	19·0	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	3·9
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	15·3	1·7
[illegible]	[illegible]	[illegible]	17·[illegible]	1·1
[illegible]	[illegible]	19	17·3	1·7
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	10	17·1	[illegible]
[illegible]	1070	[illegible]	16·[illegible]	[illegible]
[illegible]	[illegible]	17	[illegible]	1·4
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Striped cane, [illegible]	[illegible]	[illegible]	10·4	1·4
[illegible]	[illegible]	[illegible]	[illegible]	1·1
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Red Mauritius cane, Manjri	[illegible]	[illegible]	[illegible]	[illegible]
Ratooned Pundia, Manjri, plot cotton seed	[illegible]	[illegible]	[illegible]	[illegible]

Sample.	Specific gravity at 15·5° Centigrade.	Total sugar calculated.	Total sugar found.	Difference.
[illegible]				
Madrasi Pounda, plot 2	[illegible]	[illegible]	10·1	[illegible]
Do.	[illegible]	[illegible]	[illegible]	1·8
Do.	[illegible]	[illegible]	16·6	1·9
Do.	[illegible]	[illegible]	[illegible]	1·4
Do.	[illegible]	17	[illegible]	1·7
Do.	[illegible]	[illegible]	[illegible]	[illegible]
Do.	[illegible]	[illegible]	[illegible]	1·7
Do.	[illegible]	[illegible]	13·5	[illegible]
Do.	[illegible]	[illegible]	[illegible]	[illegible]
Do.	[illegible]	[illegible]	[illegible]	[illegible]
Do.	[illegible]	[illegible]	[illegible]	[illegible]
Do.	[illegible]	[illegible]	[illegible]	[illegible]
Do.	[illegible]	[illegible]	[illegible]	[illegible]
Do.	[illegible]	[illegible]	14·9	[illegible]
Do.	[illegible]	[illegible]	15·0	1·4
Do.	[illegible]	[illegible]	[illegible]	[illegible]
Do.	[illegible]	14	[illegible]	[illegible]
Do.	[illegible]	[illegible]	[illegible]	[illegible]
Do.	[illegible]	[illegible]	[illegible]	[illegible]
Do.	[illegible]	[illegible]	[illegible]	[illegible]
Do.	[illegible]	[illegible]	[illegible]	[illegible]
Do.	[illegible]	[illegible]	[illegible]	[illegible]
Dikchan	[illegible]	[illegible]	[illegible]	[illegible]
Do.	[illegible]	10	[illegible]	1·1
Do.	[illegible]	[illegible]	[illegible]	1·1
Do.	1007	[illegible]	[illegible]	[illegible]
Do.	[illegible]	[illegible]	[illegible]	[illegible]
Malwa	[illegible]	17	[illegible]	1·7
Do.	[illegible]	[illegible]	[illegible]	1·7
Saharanpuri	[illegible]	[illegible]	[illegible]	[illegible]
Do.	[illegible]	[illegible]	[illegible]	[illegible]
Madrasi	[illegible]	[illegible]	[illegible]	[illegible]
Do. fallen cane	[illegible]	[illegible]	[illegible]	[illegible]
Poona Pounda standing cane	[illegible]	[illegible]	[illegible]	[illegible]
Do. do.	1044	[illegible]	[illegible]	[illegible]
Dikchan fallen	[illegible]	[illegible]	[illegible]	[illegible]
Do.	[illegible]	[illegible]	[illegible]	[illegible]
Dhaul Field 10-11 standing	[illegible]	[illegible]	11·4	[illegible]
Do. fallen	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	1040	[illegible]	[illegible]	1·9
[illegible]	[illegible]	[illegible]	[illegible]	1·1
[illegible]	[illegible]	[illegible]	14·0	[illegible]
Mango cattle dung	[illegible]	[illegible]	14·1	[illegible]
Black cotton cake	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	14·3	1·1
[illegible]	[illegible]	[illegible]	[illegible]	1·1

STATEMENT No. 8.

Showing specific gravity of juices at 15·5° centigrade with calculated percentage total sugar and percentage of total sugar found—(concluded).

In 1870.					Specific gravity at 15·5 centigrade.	Total sugar calculated from specific gravity.	Total sugar determined.	Difference.
Varieties at Dumraon Farm—(continued).								
Samsara castor cake	...	...	...	...	1082	16·5	13·7	2·8*
Do. cattle dung	...	...	...	...	1074	18·0	16·1	1·9
Khari castor cake	...	...	...	...	1080	14·4	11·6	2·7
Do. cattle dung	...	...	...	...	1073	18	15·7	2·3
Poona castor cake	...	...	...	...	1063	12·5	10·6	1·9
Do. cattle dung	...	...	...	...	1062	15	13·7	1·3
Varieties at Burdwan.								
Kajli (Ryots)	...	...	...	...	1081	19·5	19·6	·2
Samsara (Ryots)	...	...	...	...	1079	19·0	17·1	1·9
Do. (Farm)	...	...	...	...	1073	18·0	16·1	1·9
Khari (Farm)	...	...	...	...	1079	19·0	17·6	1·4
Varieties at Behea.								
Pansahi (Behea)	...	...	...	...	1071	17·0	15·0	2·0
Mango (Behea)	...	...	...	...	1082	19·5	18·1	1·4

[illegible]-lerable number of samples of juice of different varieties of cane have now been examined chemically, [illegible] the percentage of cane [illegible] determined in them. I have therefore put these together in Statement No. 8, in which is also entered the specific gravity of the juice at 15·5° Centigrade and the percentage of sugar which corresponds to the specific gravity in each [illegible] assumption that the density is entirely due to sugar.

[illegible]wing to the presence of the other substances referred to, this calculated proportion of sugar will always be too high; and it was with the object [illegible] out whether the difference between the calculated and true percentage of sugar remained fairly constant that the comparison was made. There is no [illegible] determining the amount of these other substances (comprising [illegible] minous matters, [illegible] a simple method is to make a [illegible] eliminations of the one factor (in this case sugar) [illegible] ther material or "difference" [illegible] constant.

In [illegible] column of the statement is entered the difference between the calculated and [illegible] unt of sugars in each sample of juice examined.

It [illegible] from this column that, although the "difference figure" is not by any means constant, yet it lies between moderately narrow limits.

O[illegible] the [illegible] yzed it is less than 1·7 [illegible] between 1·7 and 2·2 in 40 cases, between 2·2 and 2·7 in [illegible] in 7 cases and over 3·2 per cent. [illegible] lay between 1·7 and 2·2 and in [illegible] it lay between 2·2 and 2·7. If, therefore, 2·0 be deducted from the percentage of sugar as calculated [illegible] error would [illegible] comparatively narrow limits and a fairly ac[illegible] ld be obtained of the amount of sugar present in the juice of any variety [illegible] ned.

[illegible] iderations, I give as an Appendix to this [illegible] tables from which [illegible] density may be reduced to density at 60°F. and 84°F., and, secondly, the approximate percentage of total sugars which correspond to the specific gravity of juices.

*Specific gravity of these samples of juice from the cane of these villages being so nearly equal, only one analysis was made. The juice was mixed and boiled down together.

10. *The amount of cane sugar and glucose in "rab".*—In the Agricultural Ledger No. 19 of 1896 is given the composition of a number of samples of "gur" or "rab." Some further [illegible] of this material were made; [illegible], but this was done prior to [illegible], in connection with experiments in liming juice, and these will be referred to in the next paragraph. Another description of raw sugar is prepared in some parts, for instance Behea and Bardwan, and this consists of a semi-solid mass obtained by stopping the boiling process a little sooner than is the case when ordinary "gur" is made. It is then transferred from the boiling pan whilst still hot to an earthen "gharra" or "[illegible]," and in this it is allowed to cool slowly, when a considerable proportion of the cane sugar crystallises out. At Bardwan this substance goes by the name of "gur," but at Behea it is called "rab."

STATEMENT No. 11.—*Analyses of gur and rab from Burdwan, [illegible].*

[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Villages Rangpata, Hartsimal, Kashal-gachi.	Villages Rangpata, Hartsimal, Kashal-gachi.	Experimental Farm.	Experimental [illegible]	Village.	Behea.
Treatment (Manure).	(*Average sample.)	(*Average sample.)	Castor cake plot.	[illegible]	—	—
Juice— Specific gravity	1080 · [illegible] · 1,080	1072 · 1076 · 1,078	1072 · 1072	1078	[illegible]	—
Cane sugar	[illegible]	12·24	[illegible]	[illegible]	[illegible]	
Glucose	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Total sugar	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Ratio: Total sugar to glucose.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Gur (rab)— Cane sugar	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Glucose	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4·30
Total sugar	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ratio: Total sugar to glucose.	[illegible]	[illegible]	14·31	9·88	[illegible]	[illegible]

* Specific gravity of these three samples of juice from [illegible] was made.

The analyses of this material, which are quoted in the accompanying Statement No. 11, are interesting as showing its composition and may be contrasted with analyses of "gur" published in my previous paper. In addition four other samples of [illegible] detailed in Statement No. 12. [illegible] were prepared at [illegible] (analyses of the juice are also given).

There is considerable variation in the composition of these samples not only in the total amount of sugar but also in the proportion of glucose.

11. *The amount of inversion during the boiling process and the effect of liming.*—The experiments which were made last year to determine to what extent the formation of glucose could be prevented by the addition of lime to the juice showed that inversion could be stopped almost completely, but that in order to add the most desirable amount of lime, considerable care was required. In Statement No. 9 of Agricultural Ledger No. 19 of 1896 it was shown that if about nine-tenths of the acidity in the juice was neutralised, very little inversion took place, but that much "inversion" took place if one-fourth of the acidity was left. Still even when an insufficient amount [illegible]. On the other hand, however, if [illegible] of the juice was neutralised and a slight excess of lime employed, then results [illegible] value black.

Although there is no difficulty in testing for acidity in the juice with litmus paper, provided a little care is bestowed upon the operation, still it was felt that if the process could be simplified in [illegible]

The first experiments which I made (at Cawnpore) this year had the object of simplifying if possible the use of litmus paper. A few words may here be said in reference to [illegible] this "indicator" is used. As is well known, litmus is a vegetable [illegible] l«r Uw colour of «Uwh bcMimr* r*d in th* prwMiM of arid* and bloc in ttio ptf wntfufttl'.- [illegible] In :j»i yf»r'-i fS|»Tii»>uiii liiw *a» adifal K» * certain poriifl [illegible] ibo jutw until that portion bmunc .i*tiy n#uM»/, tl> [illegible] nor all. For thu novi« Ihw joint of twutndiiy in, lumrv*T, »#o»e«li»i diffi'-ult on- i> liit off eyacllj : it is generally «w [illegible] • !i'jiii>i b »i<l '>r illuliw ilian • x»etly neatAl, ntxl it WM to »roid (he DMtaitjr ofwrivii.g at (hi* nnnrul |»iut that lit* first exptrrimfittii wi-n- tn»lc. It will n.iw U< nmti r-t.-^l tliat Mi|>j>--iiifi llnw b'' •tl4cd to juia« mitil : [illegible] I •—, tW i. until lU.-jui.* tweonM aJUliw, thi* <*n be readily detected [illegible] fornd litmus J«J- r *ill 1M- iluu.pr«l to l>iur. Tlmn, hn« [illegible] •uffi. i [illegible] juice mfl-i !«• wltlrd to rondrr thin ounlunftl porti»ti ii»tin>-tly w ut apiit>> Consequently it [illegible] so large a portion as $\frac{1}{12}$ of the juice limed in th[illegible] U man I if r, i. «., a[illegible] with an excess of lime, the remaining $\frac{1}{12}$ would not be sufficient to prevent the result[illegible]ing gnr hcvoninf iUrk cilonnd.

In the experiment[illegible]''•* si CWwnpurv | of lite jni«> wtu lp«btl with liiw unfit rf<:;'>' D I!H- rvnuiimtig j -.t' il- juW MMnl to il w •• [illegible] to render it adiil. In tlii* wny MintrwW mon than | of tfao *a'uU* in tbr jnier Im-am* neutralised.

STATEMENT No. 10.—•SAotrinjr (1* r/fcf 9/ tMKfnt&tny tV juwv tn(A *Litn*. I'aienfKirt Farm.*

Variety of cane.	V..1-K.		Madras Poovla, Field A.B.		ru-i 1		Field A.B.		N«[illegible] Field 10-11.		[illegible] Field 10-1-	
Tmli[illegible]	Poudrette.		Poudrette -twX.		Poudrette =[illegible] N.		Poudrette =[illegible] N.		Poudrette =[illegible] N.		Poudrette =[illegible] N.	
Juice— Cane sugar ... ... Glucose	14·45 ·80		12·03 ·99		13·54 ·67		7·81 ·96		8·57 1·19		10·30 1·12	
Total, lit*- ...	IVtt		13·02		14·21		8·77		10·10		11·42	
Ratio 1 QhKMt to ttUJ «• I ''	5·24		6·58		4·73		10·55		11·7		9·60	
	Not limed.	$\frac{1}{12}$th limed.	Not limed.	$\frac{1}{12}$th limed.	Not limed.	$\frac{1}{12}$th limed.	Not limed.	I. h«.	Not limed.	$\frac{1}{12}$th limed.	v	$\frac{1}{12}$th limed.
Gur— Cane sugar ... ... Glucose	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] !**.
T «•!, . [illegible] ...	T4W	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
RttioiSlw-cw par 100 of total sugar.	12 96	T70	li}4	942	S36J7H		3i:STt7M		[illegible]	[illegible]	1*8	18·3

STATEMENT No. 11.—Showing the effect o[illegible] neutralising sugarcane juice *trxth t\mM f: [illegible]-i Farm)*

Variety of cane.	Manure.		——CCT—	
Hun.	Castor cake.		CaMatMk*.	
Juice— Cane sugar OlMOW	12·7 •it		I M> ·71	
Total, Sugar ...	UM		11 <-!	
UIW ToUliw[M to |t»MM ...	H6		111	
	Not tmmL	1t«Md.	UBHA	-Jti.
•ft— Cane sugar Glucose —	[illegible]	Tito	:.-u Mi	«»4
Total, Sugar ... Ratio r Total awUaftc—t	• IT.'' 10·23	[illegible]	[illegible]	[illegible]

Murwvrr, in onlor to put tb« pro«M on • ptw*k»l fooim,-. [illegible] the liming was performed tb» »imi. 'lit. of ttw Agriculiiml Kh[illegible]

The r Wto of th* npmoH.ni* *tm* drt-ikd is 8tai«amii Ko. 10. In «JI OMW - w^Hilmc- w •!»*« to hart LM gftb*] iVoa. lb* appjkuum of ibj lim in th-above described manner, though (he advantage it not so great as it was in some of last y mi't experiment*. In tlw first three ctmet, however, the amount of inversion which oocurml without lime wait not great, and the effect of liming Is lyonwwhat mark«t. In the wound three cam the proportion of glueoae in the juioe wat already very high ; ; i one of tbwe inveriioa was almoet stopped, but m die other two it «H considerable.

12. About this time I determined to try to do without litmttn paper altogether. I had noticed that the many varieties of sugarcane juioe which I had examined, all contained a colouriug matter which was affected by alkali* : and it was clear that if this colouring matter could be ulilieed an an indicator, instead of litmus, an advao-tage/ wonld be gained, in that nothing but tho Um wuuld be required.

The oolowr of freah cane jaice varies and ii not in any our ewilr defined, but it U always more or lea* greeniib brow*. This oolour is, however, aJmwi eulircly due to baolaUe matten and ehlorophyl and the juioe itself hi almost colourien. The froth which forms wbtti it ii atirred rapidly b nearly white. If, however, an exoeea yfan alkali such as lime be add*!, the juice becomes yellow coloured, a colour which would be much mort easily seen if it wwe not for the nrtaence of the iniolnblc matten named i; the froth of alkaline juie* ii very yellow, fl wtrtr, this yellow colour becomes apparent, it will bo found thai a considerable excee* of lime hat bnon employed and that the juice is stro,_.|y alkal'n*. On this aocount it was deemed advisable to add lim« to only 1 lt»« juicrt until it became yellow ami then to add the other half of t,<• juice to render it all arid again.

The jto4waeilt >,„][. . rtMlts of i wo experiments made at Dumraon in thi. way, in which ordinary I id gur wa. unpan: I Here i p b there i* cvidonot that liming WM n»e(nl, but the amount of inversion in lbs uiiltrootl RUT WM only nnall. At Bebe* also ihm loto of juioe were (tartly noutralbad with lime, and the r.b, tike iurtMM sugar, eymp and gur from the syrup all analysed.

Numbers 1, 2 and 3 in t:„ ... .i accompanying Statements 12 •> 15 are from the limed juice, wb.il* No- 4 is from' unlimed «V»t of limekapr. ... 2 right throtu ••andal- in the turbi; aigar No. 3 and gur No. 8. fat lbs No. -I U ^<)bahly better than mart. (Compare aualyaw in Slatement No. 'J) :—

STATEMENT Na 12.

ComptmJion of Bab I made at Bebea, 1897.

	UiMdrats	I. •:-! rml., • .--	v- 1	(Mkawi nb, No. 4.
naiMfV	«•» 13S	THO HI	M« Mi	7*40 4-M
	IS		-1*	•M
	- »	•»›	•85	
			MO	I-W
OtC •AtakbiaUMM) wtw	MOO	•MB	1MB	
WtM,t«. - — "*				
fetal, t^w		tooes	loom	1..,.,,
B»Uc ToUl.tni«r<lote*»	3D	1*4	• i	

81ATEMENT No. 13.

Compositio turbine sugar ʃ'row tkt rah.

	Kn. 1.	. ..-«r. S›- I.	•pis	rt*.«.
Cane sugar	M'10	M •	N :i	:->it
Glucose		ttn	tva	I'M
Insoluble mineral matter —	•r*	u		
		f t	•IT	•II
Lime		«^»	•44	7»
Other soluble mineral matter		•n		rn
Water				
Other impurities				
Total, Sugar	I«KKI		IIO-tM	
K.Mo T M Sugar glucose	1		ı ı	

II

STATEMENT No. 14.

Composition oftha syrup or molasses from the four samples of rah.

	Syiu]> Xo. 1.	Sjrap No. 2.	Syrap No. 3.	Syrup No. 4.
Cane sugar	•n;-no	[illegible]	47-40	51-31
Glucose	MM	[illegible]	5-51	G-:fii
Insoluble imnerul matter	£6	•It	•14	•J2
Lime.	•40	•28		•42
Otncr soluble mineral matter	I'M	a-ra	'"2-36	2'11
Water, *&c,*	47-35	[illegible]	44-59	[illegible]
Total Sugar ,,,	100-00	100-00	100-00	100-W)
Ratio: Total Sugar to glucose ...	**80**	e-9	**10-4**	**110**

STATEMENT No. 15.

Composition of the gv,r made from the four syrups.

	No. 1.	No. 2.	No. 3.	Ho. 4.
Csue sujur ,,, ,,, ...	78-S5	61'0-t	7O-S7	60-42
Gluoonc ,.. ,,, ... ,,.	6'31	5-LH	031	8-07
ImoluLilo turners! mutter	•20	•77	•68	•33
l^inc ... ... -.	•37	•89	•31	•SB
Qttier iol able mineral mutt or	z-fyi	2-84	3TS	3-28
Water, Sc, ...	IS'IO	9-06	18-80	2073
Total Sugar ...	IQO'OO	100-00	X00-00	100W
Ratio: Total Sugar toGloucse ...	[illegible]	6-8	**116**	11-9

It **fa possible** that liming **might** be carried somewhat, further than was the oase in the experiments quoted. Tlie degree to which the process might safely go, that is, the proportion of juice which might safely **be tendered** yellow with lime, had to be guessed at. I think if likely **that two-thirds of** the juice might safely be rendered yellow by lime without effecting the colour of fhe resulting sugar, AB will bo seen from analyses quoted iu the next **paragraph,** it is **probable** that the quality of **tar-**bine Bugar is raised by the addition of lime before boiling down.

13. *Hand Centrifugal made sugar.*—In paragraph 9 of Agricultural Ledger Bo. 19 of 1896, the object of the Hand Centrifugal sugar separator which Messrs. Thomson andMyline Lave been gradually introducing, was briefly explained, "Whilst on tour this year I embraced an **opportunity which** offered of itself determining how much of the 6emi-refined sugur, **which** there goes by the name " turbine Sugar " and " kuchha chtni ", is obtainable from the Eab as generally made by cultivators, and the following gives die result:—

Exjjerimentl.—22§ seers of rah gave 11 seers of Turbine sugar or 48-8 percent.

Experiment 2.—26 scors of rab gave **13J** seers of turbine sugar or 51-9 per cent.

Thus judgiug by the results of tlieso two tests it may be assumed that about half weight of the rab will be obtained* as Turbine sugar.

I made some further enquiries as to the relative values of the several materials.

The prices whinh-were current at the timo of my visit were turbine sugar Ks. 5-4-0 gur, i'rom mousses Iis. 2-12-0, and ordinary gur from wliole juice Rs. 3-1-0 per ruimnd.

Tims assuming that rab yields 50 percent, of turbine sugar and the rest JB boiled down to gur, there would be obtained from one uiuund of " rab " 20 see« of turbine sugar, worth Es. 2-10-0 and about 14 seers of gur, worth lie. I, or si total of Us. 3-10-0 instead of Ks. 3-4-0 for ordinary gur.

The amount of this turbiae sugar which is made annually must be very considerable now, and the value may be gauged iu Isvkhs of rupees. It is sent as far as Peshawar and is largely used iasweotmeat-makiug in addition to the reiiuirjuieots of the Bffgc sugar refiners.

There is also a larger market for the gar prepared from the molasses than I had previously understood. Judging by the analyses quoted in Statement *So. IS* it is quite as good as very much of the gur commonly preparea from the whole juice.

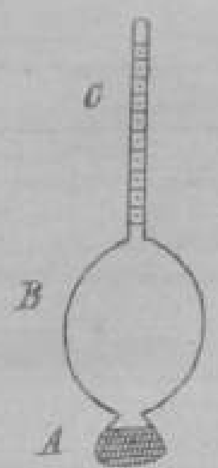
The ckeaiical composition of the several products, nib, turbine sugar, molasses and gur have been already dealt with in the previous **paragraph.**

J. WALTER LEATHER.

APPENDIX.

To find the per centage of sugar from the density of the juice. Explanation of the use of the tables. A few words in exphttuition may be of service to those who are not accustomed to use the Hydrometer.

In the first pluce it will bo well to explain that there are several descriptions of Hydrometers made, ali of which however are essentially the same in principle, and **tha** accompanying diagram represents a very common shape. Occasionally they are made of brass, bat more frequently of glass. The iastrument may be divided into three parts. A, a small bulb containing some heavy material such as mercury or shot; *B,* a larger bulb containing nothing but air; and C, the stem in which is fixed a scale of figures by which the density of the liquid is registered. The Hydrometer floats upright in liquids. So that the btdb A is downwards, and the **instrument** eouics to rest with **a** part of the stem C above the surface. The degree on the scale, whieh coincides with the surface of the liquid, corresponds to its density. Thus in a dense liquid the Hydrometer will not sink so far as it will in a lighter liquid.



In using these Hydrometers the cane juice or other liquid to bo tested is poured into a glass cylinder and the Hydrometer then put into it.

There is considerable difference between the density of such light liquids as etber and alcohol nnd such heavy ones as oil of vilriol. On this account it has been foutid convenient to make Hydrometers for liquids of only a *certain range of density* Thus for instance a series of specific) gravity Hydrometers might be the following j:—COO-SOO, 800-1,000,1,000-1,200,1,200-1,400, 1,400-1,600,1,600-1,800, 1,800-2,000. Twaddoll's Hydrometers range as follows;—No. 10°—24°, No. 2, 24°—48° ; No. 3, 48°—74°; No. 4, 74°—102"; No. 5, 102°—138°; No. 6, 138°—170°.

Thus for sugar juices one would require the specific gravity Hydrometer reading between 1,000—1,200 or Twaddell's No. 1.

There are sevend descriptions of Hydrometers mode, but only two will be here referred *to,* namely, the sjKxtific gravity Hydrometer and the Twaddell's Hydrometer. The former is (-ommonly usod for scientific work, the latter for technical purposes. I find that Twaddell'a Hydrometers are stocked by the larger firms of Apothecaries in India and they are thus readily av:iilab!e.

It will bo clear that the scale in the Hydrometer stem, is purely **arbitrary,** and as a matter of fact the two instruments here described have essentially diilerent scales.

The specific gravity Hydrometer registers the specific gravity of liquids, **that** is, the relative weights of equal volumes **of different** liquids. Thus, for simple, 1,000 on its scale is the specific gravity of water, and 1,080 might be the specific **gravity** of some sample of sugarcane juice j this wouldvnean that if we weighed, say, a quart cf **water and** a quart of the juice, we should find that the weights were k this **proportion** of 1,000 to 1,0S0.

Twaddell's Hydrometer does not register thia directly. Water is registered by it as 0, and then for heavior liquids the scale ascends. Nevertheless this scale bears a simple relation to the true specific gravity, and is expressed by the following equation: degrees TwaddelW —— E —• Thus for example sp. gr. 1075= —— or 15° Tw; and sp. gr. 1 0 6 0 = - ^ ^ or 12° Tw.

TABLE I.—TO *reduce observed specific gravity to specific gravity at* 15*6C *Centigrade or* 60° *Fahrenheit.*

Observed tenipcrtfcuro Centigrade,	10°—13°	14°—ir	18D-21''	22—25	£6—38 •	39-31 I	33—31
Observed temperature Fahrenheit	5O'-5G°	57°-63°	d—71	72—7B	79-83 I	8*—89	90—93
Amount to be uldei) to or subtracted from obterved specific gmvitj.	—1	...	+ 1	+ 2	+3	+4	+5

TABLE II.—TO *reduce observed de-a&ity on TwaddeU'e Hydrometer to density at* 60° *Fahrenheit.*

Observed temperature Fahrtnbeit	*to—es*	*56—63*	01-71	73—79	80-87	86—So
Amount to be added to or snbtracted from observed density on Twfcdilcll's Hjdromoter.	*—i*	...	+ i	+i	+ i	+ 1

TABLE III,—*To reduw ohst-rved density on Twaddell's Hydrometer to density at* 84° *Fahrenheit.*

Oltservod temperature, FVibrenbeit ...	40—55	6G-G3	64-71	72—79	90-87	88-93
Atnoojit to bo added to or Mibtawted from observed duusilv ou Twaddeil's Hjilromotor,	—1	*-i*	- i	—*	...	—i

TALIJ: IV.—*To find percentage of total sugar from s-pecific gravity or density on Twuddell's Hydrometer.*

Specific Gravity ...	IWO-il	1042-43	1041.40	1(147-18	1049-61	1063-5—	1054-66
Degrees Twadilcll ...	8	SJ	9	91	10	101	11
Per ceut. Sugar ...	8	81	9	M	lot	11	m
Specific Gravity ...	1057—S8	IO50 - 0 1	1OC2-U3	10C4-GG	10(57-68	1066-71	1072-74
Degree* Twnddalt ...	*in*	12	121	13	M|	11	lit
Per cent. Sojrnr	12	12|	13i	14	Hi	15	151
SpeciSc Gravity ...	1O7B-76	LO77.7L*	10!<0-S1	10S2-S4	10S5-B6	1087-69	
DegTOes Twaflrtell ,,	ir>	*w*	1G	1H1	17	*m*	
Per cent. Sugar ...	10	I6J	*m*	18	IBi	19	

It ia necessary **now** to say a word in explanation why the temperature of the **liquid** should be recorded as well as its density. Suppose a cylinder of juioe be taken, »nd the Hydrometer floated tnit, at, say, a temperature of 65° F., and the density bo found to be 12° Tw. (assuming the instrument has been standardised or compared with water at 60° F).

If the jar of jnieo with the Hydrometer be then placed in a can of warm water, so that tbejuiuo will gradually be warmed, it will be noticed that the Hydrometer sinke lower as the temperature of the jnioe rises, that is, to say the liquid becomes ligh*term* less dense. In the case quoted, the juice shows a density of12°Tw. at. 65° F. If the temperature rosu to, say,184° *~E.,* it would be found that the Hydrometer had sunk to 114° Tw.

Or we may suppose we hsd put the Hydrometer into aome juice early in the morning in the cold weaker of Upper Iudia, wo might haw observed thiB density of 12° Tw. and then inter in the day as it grew hot the same juioe miglit have registered only 1H^w., a change **due** simply to **the juice** becoming warmer.

A word may now be said in explanation of the difference between Hydrometers standardised at different temperatures.

The density of water on Twnddell'a Ecale is 0°. But manifestly ths temperature has something to say to this point. For example, if we put into the jar of watei a Twaddell's Hydrometer which has been standardised at 60° F., and supposing the temperature of the water is just about 60° F., we shall find the Hydrometer sinks to 0° Tw. Now warm the water until the Thermometer shows that its temperature is about 84° F., and it **will** be seen that the water has become lighter, just as the juice did in the above quoted case, and that the Hydrometer lias sunk below 0° to about —}° below. Now take this Hydrometer out and put into the water at 34° F., the Twaddell's Hydrometer which has been standardised at S4° F. It will be found to register 0° Tw. Cool the water again or put some of the cold water at 60° F. in the jar and it will be seen that (lie Hydrometer has rison a little out of the cooler water ; that is, the water lias become heavier again, and the Hydrometer registers about +1° Tw.

It is hoped that the foregoing will explain the difference between Hydrometers, why it is necessary to note the temperature of the liquid as well as the density, and what the difference is between Hydrometers standardised at one or another temperature. Usually Hydrometers are standardised at 60° F. in England, but I find that Some of those imported for use in India are standardised at 84° F. The use of the tables will now be readily explained by a few examples.

Supposing in the first place we have a *specific gravity* Hydrometer which has been standardised at 60° *F.,* and that when it is put into ajar of juice it registers 1059 and that the temperature of the juice is 72° F., we have, in tlie first place, to find from Table I what the density of the liquid would be at 60° F. Looking along the line of "observed Temperature Fahrenheit," we find under 72° the figure *"+2"* entered as " the amount to be added to the observed specific gravity." Consequently 2 is added to 1059 ; 1001 is the specific gravity of the liquid at 60° F. Now refer to Table 4 and under speoifio gravity 1061 we find 12| as the corresponding percentage of sugar-

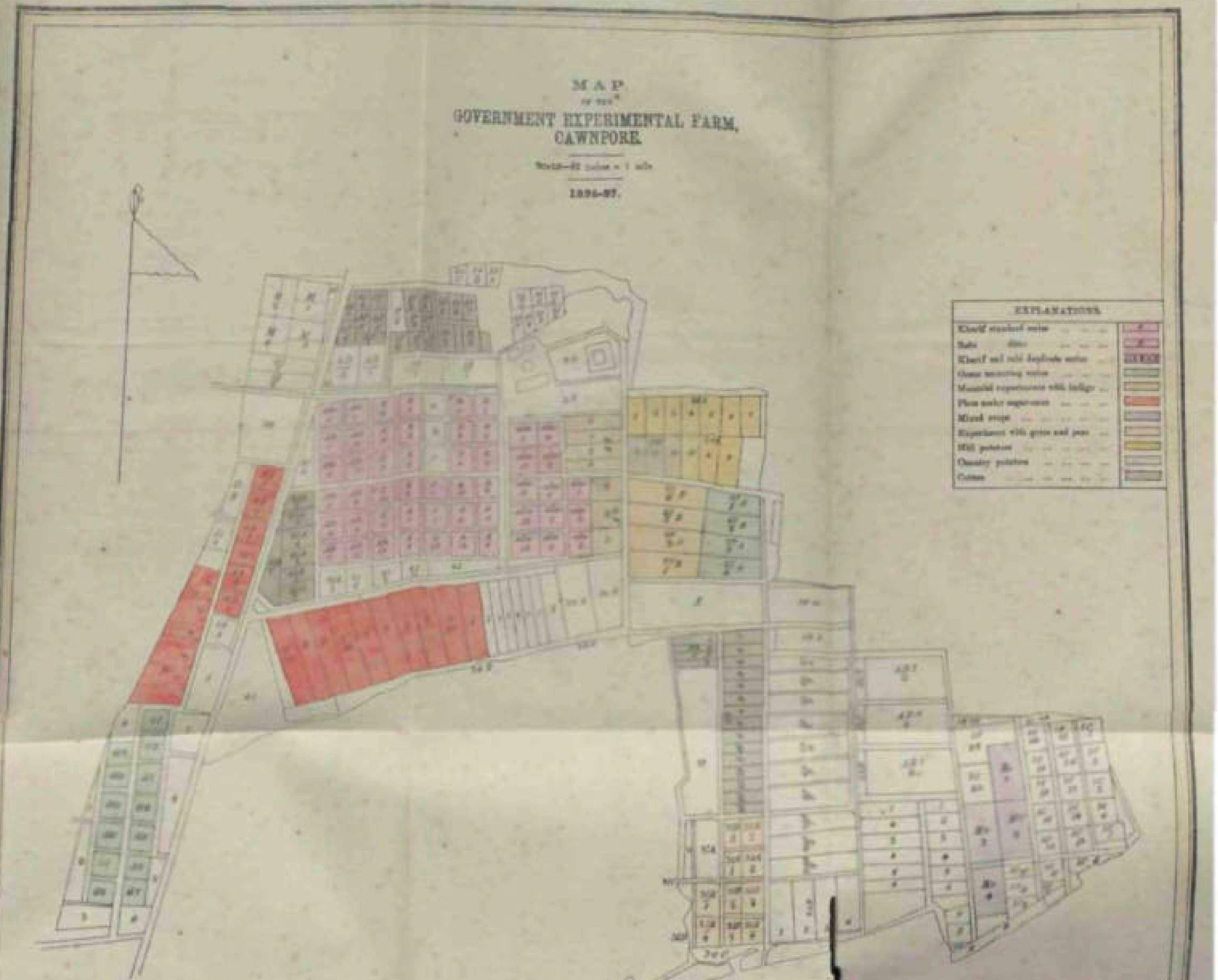
Example 2.—Supposing wo have a Twaddell's Hydrometer *No.* 1 which Las been standardised at 60° F., and when placed in ajar of juice it indicates a density of 13 Tw. at temperature 55° F. On reference to Table 2 we find that for any temperature between 49° and 55° F. J° Tw. must be subtracted from the density in order to find the density at 60° F., because the juice at 55° F. is denser than it would be at 60° F. The density of this juice would therefore be 12£° Tw. at 60° F. On reference to Table 4 we find that 12J° Tw. corresponds to I3J per cent, sugar and 13° Tw. to 14 per cent, sugar. The juice in question therefore contains between 13$ and 14 per cent, sugar or, say, 13$ per cent., which is as near the troth as we can get by this method.

Example 3.—Taking the same Hydrometer for another sample of juice pressed, may be, in the hot parfof theday or the afternoon. We find (hat it registers 16° Tw., the temperature being 86° F. From Table 2 we find that for temperatures between 80° and 87° F, we must add£°to the reading of this Hydrometer in order to find the cor**teot** density at 60° F. The density of this juice will therefore bo 16£° Tw. at 60° F, From Table 4 we find that the percentage of sugar for **s** density of 16$ ° Tw. is 18 and for a density of 17° Tw. it is 18£ ; a density of 16|° Tw. will therefore correspond to about 18J per cent, sugar.

Example 4.__Suppose **that** Me have **a** TwaddelPs Hydrometer No. 1 which has been standardised at 84° F. We have in this case to use Table 3 to correct its reading. A sample of juice is found to have a density of 14° Tw. and the temperature 75° If. On reference to Table 3 we find that for any temperature between 72° and 79° F. wt must deduct £D from the Hydrometer reading in order to find the density at 84° *F.* Thus the density of this juice will be 13|° Tw., and from T;tble 4 we find **that this** density corresponds to 14$ per ceot. sugar.

Example 5.—Another example may lie given for using this Hydrometer. A sample of juice is found to have a density of 10° Tw. at 66" F. Oa reference to Table 3 we find that for temperatures between 64° and 71° F. we must deduct 1°, thus the density at 84° F. would be 9J° Tw., and from Table 4 we find that 9J° Tw. corresponds to 9J per cent, sugar.

T. WALTER LEATHER.



MAP
GOVERNMENT EXPERIMENTAL FARM,
CAWNPORE.
1896-97.
EXPLANATIONS.
Kharif standard series
Rabi ditto
Mixed crops
Hill potatoes
Country potatoes
Cotton

REPORT

ON THE

CAWNPORE EXPERIMENTAL FARM

FOR THE

KHARIF AND RABI SEASONS, 1897-98.

ALLAHABAD:
Printed by tha Sup»rIntendant - Qovornmiint Prass, N.-W. P. and Oudh.
1898.

After the work just described, the green manuring experiments nre perhaps the most interesting *ia the* Farm. After fifteen years of systematic trials, it may now be taken as fairly well established :—*(a)* that indigo refuse (old by preference) is a better fertilizer than any green crop ploughed into the ground: and *(b)* that to plough ia a greon crop gives better results than to cut the crop and plough in only thu roots : but *(o)* that eveu the root residue of a leguminous crop has a marked manorial value, the outturn, *e,g.,* of wheat *do-fadi* after the removal of a crop of hump or indigo being, *ceieris paribus,* butter than that *o[ek-fadi* wheat. It would also seem to have beau established that, when ploughed in, hemp and indigo are the best fertilizer of all the leguminous crops tried, although it is still doubtful which of those two is the richer : and that rape is the poorest fertilizer of all the crops experimented with. In their general results these conclusions are in accord with the experience of scientific agriculturists elsewhere: and the area devoted to the experiments might BOW be very materially restricted. The comparative nitrogenous value of the root residue of different leguminous crops seems the chief point of practical interest for India j the ordinary cultivator of this country will rarely be able to sacrifice a *kharif* crop by ploughing it up as green manure for his *rabi* sowings; nor has it yet been proved that it would pay him to do so.

Some useful experiments wore made in potato-growing. The country (Madrasi) potato gave its best results when treated with nitrogen (in oileake) to the amount of 100 lbs, per acre. But the outturn of the Naini *Tai* or hill potato was better all round, the best fertilizer iu this ease having been poudretle at the rate of 200 His. to the acre. Potatoes were also grown after sugarcane, getting no manure except thie residual influence *of* what had been given to the cane. The results under these conclitioaa were distinctly poor; but the experiment is only a new one and may probably not be insisted on by the Agricultural Chemist.

For sugarcane the best manurial application seems to have been 250 lbs. per acre of nitrogen (in cowduug). A very interesting table ofprofit and loss is given at page 12 of the report. It doe3 not tell us much that we did not know already t but it proves the absolutely prohibitive cost of bono manuring, and it throws doubt on the theory that the *paurtda* or chewing cane can be profitably crushed for *gitr* making. Dr. Leather, however, vigorously disputes this latter conclusion, aud further trials seem called for.

4. *Methods of cultivation,—The* most instructive experiments here have been the testings of the comparative merits of early aud late sowings for maize and cotton. Maize sown before the break of the rains has done better than seed sown after the first rainfall; but the results have not been altogether consistent in past years, and the trials must be con(iuued for some time. With cotton the advantages of early sowing iiave been fully established, aud this set of experiments is to be closed. Several new experiments are alluded to by the Assistant Director, but it is too soon to draw any conclusions from them.

5. *Varieties of crops.*—A considerable area has been devoted for some years to the growth of different varieties of native and imported cotton. Samples of the products wore submitted to the Muir Mills Company, from whom we have obtained a thoroughly practical business-like opinion. While finding some of our foreign varieties much superior to others, the expert who examined them advises us strongly against trying to acclimatise American and other exotic cottons, which he believes are aimost all gure *to* deteriorate as time goes on. Our efforts, he urges, should be directed towards improving the quality of the local co-ttons, especially of the variety grown ia Buadelkuand and socially suited to the soil of that country. The same fate ha? long ago overtaken cotton iu these provinces that now threatens sugai* cane: competition overriding and killing out our rough and wasteful indigenous methods. The great decline during the last 30 years in the area under cotton in many Nortli-Western Provinces districts has unquestionably had other causes than the poverty of the manufactured staple; but I think we might well profit by the advice of the Muir Mills' management and devote more attention in future to

No. 2g? OP 1S98.

J. 8. MEST02J, ESQ., I.C.S.,

DIRECTOR OP LASD RECORDS AND AGRICULTURE,

N.-"\V. PROVINCES AKD ODDH.

To

THE CHIEF SECRETARY ro GOVERNMENT,

N.-W. PROVINCES AND OTTPH,

ALLAHABAD.

Dated Cavmpore, the 7th of October 1J98.

SIR,

I HAVE the honour to submit a report on the working of the Cawnpore Experimental Farm for the agricultural year 1897-93. The preparation of the report has been delayed by the unfortunate absenoe of Mr. P. V. Subbiah, the Principal of the Agricultural School, who was in direct charge of the Farm during the first iialf of the year, Mr. Snbbiah took privilege leave in February and went home to Madras, where he became seriously ill. He has not yet been able to rejoin his post; and as he left no complete memoranda on the working of the Farm, it was not easy to collect the materials for this report. The Assistant Director, however, has bsen in immediate charge since February, and he has been able to tabulate*all necessary information, which he has embodied in an unusually full and interesting report.

The report has been submitted, before printing, to Dr. Leather, the Assistant Agricultural Chemist to the Government of India, who has suggested some modifications in details, and whose more important criticisms are printed in italics in the margin of the paragraphs to which they directly refer.

2. The season was a good one on the whole. The rainfall was under the normal, but it was well distributed ; and the canal irrigation prevents any untoward results from the exceptionally dry nature of the cold weather,

3. *Manures*-—The mamma! experiments have hitherto been among the most prominent features of the Farm work. Tho "Standard " and "Duplicate" series show, side by side, the effects of certain manures on fields where only maize is grown, where only wheat is growc, and where maize and wheat are growa in alternation. Cowdung and sheeptlung have again proved their superiority to chemical manures, though poudrette runs them close; and the results have so uniformly pointed to the same conclusion that the Agricultural Chemist will be asked to suggest some other points for determination in connection with this long established series of experimental plots.

Maize grown on fields where nothing but maize is over grown has yielded the abnormally high outturn of 3,733 lbs. per acre: on fields where it alternates with wheat, the maximum yield was only 100 lbs. iess; and even the unmannred plots were as productive as the manured land has often been in former years. This exceptional fertility may bo partly due to the excellence of the season: but one of its main causes was the fact that the maize seed had been dibbled into the ground instead of being sown in the plough furrow. This change in the method of cultivation may give instructive results, and will be watched with interest in future. The maximum jield of wheat was the same, 2,880 lbs. per acre, in both the Standard and Dupiicato series: in uumanurod ground, where it was sown *do-fasli* after maize, the best outturn was 2,360 lbs. per acre. The presumption is strong that, *ceteris paribiis,* the rotation of maize and wheat will always be more profitable to the husbandman than either *ek-faeli* wheat or *ek-fadi* maize; and the object of the "Standard" series of experiments need not be taken as an endeavour to prove any superior profit in tho *elc-fasli* method.

working up the better local varieties. At the same time, as Dr. Leather points out, a consistent study of the behaviour of foreign cottons at the Farm should give valuable assistance in the general question of improving the staple.

American wheat and Canadian oats have botli given excellent crops. The former shows promise of maintaining its reputation as being rust-proof. Experiments with Australian wheat and imported carrots have formed the subject of separate and detailed reports to Government.

6. *Implements.*—A great deal of the Farm work has again been done with improved ploughs, anil the Assistant Director's comments on their working (pages 30 and 31) are interesting, A deep furrow, he concludes, *has* little, if any, advantages over a shallow one in a dry season, but it saves time and labour aud gets the seed-bed ready quicker than is possible with tlio country plough.

The]>opu!arity of our improved ploughs is steadily increasing. We soil 158 thia year as against 99 last year, and the number of indents that continue to come in is encouraging. Our chain pumps, too, are in considerable request: their value as water-lifts from a depth which is just too much for ;i single *berl* is well recognised. The Batdeo water-lift is being carofully tested and improved ; to visitors it is tito most attractive feature in our implement yard, and it has a useful future before it. "We continue to find constant employment for our well-borers and their tools and would be glad if we could afford several new sets of the necessary instruments to meet the many requisitions that reach as.

7. *Distribution of seed.*—Tiie table on page 31 shows the extent to which this very useful work is being carried out by this Department. Excluding carrot seed whicli was being distributed under the orders of Government, WR issued altogether 54 tons of selected seed during the year. Last year the issue waa only S tons, if we exclude the exceptional indents for wheat (150,000lbs.) from the- Shan States as well as the imported carrots; and in the year before it was 10 tons. Even if wo leave out of account the large quantities of kodon, *&O.,* that we specially collected for the Eerars during the year under report, our business as seed agents covered close ou 30 tons. This branch of our work is steadily increasing, and the resources of our small staff are at times severely strained to meet the demand on it.

At my s]>ecial request, the Assistant Director has devoted some laad in the Farm to specific experiments in the improvement of seed. The system is the same as English growers follow in establishing pedigree wheat, and the recognition of its value in this country is badly needed. So far tho experiments have extended only to maize: but wheat will be taken up in the coming *rabi* season.

8. There has been very little spare titue to devote to the great question of cattle breeding, but a certain amount of useful work lias becu done in that direction. Wo are slowly establishing a reserve of good breeding cattle at the Farm, and we endeavour to procure bulls of the most suitable strains for persons who consult us in the matter.

9. In concluding this review I would ask the permission of Government to offer B few remarks on certain allusions made in the Board's Revenue Administration Report for 1S9G-97 to the agricultural side of tho working of this Department. The allusions were of a two-fold nature,—criticisms on our methods, and suggestions for tho future. The latter may be dealt with first. In paragraph 28 of its review of tho Administration Report, Government expressed a wish that we should devote, attention to measures calculated to improvo tho quality of seed stocks. In paragraph 7 of this letter, I hnvo endeavoured to show that the subject tins already a most prominent place in the work of the Dtspartmant, tmd no opportunity ie lost of uxlumliDg our Operations in this direction. The question of establishing local depots for the purchase and sale of selected seed is a large and not altogether an easy ono; but, during the coming tour season, I will consult District Officers as to the project, and will thou address Government as to tho extent of the preliminary assistance that will be necessary for carrying the scheme into effect. In the meanwhile, officers who are interested in the improvement of seed stocks would greatly help us if they would

encourage agriculturists in their district to indent on our Farm office at **Cawnpoffl** for any improved varieties of seeds that tbey are unable lo procure in tlie local markets.

The strictures pnsspd hy the Board at page OS of the **Administration** Report o "the mothods of the ordinary experimental **Farms"** are presumably of a **general** import and are not directed at the Cnwnpore Farm, where **experiments** with unprocurable chemical sutetances are not carried on except to the most limited extent. During the last agricultural year onr outlay on purchased manures "waB Us. 570. For the simplest and most every -day fnrtn of maun re for the same area we should have had to pay at least Rs. 300, so tbat tlia cost of onr experiments " regarding the fertilizing power of different manures and chemical substances" **cants** 1o not more than RH. 270. Mr, Eruce's *obiter dictum,* on which the Board's strictures were based, was also wide of our work at the Cawnpore Farm. Neither Dr. Leather, who has been consulted in the matter, nor the Assistant Director nor myself can call to mind at Cawnpore any precise " agricultural experiments which modern bacteriological researches have rendered obsolete." Our work at Cawnpore is, so for as possl bte, **carried** out on lines which any intelligent agriculturist in this country can follow. **Where** this is not the case, the experiments have been taken up under the direction of experts deputed to advisa us by the Imperial Government, and are not lightly to he set aside. The discoveries of bacteriological science, *e.g.,* in regard to tb conversion of nitrogen into plant food *hy* the agenoy of bacteria and in regard to the part played hy certain leguminous plants in its assimilation, are carefully watuhed by the Farm authorities: hut it would bo a mistake to assume that, these discoveries dispense with the necessity for **quantitative** experiments conducted with due reference to local conditions.

I have tho honour to be,

SIR,

Your most obedient servant,

J. S. MESTOX,

Director.

Report on the Cawnpore Experimental Farm for the Kharifand Mail Seasons 1807-08.

I.-HISTOBY OF THE FARM.

THE Government Experimental Farm ia situated in village Gotaiya about three miles south-west, of the Cawnpore city, within a few yards of the Kawatpur Station of the C'awnpore-Acbnera Railway, and at a distance of about four miles from the Cavnpore East Indian Railway and the Oudh and Rohilkband Railway Stations. The land occupied was originally rooted from the *zamind&rs* of Gotaiya in May 18S1, and in that year the important manurial experiments still carried on iu the " standard" and " duplicate" series, which will be described presently, were started by Mr. J. B. Fuller, then Assistant Director of the Department of Land Records and Agriculture. Within a short distance of the Farm premises, a small workshop for making and repairing agricultural implements and a seed store, botii etill in cxistemce, were erected.

During the first years of management the aica of the Farm underwent frequent changes, but of late it has not varied. The Farm proper, of which a map is attached, extends over 51'33 acres excluding the land covered by the distributary from the Ganges Canal, whicii is the only source of irrigation for the crops grown.

The ownership of the Farm channel had been a subject of dispute between the Canal De]>artment and the Department of Agriculture for some time, but it was [redacted]ettled amicably during the year uudcr report, the Caual Department having agreed [redacted] an arrangement under which a timely supply of water sufficient to meet the require-[redacted]ents of ihe Farm is guaranteed, and the use of tho channel by private cultivators [redacted] the neighbourhood of the Farm restricted.

The soil of the Farm may ba accepted as a fair sample of the light reddish loam [redacted]hich occurs ttver a large portion of the Ganges-Jumna Do£b. It was chemicnlly analysed some time before 1882 by Mr. S. A. Hill, B.Sc., Meteorological Reporter to the Government of the North-Western Provinces, and the analysis is givan below :—

Constituents.	Com position
Combin<sl water	2-04
Organic matter	0-16
Carbon dioxide	0-16
Ammonia	J'ona.
Nitric peatuiida	0'11
Cliioriui!	Tr«ce.
Sulpbur Ixiositln	Do.
P)it«[>bornfl penloxide	Oǒl
Silicn nnd Uiigntic oiido	0-13
Alumina	i-SO
Oiidea of iron and manganese	S-59
Lime	0'90
Magnesia	0-91
Potasb	0-38
Soda	O'OS
CIsy Jeoomposoi *by* II-S1V (AluniidB and oiide of iron	3-37
(Silica	78-50
Insotullo s;uul	

Dr, Voelcker in his report on " Improvements of Indian Agriculture " records the following opinion regarding the Farm:—

. " In fact, I was much pleased with the Cawnpore Farm, and was not prepared to find in India anything which so nearly came up to my idea of what an esperimen-staiion should be,"

Several fields had been found by experience to suffer from water-logging when **much** rain fell within a limited period. The level of such fields, ***vis.,*** plots No. 4, £j), 10 and 11 of the " *kkarif* standard series" and plots I, % and 3 Ala of tho "duplicate series,'- was wised ia ISOiby means of spreading earth.*dag* out from uncultivated strips of land adjoining, in order to improve the drainage. In the same year large quantities of earth taken from the canal distributary were spread for similar purpose on a plot (field No. 9 on the map) which used to be under water in the greater part of the rainy season every year.

II.-GENEEAL CHAKACTER OF THE SEASON.

The year under report was on the whole not quite favourable for agricultural operations, the total rainfall during the year having been about 8 indies below normal. In none of the rainy months did the **rainfall** attain the normal figure, yet it was-well distributed and proved just sufficient to meet the requirements of tha *hkarlf* crops which on the whole produced a good yield, the highest outturn of maize (3,733 fts. per acre) having beaten the record of **the** Farm. The monsoon rains practically ceased in the middle of September and iu the beginning of October ; the Farm received a.rainfall of only '22 inches which was followed by continuous hot and sunny weather. As a result the soil of the Farm could not retain the amount of moistuTe necessary for good germination, and was unusually dry at the time of sowing. It was expected that the deficiency might bo made iqi by timely winter rains, btit these did not oome on unfortunately until as late as the tOth of February, when, instead of proving beneficial to the crops, they did tbctn some injury, accompanied as they were with high winds, by knocking down the more luxuriant plants in fields under high cultivation and favouring development of rust iu others ; the crops having bo?n already sufficiently watered before the rain fell. The *Tabi* season, therefore, was not altogether favourable, and the wheat crop suffered mainly from the circumstances just mentioned, though the damage was by no means of a serious character.

The following table compares the rainfall of the year under report with that of the past year.

Table^howing the amount of rainfall dwiwj the year under rejwrt and the year preceding it.

Xratk	Actual.				KormaE.	
	Kaiufall.		Itiiny day i.		Eaiufall.	Beta] days.
	1800-97.	1B97.98.	183U-97.	L887-99.		
AF;I	...	...	...	...	•11	.
May	•25	...	1	...	-6B	i
Juno	3-80	1-20	10	G	3-J1	4
July	540	5-lfc	17	13	10-2,)	12
Au^nst	t-31	10-33	17	at	10-08	13
September	•59	4-30	2	;t	4-33	7
OutobtT	...	•22	...	2	1'22	2
November ,, ...	•48	...	1	...	...	...
December	•99	...	2	...	•31	1
January ., ...	1-23	...	»	...	•01	1
February	...	1*63	...	3	•23	1
March ,,. , ...	...	•03	...	1	•26	1
Total ...	1775	£5-73	52	58'	3113	43

EL-TRIAL OF MANURES.

(a) *Permanent manurial experiment with maize and wheat.*

These oxperiments are carried on on four seta of 13 plots each. One set is sowu with maize and another with wheat, year after year, and the remaining two with maize and wheat alternately, so that maize follows wheat after a fallow of about three months, and wheat fallows maize after a fallow of nearly 13 months. Thus, when one of these two sets bears maize, the other remains fallow. The two sets cropped every year with maize and wheat are respectively called the *hkarlf* and the *rahi* standard series, and tho other two are known as the duplicate or alternate series. The manurial treatment of a plot in the " standard series " is idcnfical with that of the corresponding plot in the "duplicate series " in case of maize as well as wheat.

DETAILS OF CULTIVATION.

The kharif standard series.

The plots of the *kharif* **standard** serigs were ploughed with the Howard's pony plough twine, **BtibsoUed with** the Watt's plough once, cultivated with the Plauet Jr. horse-hoe five times, and **levelled** with the *paiela* (woodeu flat beam) three timta. The **different** kinds of ma nines wore applied to the **various** plots on the 1st of Juno, except saltpetre, which was applied on the 2Gth of June. Selected maize seed of (lie Jaunpur variety was sown on **the** H1h of June.

In the year under report a new method of sowing was adopted which consisted in dibbling two grains in holes made on regular lines, **each** two feet apart from each other. Tite distance kept between two holes was one foot; and thus eajh plant got two square feet of ground to grow and spread on. Under this now method of cultivation the plants grew more luxuriantly and vigorously than in former years under the ordinary method of sowing the seed in ftirrow3 behind llic country plough, and the cobs sprang up at *a.* higher place in the stem beyond the roach of wild animals which usually damage the crop.

The peed began to germinate after five or eix days and after 15 days the weaker plants were tiiiuncd out. The crop was weeded and earthed up twice during the season. In order to soften the land and make it fit for ploughing, canal water had been applied once in October 1898 jnst after the removal of the previous crop. In 1897, two waterings were given during the period of growth of the crop and two before sowing. The crop was harvested on the 5th of September 1S97.

The kharif duplicate series.

In this scries it is not possible to carry out the tillage operations to the same elaborate extent as is done in the standard series, because the latter gets a rest of uiae months while tho former remains tallow for three months only; but, except for the number of ploughing^ the treatment of both the series in respect **of tillage** is practically the same.

The respective outturns of the two series of the maize plots are shown in the two subjoined statements :—

(1) *Statement showing the, outturn of the kharif standard series*—**Maine.**

Plot number.	Plot area.	Treatment with reference to manure per acre.		Outturn per acre in pounds. Average outturn for four years 1883-84 to 1886-87.	Average outturn for four years 1889-90 to 1892-93.	Average outturn for four years 1893-94 to 1896-97.	1897-98.
K 3	Each plot = 400 square yards.	Cow-dung 180 maunds	Grain	1,139	9G8	1.793	8.1SS
			Straw	4,387	4,810	9,488	13,11G
K 1		Cow-dung 180 maunds and bone-dust 41 maunds.	Grain	1,600	1,010	1,821	3,243
			Straw	5,353	G.Klu	9.811	14,826
K 2		Cow-dung 180 maunds and gypsum 3 maunds.	Grain	1,289	1,219	1.860	3,424
			Straw	5,30!)	6,816	10,487	11,774
K 10		Sheep-dung 180 maunds	Grain	7ii!)	995	2,338	3,733
			Straw	4,463	6,399	10,206	14,907
K 7		Sheep-dung 180 maunds and bone-dust	Grain	1,149	1,258	2,291	3,025
			Straw	6,049	6,668	10,960	12,047
K 12		Sheep-dung 180 maunds and gypsum 3 maunds.	Grain	1,005	1,189	2,0U	:i,225
			Straw	4,251	4.970	9,772	11,047
K 9		Poudrette 180 maunds	Grain	1.Dl')	10,71	1,801	3,527
			Straw	fi,144	0,522	8,7lJ8	14,950
K 5		Saltpetre 3 maunds	Grain	1,113	733	1,00?	2,.-,U
			Straw	5.GSQ	3,777	(5,702	11,079
K 11		Saltpetre 3 maunds and bone-dust 41 maunds.	Grain	1,150	835	1,232	3fi96
			Straw	5,273	5,351	5,702	13,467
K 6		Saltpetre 3 maunds and bone-dust 41 maunds and superphosphate 3 maunds.	Grain	1,003	1,025	1,552	2,810
			Straw	3,958	3,981	7,018	H.257
K 4		Ashes of 180 maunds of cow-dung	Grain	802	680	982	S.411
			Straw	4,C07	6,019	G.G81	[illegible]
K 8		Ashes of 180 maunds of cow-dung and saltpetre	Grain	1,233	9S9	1,649	S,713
			Straw	4,964	5,551	6,447	12,Sii2
K 13		No manure	Grain	702	478	813	3,021
			Straw	4,377	3,082	6,'tiu	8,047

In 1887-88 and 1888-89 the crop of maize was destroyed by rain and no produce was obtained, hence no outturn for these years has been shown in this statement. For individual outturns of the year for which averages have been given in columns 4 and 5 above, the reader may refer to the report fur tlie year 1895-96.

(2) *Statement, showing the outturn of the hharif alternate* **series—Maiae.**

		Treatment with reference to manure per acre.	Outturn pec at re in pound i.			
	a m		Average outtnrn for four years 1888-84 to 1BSG-87.	Average outturn fo four years **1889.80** to 1802-113.	Av£ra«o •"IIIIMTj fo] four y.-ars 18H3-»4 to 18'J6 U7.	1897-98,
Alb, C		Cow-dnng 180 inanndi ,,, f *Onia* ...	1,005	ST>3	1.001	S,S89
		t Straw ...	4,531	4,0 5H	6,015	H.G53
> 7	[	Cow-duup 180 maniidt and bone-(Grain ... dual *11* inminda. £ Straw ...	**1.0i;i)** 4,037	1,098 6,201	901 E.822	1,123 7.7HL>
., 8		Coiriliiii^ l.so maundj **and.** gyp. (Grain ... aiiiu It iiiiitiiiiis. £ Straw ...	L'T.i 4,53(1	971 6,401	1,088 G,389	2,Lli2 12,040
.. 1		Shwp-dmtg ISO uidundj ... (&'«" .	**914** **4,860**	\3$*l* 6,330	1.C0J **7,259**	1,B7a 10,442
,. 10		**Steep-dung 180** mauudaund bone-l GmiTi * iluat -!i Inminds. (Stmw	7>:r. 3,740	**1.160** 5.0C0	1,400 7,5!U	8,688 **13.794**
,, 12	3 E	Sheep-dung ISO nrnnnds Mid gyp. < Grain mm 3 inuanda. I Straw !	833 4,085	1,143 6,424	**1,390** 7i«a	3,373 1 1.1S-1
» 2		Poudrttte lSOmaunda [Grain ,, '" j. Straw .	1,213 4,618	1,406 C.479	4,213	**1,794** 10.019
> 4		Ssltpetre 3 maiiDdi... ,,, J?™n •	*en*	*Ki*	ME	2,228
., E		Saltpetre 3 raauti da and bona-d.u₆t t Brain **••** ***amnai,,*** *[Straw*	*SflOQ* 1,201 3,870	4.271 8-tC 6,«02	5302 9S3 8,108	7.7E*a 2,493 **16,648**
«n	J 1	baltpetre 3 mauncis and bone i Grain ,. snporplioapU»t«3mauntU. \ Straw .	***l-.ir,*** 8,888	1,009 4,034	701 5,738	1,410 3,946
.. 0	1	Ashca of 180 tnaunds of cow-dung j j*™'" •	555 8,621	820	G78	2,133
a 3	1	AahesoC 130 raannda of cow^niig C Grain and aaJtpatre 3 maunds. [Strsiv .	902 **5,2as**	6,197 1.U12	6,091 II-', 7,702	6,301 2,015V 10 903
u 13		Unmatmrcd J Grnin .. '" I Straw ...	441 3,145	C17 3.020	514 **4,064**	1,867 11,314

if. *B.— Vidt* footnote to fcbe last precediug statement.

*Sheep-dung ***tfft*** *ran-* tains a good '-"> ***mon*** nitrogen than cattl dung, and this ***pntetg*** accounts in the larger """,,{Z **UMIIU**

J- *W, LEATHER.*

Itwiil ^ seen that during the year under report the plots treated wttti sbeep-dung* alone or in combination with concentrated manures gave the best outturns as ia PreTious J'ears» the cow-dung aud poudrette plots coming next. These results confirm tb0Se obtailled *in* former)'ea^> *vis., that* nitrogenous manures arc specially **beneficial** to **maize.**

It will **also** appear that the outturns obtained during the year under report have been much higher than those **obtained** in previous years, the unmanured plots yielding 2,021 jfea. per acre in the **standard** and^ 1,857 lbs. per acre **in** the duplicate series, whieh' tile manured plots did not yield in many eases in past years. In fact tbe highest out-turn, 3,733 as., obtained this **year** has never been attained siace the commencement of the experiment The reason seems to lie in the new method of sowing adopted during the year under report In early and late sowing experiments to be noticed further on in part IV of this report, **the** plot sown with maize by the ordinary country method yielded less than the unmauured plots sown by the improved method in the **two** scries just described.

The *rabi standard and duplicate* series—Wheat.

The t illagef opemt ions of these series consisted of four ploughings with the Watt's **plough** aud two with the 3:irgc Howard's plough, cultivating twice with the Planet **Jr. horse-hoe** and levelling four times with the *pateta* {wooden flat beam). Before-snwmix, ,],,. **ground ma dearod »£ weeds** ***eon.*** All **msnorea except saltpetre, which** was used asa top dressing on tho 29th of October 1S97, wen spread on the lOthand 11th of October and ploughed in. Muzaffarnagai wheat seed was sown on the 12th of October 1897 at the rate of lOOfts. per acre. The crop was weeded once in the first week of December aud irrigated fiva times during the Beason. Where germination had been poor in a plot, tho blank spaces were filled in by transplanting **plants** from that portion of the plot where tho germination **had** been too close. This method of filling **vacancies** has been practised since 1895-96.

I « L **V? !aHi. 'ra!™teredI'U « J 1897 to (often tbe soil for ploughing nnd the tilings commenced on **tte** J3ib of Jloy. TIis fields were ploughed *tv-ite* ju Hay, «tice in July, once in Aticuat, onco in Scptcmbor aud once IU October ; tUo last llireo plong!iitu>j woro fuUttwod *hy* ImlUog tlie (tround witn tlio *patela.* Tbe plote wera cultivated oa^ein *May* und itgoln it. October, tbe ground bciiiR levelled with the *patela* after tbo cul-tivHting in October. Tho crop was irrigated ouco a month from October 1807 to Februarj

The crop In plots 2fo. 1, 2, 4, 5, 10 and 12 of the duplicate series was severely knocked down by the high wind and rain of the 10th February 1898. The fields were harvested on the 27th find 28th of March l^OS. The following statements show the resulte obtai:ierl during the yettr under report and tu previous yefira :—

(3) *Statement showing the oidtum of the rahi standard series.*—Wheat.

Plot number.	Plot area.	Treatment with reference to manure par sere.	Average outturn for five years 1883-84 to 1887-88.	Average outturn for five years 1888-89 to 1892-93.	1893-94.	1894-95.	1895-96.	1896-97.	1897-98.
			Outturn per aero in pounds.						
R 3	Each plot=400 square yards.	Cow-dnng ISOrowmda ... [jjfTMTM	M	1,581	I.6S8	1,0(34	2.7C5	2,558	2,381
		iraw	2,477	S,0M	3.333	wu	4,283	6,070	3,330
R 4		C'ntt'dunfr 130 maunds undf Grain	1.S60	1,7HJO	1,700	1,113	2,310	2.472	2,880
		bono-<!u«t 4) mttuiida, JStrjmr	3,243		9,908	1,984	3,820	4,662	4,198
R 5		Cow-duop 180 niaumls and t Grain	1,496		1,63!]	793	2,904	s,5S8	2,069
		gypsum 3 mnutitls, (Straw	8,430	3,070	3,122	1,110	5.7$ i	I4,fi74	4781
R 6		Slieop-dung 180 inauuds ... j §TM^	1,370	1,610	2,016	1.U95	3,001	8,976	2,543
			2.1OS	2,423	3,77S	2.->JX	0,002	JS.J3J	0.518
R 8		Sbeep-dting 180 lnnunds and i drain	1.oas	1,584	8,088	W74	3,266	3.107	2,800
		bone dust 41 mnuni.s.] Straw	3,031	2,337	Mini)	1,501	4,646	6,311	1.46S
R 10		Sticep dung ISO maunds and (Grain	1,193	1,7+8	,331)	,	3,146	S,*;6	2,263
		ivpHiim 3 uiuund ... 1 Straw	3.27!i	3,009	J.7C9	2,232	4,060	4.S7I	0,028
R 12		Pondrette 180 maunde ...! g(TM£	1.25S	1,699	.528	1,181	2,819	2.S89	2,202
			1,030	3.U11	.7G4	2,299	5,975	•1.107	4 35
R 1		Itpetrc, 3 maunds ... | ^ J J	1,357	1.119	,G30	1,313	1.889	1,853	1.851
			2,503	2,77(i	,327	1,839	2,432	8,486	i.:!u:i
R 2		Saltpetre 3 mnuuds and bone- (Grain	1,206	1,480	,053	1,064	2.0U3	1,948	2,154
		dutt 41 mannils ... 1 Straw	2,r,:ii3	B.666	,SS6	1,851	4,081	2.703	4.29U
R 9		Saltpetre 3 niaiinJs and iione. f liruiii	1.HS0	1.427	1,869	1.156	2,436	3,830	2...
		superphospliate 3 mnitndj, \ Straw	E.886	2,808	3,232	2,105	3,310	•kWS	2,533
R 7		Ashes uf IHOiiiiiuirJd of oiw- I Grain	[illegible]	1,339	1,432	72ti	2,802	1,757	1,743
		Jung. (.Straw	1,846	2.4L3	2,604	!.:{:>=	(.881	3,261	2,928
R 13		Ashes of lSOmanndi of eow- (Uraiu	1,298	1,442	2,048	998	3^96	2,188	1,827
		dui]gB!idialtpetr(,'3nuiiiiids. / Straw	2,305	2,038	3,763	1.742	3,606	....	3,+73
i; u		Dnmanared ... J ^TM°	91S	1,181	1,146	4S4	2.257	J.723	1,n-r
		iraw	1,202	2,427	2,181	9SG	4,271	3.Q10	2,154

y.B.—The raider will find In the report on the Farm for IS35-9I> the individual outturns for the yenrs of wbich tbu averagos have txwn ^iven in volumni 4 and 5 above.

(4) *Statement showing the outturn of the rabi duplicate series*—Wheat.

Plot number.	Plot area.	Treatment with reference) to manure par sure.	Average outturn for five years 1883-84 to 1887-88.	Average outturn for five years 1888-89 to 1892-93.	1893-94.	1894-95. id	1895-96.	1896-97.	1897-98.
			Outtorn por ucro in pounds.						
Ala 3	Each plot=400 square yards.	Cow-dnng ISO mannds '" f Ornin	1,802	1,81"	U4S2	874	2,184	2,729	2,H2
		£ Straw	3,016	3,352	L'.;i.,	1,730	S.80S	e,I31	S,3fi«
Ala 4		Cow-dun \> 180 maunds and (Urnin	1,739	1.5S2	1,263	1.2S0	1,900	2,553	2,041
		bone-dust -l4 niuimcls. 1 Straw	2,873	3,1 H2	2,532	I,fl21		4,302	3,700
Ala 5		Cow-dung 180 maunds and (finiin	J.773		1,713	1,074		-',71']	2,268
		gjpsiuu) 3 mauods. f Stinv,-	2,770	2,074	3,433	1.7MI;	5,810	4.471	|3,(J78
Ala 6		Sbrep-duog 180 mnonda "• f Grain	1,002	i.noi	1,730	U6S6	3 120	2,868	2 232
		I Struw	3,U54	2,886	3,784	2,747	5,817	4,773	3.5S2
Ala 8		Sbeep-ilnng 180 tnaunde and f Grain	1,750	1.742	2,033	1,2s,;	3,104	2,777	2,lMl
		' bout-dust 4) maunds, J ! Straw	2,948	8,(66	3,545	J IE6	5,121	4,822	3,2-13
Ala 10		**Stan-dung** 180 maunde and (Onun	1,589	l,:<2t	1.0G0	1.21.1	2.tt83	2,952	2,565
		gvpsmn 3 uiaunds i^, tra .r	2,908	8,579	4,283	2,154	5,263	5,324	fi.OKS
A:., 12		w l ^ , f Grain	1,6-W	1,PG8	1^75	1,180	3,0<)l	3,219	2,553
		Poudwtte 180 inaniidB ... j s t m,w	2,9 fW	3,944	4,253	2,130	6,820	4,037	E,13O
Ala 1		[Grain	1.7S5	1,123	1,736	1,443	2,353	2,505	2,880
		Saltpetre 3 maunds ••• £ straw	3,132	-'.•>1	3,'Jlt>	2,2D1	4,501	J.830	4,477
Ala 2		Saltpetre 3 mtiunds and bone-fOntln	2.137	1.G20	1,742	1.4U1	,5JiJ	2,580	2,372
		ttuit 4t mannd«. I Straw	3,682	3,034	3,506	2,11s	JBII	4,189	6,276
Ala 9		Saltpetre 3 maunda and hone-jGratn	1,803	1,51)5	1,986	1,261	.927	2,559	1,307
		Klpiei-p)nhsphatf 3inaunda, t Straw	3,370	2,505	3,401	2,323	,09S	3,884	2,275
Ala 7		Ashes of ISO roaunds of oow-f (iroin	1,457	1,260	1,434	1,032	fiSO	1,785	2,239
		dung.	2,57G	2,0:t8	2,257	1,767	.985	2,320	1,078
Ala 13		Ashesof ISO niaqnd» of cow. Gr«in	i,2aa	1,564	2,184	1,2.19	.408	2,474	1,246
		diuiK and saltpetre 3 maunds. l btraw	3,874	B8W	2,758	2,C57	'102	3,809	I,CM
Ala 11		\ i Mill	1,318	1 .:;..	1,107	SW	'183	1,983	2,3 CO
		rnmanurod ..> •••) Straw	2,407	i',475	2,154	1,077	,170	3,001	3,812

Jt. JB_Pi<I* toot **onto** to tbe last ptrceding statement.

It will be seen that in the standard series the best results have been obtained during the year from nitrogenous manures [illegible] and sheep-dung, with or without bone-dust, and saltpetre with bone-superphosphate. In [illegible] result is consistent with the conclusion arrived at [illegible] past year, [illegible] sheep-dung plus gypsum ar[illegible] manures [illegible] with bone-dust [illegible] best outturns. But the ren[illegible] pondrette [illegible] nitrogenous manures have given the [illegible] red plot No. [illegible] the seed-bed, when prepared, lacked in the degree of moisture necessary for perfectly healthy germination, and that the seed was sown a few days earlier than usual. In some plots the seed germinated [illegible]nly, in others the young plants succumbed t[illegible] effects of the heat,—[illegible]fortunate circumstance wh[illegible] be[illegible] pletely by transplanting young plants into the blank [illegible] an[illegible] turn was the inevitable consequence. It may be added that under similar circumstances fields were re-sown by cultivators in the neighbourhood of the Farm and by the students of the Agricultural School. But of course in experimental cultivation such a procedure would have been open to serious objections, and was therefore not adopted.

(b) Manurial experiments with potatoes.

This experiment in its present form was started in 1896 under the directions of Dr. Leather, as mentioned in the last year's report. Two varieties of potatoes, *viz.*, the white-skinned Madrasi of Farukhabad and the hill variety of Naini Tal, were grown on two sets of ten plots each.

Detail of cultivation of the Madrasi variety.

Tillage.—Ploughing with Watt's [illegible] [illegible]ing twice, and levelling with *patela* three times.

Manuring.—The manures were applied on 14th November.

Sowing.—This was done on 16th and 17th October on ridges two feet apart made by the Planet Jr. horse-hoe, whole tubers being dibbled in holes nine inches apart along the ridges at the rate of 808 lbs. per acre.

Weeding and earthing up.—Once during the growth.

Irrigation.—Once before sowing and nine times afterwards.

Harvesting.—The crop was dug up on 12th and 13th March 1898.

The subjoined table gives the result of the experiment obtained during the year under report and the previous year.

Statement showing the effects of certain manures on country potato (Madrasi variety).

Plot number.	Plot area.	Manures applied per acre.	Actual quantity of manure applied per acre in 1897-98.	Outturn per acre in lbs. for 1896-97.	Outturn per acre in lbs. for 1897-98.
1	Each plot = 484 square yards.	Unmanured	...	9,880	6,500
2		Pondrette @ 200 lbs. nitrogen per acre ...	93,020	7,720	11,640
3		Ditto @ 100 lbs. ditto ...	46,510	8,700	9,730
4		Cow-dung @ 200 lbs. ditto ...	37,040	9,730	9,130
5		Ditto @ 100 lbs. ditto ...	18,520	9,260	7,340
6		Castor cake @ 200 lbs. ditto ...	2,900	4,740	9,410
7		Ditto @ 100 lbs. ditto ...	1,450	8,430	10,280
8		Saltpetre @ 50 lbs. nitrogen per acre and bone meal @ 50 lbs. nitrogen per acre ...	530 1,450	7,000	9,200
9		Saltpetre @ 50 lbs. nitrogen per acre and bone superphosphate @ 50 lbs. nitrogen per acre ...	530 1,850	6,780	1,000
10		Unmanured	...	4,080	6,100

It was stated in the past year's report that no attempt could ba made at drawing any conclusions from the results of that year as the plots were obviously not of uniform fertility at the commencement. From the results obtained during the year under report it *is* expected that aftor a year or two it will be possible to arrive at Bome definile conclusion, because, contrary to the past year's result, the manured plots except the one treated with cow-dung at lOOIbs. nitrogen per acre have givon better outturns than the unmauured plots.

The chief reason for the low outturn of plot N"o. -~. seems to lie in uneven germination, caused by water-logging in the low lying portions of the field.

Details of cultivation of thu ^faini Tal variety.

The same operations were carried 011 in this series of plots under the above-named variety as in the series sown with country potatoes. In this cose, however, at tubers or ' sets' were planted at the rate of 1,107 lbs. per acre on the 18th, 19th and 20th of November. The germination waa not quite evea, and the blanks were filled in by re-sowing at the end of December. Twelve waterings were given during the period of growth and *one* before sowing. The crop waa harvested on 25th March 1898.

The outturns obtained in these plots are tabulated in the following statement :—

Statement showing (Ae effect of certain wwwes *on the hill potato (Naini Tal variety).*

Plot number.	§ area.	Treatment.	Actual quantity of applied per acre in lbs., 1897-98.	Outturn per acre in lbs. for 1838-97.	Outturn per acre in lbs. for 1897-99.
SOa / 1	Each plot = 484 square yards.	Unmmurod	...	13.5G0	8,310
2G» / 2		I'outirette @ 200 lbs. nitrogen per acra ...	[illegible]	15,020	16.2C0
26a / 3		Ditto ® 100 Bis. ditto ...	4*510	1S.260	10,920
26a / 4		Cow-dung @ 200 ISs. ditto ...	39,220	13,410	10,390
36a / 5		Uitto (g 100 Ibt, ditto ...	27,400	18,540	7,040
JBa / G		Caltor caliO @ 200 lbs. ditto ...	2,900	6,100	12,830
23a / 7		Ditto © 100 Ha. ditto ...	1,450	9,970	[illegible]
8		Snltpctre @ 50tb*.jindl ditto feme meal @ 60 lbs. ...	590 / 1,450	[illegible]	7,190
2Gre / 9		Saltpetre @ GO !bo, an3 bone superphosphate @ 50 Bis. ditto ...	530 / 1,880	9,850	11,470
28* / 10		l'nin:inmtil	...	0,090	6,350

In the year under report one of the unmauured plots has given a higher yield than two of the manured plots, and it is therefore clear that the residua of manures applied to the former plot before the potato experiment commenced has not yet been completely consumed; and this remark may be applicable to other plots also. It is hoped another year's cropping will bring about the required uniformity in the natural condition of the plots. The circumstance just mentioned would not, however, justify an attempt to draw any definite conclusions. Yet it will be seen that where 200 fbs. of nitrogen had heeiiapplied the yield was uniformly higber than when only 100 Sis. bad been applied. The use of bones in the shape of superphosphate in conjunction with saltpotre has proved more effective so far than when applied in the shape of bone meal mixed with saltjwtre, both in 1896-97 and in the year under report. The greater solubility of the superphosphate may account for this result.

(a) Manurial experiment with indigo.

This experiment was closed in the year nnder report before giving any definite conclusions to make room for another experiment of a different kind .ug-estcd by the Agricultural Chemist to the Government of India, for which the land occupied in previous years by the indigo experiment was, I understand, pointed out by the Superintendent of the Farm as most suitable. *me*

(d) *Manurial experiments with gram and peas.*

The object of these experiments is to determine the effect of gypsum and ground kankar as compared with other manures on gram and peas.

The outturn of different plots nnder these experiment*, are shown in the following statement;—

Statement *^owina the comparative effect of certain manures on* ***gram*** *and peas.*

Plot number. Gram.	Peas.	Plot area.	Mannre .pplicd per acre.	Outturn per aero of gram iu lb-s. -94.	1894-95.	1895-96.	1896-97.	1897-98.	Outturn per acre of pan infix. 1894-95.	1895-96.	1896-97.	1897-98.
aii	31a	Each plot is equal to 400 square yards.										
1	1		**Fiirm-jard manure 100 nmunds, (Grata**		**3*4**	**1,510**	*tso*	145	ES9	**375**	**454**	611
			(.Straw	1,080	**4-18**	**U7S**		**839**	1,783	**810**	**1,912**	3,327
SI)	31a						**89S**					
2	2		Gypsum 3 maunds, { Grain	1,730	321	**1,512**		**S30**	*2m*	**£02**	**367**	199
315	flla		{ Straw	1,470	less	**387**	GS9	**888**	**411**	**S12**	**033**	**GS3**
3	3		Grouud lnnl$_B$r nmuudij. Jj *e* drain	1,183		1,100	**614**	**254**	327	**381**	**399**	**121**
318	31a		{ Straw	1,001	1G7	1,204	60S	**3S7**	6U5	**356**		**GBG**
4	4		**Bone saj*rplioi.f Grain phate 3 miund..**	**1.128**	**61**	780	**411**	**278**	**31S**	**430**	**(iS-t**	**387**
			[stratr	**9SS**	**182**	920	**484**	750	**•i:fu**	805	**1,815**	**1,767**
315	31a		Unmanured f Grain	856	21	72G	**408**	1254	**134**	**31S**	**351**	**774**
5	5		"• 1 Straw	035	85 f	041	**544**	**•03**	254	**(J41**	**656**	4

The rcsnlta obtained in these experiments have been very indifferent during the year under report, on account of scanty germination in general, dne to dryneas of the soil and also to flooding of some of the gram plots on 27th October 1S97 by a sudden overflow of the canal distributary. It is to be regretted that the results consequently led to no conclusions tli» year.

(e) Manorial experiment with sugar-cane.

This experiment was originally started in 1S94 with a view to determining the **effect** of certain manures on the Cawnpore variety of sugar-cane known us " matna." It was carried on for two successive years in fiolds No. 29 and 30. The results of tueae two yours have been fully discussed in the Farm reports for the years 1891-95 and 18*S-9& In 1895, however, the plan of the experiment was completely **modified** by Dr. LeatUer) then Agricultural Chemist to the Government of India, who prescribed larger quantities of manure, replaced the matna by a variety known as « **Mad-** *Wnda* and directed that instead of being carried out year after year* in the same p•ob it **should** he tried on two series of plots alternatively, and that after cutting the sugar-cane, country potatoes should be planted in the autumn without applying **any** manures so that manures applied for sugar-cane might benefit both crops, viz., ZZ'inTW U f' TW TM of PlotS WerG "Singly allotted to the experimeut in *(a)* fl^s No. 29 and 30 and *(b)* fields No. 37, 38 and 39. According iQQr"n" *AT** *ie uane experiment wa9 «miod out in field$_8$ No. 37, 38 **and** 39 in 188S-8? and the results of (he experiment were noticed indetail in the Farm **ceoprt** for that year. Dunng the year nnder report potatoes followed **the** sugar-cane U. these plots, which, H$_B$ rcqllimi *by* the Agri,.,,ihlral oi.emist, received no manures

* **W* tit ifffMHot** *btcaute it u practic-* ***allf*** *imponiile to pla*l conn in lutctrd-tap ytart on the tame* ***la*d,for a*** *i, ao 11.J2 mouths' trap 1 And in any fait tren if it mere* ***practically*** *it u* ***not dttiraUt, lettmut*** *the. land would ham no opportunity for iging properly evltivaltd or* ***Fl.Jailt*** *planting potatoes after *«,<>er-raHe to «,e •up manure reiidtiet , it "t that I cmueai. ed to t& prejMual.to,, •' tit tame time I ex pretttd a dault ,,, io •itt desirability.*

J- W. LZAT'HER

beyond what had been applied for the sugar-cane. The outturn of potatoes obtained from the various plots is given in the following taljie:—

Plot number.	riot area.	Trcstmant.	Oattnrn per at'ii in lbs.
37, 38, 39 / 1	Each plot is equal to 968 square yards.	t'oir-duug @ 125 lba. nitrogen par acre	4,050
37, 38, 3D / 2		Ditto @ £50 fts. ditto	2,425
37, 38, 39 / 3		Ditto @ 500 lbs. ditto	2,435
37, 3S, 39 / 4		Poudretto (§ 250 ftfl. ditto	1,365
87, 38, 33 / 6		Ditto @ 500 lbs. ditto	1,050
37, 3H, 39 / 6		Uu manured	1,030
37, 38, 39 / 7		Bone meal and saltpetre Mali @ 135 QH nitrogen per acre	1.SS6
37. 38, 30 / 8		Castor coke @ 250 ttt. nitrogan pt; acre	1,300
37, 38, 39 / 9		Ditto (g 500 Hit. ditto	1,885
37, 38, 30 / 10		I'limit ii ured	S4£

From the above statement it will appear that the outturns were **generally** so poor as to hardly cover even the coat of the seed. The results have been **obviously** far from encouraging during the year under report, ;ind the next year's results will !je watched witli interest Perhaps some other crop like *chena (panicum miUacium)* or gotnds **might** be more suitable to grow than potatoes. The fidds allotted to the manurial stigiir-eaoe experiment during the year under report were Nos. 29 and SO, consisting of1O plofs. These were ploughed once with Howard's plough, twice with Wall's plough, sub-soiled twiue, cultivated with Planet Jr. horse-hoe once, and levelled with *patela* five times. After applying the manures, cuttings of Madrasi *pwnda* were planted on 20th aud 22nd February in furrows made between ridges two feet apart. As usual the plots lVore watered with canal water just after planting. In all 17 waterings were given during the season. The crop was weeded and hood scvea times. The crop iu general suffered slightly from the effects of heat in summer, but recovered ita vigour during the rains. The plants that were laid by rain and high winds were lifted up, tied and earthed up in October. The cattle dung, poudrettc aud saltpetre were applied in two instalments ; once before sowing and the second time iu the first week of July. The cutting aud crushing began from 21st January 1S!)8. Only half the cropineach plot was crushed for *gwr*—makings the otlur half being out and Bold iii markc- by public motioj. Tlle foilowing' statemeat eho vs the results obtained :__

cine KJ mowing the compm feei *of certain* «ic.nuret on Madra ni paunda.

		Manure applied par acre.		Outturn per ucre in BM			Pereeiitnpa of—				
2 U 0		tTumanured ...		41,82	23,440	4,76	70-3	16-17	11'3	7,01	12,OSS
39,30		Catilo dnn @125B,nitfogea per aero.	34,72	*6,7U	SG,3!>	4,5S	57-62	17'21	0-9	4,723	11,033
2E>, 30		Ci'tlo duo @2B0B>»a;. trogon per aoro.	69,-IM	ifl,132	37,248	e,3s	8003	17*20	18-70	6,312	13,732
20, 30		Cattle dqnp @ GOOftsai. trogsn pcrocra.	1.38,888	61,528	39,22	6,0«)	G3-80	1G-*O	3-00	4,46-	11/.1S
-J. 31		Pondratto @ 250 lbs nitrogon per acre.	00,975	7,520	33,083	6.2BG	70'90	16-78	11'15	4,440	15,711
23,30		Pondret(i9@S00;nij oitro-If en per acre.	1,21,9S0	46,382	32,520	6,008	70-10	1540	10-88	4,392	16,400
2f, 30		Bono «oporp)iogphate ana Mltpeiru end, nt 125 tt» nitropcu per acre.	8.SG7 1,^120	0,eoc	8,216	4,5i8	6933	16-50	H-40	3,GG1	7,672
20,30		Bono dust sad naltpetro «wli @ 125 Un nitroean por acre.	3,284 1,420	8,466	0,752	4,616	09-68	1771	12'00	4,502	8,73G
29, j'i		Castor eako ®25Oftt nl. tro^n pot	3,788	7,3C8	32,328	*SfiSC*	60-51	17-17	1193	6,608	8,353
		Castor caks @ fafc &,,,[. J	7,576	1,768	30.3GO	4,912	67-C	16-17	10'97	3,864	7,sie

Tins ueirjg the first year of the experiBlent ia its present form in this set <)f piots it is premature to euter into a diedssion oi' tlie efieets of mmures on the qiantity of the oitturn Txim >e juice of the cane yras liim-il *as* in former ;enrs [irior to boilmg. Tho? tw obtained, though fairly rich in crystals, was of thin co!is is tency ant I \)rn i P in 1 appearance and fetched tlie lo\i' price of I! 6eers per njpee in the JJIWHI >ore bazdr. -me poor quality of the *gur* wa.s in some measure due to oc<:asiomil cloi•dy or rai uy weather during tho crushJDg seasoa.

The financial aspect of tbi3 e^periment has not >een]ooked into in forEtier yesrs, and tl question lormeti a Etibject of tallc in some quarterH last yea|\ Dttring the year under report the *cnat nf n,a* whole experinaent taa been cart fully calculated, imd the following is a brief memor.im luEa off nt.

•Actual o03t of cultivation and manufacture of aw from li »crea-c^, Uf tUc crop wb;d[n&i rt'inl-irtil ^	Es.fiOG 0 4		
I^ca of ,«r obtains from the >bo«! CTop		Hi. 209 E 6	
S°«t o(too balf cton Hat™* ind sold as caues			Ita. 296 10 10
Priffn. oL dUHM	Us. 3S1 0 4	Bt. 275 5 6	Us. 75 10 10
Total cat on tLo 21 aere	R». 857 0 8		
rctal incotno from ,»ie of *gvr hai* •line		Rs. 484 L a	
Total loss			Rs. 372 G 8

TJJC figures of cost given above d<> not inelu je c«; the OOHUission paid *u* auction eers, wliich is 5 per cent, o^ tlic price realized • CM t boiling *gur;* and (c) one or two other pett;/ charges. I) W io pn 3e of iiiel useo i lie ne therefore was som what greater than that shown above, and should noi be reckoned at less than Rs. 170 per acre. It will appear that the loss Las been less in disposing of the crop in the form of cane than in the sbnpe of *gur*. This is of course due to the heavy cost of the manufacture of *gur*. In an experimental business, however, where tbe cane of each plot, the juice obtained from it and the *gwr* produced have to be weighed and dealt with separately, the cost under tbe.se heads necessarily runs up to o high figure including, as it does, items of expenditure which the ordinary cultivator will not have to incur.

As stated already half the crop was converted iuto *gir<r* and the other half sold ns canes. From the figures of coskincurrod under the two systems of disposing of the crop the following statemeut has been prepared showing the calculated profit or loss per acre from eaeh plot under experiment and the relative economy of growing the *paunda* cane with the various manuroa for the production of sugar and as a crop for tlie market.

Statement showing the calculated profit or loss per acre from each plot under sugar-cane experiment.

Plot number.	Area.	Treatment.	Cost per acre of cultivation of paunda crop and manufacture of gur. Rent.	Ploughing.	Manuring. Price of manure.	Manuring. Wages weighing, carting and spreading.	Sowing. Price of seed.	Sowing. Wages of sowing.	Weeding, hoeing, digging and earthing.	Irrigation. Canal dues.	Irrigation. Labour.	Cutting, crushing, and gur making.	Total.	Calculated value of gur per acre.	Profit or loss per acre.	Total expenditure shown in columns 4 to 12.	Cost per acre of producing the paunda crop to be cut and sold in the field as canes. Cutting and carting.	Total.	*Average calculated price of canes per acre.	Profit or loss per acre.	Price of the various manures per maund (82 lbs).
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
			Rs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs.	Rs.	Rs. a. p.	Rs. a. p.	Rs.	Rs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
29—30 / 1	Each plot 1,210 square yards.	Unmanured ...	13	7 8 0	...	...	50	7	24 2 0	3 5 4	21	136	260 16 4	187 1 1	−73 14 3	124 15 4	12	130 15 4	230 4 5	+93 5 1	
29—30 / 2		Cow-dung at 125 lbs. nitrogen per acre.	12	7 8 0	15 13 1	2 8 0	50	7	24 2 0	3 5 4	21	136	283 4 11	177 10 3	—105 6 8	147 4 11	12	169 4 11	230 4 6	+60 15 6	
29—30 / 3		Cow-dung at 250 lbs. nitrogen per acre.	12	7 8 0	30 11 5	5 0 0	50	7	24 2 0	3 5 4	21	136	308 10 0	248 11 0	—60 15 0	169 10 0	12	181 10 0	230 4 5	+48 10 5	
29—30 / 4		Cow-dung at 600 lbs. nitrogen per acre.	12	7 8 0	79 6 4	10 0 0	50	7	21 2 0	3 5 4	21	130	350 6 8	237 0 0	—112 U 8	214 5 8	12	226 5 8	220 4 5	- 6 1 3	
29—30 / 5		Poudrette at 250 lbs. nitrogen per acre,	12	7 8 0	23 3 1	5 0 0	50	7	24 2 0	9 6 4	21	130	289 3 1	208 2 1	- 81 1 0	163 3 1	12	166 3 1	220 4 5	+ 55 1 4	
29—30 / 6		Poudrette at 600 lbs. nitrogen per acre.	12	7 8 0	46 7 6	10 0 0	50	7	24 2 0	3 6 4	21	136	317 0 10	130 13 0	—120 a io[	w i e io	12	103 6 10	220 4 6	+26 13 7	
29—30 / 7		Bone superphosphate and saltpetre each at 125 lbs. nitrogen per acre.	12	7 8 0	j I SO S O) I 80 S *j	0 1 0	60	7	24 2 0	3 5 4	21	130	1,103 11 6	162 10 6	—921 1 0	967 11 8	12	979 11 8	220 4 8	—759 7 3	
29—30 / 8		Bone dust and saltpetre each at 125 lbs. nitrogen per acre	12	7 8 0	f 60 1 2) 1 I 86 9 4JJ	0 1 0	50	7	34 9 0	3 5 1	21	130	467 10 10	181 6 6	-286 4 4	271 10 10	12	283 10 10	220 4 5	—63 6 5	
29—30 / 9		Castor cake at 250 lbs. nitrogen per acre.	12	7 8 0	60 1 4	0 1 0	50	7	24 2 0	3 5 4	21	130	330 i 8	222 4 6	—108 0 2	194 4 8	12	206 4 8	220 4 5	+13 15 9	
29—30 / 10		Castor cake at 500 lbs. nitrogen per acre.	12	7 8 0	138 8 8	0 2 0	50	7	24 2 0	3 5 4	21	130	393 10 0	193 0 8	-200 9 4	263 10 0	12	276 10 0	220 4 5	—55 5 7	

*The cane of each plot was not sold separately, hence an average of each plot has been struck from the total price realized for the whole crop sold off.

This year's results ahow that wink it **appeared** profitable to grow *paunda* as a crop for the market it proved far from economical to do so for tho production of sugar,—a fact most commonly believed by the cultivators of this part of the co mi try. Among the manures tried the cost of bone superphosphate seems to be simply prohibitive,*

if) Experiment with vegetable and green man-wres and alternation of wheat **with** *leguminous crops.*

This experiment was started in 1SS3-S4. It has for its object the determinatioii of the manurial effect on wheat of—

(1) the ploughing in of certain greeu leguminous ero|>8 in the rains preceding the cultivation of wheat;

(2) the root residue "of a leguminous crop taken immediately before wheat;

(3) indigo refuse as manure.

The experiment is carried out iu two sets of plots, *vis.*, G 1 to G J3 and 27A1 to 27A4. The portion of the experiment tried in the second series which commenced in 1S93 is denominated as " temporary " in order to distinguish it from the "permanent " cxpsrimout started iu series G 1 to G 13 in 1S33. For (he sake of convenience the plots treated with the two kinds of indigo refuse and with green manures are arr/nged in one place in the tablo A,—and the plots in which wheat is taken in rotation with leguminous crops in the table B following. Table A covers **ttelf-a-dozea plots of** the " permanent" besides the four plofa of **tho "temporary"** series, while in table B all tho plots happen to be of the "permanent" series.

In Hay 1S97, nil the plots of the "permanent" series, except the two indigo plots sown in April, were watered once with canal water to soften the soil for ploughing and M-ere ploughed four times, sub-soiled once, cultivated with the Planet Jr. horse-hoe twice, and levelled **with** the *pxtela* five times. Selected MitzaIfarnagar wheat seed was sown on tho 14th and 15th October at the rate of 100 &3. per acre. Where the germination had been uneven blanks were filled in by transplanting towards the end of November. Weeding was done in the second week of December, and five waterings were givun iu all during the period of growth.

The following are the weights of green plauts that were ploughed in or removed fro the different plots in tho " permanent" series :—

J'Jot No. G. 0, Hemp romorod ,,	... ...	18,937 1*8. pet acre.
,, 0-7, ii ploughed in	... ...	13,150 ,, ,,
,, 0. 8, Indigo	... ...	11,713 ,, *
,, 0. 9, ,, removed ...	... ...	13,455 ,, ,,
,, G.10, Crd ,, ...	... ...	13.0G3 ,, ,,
,, '0,3, Rapo ploughed in	,, ,.. ...	1W ,, »

Last year the green itrd crop was ploughed in, but during the year under report it was removed.

The quantities of green plants that were ploughed in, in the temporary series, are given below :—

HrtSo. 27a/1 Hemp ploughed in	... ...	17,201 D)i. per aero.
	... ...	13,405 ,, ,,
Hi urd	... ...	17,480 ,, ,,

In this series the wheat was sown on 19th October 1S97, and received three waterings in all.

Tho results obtained in tho two series of experiments are given in the following tables A and B.

Note.—It is hardly ne- cessary for mt tu" mo (hat I disagree Kiti Bitch a motle of calistt I at tuff the cost of pro- dnction of gnr at detailed above. The principal objection it vf courte that the icaget paid by Goterw meat are douhtteit higher than those paid ty a notice grottier a large part of tohich he would Mmrelfpro. tide. Then again, eon* tider the item Us. 00 for cane cuttings (seed)! These crops weighed, if lam not maehmistaieit.at least ten fimet that of the cut tinge planted—pro- bably tnore—^ierea* only Jls. 220 per acrt tea* realized tu the ba- zaar for the cane told as tueh. Other detailt might jutt at readily be criticised. But the most serious objection to the paragraph it that it maJcts out (hut it does not pay to grow pnunda for gur making! There it n«3 reason for be- fitting (hat tuch it not the case. In He residency, in the Central Provinces, in B... parts of Madrf, "psunda" O/B;I» sort or another i, principally or entirely grown for "rat" manufacture. and it is only in £ehar and north-Western Provinces (I leave out the majority) where ilan, hard and poor belies are 3Z,,n, gro,cn too n ,, very com- pardon to be made f all at the f ^ then grow some .wu,,? fhiK-iVA liberal ,»;,,,,,.. tng and OH ridge,, a, agatmt the "mBtiim" on the fiat with a f,i- vial amount ofmtlnvre and then tee K/tirA' «>iUca*ie the greater loss. Attoprojlt if (, rery t^fiemlt to make on* af a,,s eiveri. mental fiirm.*

J. W. LEATHER.

TABLE A.

Showing the result of experiments to determine the effect of indigo refuse and green manures on wheat.

Plot number.	Plot area.	Manure applied per acre.		Average outturn for five years 1883-84 to 1887-88.	Average outturn for five years 1888-89 to 1892-93.	Outturn per acre in lbs. 1893-94.	1894-95.	1895-96.	1896-97.	1897-98.
		Permanent Experiment.								
G.1	Each plot = 400 square yards.	Old indigo refuse 120 mds. ploughed in.	grain ...	1,577	1,644	1,543	517	2,729	2,074	2,142
			straw ...	2,921	2,653	4,187	1,079	5,221	3,952	4,189
G.2		Fresh indigo refuse 120 mds. ploughed in.	grain ...	1,646	1,624	1,349	209	2,354	2,250	1,513
			straw ...	3,058	3,427	5,838	774	4,438	4,041	3,194
G.8		Green indigo ploughed in	grain ...	1,007	1,442	750	251	723	1,464	1,004
			straw ...	2,011	2,503	1,557	7,200	1,163	3,315	2,940
G.7		Green hemp ploughed in	grain ...	1,079	1,302	935	420	1,401	2,407	1,428
			straw ...	2,103	2,421	1,704	1,089	2,423	4,332	3,001
G.3		Rape ploughed in (until 1893 the plot was treated with indigo water)	grain ...	1,437	933	756	290	430	1,238	956
			straw ...	...	...	1,957	750	826	1,912	1,597
*G.5		Unmanured	grain ...	1,027	1,004	877	287	1,745	1,101	871
			straw ...	2,004	1,026	1,730	787	2,465	1,924	1,283
		Temporary Experiment.								
27A.1	730	Green hemp ploughed in	grain ...	...	...	837	264	975	969	1,057
			straw ...	...	...	2,147	832	1,764	2,355	1,379
27A.2	780	Green kulthi ploughed in	grain ...	...	...	858	206	1,059	1,200	983
			straw ...	...	...	1,943	836	2,117	2,007	1,903
27A.3	930	Green urd ploughed in	grain ...	...	...	720	370	791	713	762
			straw ...	...	...	1,556	2,124	1,318	1,183	1,380
27A.4	900	Unmanured	grain ...	...	...	641	414	1,138	858	897
			straw ...	...	...	1,509	1,056	3,153	1,322	1,046

* This has been also included in Table B for the sake of facility in comparing the results.

TABLE B.

Showing the effect of growing leguminous crops in alternation with wheat.

Plot number.	Plot area.	Manure applied per acre.		Average outturn for five years 1883-84 to 1887-88.	Average outturn for five years 1888-89 to 1892-93.	Outturn per acre in lbs. 1893-94.	1894-95.	1895-96.	1896-97.	1897-98.
		Permanent Experiment.				gram.	wheat.	gram.	wheat.	wheat.
*G.4	Each plot = 400 square yards.	Gram and wheat alternately (until 1893 this plot was treated with hemp water)	grain ...	1,171	1,060	1,113	300	1,097	2,130	944
			straw ...	...	...	1,322	750	2,517	3,705	1,429
G.6		Sann hemp and wheat alternately	grain ...	933	1,004	1,031	409	1,624	1,718	1,307
			straw ...	1,879	1,949	2,139	1,041	2,241	3,194	2,503
G.9		Indigo and wheat alternately	grain ...	1,430	1,304	490	287	1,135	1,041	980
			straw ...	2,627	2,209	1,570	774	2,347	1,040	1,803
G.10		Urd and wheat alternately (until 1893 this plot was manured with green indigo and gypsum)	grain ...	1,723	1,312	935	430	1,301	1,422	1,488
			straw ...	...	...	1,878	986	2,759	2,632	2,311
G.11		Arhar and wheat alternately (until 1893 this plot was manured with green lucerne and gypsum)	grain ...	1,321	1,167	1,028	arhar 968	wheat 1,358	arhar 864	wheat 1,355
			straw ...							
G.12		Lucerne and wheat alternately	grain ...	...	...	2,154	1,513	3,107	6,316	2,021
			straw ...	...	...	1,168	lucerne	1,155	lucerne	847
G.13		Lucerne and wheat alternately	grain ...	...	...	2,955	...	2,387	...	1,234
			straw ...	...	...	...	402	lucerne	1,123	lucerne
				...	...	...	762	...	1,922	...
G.5		Unmanured	grain ...	1,027	1,004	877	287	1,745	1,101	871
			straw ...	2,004	1,026	1,730	1,730	2,465	1,924	1,283

* In the ordinary course this plot should have borne gram in the year under report, but in accordance with the suggestion made by Dr Leather that arhar in plot G. 11 and gram in plot G. 4 should come in the same year, wheat was sown in the latter plot so as to give effect to his wishes in the year 1898-99.

Eemarks on plots of Table **A.**

Among these the highest outturn of wheat has been obtained during the year ••Under report from the plot treated with old indigo refuse. Fresh indigo refuse stood next as a fertiliser. Among the green manures hemp ploughed in gave better Jesuits in both plots .than the jest.

Jtcmarlx on plots of Table B,

Iu the rotation series tlie plot from which a crop of urd had been removed gave the highest outturn or' wheat; tho next beet outturns being obtained from plots in which san hemp and arliar had preceded the **wheat** crop.

General Eeinarks.

It is too early to discuss the result of the ' temporary ' experiment with refer-ence to the effect oi' green manures; but the ' permanent' experiment lias been fifteen **years** under trial, and it is now time to consider what deductions might be drawn from the results it lias given. The plots whoBe treatment has undergone changes during -.this period might be left ont of consideration at present and the discussiou confined to plots wbich have been uniformly treated since the commencement of the experi-ment, *viz.,* plots No. Cr 1, G % G 8, G 7, G C, G 9 and G 5.

A brief statement is appended showing the average outturn of wheat from ach of these plots during tho three quinquennial periods:—

jPlofc Vfrt.	Treatment.	Average outturn in lbs.			
		for the E v..-;-.!-. 1863 - 84 to 1887-88.	[•or *Oa t* ;.. u-• 1888 39 to 1892 93.	For the 5 years 1H93- M ! i 1897- 98.	For tlie IS j-esrs 1BS3- S-l to 1SU7- 9a:
CL	Old imttgo MfuFe 120 mtfs. ptougliod in ...	1,577	**1,011**	1,021	i,nt
V.2	Vre-li ind go ji'fuse ISO tiula. ploughed ia ...	**1,648**	*Ifiti*	1,5CT	1,589
G8	Grtcn indigo ploughed En ... >. ...	1,697	1,442	844	1,328
07	**lin.... Jieijiji ploughed In ..,**	1,079	**J,:in-J**	1,313	1,233
GG	Hemp mid whoikfc altarnatoly ... ..,	933	1,004	**1,2^1)**	1,U5"i
.G9	**[wlljjo** untl wheat H! to mutely	1,130	1,30-1	810	UM
.05	Unman a red	1,027	1.OD4	076	***tfiSi***

The value of indigo refuse as a vegetable manure suitable for wheat may now be &iken as fidly established; old indigo refuse being on tho whole more useful and consequently preferable. Tho results further go to prove that it is also advantageous to **plough** in a green crop in tho rsius, and that it is better to take a leguminous crop off tho ground intended for wheat than to keep it bare fallow, tho root residue of the leguminous crop decidedly enriching the land. Ploughing in a green leguminous crop improves the condition of the soil in a more **marked** degree than if it were takea off .tho land.

A question now arises which of the two leguminous crops—indigo and hemp—it is preferable to grow for the purpose of ploughing to or removing from the field before the wheat is sown. The results obtained have not been so uniform sis to enable one to form an absolutely definite opinion on the subject. Taking, however) the twe plots G 7 and G 8 into consideration it wfll appear that iu the first two quinquennial periods indigo plouglicd in produced a higher outturn of wheat than hemp ploughed in ; but comparing the average outturn as well as the Individual outturn* of the two plots during the la.et iive years, tbe outturn from the hemp plot was in each year higher **than** that from the itidigo plot. Exactly the same remarks apply to the plots No, GG and G9 in which hemp and indigo respectively were removed before the sowing of wheat.

Comparing **the** individual annual outturns of these plots it is found that during tho last *six* years tlie ontturn from **the** hemp plot lias been higher without exception in each year than that of the indigo plot;. while in the years preceding the said period of six years, the result has been exactly the reverse in each year.

• i'or tbe uulivrtniil outturns tlie reinler is referred to. the Ksyort on tho farm for 1895-86; page 13.

The only explanation for this remarkable circumstance that suggests itself is that as a crop of hemp ploughed in supplies more organic matter to the soil than a crop of indigo ploughed in, also that the root residue of a hemp crop is larger in quantity than the root residue of an indigo crop, therefore hemp whether ploughed in or taken off the ground enriches the soil *to a* greater extent in the long run than indigo ploughed in or taken off, but the organic matter supplied by hemp in both cases takes a longer time on account of comparative thickness of stems and roots to decompose than the organic matter of indigo stalks and roots which are more tender. I think that on this account the two hemp plots have become richer in condition than the two indigo plots in course of the first few years, by slow and gradual decomposition of the larger quantity of the organic matter they received, and being thus enriched they have been giving higher outturns of wheat than the corresponding indigo plots. Probably this theory is correct, but it is necessary to continue the experiment for some years to come in order to ascertain its accuracy. If finally proved it would establish the superiority of hemp over indigo both for green manuring and for rotation purposes, and might eventually show that where a quick return is the object, indigo is better than hemp to be grown for either purpose. The futility of rape as a rain crop for green manuring purposes has been further established from the result of the year under report.

IV.—METHODS OF CULTIVATION.

(a) The early and late sowing of maize.

This experiment was started in 1887, having for its object the determination of the effect of early and late sowing on the yield of maize. The early sown plot was sown on 1st June 1897 before the commencement of rain, and the crop harvested on 1st September 1897. The late sown plot was sown on the 24th June, somewhat earlier than last year, and the crop harvested on 15th September 1897.

Contrary to the results of the *last* three years, but in accordance with the general experience, the early sown plots gave better outturns during the year under report.

The following statement shows the results obtained in this experiment:—

The early and late sowing of maize.

Plot number.	Plot area.	Quantity of manure applied.	Description of sowing.		Outturn per acre in lbs.										
				1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	1895-96.	1896-97.	1897-98.
35a	Each plot = 1,522 square yards.	Farm-yard manure 200 maunds per acre.	Early sown { Grain ...	734	1,183	2,832	500	1,045	1,678	1,825	213	553	260	1,532
			{ Stalk ...	3,751	2,487	7,000	7,000	3,088	7,724	5,782	4,978	5,066	4,784	11,731
35b			Late sown { Grain ...	810	1,033	1,553	458	1,500	1,328	1,501	270	1,053	1,322	1,152
			{ Stalk ...	4,004	3,302	5,040	5,124	3,070	6,514	5,329	4,545	3,831	9,405	6,033

(b) Experiment in early and late sowing of cotton.

This experiment was started in 1891 in order to ascertain whether it is more economical to sow cotton before the rains by the aid of artificial irrigation than after the rains, as is ordinarily done by cultivators.

The early sown plots were watered twice before sowing on 27th April and 30th May 1897 and once after sowing on 7th July 1897, ploughed four times with

Watt's plough, manured on 1st June 1897 and sown on 5tti June IS07, a/lowing a space of four square feet for each plant of the foreign varieties and two square feet in the case of the country variety. The lafe sown plots ooukl be ploughed only twice, and were sown on the 21st of June 1897.

The results of the experiments are embodied in the following statement:—

Statement showing the results of early and late sowing of cotton.

1 Plot!s	Plot!∞	Trent to m 5	Varieties.		Outturn per ocra in Us. 1891-92. Fibre	1891-92. 1	18D2-93 Fibre,	18D2-93 I	1893-94 Fibre.	1893-94 •2	1894-96 1	1894-96 at	1S05-9G 1 IS	1S05-9G r' EC	189607. 1	189607. (Q	1897-38. s	1897-38. 1
17 / 1			VaradLi... 5	/•Early...	120	295	93	223	55	63	33	39	125	304	08	256	1£3	817
A.C 1				Cute ...	60	102	70	t45	118	•28	£8	CO	85	237	29	70	27	2
17 / 2			Baal ... j	{ Enrly,.,	115	281	C5	158	35	68	27	89	103	290	SI	245	111	
A.C. 2				C Lute ...	30	C2	63	103	Z\	80	10	27	ES	148	23	CS	ID	42
17 / 8		A	blinrnarU <	/ Early...	185	447	123	298	22	78	17	20	07	13	40	385	07	378
AC ~~5"	1	5		(Late ...	42	110	10	218	37	30	e	10	SI	-37	32	S3	SO	62
17 ~ 4~	1 ta E	1 1	Birodlm,,. i	Early...	172	417	33	26S	29	09	39	86	48	15	77	m	202	I
A.C. 4	S			tUto ...	32	57	CO	145	43	5G	19	17	B9	71	60	54	26	
17	it 1	44	LottiaUua, <	/Early...	72	20	28	280	42	20	31	to	34	34	"I	we	306	
A.C, 'TT	1	3		Late ...	£2	45	50	25	M	19S	i'l	23	M	.68	71	209	60	
17			Jiri ... j	(KarJif...	CO	82	18	33	55	12S	21	26	11	302	98	298	86	31G
A.C.				(.LatB ...	22	4C	76	85	64	60	13	20	28	338	83	252	43	10S
17			Country... \	/Early...	73	15	53	33	L14	327	64	70	38	BBS	22	120	02	512
A.C. 7				Late ...	22	24	13	50	71	L80	13	93	GO	)70	to	HO	GO	143-

It is conclusively proved that early sowing of cotton, where artificial irrigation is available, is an improvement on the present practice of sowing cotton after the commencement of the monsoon. This definite conclusion having been arrived at, the experiment will be discontinued next year.

(c) *Experiment with mixed crops.*

This experiment was started six years ago with the object of determining:—(a) the comparative outturn of certain *kharlf* crops in some of the more common mixtures **in which** crops are generally grown by the ordinary cultivators; (6) the mixture whose produce yiulds the most profitable outturn. The fields are prepared in the ordinary native **fashion** and lhe mixtures are sown broadcast. The following jstutoment ahows the outturn :—

Statement showing the result of experiment wilk mixed crops

Plot number.	Plot area.	Name of crop.		Quantity of seed in pounds.	Outturn p«r acre in lbs. 1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	1895-96.	1896-97.	1897-98.	Cost of cultivation including labour, rent &c., per acre.	Value of outturn.	Net profit or loss.
M. C. 1.	Each plot = 1,200 square	Arhar	Grain	...	...	...	...	1,390	137	1,180	608	128	260	850	22 12 0	36 4 0	+13 8 0
			Straw.	1	...	...	...	•1,1 Hi	508	3,296	2,422	436	1,040	5,052			
		Cotton	Fibre.	...	...	...	...	36	5	1	12	23	24	8			
			Seed.	2	...	...	...	81	12	3	21	53	60	17			
		Til	Grain.	¼	...	...	...	SQ	...	...	...	2	12	21			
		Urd	Grain.	...	...	...	...	ISC	21	31	65	56	12	114			
			Straw.	¼	...	...	...	928	298	312	182	224	178	1,232			
M. C. 2.		Arhar	Omin	...	97	87	97	£10	371	756	...	161	96	296	24 13 0	39 9 3	+14 12 3
			Stra*.	1	...	...	...	734	1,100	2,302	1,194	479	336	984			
		Bajra	Grain.	...	...	...	...	85	524	280	...	320	28	932			
			Stmw,	2	338	2,038	968	1,488	4,007	2,434	...	1,900	1,500	6,264			
M. C. 3.		Arhar	Grain.	...	363	333	387	630	1,424	536	598	155	280	304	24 13 0	45 2 0	+20 5 0
			Straw.	1	...	...	...	1,670	3,406	2,210	1,541	469	1,048	2,872			
		Juar	Grain.	...	...	...	...	6S2	[illegible]	840	52	724	280	1,072			
			Straw.	2	5,046	[illegible]	5,3[illegible]	8,S7i	8,268	3,082	2,315	4,456	2,544	8,824			
M. C. 4.		Castor	Seed...	1	...	...	...	432	387	330	...	84	8	322	21 15 0	23 7 3	+1 8 3
		Cotton	Fibre.	...	...	...	...	36	1	2	7	20	28	7			
			Seed.	2	...	...	...	69	2	2	11	55	52	13			
		Til	Grain.	¼	...	...	...	52	...	...	...	4	6	4			
		Urd	Grain.	...	...	...	...	81	7	23	60	164	8	138			
			Straw.	¼	...	...	...	403	50	225	153	1,008	348	1,008			

Tlie tiigUest return of tngnoy value was obtained from sowing *a/rhfi-v* in conjutic-tioa with *juar* as in tlie two previous years.

(d) Experiment with lucerne.

This experiment having proved that it was more profitable to aow lucerne on ridges than in frirrowa or broadcast, has been abandoned during the year tinder report.

(e) Experiment with transplating wheat.

This experiment wLB carried on during the year under report on the same plot as in-the past year but without application of any manures.

The subjoined table shows the outturn obtained ;—

*Statement showing the **OUttwrn** of transplanted Itfnzaff'amagar wheat-*

Plot THimbir.	Hot area.	Distanof.	Ontturn per sett. in tbg. Grain,	Straw.
1	733	Transplonted at tbe diiUnea of 20 inoica from row to row*nd 6 iDeboa in tLo row.	1,356	2.72C
2	330	TruiifplanU'd at th« distunes of M inches from row to row and 6 i lichen in the row.	1,663	3,251
3	390	Transplanted it tie distancf] of 9 inches from row to row and C ineliei in tbo row.		•I.'-IT

The experiment has again proved the possibility of growing wlieat by transplanting, and more time is necessary to determine the eoonomical value of the method.

(b) Testing of new or improved implements.

The following implements were tested at the Farm during the year under report:—

(1) *The Meston plough.*—This implement has been perfected during the year, and combines all the good qualities ordinarily desirable in a plough. It weighs only about 26 lbs,, and though suitable specially for the lighter class of soils it can be worked without difficulty on clayey soils. The draught is not heavy even for the inferior type of cattle generally found in Oudh and the eastern districts of the North-Western Provinces. The ploughman has little exertion to undergo in working the plough beyond the handling of the stilt. The motikl board boing made of wrought iron is particularly strong, and the body and the share which are made of cast iron are also substantial. It was found to plough au acre of ground in 11 to 12 Lours according to the quality of the soil; tho width of the furrow being about 7 inches and the depth varying from 4 to 5 inches. Its price is Rs. 4 only.

(2) *The Stoney water lift.*—The Stonoy water lift consists of two self-emptying buckets of special construction, and is worked by one pair of bullocks on tho same principle as the double *inot,* the buckets being raised and let down alternately. The bullockg have to reverse their course of motion after each round and have to be trained to do so. Its price is Its. 150. The water lift is on the whole a fairly good coutrivance for irrigation from deep wells. In trials held at the Cawnpore Farm it has lifted roughly about 700 gallons of water per hour from a depth of 45 feet, but has been found to require more skill to erect and keep it in working order than is possessed by the ordinary blacksmith of this country. It has cost the Department over Us. 200, besides the price, to import the water-lift from Madras and to set it upon a well, and the total cost of the machine has therefore been very high indeed. There is no chance of its ever being introduced among the native *cultivators* on account of the heavy *coat* and skilled supervision under which alone it can be properly worked.

(3) *The Oawnpore swing basket (beri),*—This is commonly used by the cultivators for raising water from depths not exceeding 4£ feet. It works satisfactorily up to a height of 3* feet for raising water, but not with advantage for greater heights. When water has to bo lifted at a height exceeding 4£ feet, it is generally raised from one channel into another on a higher level by baling—a swing basket being at each baling station. The quantity of water lifted by it pur hour in ordinary daily work may bo taken to range from 750 to 850 cubic feet per hour according to the depth and the strength of men working it.

(4) *The Cawnpore chain pump,*—These irrigation implements are now pretty well-known in the United Provinces, and a number of them is sold and given on hire or for trial every year. Printed partioulura are supplied free on application. During the year under report a number of these pumps were tried at depths varying from *3i* to 17 feet at the Farm with a view to comparing their work with that of the swing basket and the results of the trials are summarised below :—

(a) The chain pump at a height not exceeding 3J *feet* may *ho* taken to raise ordinarily about 1,000 to 1,200 cubic feet of water per hour, *i.e.,* about 40 per cent, more of water than the swing basket tried. The work is more taxing than that of the basket, butnot beyond the capacity of ordinary labourers—men, women, and boys over 15 years of age. The increased quantity lifted may be taken to more than compensate for the greater initial outlay in purchase. The daily experience at the Farm, the established lower rate at which the labourers at the Farm and the neighbourhood, undertake to irrigate a *bigha* on contract when supplied with the pump than when supplied with the basket, and the keen requests of the neighbouring villagers for the loan of the pump for a day or two when crops require immediate watering, place its superiority over the basket beyond doubt.

(6) *The chain pump at a height of 5 feet* might be taken to raise ia ordinary practice about 800 cubic feet of water per hour, or about double tho quantity done with tho basket at that height. The work is not beyond the strength of ordinary labourers—men, well-built women, and boys over 18 years old.

(*f*) *Experiments in growing maize without manure after country and hill potatoes with manure.*

These experiments have been started during tho year under report under the instructions of Dr. Leather with a view to ascertaining liow far the residne of certain manures applied in certain quantities to a crop of potatoes will benefit the succeeding crop of maize. The plots were sown accord lug to the new method described in the case of the *klw.rif* standaad aud duplicate series, but as stated already no manures were applied for the **maufe** The result arc embodied in the two following statements :—

Statement showing the outturn of maize sown after hill potatoes.

Plot numlwr.	Plot area-	Treatment only for the previous crop (i.i. potato).	Outtnrn perncrii in lbs.	
			Grain.	Straw.
2G« / 1		Umnannred .,, ... ••• >•• ...	2,300	11,700
26a / 2		Poudretta @ 200 lbn. nitrogen per acre ...	S,3flS	12,800
S		Do @ 100 lbs. ditto	2,530	13,800
2t!o / 4		CatUc .lung @ 200 fos ditto	2,910	11,090
5		Ditto @ 100 fos. ditto	2,580	12,840
20a / 6		Castor calr« @ 200 Bis. ditto	2,0.15	13,070
26a / 7	i	Ditto 100 fb». ditto ...	2,613	10,310
2C4 / H		Saltpetre (g 60 Hi. nitrogen per aero und bonc-dast (Si 50 ft!, nitrogen per acre.	3,150	9,720
26b / 9		Saltpetre and bouo saporpuospliats eaoh @ SO Ibi. per aero	3,050	8,970
2Ci / 10		Unmnnurcil ... •••	2,rt75	3,780

Statement shouting the outturn of maize sown after country potatoes.

Plot number.	Plot area.	Treatment only for tie previous erop (i.s. potato).	Outturn per aero lull *t*.	
			Grain.	Straw.
25 / T		Uiioinnnrod	B,1M	10,760
25 / 2		poudrette @ 200 fti. nitrogen per oere ...	3,400	fl,fl70
25 / y	i	Ditto 100 lbs. ditto	3,2G6	11.KO
21 / T	i	CiUlo dung (g 200 ftm. ditto	3,O3B	11,030
21 / *f*	i	Ditta @ lOOIbB. ditto	2,955	12,630
6	'En	Caator cako @ 200 ft«. ditto	2,603	14,000
y	1	Ditto @ 100 lbs. ditto	2,533	13,010
20b / 6	W	S»Upctro @ SO lbs. nitrogen per aero and bone-doit @ E0 lbs. nitrofjen per ULTO.	2,958	11,720
26b / 9		Ssltpetro and bouo snperphoipbatfl each @ GO.lba, nitrogen per Wro	3,043	11,800
2(Sb / 10		L*ti manured .,, «• ••• •••	3.005	15,010

It will be seen tbat the outturns obtained were very good, but *AS* the unmanned plots in the two *sets* yielded mow corn than many of the manured plois—aud this is only the first year of the experiment—it is possible the high outturns might be due more to tho new method of sowing than to the effects of the residue of manures. Indeed it is premature to discuss the results*.

NOTE.—*Thitwat hutii ltd toiYA /At idea of utilizing manure midvt in (he same may as Mr. Suhbiith wished to utilise the manure Tttidve i» tie ottit of >Hgar-ca»e plots. It U done purely nriii an idea of economy, and hardly rankt~ at a it par ale experiment. It ikwld jlittt a place it tht tame paragraph at that in nfiirA the potato experiment is dtsi-ribed. It rtmaiat to be tetn whether it it desirable to contisKt it, Gtnerutli/ the procedure is not to be recommended is experiment since it complifatet the issues ; but at the manuring for both sugar-cane and potatoes is very Aeaey, Mr, Sulbiah mggtsted Korkingup the manure residue in this way; and I thought the ruggetlion might toell be acted upon for a time at least.*

J. W. LEATMEE.

"It should be noted that the outturns of pota toe) on the untnaaHred plots have been decidedly high, and it may be assumed that these plots Ktrt decidedly rick at tJie commencement of the experiment; hence it is not surprising to find that the crops of maize from them should hane been good* ***alto***

J. W. LEAIUEK.

V.-TRIAL OP IMPLEMENTS.

(a) *Permanent experiment with deep and, shallow ploughing.*

This waa started in 18S2. Its object is to determine the relative economy of deep and shallow ploughing in preparing the ground for wheat and the effect thereof on the outturn. Of the three plots assigned to the experiment two are ploughed four times with improved ploughs, one nine inches deep and the other five inches deep ; while the third plot is ploughed eight times three inches deep witjh the country plough in ordinary use in the Cawnpore district; the treatment of all plots being similar in all otlier respects. No manure is applied to these plots. All tha plots were sowtt on the lGth aud 17th of October 1897 with Muzaffarnagar wheat, and the crops harvested on the 2nd and 3rd April 1S98. They were watered four times during the season of growth. The subjoined table compares the outturns obtained in various years.

Statement showing the results of the experiment with deep and shallow ploughing.

Plot number.	Plot area.	Treatmeut.		Outturn per acre in poundi.						
				Average outturn, for four yenrs.			I h dividual outturn for—•			
				1882-83 to 1885-86.	18SG-87 to isse-eo.	1800-31 to 1803-0*.	JS0.1-96.	16D5-EJG,	1306-97.	1S97-08.
VI	[illegible] square yards.	Ploughed niiii) inches deep with Impro- ved plough.	Grain..,	330-25	833'6J	1,024-50	265	1,139	1,277	713
			Straw...	l^UT'OO	1,15833	2,052-00	SOS	2,003	2,148	1,358
P2		Pln-jghcd fiTO inches deep with imjfu- Ted plough.	Grain,.,	63B-50	661-C6	SDG25	see	1,250	1,230	1,190
			Straw,.;	1,325-75	1,SSS'OO	2,009-SO	464	1,949	1,833	1.0O2
P3		Planglied three inches duep with native plough.	Gr»in...	•isroo	G02-O0	860-25	183	1,431	1,101	1,148
			Straw...	SBS'OO	1.O48C0	1,918-25	453	2,077	1359	2,035

During the year under report the plot ploughed deepest gave the poorest outturn, contrary to gen oral experience. In this case the loss of moisture from the seed bod due to the unusual heat of the weather which prevailed in the beginning of the *rabi* season was naturally greater than from the plots ploughed less deep. The germination in the former plot was consequently poor. The same thing happened in another dry season, 1895-96. These results suggest the advisability of adopting invariably, in dry years, the practice not uncommonly followed of flushing or irrigating the land in October before sowing, if deep ploughing is to he resorted to. The plot ploughed five inches deep witb the improved plough gave n somewhat better result than that ploughed three inches deep with the native plough. But as stated in fflrtaer years the advantages of the improved plough lie chiefly in the greater economy of time, labour aud money, speed and efficiency with which the seed bed is got ready for sowing, and uot in the increased outturn which may or may not follow; although, aa a matter of fai:t, deep ploughing has in the majority of instances produced a markedly increased yield in the particular class *o£dnmat* soil concerned.

The improved plough is, moreover, drawn by the *ordinary* cattle of Cawnpore and ploughs quite as much land in a day as the indigenous ploughs. Assuming eight ploughings with the native as equivalent to four with the improved plough, and the cattle and manual power employed to be worth 10 auuns per aero, there is a clear gain to the cultivators of about Rs. 2-8-0 per acre in using the improved plough. Thus the saving effected in ploughing three acres of land more than covers the cost of the beat and most expensive improved plough of the Farm, *viz.,* the " Wart's."

With reference to the time required for preparing the ground, the cultivator can with the.use of the improved plough manage twice as largo a holding as he could with the country plough, or make his seed bed ready for sowing *rabi* crops of the first order in time after removal of a *kharif* crop, whiali lie could do but imperfectly if ho were to use the native plough.

*(c) The chain pump at a height of IZ to 17 feet can be e*spected to raise abiout 400 cubio feet of water per hour in actual practice. Ordinary male labourers are a*ble to work it conveniently.

(a) *The Baldeo balti* which has been noticed in previous years' reports was placed under **special** test during the year, but the particular implement tried was rather leaky, aud the results were therefore not conclusive. Further **trials** will be made.

The water lift experiments mentioned above (except those- with tlte Stony water lift) were not conducted under my peraomd supervision, and for the figures aud notes regarding thorn l am indebted to Mr. P. V. Subbiaii, Superintendent of the Farm, who carried them out.

VI. VARIETIES OF CSOPS.

(ci) *Experiment with varieties of cotton.*

This experiment was originally started in 1S83 Vith the object of determining which, if any, of T i HffZ ^foreign TMrieties OfCOttoa wercatiitable for estivation in the DoSb. la ltHtt four varieties wliioh had proved to be inferior were eliminated as not deserving of further trial; and certain varieties of Assam cotton were added to the experiment. As in the previous year all the varieties were grown in the same field, and were treated alike with regard to cultivation and manuring.

Details of cultivation.

Tillage.-^ Und was ploughed with Watt's plough three time,, cultivated with Uie 1 lant Jr. bone-hoe once and levelled three times.

Manuring.-CMie dung applied at the rate of 200 manuds per acre.

made ^ ^ - Seed was dibbled on the ^26th ^of June in holest,vo feet apart along lines in t! at intervals ficl, h fa countr the varies where the hole, were only one foot apart: eaeh hole received abou, five ,,cd., hole ^Tn7*r Wi the crop wasab<>llt 15dayao3d,theweak, yp laniaateacll hole we« pulled off **leaving** one, **ttd** strongest plant, at th. place. While thinning Ihe **plant.,** the blank SI>aee3) where the seed had failed to germinate, were filled up by

I

l,.ef ««««, of the comparatn-ely low outturn during the year under report.

the SSZ^ZnSf* the *mmiB* of November 1897 - — *t0

ft I «S T I(S of i h0 6Xperimeat8 are tabulatc(l - the following statement :-

Statement slowing the outturn of different varieties of cotton {foreign and Indian .

Field Nos. 1897-98.	Plot 1897.	Name of cotton.		1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	1895-96. i	Second year 1896.	1896-97.	1897-98.
Field Nos. 32 and 33.	303 square yards each.	Tree cotton ...	f Fibre.	111	143	115	Bi	100	21	23	200	141	213	in
			I Seed .	sn	U5-i	251	m	[201	71	41	92a	28S	BM	207
		Louisiana ...	f Fibre .	...	l!14	,12(J	,'D	103	:.:-.	65	BID		217	178
			t Seed ...	863	457	SK>	128		77	99	IS	toa	480	417
		Gars Uil] ...	(Fibre,	LSH	LM	SI	tea	S8	B8	19	320	168	M	84
			) Seud .	24B	803	137	1S6	217	167	38	US	I..7	72	47
		Hjbrid ...	f Fibra.	B3	183	L03	ED	160	::s	97	ess	[flt	28B	[SO
			t Seed .	207	n->	:(!;{	L88	288	-srt	67		390	732	315
		Sea Island ...	} Fibre.	i 97	104	til	M			38	77:;	IS.)	2G7	179
			'(Seed .		r.li	861	185	58S	7(1	69	320	BW	U72	409
		Egyptian ...	C Fibre,	[sas	19-1	I 80	6G	I-'-."		29	805	164	272	178
			Seed ...	97	i.i I	K'l	162	BOS	i:.	70	314	382	t)58	380
		Hinganghat ...	(Fibre a „	111	1H3	103	64	153		23	3U9	113	128	i-a
			I Seed .	235	ir.7	B61	tS8	SOU	SO	41	237	[£83	339	140
		ffuikln ...	(Fibro.,	...	...	...	...	...	88	...	...	...	108	09
			• I Seed .	...	...	...	...	...	...	...	...	...	7-,\>	
		Jantiya ...	(Mb» .	...	...	...	...	...	...	6	229	JO7	B0	55
			"(Seed .	...	...	...	...	...	...	13	•130'	.'.I I	n;	10
		Bald ...	...	...	...	...	...	...	...	10	118	:>7		tii
			I Seed ...	...	...	...	...	...	...	21	SM	I28.S	89	1218
		Jari ...	(Fibre ...	...	...	...	...	...	...	17	221	33	334	110
			{ Seed ...	...	...	...	...	...	...	84	616	276	858	lass
		Country, i. *., lucul variety. Cawnpore	f Fibre .	...	...	...	...	...	...	...	...	...	11	80
			[Seed .	...	...	...	...	...	...	...	...	...	981	133
		Hydr&badi ...	(Fibre .	...	...	...	...	...	...	...	...	...	872	99
			(Seed ...	...	...	...	...	...	...	...	...	...	576	168

It would appear that foreign varieties gave better outturns in several cases during the year under report than the indigenous and the Assam varieties, contrary to the experience of the past year. This was due to the plots having been unfortunately flooded by a sudden overflow of the canal distributary on 27th October 1897 and 7th November 1897. The water was drained off as quickly as possible, but this could not be effectively done in the case of plots which have given poor results on account of their comparatively low-lying situation, and consequently those plots, besides some others not mentioned in this experiment but situated in continuation of the series of experimental plots, were damaged, some of them very seriously.

The system of allowing a crop of cotton to stand on the field a second year with a view to obtaining successive outturns of fibre and seed has ultimately proved to be far from economical, and has therefore, not been tried again.

With a view to obtaining expert opinions on the quality of the different varieties of cotton, samples of the varieties enumerated in the above table, and of certain other varieties not included in the experiment but grown on the Farm during the year (except the indigenous variety) were sent to the Managing Directors of Muir Mills Company and Cotton Mills Company, Cawnpore*. The Managing Director of the Muir Mills Company has very kindly furnished his opinion about each variety which is quoted below: —

1. *Louisiana Cotton*—A [illegible] silky cotton; medium to long staple; fibre evenly; suited to fine counts; would apparently gin easily leaving fairly clean large seed.

2. *Hybrid Cotton*—A silky, fairly long staple cotton, and very strong; suited to spinning fine counts.

3. *Abi Cotton*—A soft cotton; some of [illegible] staple very long averaging 1¼ to 1½ inches, but variable; cotton apparently from Egyptian seed; fibre not strong.

4. *Sea Island*—Differs materially from real Sea Island cotton; staple very short and weak for Sea Island, and if sample is from imported Sea Island seed the cotton shows marked deterioration.

5. *Hinganghat*—Except in regard to abundance of seed the sample does not compare favourably with real Hinganghat. The staple is short and somewhat woolly.

[The foregoing two samples, viz., Sea Island and Hinganghat, show such marked deterioration that I should say that they are quite unsuited to the soil and climate of the Cawnpore district.]

6. *D[illegible]ari Cotton*—A soft, short stapled cotton; fibre weak; abundant seed.

7. [illegible] cotton, with very fine and fairly long staple; fibre not strong.

8. *Garo Hill Cotton*—A woolly, short-stapled cotton, fibre very rough but strong, not [illegible] to commend itself in this variety.

9. *Barodha Cotton*—A medium staple cotton [illegible] suited for spinning medium counts, but not an attractive cotton.

10. *Nankin Cotton*—An absolutely worthless cotton. The writer of this report cultivated it for a series of years, and found that with each successive year the staple became weaker until it was something like thistle-down and could not be worked. The colour is fugitive.

11. *Egyptian Cotton*—A very white silky cotton; long staple, but not at all equal to the staple of the parent stock.

12. *Bani Cotton*—A soft silky cotton; medium staple, but strong; would spin well.

13. *Egyptian Madrasi Cotton*—A soft silky long-stapled cotton, superior to No. 11.

14. *Country Cotton*—A very white, somewhat coarse cotton, but finer and longer staple than is grown in the Cawnpore district.

15. *Tree Cotton*—A very soft medium to long staple silky cotton; staple weak and very fine; doubtful how it would work.

16. *Jari Cotton*—A short staple coarse cotton; good colour, but not commendable.

17. *[illegible] Cotton*—A [illegible] cotton, long staple, [illegible] strong, good colour.

18. *Jaulia Cotton*—A coarse short staple cotton, somewhat resembling [illegible] in Northern Bengal.

General.

"My opinion of imported cottons is that they always deteriorate on an Indian soil, the deterioration being in the direction of a gradually weakening staple until the cotton is no longer workable. This applies only to such cottons as are greatly superior to Indian cottons, such as Sea Island or fine Egyptian."

* *If this report of the Manager, Muir Mills, be compared with his similar report of 1894, it will be seen that Louisiana, Hybrid, and Tree cottons have not depreciated; Sea Island, Hinganghat, Garo Hill, and Egyptian have depreciated. This is specially marked in the case of Garo Hill cotton for which the seed was, I think, obtained in 1894 or 1895. It is very important. If I had to decide about this experiment I would get new seed of these varieties and grow both the present stock and the new seed for some years and again obtain expert opinion. I do not think that such rapid depreciation has been observed in cottons elsewhere and if the depreciation is proved, it would go far to settle the question of improvement of cotton in India.*

J. W. LEATHER.

What the result would be o£ tba grauwl blending of a good imported cotton with an Indian variety it is difflmlt to soy.

The opinion in **the** Bombay Presidency is, I think, that in the course of yours the prodnce esnnnt bo (liitiiit'iiisliiil from the original stock. Hinvcvrr this maybe, it would appear u» if nurli an experiment would ho risky ; if the imporUnl strain was always made to predominate tlu'rv would probably boa long cotton but with ft weak staple. If on tbo other liand tliu indigenous growth predominated, the iitii>orto*l strain would hnvu but little **eflwi.**

1 balins—and my belief him been coiifirmod by experiment*—tliat nil efforts should bo in the direction of improving indigenous growths, not by importing foreign cottons, but (1J by selection of seed and (3) by mora careful cultivation, wpeoially in the direction of deep ploughing.

In parts of Tiundelkband tUerc are varieties of cotton aome of which are neatly as good &s any grown in India; **the toil** is sn eminently suitahle our, and tho diatrict is deserving of greater attention brought than it appears *ta* receive. 1 bdievo there is a Rroat deal of laiHUyiiiR wasto in parts wbicb might be brought uudcr cultivation and made tu produce :i cotton equal to any In India."

In paragraph 2 of the letter forwarding bis pinion tbe Managing Director of Muir Hills says—

" I would, however, venture tn repeat **that** but. **little,** if any, practical good in likely to result from experiments with imported *weed,* egpucinlly as Uu'sc experiments must be conducted under eonditinna which would not generally prevail or be **•ttsinablo. If** cultivators wcr« en enurngod to always select seed and to plough deeper, I am convinced that beneficial results wonld immediately follow and that theao aro the beet, safest, and chnapiijt means by which Indian eottnns o^n be improved." Hia suggestions regarding selection of seed and deep ploughing will be given affect to.

(6) *Experiment with Canadian oats.*

This waa started in 1890. The plots under tbe experiments wore watered once with canal water on 24th October 1897 to soften the soil. They were ploughed four times with Wait's plough, cultivated with Jr. horee-lioe once and levelled four times with the *patela.* The seed was sowtl on 2nd November 1897 :ii (In; rste of 120 lbs. per acre. Two wittering* were given during the period of growth, ami tlie orop harvested oa 29th March 1898.

The following table shows the outturn obtained fronj the six plots :—

Statement show ing the outturn of Canadian oats.

Plot No.	Plot area.	Variety of oats.		Outturn per acre in tt>fl.								
				1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	Average from 1890-91 to 1894-95.	1895-96.	1896-97.	1897-98.
36/1	Each plot = 400 square yards.	Prize Cluster ...	Grain ...	620	240	3U	178	149	29C	217	57S	2,045
			Straw ...	2,112	1,125	10,239	S.456	3,0u'G	4,-WC	8,307	7,230	5,639
2		Canadian triam ph.	(Grain ...	787	2JC	31G	100	71	31C	126	620	8,360
			Straw ...	2,527	1,050	0,070	6,588	2,917	4,220	0,730	6,474	5,917
M/3		Rennie's prize,	(Grain. ...	**478**	IDS	300	544	134	339	**167**	3S7	**3^**[illegible]
			Straw ...	1,980	942	3,731	**18,680**	3,300	5,729	8,787	5.G15	5,403
36/4		Welcome ...	(ftrsiu ...	70S	240	•13E	£00	71	313	*in*	071)	2.-108
			XStrav ...	**2.3U8**	756	9,730	5,920	2,806	4,334	7,8^7	6,173	6,244
36/5		Bonanza ...	Grain ...	787	252	277	336	US	3S0	175	**472**	032
			Straw ...	2,573	013	10,578	13,960	3,UB'J	6,221	7,73»	6,861	6,873
-38./6		White Egyptian,	Grain ...	**847**	300	25-t	192	64	331	192	545	1.0O9
			Straw ...	2,638	356	7,110	5,368	2.903	3,701	6.9B1	5.72S	U.-137

These oata need to yield a very high proportion of titraw as **compared** with the grain, a feature **which** they maintained (brougbout the period of the past ciglu years; but contrary to this experience they produced during the year under report 3 much.

higher outtura of grain in proportion to straw than usual.* Tlie only change in treatment introduced during the year was the artificial irrigation of land prior to its preparation for sowing on account of timieual dryness of tha soil. This resulted in excellent germination of the seed. It is, however, noteworthy tliat plants were somewhat stunt.-il in growth *as* compared with former years, but bore larger and more numerous ears, alt full of grain. Tiiis may be due possibly to the peculiar dryness of the first half of the past *rabi* season. Tlie current year's result of this experiment will be watched with much interest.

•XOTE.—*TAt Outturn nf ttrate t&iit/far it prac-tirall.t/ equal to that °f tie foregoing year, and thuTefart if* fir *Hrna* ipa» *shorter in* 1807-88, *tit plant, must have tilt art d mart frefill to taakt up the wtighi.*

J. HI. LXATEER.

(c) *Experiment with Am&rican wheat.*

The American variety received from the Pi>litii3al Agent of Bundelkhand, who had found it growing i'ree from mst in the ginlcn of a native chief while the neighbour ing fields wjre attacked with the disease, has been under trial at the Farm siuce 1805, and was grown in different plots during thia period of three years. Duriog the year under report the wheat was sown on the 4th of November 1897 in the ordi-nary way, and the crop harvested on the 29th of March 1898. No signs of rust appeared on this crop, though other crops of wheat grown on tho Farm did suffer from it. The American variety had also been free from rust during tlie two previous years, but the trial must be continued for a series of years to determine whether it 13 really mat proof. The statement given below shows the outturn obtained:—

Statement showing the results of the experiment with American wheat supposed to be runt proof.

£ *fu*	flot area.	Nirac of variety.	Outturn p<T riero in UIN.					
			18D5-:'i!.		1896-07.		1897-38.	
			3 *a* 5	1	a 1 O	1	q *a*	1
18 T	COS square yards ...	.'Vmericiui wheat ...	E£56	5,872	...	...	...	...
2a Co)	1,210 ditto ...	Ditto ...	...	...	2.1.-0	6,450	...	...
SG 7	800 ditto ...	Ditto ...	...	...	...	...	1,150	2,7155

(*d\ Experiment with varieties of sugar-cane.*

This was originally started in 1894 along with the mannrial experiment already noticed, but tho character of the experiment was subsequently changed altogether under the instructions of Dr. Leather. Six varieties are now tried in two series of plots. Tliroe of them belong to the *paunda* class (chewing ones) and three to the *ukh* class (canes usually grown for the production of sugar), the manures applied in oue series being twice as rutiuh in quantity as those used in the other. The experi-ment is carried out in two sets of plots iu alternate years.

Details of cultivation.

Tillayc.—The plots wore ploughed once, subsoilcd ODCC, cultivated with Planet Jr. horse-hoe once and levelled with the *patela.*

Manuring.—The manures were applied on the 6th of February 1S97.

Planting.—-Cuttings were planted on the 7th of February 1897 in the usual manner iu furrows.

After—cultivation.—.The plots that received 500 lbs. nitrogen per acre were weeded eight times and -watered fourteen times altogether, while the plots treat-ed with 250 lbs. nitrogen per acre were weeded seven times and watered seventeen times.

The crop in all the plots grew with such extraordinary luxuriance and vigour that it became quite " laid up," the plants having failed to keep standing in spite of having been lifted up, tied and earthed up oftener than usual. The popular belief was that the quantity of manure (nearly 847 mds. per acre) used even in the 250 lbs. nitrogen plots was excessive, at least for the *ukh* varieties.

The cutting and crushing began on 26th January 1898. The *gur* made from the various plots was of a very poor quality, having little consistency or grain, which lowered its market value considerably. It looked little better than a thick syrup. The outturns are tabulated in the following statement, the highest having been obtained from the Madrasi *paunda* as in the past year:—

Statement showing the results of the experiment with six varieties of sugar-cane.

Field No.	Plot area.	Manure applied per acre in 1897-98.	Name of variety.	Actual quantity of manure lbs. per acre.	1897-98. Outturn per acre in lbs. Weight of cane.	Weight of juice.	Weight of gur.	Percentage of Juice to cane.	Gur to juice.	Gur to cane.
1 to 6 out. [illegible]	Each plot [illegible] of an acre.	Poudrette 250 lbs., nitrogen per acre.	Saháranpuri	69,444	49,840	30,256	4,896	60·07	16·18	9·82
		Do.	Madrasi	Do.	55,296	42,848	7,008	77·50	16·35	12·67
		Do.	Poona	Do.	48,088	32,320	3,712	66·30	11·47	7·81
		Do.	Dikchanukh	Do.	55,728	33,714	4,064	60·55	12·04	7·29
		Do.	Dhaul ukh	Do.	46,528	25,904	3,840	55·67	14·82	8·25
		Do.	Hatna	Do.	44,088	24,912	3,904	55·74	15·67	8·73
[illegible]		Poudrette 500 lbs. nitrogen per acre.	Saháranpuri	138,888	46,176	36,708	5,896	79·03	16·04	12·77
		Do.	Madrasi	Do.	67,184	48,880	7,844	72·73	16·05	11·69
		Do.	Poona	Do.	36,360	24,540	3,100	67·53	12·63	8·53
		Do.	Dikchanukh	Do.	60,336	38,512	4,384	63·83	11·38	7·27
		Do.	Dhaul ukh	Do.	46,580	27,216	3,672	57·06	13·50	7·80
		Do.	Hatna	Do.	37,352	[illegible]	3,152	50·19	14·02	8·39

(e) Experiment with old imported carrot seed.

A report on this experiment was submitted to Government (separately in May last and is reproduced here with a view to publishing it with the general record of experimental work done at the Farm during the year.

The undistributed European carrot seed returned by District officers was preserved at Cawnpore during the rains of the year under report in air tight chambers, which were opened early in September 1897. One bag of cleaned seed of each variety, which had never been opened since it left Europe, was selected for experimental sowings at Cawnpore, and the contents were used for the purpose. Uncleaned seed was also sown, but this was taken out of bags which had been opened in the beginning of 1897 in districts.

Several plots were selected at the Farm proper and in the garden attached to the Farm for experimental cultivation, and the land was prepared in the ordinary native method, with the exception that the plough used was an improved plough (the Watt's), and that certain plots were laid out in ridges. At the Farm only two varieties, viz., the white and the red, were sown, as the yellow seed had been exhausted in distribution before the Farm sowings commenced. The two kinds of seed were sown at the Farm on ridges between the 4th and 6th of October 1897.

At the garden, however, all the three varieties were tried, and in one place the country (or the indigenous Cawnpore variety) was also sown at the same time as the imported seed. The sowings at the garden were done by three different methods, viz., (1) broadcast, (2) on ridges and (3) in furrows. Besides, some plots were sown within the normal period, while others were sown comparatively late in order to determine the relative merits of timely and late sowing. The usual time for sowing carrot in the Doab is from the middle of August to the end of September. At the Garden three series of plots were sown between the 25th and the 27th of September, and may be regarded as sown at the proper time. One series [illegible] of October, and another, the last, on the 19th of October. The last two may be treated as somewhat late sown plots.

No manure was used at the Garden, but at tlie Farm cow-dung at the rate of 200 muunds per acre wits applied, aud on flirs account ,the outturn of the Farm plots was generally much higher, carrot being a crop which requires plenty of plant food in the soil. Only cleaned seed was tried at the Farm, but both cleaned aud uneleaued seed were sown at the garden, tho former at the rate of 14 to 24 H>3. per acre aud the latter up tp 36 lbs. per acre. From six to nine wate*iDga were given to the various plots, and the crops were weeded, when necessary, thinned out and earthed up, where the seed had been sown in furrows. The uucleaned seed did nol germinate iu most cases, and where it did germinate the outtaro was exceedingly poor.

The sui-jriined table shows tlie highest, the lowest nnd the average outturn obtained from the imported varieties compared with the country variety :—

Variety.	Manured.				Un manured.				Kemarks.
	i a. of p A	il f w8	HI A	[illegible]	u v z;	a a. 1 - £	5 p.	si's	
		1Kb	Mils.	Mds.		[illegible]	[illegible]	Mds.	Tin; out mm* obtained from plots sown with nn cleaned «w(i have not bemi slionn in [illegible]
Red Jtoditerrntienn ...	4,	338-30	NJSM-J	255 -i	5	[illegible]	2'JO	[illegible]	
White ditto ...	S	40128	[illegible]	300*1	5	1 I'rlIL'	BW1	[illegible]	
Yellow dttUi ...	...	...	...	...	5	]:J9'27	38*!)3	10531	
Coun t r v (Cannpors variety).	3	331-28	177-20	271-8	5	315-34	14310	209'60	

JV. *lit*— A mann(l=S2 flu.

It would appear that, with regard to the bulk of produce, the white Mediterranean gave the best result on manured land; that the highest outturn of the red variety was somewhat above the highest outturn of tlie country variety; and that tlie average outturn of tlie red variety was not very much below the average outturn of the country variety. On unui inured land the country variety yielded, on the whole, a considerably larger product) of roots than any of the imported varieties. Among the latter tho red **Mediterranean** gave the highest yield. The highest outturns of the white and yellow are very nearly equal. The average outturn per acre of tlie yellow variety was higher than that of the other imported varieties *(a* result similar to that obtained last year), but was over a hundred mauuds less than the average outturn of the country variety. These results show that under high cultivation quite as large an outturn may be oxpeeted from tlie imported **red** variety as from the indigenous variety, and that the **white Mediterranean** *may* yield a much larger bulk of roote than the country variety provided tlie seed is eown at the proper time. On unnaKred laud tho resnljs have been **indifferent;** yet they go to show that, while country seed may do tolerably well on -inmanured land, the English carrots cannot be grown with certaiaty of success without manure.

As regards the germinative power of the. seed, tho experiment has shown that, fully matured foreign feed, preserved carefully in air tight cells during the rains in India, keeps its germinating qualities sufficiently well, and ***thai*** the belief current in some circles that, unless exported from England iu hermetically sealed vessels, or if the seed is over one year old, it gets spoiled or is not quite tit for cultivation iu **India,** is groundless.

Tlie highest outturn per acre on unmaniired land was obtained at the Garden from the broadcast sown plots, contrary to the experience of the past year, when the seed sown oa ridges had given the highest produce of roots. The reason for this result soems to lie chicily in too close •germination of the seed sown on ridges, and insufficient (liinninj of the plants, as also to the fact that the crops on ridges were over-irrigated and therefore developed more foliage than roots.

The experiments carried on at the[1] Farm proper, where all kinds of seed were sown on ridges alone in manured lajid, show distinctly (lie superiority of that method of cultivation, not only because they have yielded more roots than any of the broadcast sown plots at the garden, but also because such heavy out turns are not obtained oven under high cultivation by the native cultivators, who usually sow carrot seed broadcast on flat ground.

With reference to the quality of the outturn it may be observed (hat European carrots were generally longer und more tsipsring than native carrots, but not so fleshy as the latter. The red European carrots were very pleasant to the taste, but the country carrots were a shade sweeter, though not otherwise as nice as tho red. The •white and yellow carrots were comparatively coarso, and these, especially the former, may be considered more suitable for feeding cattle than for human consumption ia a year of agricultural prosperity. The red and yellow carrots were generally of average size, comparing very favourably, as regards thickness, with the country carrots; but the •white carrots were both longer and thicker -than all other uarrots, including the country carrots. Some of them were extraordinarily long and fat, and measurements of five of sneh carrots are given below.

	Length.	Circumfertatt at He top.
English white canota	(1) 1' 4"	
	(2) 1' 3"	n i"
	(3) I'1'	fli"
		s"
	(6) 1 1"	7 4"

The advantages of timely sowiug'as compared with late sowing are jwsrfectly clear from the foil owing statement, bised on tUe results obtained at the Garden, where tho sjjcd was sown on different dates:—

Time oC soi ring. Month.	Date.	Number uf plots.	lliffiitst outturn per acre :; !]ii^.]:iiU	Utirut out-turn per Be re in mauiidu.	Average outturn •i> t' acie in Liiiins.]^.	lie [ii irks.
September	25th	3	203 33	130-27	1GO'97	Thentitlnrtw in tliPs'steinentBliav-c been sliown iviitumtrefewmee to any juirtifiiliir imtiEirU."! vskrifit.v. 'f ha outtume nbtnined from plots with uneleaned European seed liiivc not beeasbown either.
!•	27th	3	172-37	107-37	130-23	
n	28th	3	12107	2102	77 83	
October	3rd	3	113 23	17-42	07-70	
,.	I9to	3	50 91	2-19	3067	

N. S.—A nmund=S2 pounds.

At the Farm, European carrots were sown ou3y on.tlie 4tli and Gth of Ociolier. The plots sown on the Inst mentioned date gave a distinctly lower outturn than the other plots. Seed obtained from Ahmeclabad (Bombay) was sown at the garden *on unmanuredlandonlhe* 25th of September 1397, and at the Farm *on manured land* on the 3rd of November 1S97. In the former case tho outturn was 255'95 maunds, but in the latter only 135-26 maunds. The Bombay carrots proved very liable to 'forking' in this country. They were very fleshy, bit exceedingly poor in sugar.

Attempts to produce seed of the imported varieties have failed, both at the Garden and at thePurin.* The "sets" were planted in the usual manner, and grew fairly well but did not hear seed. 'Sets' of country carrots of several varieties were planted similarly at the same time as those of the imported varieties, and they gave very good crops of seed. Experiments to produce tho seed of the imported varieties must be repeated under modified treatment.

Tho two Statements A mid E appended herewith show in detail the individual outturns obtained from the various plots under experiment.

(A)St itement showing tlte outturns of English and country carrots sown at the Farm in 1897-98.

Field no.	Area	t	I) nun of Soiring.'	rEarvojtirif;	Crop.	Outturn per plot io inuun-di. Hoota. M. &	Leaves. -M. S.	Outturn f cr acre iu maim-ds. M. &.	Leaves It S.	Averaga out-turn pec aw Roots. If. S.	r.carcs. M. S.
	200		Ith Octobe 1898.	ICtli .Tail uar 1698.	English red carrot (tlic large red Sleiliterra-nean.)	14 (	2 8	J38 8	S3 2S		
y	200		nitto ...	Ditto ..	Ditto ...	14 (	2 20	::-s L>n	61 13	j.235 4	42 36
	224		Ditto ...	Ditto ..	Ditto ...	8 3	1 lit	174 30	S. 0		
•	224		Cth October 1898.	Ditto m	Ditto ...	7 31	1 12	[illegible] 1 4	27 BE		
	200	i 1	4th October J8E8.	Ditto ..	English white carrot (largo white Mediterr* auean).	16 i<	2 16	104 24	KB 12		
	200	f	Ditto ...	Ditto ..	Ditto ...	16 3£	3 11	181 3fi	79 3	>300 !	55 24
	200		Ditto ..	Ditto ..	Ditto ...	13 S	Z 0	;U7 1-	•15 10		
	21	i	Ditto ,,	Ditto ..	Ditto ...	10 3	2 11	318 4	it 0	I	
I A	200	i	tjth October 1898.	Ditto ..	Ditto ...	7 3i	21 30	ics a	•11 10	t	
	200	i •	4th October 1898.	Ditto ..	Country red carrot, (CawnpoHs variety}.	1 IS	4 2H	177 20	114 10		
	200	t,	Ditto ...	Ditto ..	Ditto ...	13 a	9 0	334 2S	l- 25	,,	
•	200		Ditto ...	Ditto ,.	Ditto ...	12 IS	S 16	301 24	!:>' 32	i l l D	la& 0
1	224		Ditto .,	Ditto ,.	Coantry white car-tot.	7 V,	G 32	153 3	ta 4		
i t	200		6th October isea	Ditto ..	Acclima-tized Ditto ...	S I	1 2G	122 20	40 C	110 2*	85 7
I t	200		4th October 1698.	Ditt< ...	Couutry yellow car-rot.	1 1 f	Q E	271 8	us	271 4	148 28
4 I	600		3rd Nnvomber 1838.	Ditto ...	Country Bom bay carrota	Id SS	1d.1;	133 2G	S 0	135	83 0

Ous maund = 82 Ebs.

(B) Statement sJtowing results of cultivation of carrots at the Garden in 1897-98.

H a 1	Data of •owing-.	Data of harvesting.	M R S	"4 US' S	Name of variety sown-	Outturn per plot in iiiutiiia. Roots. M. S. C	Lcuvos. it. S. C	Outturn per aero in rouunda. Boots.	Leavea.
• 1	[9th October 1897	jsij, pcn-raary 1898.	V	J21	Rod carrot, unclcuDCd,	0 5 (	0 3 0	E-00	3-00
			V	Iil	Wbita ditto ,,	0 9 t	0 0 (	:ciin	e-00
			V	121	Yellow ditto	0 IB t	0 3 0	1200	300
			V	117	Country carrot of Uonibfly.	3 0 I	1 27 t	12410	69-29
			V	5G2	Carrot of mixed varia-tion.	0 20 t	0 4 0	4-30	[illegible]
•2	5th Soptem-ber 1897.	14th Jatina-, ryl8i,		230S	Country carrots of Cawnpore.	S 0 (	8 33 0	31534	86-58
			V	230J	;»rr«U of liiiuibiiy ,..	2 7 t	a SO 0	235-05	120-35
				230J	English carrot, yellow, cleaned'	G 20 (	3 35 I	130-27	81-46
			¥	23OJ	Unelittt carrot, wbJte, cleaned.	6 27 0	2 35 0	140-32	CO'«
			¥	230J	En IT! iah cirrotj i-ud cleaned.	92T 0	2 5 0	203-39	44-67
•3	Ditto ...	8tb Janua. rylB98.		106i	ngliflh carrot, yellow, uncleaued.	0 15 0	0 7 B	17-01	8'83
			¥	10C1	nglieli carrot, wbite, anclesucd.	1 10 0	020 B	[illegible]	S4-1G
			¥	I06J	ii(f!ts!i carrot, rod, ou. cleaned.	1 3 E	0 IS 0	60 08	70-01

• Tbo *seed* was sown broadcast.

(B) Statement showing results 6f cultivation of carrots at the. Garden in 1897-98— (concluded).

3 a I co	Date ot lowing.	Dnteof harvesting.	Plot — n 0	f a s E *. " S	Name of variety sown.	Outturn per plot in [illegible] Boots.	Outturn per plot Leaves.	Outturn per acre in [illegible] Boots.	Outturn per acre Leaves,
						U.S. C	M. ii, C		
			V	170}	Conntry carrot (Cawnporo.)	7 S 0	2 !5 0	2020C	61-33
			[illegible]	170J	Country carrot (Bombay).V	5 4 [illegible]	1 i» 0	14*88	4P-C3
[illegible]	381ft September 1897.	21st and 2 2 D d J January' 1898,	V	170J	English carrot, spoile: (cleaned) *f.*	2 30 0	1 0 0	77-OS	21 SO
			¥	170i	Engiisti carrot, yellow	4 15 0	i :13 0	13107	51-04
			¥	170|	English carrot, white cleft n tKi.	3 & [illegible]	1 0 0	87-91	21-W
			[illegible]	168J	English carrot, Ted cleaned.	0 30 0	0]10 0	21-53	717
			[illegible]	1634	Country ctrrob *(Cawn*pore).	7 20 0	S: 19 0	221-94	88-03
			V	[illegible]	White carrot (Bom. bay).	*i* 35 (	2 3 0	144-26	61-40
S5	27th September 1W7.	18th January 1808.	V	I68f	Wbita carrot (Corn. pore).	6 10 0	1 1!6 0	4S5-3G	48-08
			V	1fi3t	Eng-lisb tartot, yellow	3 30 0	2 0 0	111-06	60-18
			¥	163J	English carrot, white, clennpd.	3 £5 0	1 15 0	107 27	40'OS
			Y	168}	English carrot, red, cleaned.	5 33 0	1]I3 0	172-37	39 20
			y	177J	?onntry carrot (Cawapore).	*4* 15 0	1 30 0	1-K'-Kl	47'G4
•c	3rd October 1897.	-'3rd and 24tuJan-J nary, 1693.	V	69}	Knglish carrot, wd, cleaned.	0 10 t	0 3 0	17-1B	6-as
			...	»*	Enp-lisli carrot, white, el^iMicd.	0 3C (	0 12 0	727Z	B088
			...	[illegible]	Sngliib canot, yellow, cleaned.	1 25 0	0 25 0	113-23	43 5G
			[illegible]	SOS	English carrot, te&. ijeaned.	0 5 \	0 3 0	2-99	1-79
'7	19tb October 189?.	19th, 20tb, and 21ct J *a* iiuary 180b.	don i	202	On^lish carrot, white, [illegible]	2 0 D	0 SO 0	5001	IMS
			0 00 1	202	English carrot, yellow, rl-:irjC'l.	1 S3 L	0 25 0	3B'0S	14-B7
			« 0^D1	S03	Carrot (Botntisj) ...	Z3 33 0	4 1 1 0	30719	102M3
			no* 1	202	Country carrot (.Caivnpore).	6 27 D	1 36 0	159-33	44'92

* This seed was sown broadcast.
T Tbiswas dwnaged by rain, t In thii Krioi seed was (owe infnrrows.
i Seed wai sown on ridges.

TIL-DISTRIBUTION OF IMPLEMENTS.

XJie following statement shows the **distribution** of implement; during the year under report as compared **with 1**ho past year :—

»,,,,.	1BDG-97. 3 &	1BDG-97. [illegible]	1BDG-97. [illegible]	1BDG-97. 3 a Si	1897-98. *o m	1897-98. £	1897-98. i c	1897-98. £	i a	3
Plonghi	99	8	14	121	158	13	7	178	57	...
vun in l• i L UJ T • ir	24	G	6	35	12	fl	4	22	...	13
Enid™ water-lifts ''' ...	a	1	[illegible]	4	u	...	...	c	S	...
It. Hnnfs liibblers,.. ...	8	...	*m*	3	8	...	...	S	5	-
Kahnn libblcrs ...	2	...	...	2	S	"1	...	5	3	
Chaffcuttera ... '''	4	1	...	C	10		...	11	G	...
Harrow ...	2	...	...	2	1	...	...	1	...	
Sivni (vermicelli) presi ~	1	...	...	1	1	...	...	1	...	..
Dredgtrs ...	...	...	...	7	. .	...	i x	1	"1	...
Set of Loring tools... *"	...	13	...	13	...	14 o	...	14	...	...
Baldeo ilonr mill . .	n	...	...	...	...	...	...	...	...	...
40 feet pump complete with **tlo gear.**	...	...	...	...	' 1	...	...	*1*	"'i	...

The ilemand for chain **pumpa** and dredgers was not go brisk during the year nuder report as iu the praeeding year of drought. The exhibition of the Cnwnpore double chain pumps at work iu some of the western districts formed a new feature of the department's programme of work iu the **direction** of bringing improved implements to the notice of native agriculturists during the year under report. One of these pumps was supplied to a wealthy zaniludiir of the Lucknow district who sought the advice of the department as regards purchasing irrigation apparatus suitable for his purpose.

In the distribution of all other implements except the improved native harrow there has been a very marked increase which is specially noticeable iu the case of ploughs, chaffutitters, and kibblers. This was brought about chiefly by the efforts of the representative of the department at the agricultural fairs, aud was also due partly to causes mentioaod iu the next succeeding section of this report.

The Meston plough referred to in the chapter on trial of implements attracted considerable atteution at the fairs, and commanded the largest sule during the year.

The demand for boring tools was much greater than the **department** could possibly meet with the limited number of boring sets at its disposal, and there is much room for extending operations iu this useful direction. The agricultural public will, no doubt, be grateful ii' this is done.

III-DISTRIBUTION OF SEED.

The following table compares the figures of distribution during the year under report and **the** two preceding years :—

Xnrae of seed.	Weight in lbs. supplied daring 1B05-06	Woiglit In lbs. supplied flaring 18eB-a7	Weigbt in ills- mii | 1:_L1 aoring 1807-03.
Miixe cobf	...	...	**441**
Wai™ ...	**6**	**40**	**10,013**
Sorghum impi	**20**	**1231**	**•u J**
Lucerne...	•17	**IS**	**84**
Paddy	**525**	**112**	***Si***
Desi bsjra *(J'tnnisgiua Typieidcum)*	...	**120***	**1,892**
Gujrkti bujr*	...	...	**1,808**
Arhur *{Cajauvt Indica)*	...	...	**S3**
Guinea gross	...	...	**1**
Tlrd *(Phattoltu Eadiatut)*	...	MI	**180J**
Sorghum TTilgnre ...	...	...	**725**
Tilli *{Setamum Indicvm)*	...	..•	2. "I
Wheat ...	9.933	**156,3BG-5**	[illegible]
Cape *onla*	11,655	[illegible]	[illegible]
Hit) itutatws	...	**820**	.*.
Barley ...	...	...	**1,0C6**
Canadian oats	...	...	**118**
Seed canes	...	...	**T lii r ten banJred ciiiiGi iu number.**
Peas	...	...	**666**
White gram	...	...	•ftp.
Country prrani	...	...	**123**
Cot!'in seed	...	G1J-5	**97**
Ingadnleis	...	24	**£11**
Babul *{Acacia Arabics)*	...	**188**	[illegible]
Indigo seed	...	**B**	**S2**
Carrot seed	...	**140,143**	**60,503**
Jffoni cotton seed	...	...	**10**
Nankin ditto	...	...	**6**
White poppy	...	...	**73**
AIsi *(Linum Usitatistimnfn)*	...	...	**11**
Wairson *(Urussica Camvettris)*	...	...	**6**
Tobacco...	...	...	**SO**
San wan (panic um *Utiliaceum aai Panicum Frumtn-faceum).*	...	...	**8,768**
ILiiidun *(Eleusiw Caracana)*	...	...	**2,091**
Kodou *{Bitjpalum Scrabicutatvtn)*	...	...	**63,3-12**

This subject has been receiviug special attentioa from the officers of the department since the past year, and as a reKtilt this branoh of the department's agricultural business has, it will appear from the statemeat, developed very considerably during tBe year under report.

Under the Board's orders the special managers of some of the important Court of "Wards Estates of the United Provinces assembled at Cawnpore on two occasions during the year to sice the Farm and discuss some agricultural questions of practical utility. Among the matters considered at these ineBtitigs, one, perhaps the most important, **was** the **utilization** of the resources of the Farm for the **supply** of sound and selected agricultural seeds to the common cultivators. IudeiiSs for different kinds of seeds from the various Special **Managers** followed, **and** were duly complied with. My increasing familiarity **with teitiqcUrs** and zamiud&rs during **my** tours has also been productive of some good in this respect.

Experiments have bean started recently with the object of improving (he quality of the seed stock of the Farm by sowing specially selected seed of the Jaunpur and the Cawnpore varieties of **maize** with a view to ultimately establishing two kinds of " pedigree maize," and the results just obtained from the ***kharif*** harvest promise a real success in thi3 direction in course of time. Similar experiments with one or two varieties of wheat will bo commenced in the ensuing *rabi* season, and a very useful future for them might be expected. *Two* of the Court of "Wards estates (Gh&zipur and Sitapur) have each indented fora "saed separator" through the Department from England. This useful implement efficiently separates the thick and plump grains, **Specially** suitable for seed puqwses, from the thin ones. "When the seed passed through this machine £a freely distributed and sown in the estates, there will no doubt be a very marked change in the quality of the produce of the cultivators' fields.

"With reference to the table above, the apparent decrease under wheat as compared with the past year U due to thti inclusion in the past year's figures of 150,000 ftw. of white wheat procured from Meerut for the Director of Laud Records, Burma, who required it for experimental cultivation in the Southern Shan States. This was an extraordinary demand, and if it were not taken into consideration, the figures of the year under report will show an enormous increase compared with the previous year. Among other agricultural seeds the iacreaso is particularly marked tinder maize, bajra, barley, Canadian oats, urd, juar, peas and gram.

The poppy seed was supplied under the orders of tlio Government of India to the Premier of New South "Wales who required genuine seed of the white variety for experimental cultivation. The seed canos were supplied to the Collectors of Miraipur nix! **Gys** and the Ingadnlcis seed chiefly to the Superintendent, Family Domains of the Mabirija of Banares, for cultivation id poor soils. It inny be remarked that Ingadulcis is a particularly qniok-growing plant specially suitable to bo grown as a hedge and for' fuel or for making shady avenues.

The large supply of *kodon, mnwan,* and *mavdaa* seeds was sent to the Conservator of Forests in tiie Hyderabad Assigned Districts, and the Department had to take special pains in procuring the seed3 in such considerable quantities on account of tho scarcity which prevailed in the United Provinces when the indent was taken *in* hand.

Tho whole of the month of September and the greater part of October were taken np with tho laborious task of distributing the past year's surplus stock of European carrot seed, with reference to which a separate report has been enbrn'tted to Government.

IX.-SERICULTTOE.

Nothing could he done during tho year towards resumption of the silkworm experiment, l_a the month **of Jane,** which was the time to study practically the iuettiod followed by Raja Rarapal Singh at ICalfikankar in order to keep tho moths alive in the height of summer, I was out in Kohilkhand and Meerat Divisions inquiring into the condition of the sugar trade and industry, »nd could nut get away. The matter will be taken up i_u the next hot -wether.

X.-HOKSE BREEDING.

The Arab shllion "Latora" maintaiuedat the Farm for breeding purposes has kept very good health during the year, and done his work satisfactorily. The

Superintendent of the Civil Veterinary Department, who examined him in the middle of the year, recorded a favourable opinion of the condition of the auimal.

The results of the past year's coverings were not known in 29 oases when the last report was submitted. Since then five have fouled, one died, and the remaining were either failures or not reported on by their oivuers.

During the year nuder report the stallion served 40 marcs, the results of which will be noticed next year.

XI—CATTLE AND CATTIE BREEDING.

(a) Cattle. Breeding.

During the year under report one Kosi bull was supplied to the Superintendent, Lunatic Asylum, Ikreilly and another to the Special Manager, Court of Wards Estates Situpur (Oudh), besides four bulls of different Kheri breeds to the Managers, Court of Wards, Bara Banki and Bahrawh, all procured by the Department.

Of the coverings by the breeding bulls kept at the Farm, done in the past year, results were not known hi 30 eases when the report for Chat year was drawn up. Of these, 17 have since calved, 10 have been failures, and 9 are reported to have died. The Kosi bull of the Farm reported last- year maintains ita reputation, and is much appreciated generally. He served 54 cows during the year under report > the results in 30 coses are not yet known, 14 have calved, 5 have died, and G proved to have been servel unsuccessfully.

The two Parehar bulls reported in the past year commenced regular work during the year under rei>ort They served altogether 18 cows during the year, of which 4 have calved, 2 are reported to have di&l, ant] 5 coverings proved unsuccessful. The results iu the remaining eases are not yet known.

(b) The Veterinary Hospital,

This small institution has been maintained especially for the benefit of the Farm and the neighbouring villages. The *salotri* in oharge of the dispensary has to bfr absent, on and off, for procuring breading bulls, and duriug his absence no patients are treated.

During the year the former *salotri* was deputed to Meerut on agricultural work, and his place given to a qualified *salotri* who was obtained from the Civil Veterinary Department, B;»bugarh, in the hope that under him the work of the hospital would materially improve ; but the man proved most careless and negligent. His services were dispensed with, and th? old luciimbeut called back from Meerut.

Altogether 21 patients suffering from various disorders were treated during the year, all being cured except one.

(c) *Miscellcmeous.*

Experiments in different systems of conserving cattle manure.

The objects kept iu view in these experiments are (1) to determine the quantity of manure that can be obtained ia a year from a pair of working cattle ; and (2) to utilize the urine, which contains more nitrogen thaD dung, but most of which is wasted in the ordinary practice of the cultivators. "With these objects various systems are tried in differevit sheds as detailed below.

Sited A.—la this shed the dung dropped in course of 24 hours is spread and covered over with 5 tti3, of litter per pair every ntoruiug and the dung, nrine and Iittor are removed together at the end of the month.

Sktol B.—Tito same quantity of litter is used in this shed as in shed A for absorbing tho urine, but the dung is removed every morning and the litter at the end of each month.

Shed C—The box system of preserving dung and urine is tried in this shed, and has now had three years' trial. The box consists of a pit 3£ feet deep, 7 feet broad and 10 feet long, having its bottom plastered with clay, sprinkled over wi A ashes, and a thin layer of straw spread thereou. In front there is the manger for the fodder. The dung dropped duriug the night is spread evenly and covered over with a fresli supply of litter at 5 lbs. a pair every morning.

After a period of about six months the pit gets full, when its contents are taken out and used directly as manure, having undergone sufficient fermentation in the pit. The manure from the upper surface is, however, separated from the well-fermented mass below and is kept back again in the pit. The pit is sometimes emptied sooner if manure is required for fields.

Shed D.—The absence of material to be used as litter might be a difficulty with some cultivators, even supposing they get to recognize the importance of urine as manure and the necessity of preserving it. Hence no litter is used in this shed, but dry earth is employed for the absorption of the urine and keeping the filled clean and free from smell. The urine not so absorbed flows down a drain into a pot sunk into the ground for collecting it. The cattle of this shed get concentrated food, such as cotton seed, gram *&c.* This system which has now been under trial for about two years and a half has received the approbation in particular of the Special Managers of Court of Wards estates and all other visitors to the Farm, being the simplest and cleanest of all.

Shed E.—The same system is followed in this as in shed D, but the cattle kept in it are of older age and get no concentrated food. The object of this experiment is to see how far concentrated food improves the quality of the dung and the urine as a manure, specially as regards the percentage of nitrogen. This was started in the past year.

The quantities of manure obtained under these methods from a pair of working cattle during the year under report and the preceding years are given in the following statement:—

Name of shed.	Description.	Quantities of manure obtained under the several methods from a pair of working cattle		
		1895-96.	1896-97.	1897-98.
		lbs.	lbs.	lbs.
A.	Dung, litter, and urine	7,821	9,440	10,863
B.	Dung alone	7,325	8,808	10,069
B.	Litter and urine	2,371	3,524	2,903
C.	The box manure		7,372	9,800
D.	Dung and urine	10,517		14,100
E.	Ditto	...	8,717	11,203

Samples of all the manures prepared under the different systems could not be analysed chemically during the year under report owing to the absence of Dr. Leather from India since November 1897, but a few of these manures were analysed, together with certain other manures used at the Farm, by the Assistant Agricultural Chemist at Dehra Dûn. The figures are given in the following table :—

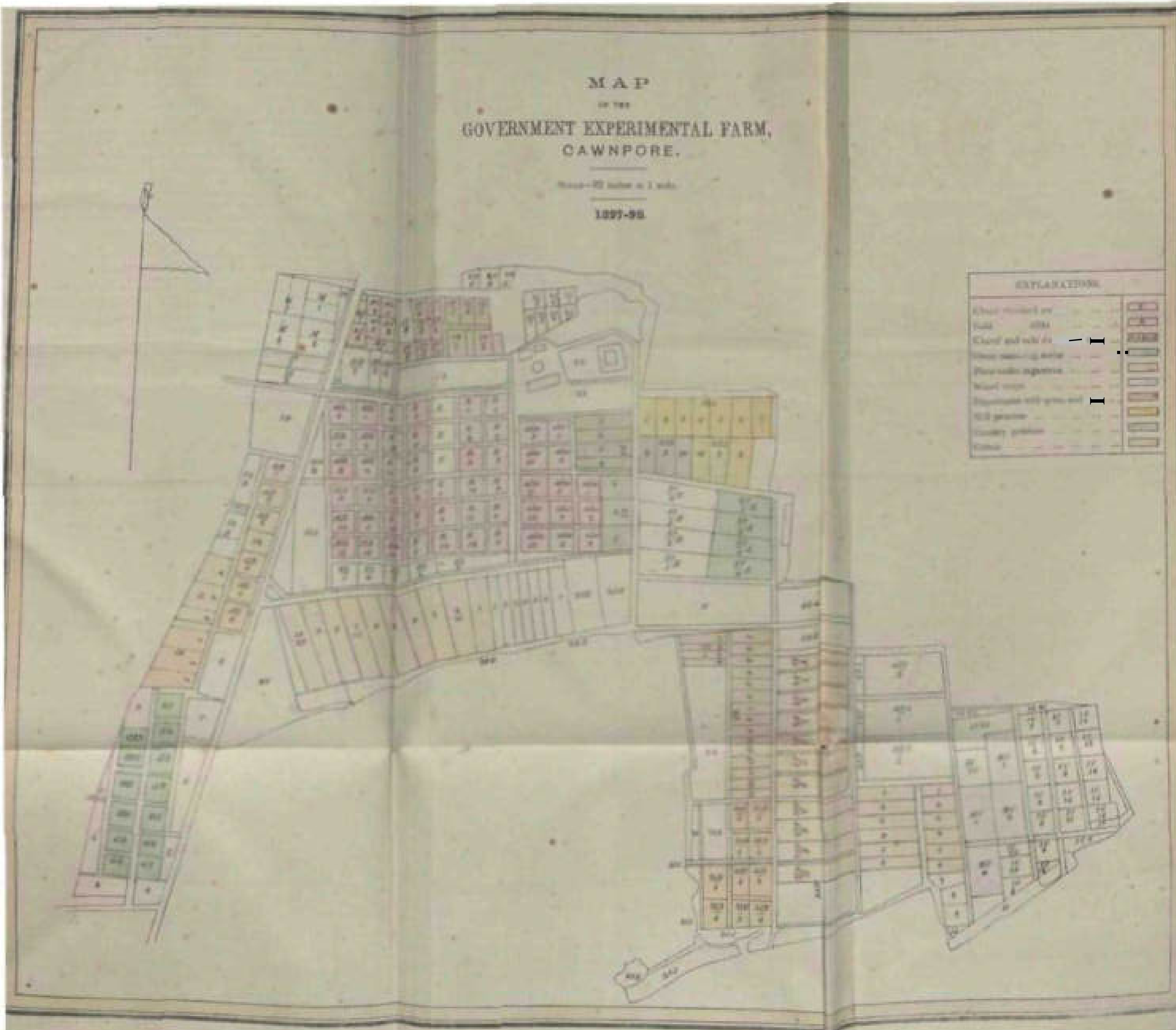
Statement showing analyses made by the Assistant Agricultural Chemist to the Government of India.

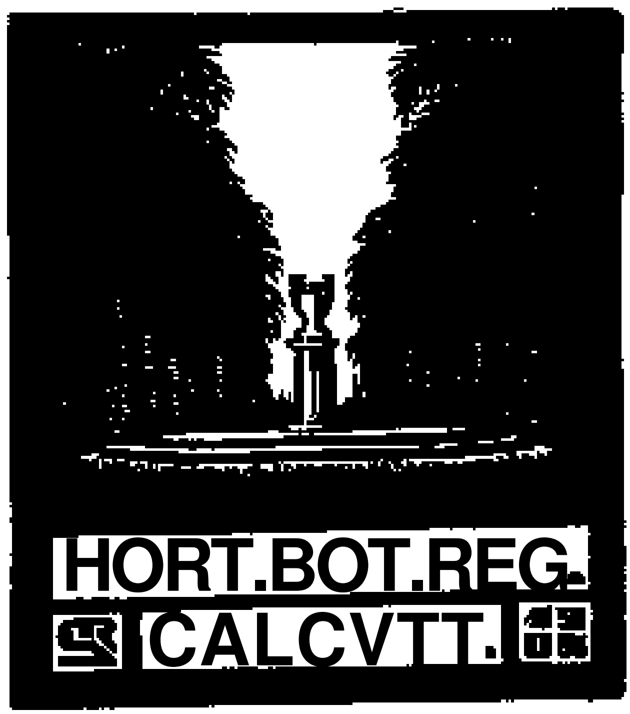
No.	Description.	Percentage of moisture.	Percentage of nitrogen.
1	Dung, litter, and urine of shed A	36·21	·70
2	Dung of shed B.	76·46	·33
3	Dung of shed D, (cattle getting concentrated food)	70·81	·33
4	Cattle dung bought from the bazaar	26·39	·440
5	Poudrette of Cawnpore municipality bought at Rs. [illegible] a cart-load ...	24·92	·605
6	Saltpetre bought from Cawnpore bazaar at Rs. 8-4-0 a maund ...	...	13.4

The above statement shows that of the organic manures analysed, the farm-yard manures prepared under shed A was richest in nitrogen.

DATED CAWNPORE:
The 20th of September 1898.

S. M. HADI,
M. R. A. C., M. R. A. S.,
Assistant Director.


MAP
OF THE
GOVERNMENT EXPERIMENTAL FARM,
CAWNPORE.
EXPLANATIONS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CAWNPORE EXPERIMENTAL FARM>

OFFICIAL MANAGEMENT OF THE FARM.

THE farm work is now divided under two heads : —

1.— Agricultural experiments, which consist mainly in the measurement of results of various methods of cultivation.

II.—Mechanical experiments, which relate to the development of agricultural machinery,

2. Progress under the first of these classes has been much impaired by the neglect of the managing superintendent which led, under circum-* stances already reported to Government, to his enforced resignation. Progress under the second class may be accepted as considerable.

3. Since the removal of the late superintendent in October last, Mr. Fuller has been placed in responsible charge of operations, and has been provided with accommodation in the house belonging to the department near the farm lands, iu which, pending other arrangements, he will continue to reside during the greater part of the year.

4. Previous reports have noticed the initial attempts which had been made at the farm for the development of agricultural workshops. Mr. Fuller since joining the department had personally superintended work in this direction, and by last May had made no little progress in the modification of English ploughs for native requirements.

5. I had also during 1878 and 1879 prepared on the farm premises, for the scientific trial of various kinds of waterlifts, a series of wells and measuring tanks, the construction of which occupied a considerable time, but which during last rains were brought to completion. They were so constructed that any kind of waterlift could be tested in them, and meanwhile I had procured from Roorkee or had had constructed on the farm such models of waterlifts as I could obtain.

6. While these operations were ia progress, I lost no opportunity of representing to Government the importance of attaching to the department the services of a skilled engineer, on the ground that the development of machinery suited to the country must be kept under the control of skilled supervision, for very obvious reasons, some of which Avill be presently recorded,

7. The result was that Mr. Jones of the Irrigation Department, in charge of workshops at the Narora head works of the Lower Ganges Canal, was in May, 1879, temporarily transferred to the department, but in consequence of his services being required for railway purposes, was very shortly afterwards transferred to the Kajputana State Railway,

8. I then made an urgent request for the services of another engineer, and as it so happened that the committee appointed in 1878 for investigating questions connected with the deteiioration of land under the influence of *Reh* (saline efflorescence) had at about the same time strongly

Note by Director, Dept. Agriculture and commerce.

recommended Government to place the scientific investigation of *Reh* phenomena under a special officer, it was determined by Government to depute permanently to this department an engineer from the Public Works Department. Mr. Wilson of the Irrigation Department was specially selected by Colonel Brownlow, the Chief Engineer, Public Works Department, for the appointment, and this officer joined at Cawnpore in the month of August. His report on the comparative results of the different classes of waterlifts tried on the farm, to which I will refer again, is appended. Mr. Wilson has since been transferred to another district, to lake charge of operations connected with *Reh,* but will continue to give his assistance to Mr. Fuller at Cawnpore when required to do so.

9. At tlae beginning of the year I took on the farm a European apprentice (Mr. Crawley) who had had some years' experience in farming and flax-growing in Ireland. He is now in immediate superintendence of operations under Mr. Fuller's orders, and occupies the late Superintendent's house on the grounds. So far he has proved trustworthy and careful.

10. I had sometime ago determined that experimental work should as far as possible be transferred from the farm area to a neighbouring Court of Wards' estate known as the "Rawatpur" estate, which is likely to remain under Government management for several years. An opportunity was given to me to do so by the orders I received from Government to take any advantage of Court of Wards' estates for agricultural experiments, so far as they did not iuvolve unremunevative outlay to the treasury of the estates.

11. The following quotation from one of my letters will explain my reasons for wishing to carry out agricultural operations on the Court of Wards' villages rather than on the farm :—

"The farms which Government maintains cannot be termed model farms, " partly because for one thing in which we can beat the native, he can beat us in a " hundred, and partly because if the farm was cultivated on Government account, " peculation and dishonest labor would destroy the value of every result. As it is, " native dishonesty goes far to impair the value of experimental cultivation, but it " would absolutely ruin any attempt at model farming. Every man employed to cut " the crops, to thresh, winnow or store the grain, or to sow the seed, takes something " of what passes through his hands, and thus prevents accuracy of measurement, while " by shirking their work, the cultivating laborers prevent accuracy of the record of " cost. The only hope of ensuring true experiments is *to* adopt a system under which " cultivators will carry them out on their lands for their own benefit."

12. The situation of the Rawatpur estate offered a convenient opportunity for establishing a system of agricultural experiment by the best agency, that of cultivators themselves, under our own directions.

FARM OPERATIONS.

Before noticing the operations desciibed by Mr. Fuller and Mr. Wilson, I will repeat the remarks which I placed nearly a year ago before Government in exi^lanation of the principles which have been adopted in developing experimental operations for the adaptation of foreign machinery to native requirements.

Note by Director, Agriculture and Commerce.

« In the first phce, we have to deal with a climate and with conditions of soil " completely at variance with those of England. The most skilled English agricul- " turist ought, therefore, to have the greatest diffidence in proposing any change, " founded on any English experience; in a system of cultivation which has been " evolved by centuries of' natural selection.'

" Every English machine or implement may, in the first place, be condemned as ?*prim& face* unsuitable for India, notwithstanding even that the principle on which " it is contructed may be equally sound for Indiau as for English conditions. The "onus of proof will always lie on the side of establishing that an English machine is " useful to this country, smd not on that of proving that it is not useful. Hence " our farms must {*quoad* machinery; be experimental, not inodol.

" The chief objections to English machinery (the word is intended to include "' implements') are, first the price, utterly and completely out of the reach of tho " mass of Indian cultivators; the second is the cheapness of labor with which machi- " nery has to compete, and the third is their unsuitability to Indian conditions.

" We have therefore to begin firstly, by reducing the cost of construction of "machines; secondly, by limiting our machines to those which will increase the " effect of available labor rather than economise or provide a substitute for labor : " thirdly, by modifying the machines until they are suitable for Indian conditions. " It follows that, until these objects ^re effected, we cannot, so far as machines are " concerned, come forward *to* advise natives *to* adopt any class of machines, or to " attempt to instruct them in their use.

"JThe second point noticed requires illustration by a practical example. A well " bucket (A) has been invented which is drawn by *one* bullock and *one* man, the ordi- "nary bucket in use (B) is drawn by *two* bullocks and *two* men; B raises less than ."double the water raised by A. But A, though it economizes labor, does not " increase the effect of existing labor. B gets more out of existing labor than A ; " *the* number *of* wells remaining the *sime*. *For* this reason cultivators prefer B " to A.

" If, then, the position assumed is accepted, that we must ascertain *how* machi- " nery can be adapted to meet native conditions before attempting to introduce them "*or instruct others in their use, then the first step is to choose the class of machines " to be adopted, the second to"adopt them, the third to introduce them."

13. During the past year, or*for a still longer period, we have adopted for experimental development three classes of machines, *viz.,* (1) Foreign ploughs, which I shall presently explain are implements new to India ; (2) waterlifts, in which improvement will (if practicable) be of great service to an irrigating country, (3) grain-cleaners or sifters.

14. The next step has been to attempt their modification or adaptation to native requirements. An account is given in the appended reports of progress made in this direction.

15. The third step has been to commence their introduction.—That this has been effected with some measure of success in the case of ploughs, and with some prospect of success, in the case of waterlifts, is also shown in the reports. The adaptation of grain-cleaners is not complete, but it is intended that some should be ready for trial by next rabi harvest.

16. *A. Ploughs.*—Mr. Fuller, the assistant in this department, deserves much credit for the energy and perseveranca which he has devoted to the development and construction of a cheap plough in which the

!$.%riMta& « Commerce.

mechanical principles of the English plough, altogether wanting in the natire implement, brought ... cultivator, as I have represented elsewhere. The Indian plough ought not to be called a plough at all. It is a grubber or toothed implement, which (aa Mr. Fuller explains) stirs the soil without inverting it. It is an extremely good implement for the purpose it fuMls, and will probably never be superseded or ousted by any implement that we can introduce under the name of a plough. But it cannot be too often repeated, that the native implement, good as it is, is not, in English farm language, a plough at all, and that in introducing the implement which we are trying to establish, we are introducing a new implement into native agriculture and not trying to oust an old one. The same development has occurred in England. Diagrams from early English books prove the so-called Saxon plough to have been a very similar implement to that which has hitherto been known as the Indian plough, *I e.*, a soil stirrer, and not a soil invertor. The new principle of " inverting the soil" by an implement drawn by cattle is of comparatively modern application. In fact, the plough of the Saxons has received a double development in recent agriculture, one of which is the soil-inverting plough, and the other the soil-stirrer, known uuder the various names of grubber, subsoiler, bull-tongue, &c.

17. At the same time, while the new principle of inverting the soil has been thus introduced, an attempt has been made to combine the further advantage of opening the soil to a greater depth than can be effected by the native implement. How far this can be successfully effected without a corresponding increase in the power of the cattle used for agricultural purposes is yet doubtful, but if increased depth of soil-stirring, as well as inversion of soil can be attained, a double advantage will have been gained. It is now a matter of trial, which the farm experiments will shortly bring to a certain conclusion, to what depth we can allow the soil inverting plough to be used without placing too great a burJen on the cattle of minimum power, usually employed by cultivators^ As Mr. Fuller points out, much difficulty has been occasioned by an imperfect knowledge of the method of using the new implement, which has led to its rejection in some cases on theplea that cattle have not been equal to its draught. But the experiments now being conducted will succeed in determining the exact draught which ordinary cattle can sustain when the plough is properly used, and meanwhile the principle has been adopted of discontinuing the distribution of ploughs until competent ploughmen can in the first instance be sent out to teach their use.

18. Mr. Jones and Mr. Wilson instituted some careful experiments (which are still being continued) to establish the average draught which an ordinary pair of bullocks can sustain, and this once determined, it will be a matter of mechanical adjustment to construct implements to which the strength of bullocks is adapted.

19. I wish to draw attention to those remarks made by Mr. Fuller which indicate the great advantage which has been derived from Ameri! can models. For cheapness and adaptation to Indian requirements,

Dept. [illegible] and commeice.

they appear certainly in advance of English patterns, and I believe that it may be even found possible to obtain the ironwork from America almost as economically as it can be constructed here, with the great advantage that it will be far more durable.

There is no doubt that a light American plough constructed iu America is a more perfect instrument than we can (under any circumstances) make up in India, and that if we can import the metal portion from that country cheaply enough we shall be able to give to the cultivator a more useful instrument than any that we can make, and at the same time an implement which a native *mistri* can ordinarily put together and keep in repair without difficulty, since, if it occurs that any portion of the ironwork should break, a new piece of the same pattern would be supplied for a few annas.

20. I have not gone into the question whether soil inverting is or is not useful. I assume that it is. Of course, if the assumption is wrong, the advantage of a soil inverting implement disappears.

But so long as we have the experience of England, America and other civilized countries on our side, and so long as natives in India believe, as they do, in spade digging, so long are we entitled to presume that there will be an advantage in applying to this country the principle of the English plough, which may not be improperly termed a cattle drawn spade.

21. *B. Waterlifts.*—The object of the experiments in waterlifts is to ascertain whether any more effective machine than those now used can be placed in the hands of the agricultural population.

In order to solve this problem, it is necessary first to measure the cftective work of existing appliances, next, to make experimental trials with new models, and to select any which are more effective than those existing. Thirdly, to adapt models thus selected, so as to bring them within the reach-of native agriculturists.

For the purpose of measuring the work of different waterlifts the following arrangements have been made:—A masonry well about 50 feet deep has been constructed near a large tank, which latter is filled with water from the Ganges canal. The well is closed at the bottom with a brick floor, and a channel from the tank admits water to any depth required. This arrangement permits of the adjustment of any waterlift for depths not exceeding 50 feet. Near the well small masonry reservoirs are placed in which the water lifted in a given time can be accurately measured.

Of the general results obtained and recorded in Mr. Wilson's note the following is a brief abstract:—

22. Native appliances tested on the farm are three in number—

1. The swing-basket used by hand-power for depths not generally exceeding 5 feet.
2. The dhenkli, or earthen pot raised with lever by hand-power for depths of about 15 feet and under.

S£ lS^Sl and commerce.

3f The ordinary leather bucket worked by cattle on an inclined plane and generally used for depths exceeding 15 feet.

Persian wheels are little used in this province, and have not yet been tested on the farm, but statistics have been obtained from Bundelkhand, which are included in Mr. Wilson's note.

23. So far as observations have been recorded, baskets are most effective between 3 and 4 feet; and in terms of one Horse-Power the useful work done by 4 men is about 0·08—or 0·02 per man.

24. The work of one man at a dhenkli raising water from 13 to 15 feet is equal to about 0·03 of one Horse-Power. It must be however borne in mind that one man is in each case required on the field to regulate the distribution of water, and that with the dhenkli much less work is required from this man than in the case of the basketlift (by which much more water is raised in the same time). It is usual therefore for the two men at the dhenkli to take turns in raising water, whereas the fifth man at the basket does not assist. This circumstance makes the work done per man in the two cases nearly equal, and gives as a fair working unit 0·02 of a Horse-Power as the effective work of one man.

25. In the third case, that of the leather bucket, which may be said to be the ordinary waterlift of the province, the effective work of 2 bullocks increases considerably with the distance of water from the surface. The experiments, so far as they have gone, indicate the effective work per hour at 40 feet as about double that at 15 feet. In the former case it was 0·127 of a Horse-Power, in the latter 0·064.

26. The experiments are not considered final, and will be continued with different pairs of bullocks until a sufficient series has been recorded to justify more definite conclusions. Assuming however the results of the observations to afford a basis for calculation, the problem which has to be solved takes the following form :—

Can a waterlift, sufficiently cheap and easy of construction, be provided which up to 15 or 20 feet can be worked by manual labor, so that the effective work of each man employed will be greater than 0·02 of a Horse-Power, or which at a depth of from 15 to 40 feet can be worked by bullock labor, so that the work of a pair of bullocks is greater than 0·127 to 0·064 of a Horse-Power? The solution of this problem cannot, as I have indicated, be definitely undertaken until the data are more conclusively established, but the above statement will show clearly the method in which it has to be worked out.

27. Side by side with the above observations experiments have been tried to ascertain the effective value of new appliances, in order to provide data for the solution of the problem stated in the last paragraph.

These have been three in number; (1) a chain pump worked by hand labor ; (2) a chain pump worked by bullock labour ; (3) a double bucket worked by bullocks.

[The latter is only so far new that it has not been yet adopted by native cultivators in the North-Western Provinces, though it has been often the subject of experiment on experimental farms, private gardens and elsewhere.]

Note by Director, Dept. Agriculture and Commerce.

28. The general results are these—

(1.) The chain pump worked by four men is proved to be very effective for lifts under 15 feet ; the effective work of one man being about 0*034 of one Horse-Power.

(2.) That worked by bullock-power has only been tried at about 40 feet. It is much less effective than the ordinary leather bucket, the effective work of a pair of bullocks not exceeding 0-1 of a Horse-Power.

(3.) The term " double bucket" indicates that one bucket descends while another rises, both being worked by the same bullock or pair of bullocks. The effective work of one pair of bullocks, so far as experiments have been made, is about 0·18 of a Horse-Power. At depths up to 20 feet this exceeds the effective work of the ordinary bucket by about 50 per cent.

29. Another form of comparison is given by Mr. Wilson in tabulating the cost of the work performed by different appliances. The result is shown in the following table :—

Name of appliance.		Height of lift.	Cost of raising 1000 tons of water 1 foot high.
			Annas.
Manual labor,	Basket ...	3' to 4'-5	14·1
	Dhenkli ...	13'	8·7
	Chain pump ...	10·5 to 15'	8·2
Cattle labor,	Ordinary water-bucket ...	20' to 50'	14·0 to 9·6
	Double ditto ditto ...	20'	8·9
	Persian wheel ...	20'	11·7

30. The results indicated in the foregoing remarks have justified an attempt being made to adapt the chain pump to native requirements. The working models first employed were :—

(1) A pump brought myself from Australia at a cost of Rs. 300.

(2.) A pump manufactured at Roorkee for about Rs. 100.

These prices are too high forordinary cultivators, and can only be given in exceptional cases by rich zemindars. Experiments have been made by substituting, (a) sheet iron, *(b)* wood, (c) leather and bamboo, for the ordinary iron tubing. The result has been a reduction of cost to something like Rs. 20 to Rs. 30, though it is not yet determined which of the new models will be formed most permanently effective. There is every reason to believe that this waterlift (of which the principle has been adopted with success in Australia as well as on pumps used by cultivators on the Ghazipur tobacco farm) will in one form or another be made readily adaptable to native requirements with great effect in all areas in which water is not more than 20 feet from the surface, and especially in those tracts (which are far from uncommon) in which bullock labor is deficient.

31. The above remarks will give a definite idea of the principles on which experimental work is being conducted. I cannot speak too highly

Note by Director, D[illegible]

of the energy and ability which Mr. Fuller and Mr. Wilson have devoted to it, and, as I have said, whatever improvement has been made in the plough is due to Mr. Fuller. I regret however the difficulty which has been experienced in finding a good farm superintendent. The choice lies between aa incompetent man who knows something of the country and its agriculture, and a competent man who knows nothing of them. The criticism is true, that competent mea in India have succeeded in providing for themselves elsewhere, and are not forthcoming, while the experiment of bringing out a farmer from England who may or may not succeed, is a dangerous one to adopt without much caution, and has been indeed viewed with disfavor by high authority, in one instance at least, in which it has been proposed. Moreover, as I have in previous reports explained, we were saddled at first starting with previously imported farmers of the wrong class, men more fitted to grow roses than wheat.

At the present time experimental work of one class, *viz*, that affecting agricultural machinery is, in my opinion, making sufficiently good progress. Experimental work of the second class, *viz.,* that affecting methods of cultivation has been hitherto unsatisfactory, and although it will be placed on a much securer basis for the current year than the past year, and the assistant now on the farm under Mr. Fuller is a farmer of some experience at home, it remains a question, which will be brought under discussion elsewhere, whether or not scientific supervision should be obtained, and if so, in what way it should be provided.

E. C. BUCK,

llth February, 1880. *Director, Dept. AgrL and Commerce.*

REPORT

ON THE

CAWNPORE BIPERIHENTAI FARM,

FOR THE TEAR ENDING DECEMBER 31st, 1879.

Report by Mr. J. B. Fuller

Official superintendence.

AT the commencement of the year a new Superintendent was engaged, who, judging from the excellent recommendations he brought with him, should have proved himself more successful than his predecessors. But events have shown him to have systematically neglected orders from the very commencement of his tenure, and he is proved to have exercised no real supervision over the various operations in progress in the farm, and have trusted entirely to his native subordinates for the accurate recording of the results. An enquiry instituted in October last ended in his resignation from November 1st—the date from which I was put in immediate charge of the farm.

2. Under these circumstances I hesitate to put forward the various results which are represented to have been obtained. Unless they are guaranteed to be accurate, the publication of such results will be worse than useless, and the circumstances under which they were collected, and to some extent, the suspicious regularity and correspondence exhibited by the results themselves throw the very gravest suspicions on their accuracy. I therefore put aside all agricultural operations for the conduct and record of which the Superintendent was solely 'responsible, and confine the present report to the following three heads :—

(i.) Experiments in the reclamation of *reh-infected* land on the Ráwatpur Court of Ward's estate.

(ii.) The adaptation and construction of improved agricultural implements for Indian use, which were conducted under my immediate direction.

(iii.) Experiments on the comparative efficiency of various methods of lifting water, conducted for the most part on the farm premises by W. J, Wilson, Esq., Assistant Engineer, on special duty with this Department.

3. (i.)—*Experiments in the reclamation of reh-infected land on the Ráwatpur Court of Wards estate.*

(i.)-Experiments in the reclamation of *reh*-infected land on the Rawatpur Court of Wards estate.

A number of the villages which constitute the Biwatpur estate are situated at only 2 or 3 miles distance from the farm premises, and the programme which was laid down for the guidance of the late Superintendent included the introduction into these villages of improved methods of cultivation under the orders of the Collector of the district. This remained a dead letter, and the only agricultural operations, worthy of the name, which were conducted on this estate, were some attempts to reclaim *reh*-infected land in the village of Sh^hpur on the banks of the Ganges canal. These experiments were not under the immediate charge of the Farm Superintendent, but of his Assistant, and I believe that they were conducted with fidelity and the results accurately recorded.

4. The ground operated on lies close under the canal bank, and is a fair specimen of *tear* land, covered with efflorescent salt in some places, and in others bearing scanty

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tufts of grass and, here and there, small *babtil* trees. The following is a summary of experiments which were tried :—

No.	Area of plot.	Ploughing.	Manure.	Seed.	Watering.	Results.
1	i acre,	Watered and ploughed with the English plough in May and again (8" deep) in July,	*Ashes of the Madar (*Calatropis gigantea.*)	Babul sown broadcast.	None ...	Seed germinated fairly well, the young trees now (December) 3° to 6" high, not looking healthy.
2	Do. ...	Ditto ...	Ditto ...	Juár, as a fodder crop	Ditto ...	Germinated unevenly, and in some places grew to a good height. The yield was only 13 mauads 14 seers of green fodder.
3	Do. ...	Ditto ..	Ditto ...	•Madár (*Calairopis gigantea.*)	Ditto ...	Germinated well, but the young plants are now (December) withering.
4	*Do.* ...	Ditto ...	None ...	Babul, sown broad-cast.	Ditto ...	Germinated well and the plants are in rather better condition than on plot No. 1.
5	Do. ...	Ditto ...	Ditto ...	Madár ...	Ditto ...	Condition of crop similar to that OI *a\J.* o.
6	Do. ...	Ditto ...	Ditto ...	R'ce ...	Was to have been kept flooded, but from failure of canal water this was impossible.	Only the plants situated on the high parts of the field grew to any height, the whole crop withered away when the ground was allowed to dry and only yielded *A* seers of grain.

In addition to the above experiments the effect was tried on smaller plots of—

(a). Removing the upper crust of soil to the depth of three inches, and replacing it by earth dug from a pit in the corner of the field.

(b). Paring and burning the upper crust of soil, and re-spreading it.

(c). Surface draining by shallow trenches 5' apart sloping into a pit at one corner of the field.

Although twice sown not a single seed germinated on plots *(a)* and *(b);* plot *(c)* was not to be sown till November, but appeared to give better results than any other of the plots experimented on, judging from the crop of grass it bore in the rains.

5. The processes experimented with, of the success of which some hope may be entertained, were therefore in the main three, (i.) deep cultivation two months before the rainfall, and again at the commencement of the rains ; (ii) manuring with madir ashes; and (iii) surface drainage,—but it is too early as yet to form a definite conclusion as to their results, which in some cases *(i. e.,* babul cultivation) will not be complete under a full year. A portion of the ground has also been sown with rabi crops.

(ii.)—The adaptation and construction of improved agricultural implements for Indian use.

6. (ii.)—*The adaptation and construction of improved agricultural implements for Indian use.*

The implements which have engaged attention during the year are ploughs and waterlifts.

Ploughs.— The main difference between the European or American and Indian plough is that the one inverts the soil while the other merely stirs it. The popular idea which associates English ploughs with deep and the native implements with shallow cultivation must be accepted with much reserve. Enquiries have shown that in the case of good cultivators at all events, the depth to which the ground is stirred in preparation for a *rabi* crop, is often equal to the average depth of English cultivation. This depth is generally attained by a laborious and costly system of ploughing and reploughing, and occasionally by the use of a more powerful implement than that ordinarily employed. Under the orders of the Director, Department of

Maddr ashes were tried as a manure in consequence of the r[illegible] of several [illegible] .emindars, but its efficiency was not apparent in these experiment* *MJS*[illegible] [illegible] object of determining whether the laud could be made at small cost to produwa nlant theashes [illegible] would be serviceable when returned to the soil. [illegible] a plant, tne asnesof [illegible]

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Agriculture and Commerce, a collection of the ploughs used in each district of these provinces has been commenced, and the differences thus brought out are very striking. In the majority of districts the plough which is used, though of varying shape, consists essentially of a tongue of wood fitted with a small iron tooth. But, to notice one or two of the most striking divergences from this type, the ploughs contributed to the collection by the SaMranpur, Muzaffarnagar, and Meerut districts are of nearly double the ordinary size and weight, are shod with a horse-shoe shaped piece of iron round the edge of the " tongue," and instead of a small iron tooth are fitted with a long pointed bar of iron which projects out behind the Aeel of the plough and can be forced forward as its point wears down. Another plough used in one portion of Bundelkhand (the *ndgar)* weighs 3 mds., 14 seers, that is to say, considerably more than an ordinary English or American plough, and stirs up the earth to a depth of 9 inches or a foot. It is dragged by three pair of oxen and worked by nine men, yet so well appreciated are the advantages which result from its use, that cultivators club their oxen together for the purpose and plough each other's fields in turn.* It must be remembered that both the iron shed pough of the Meerut Division and the *ndgar* of Bundelkhand, aie only used by the most careful and painstaking classes of cultivators, but the fact of their being used disposes of many of the objections which are urged against the possibility of introducing European implements into the cultivation of this country, and proves not only that good cultivators recognize the advantages of deep cultivation, but that they are prepared to go to some trouble and expense to attain it.

7. The inversion of the soil which is effected by an English plough could however only be effected by the Indian cultivator through the expensive process of hand digging and the extent to which this is resorted to in the cultivation of some of the more valuable crops *(e. g.,* potatoes and sugar-cane) shows that the beneficial results (on some soils at any rate) are well known and appreciated. To dig an acre of ground by hand labor to a depth of six inches employs four men for five days, even in the comparatively soft soil of Bohilkhand; a plough on the European model worked by good bullocks can easily do this in two days. It is quite possible, or even probable, that inversion of the soil may cause at the outset some loss *of* produce. The earth which lies below the upper veneer of cultivated soil, has from non-exposure to the sun and air, never been properly disintegrated, and, if brought to the surface at the wrong season, will probably at first give less return than the upper layer. But cultivators readily admit, and experiments have proved, that the subsoil (if of the same character as the upper layer) will exhibit its natural fertility after a year's exposure, and the increased depth of the tilth will then largely add to the outturn. This is frequently to be observed in the case of land which has been disturbed to a greater depth than ordinary, and the sites of old embankments or watercourses, which have been levelled off into fields, are often marked for miles by the greater height and richness of the crops on them. If it is impossible to give land a fallow after inverting its soil, it should be ploughed at the commencement of the rains, and sown with an autumn crop, which is influenced far less than a spring crop by the rawness of the soil it is sown in. But the most favourable time for the use of an English plough would appear to be the end of the rains, followed by a fallow during the cold and hot weathfer months, or if possible, land should be watered and ploughed in April after the spring crops have been cut and carried. In no case is the English plough meant to supplant the native implement, which in its best forms is probably as effectual an instrument as could be devised for pulverizing the soil and for covering the seed.

8. The two chief objections to imported ploughs of either European or American manufacture were on the score of—

(i.) Their expense.

(ii.) Their draught, which was beyond the capacity of a pair of ordinarily good bullocks.

"The process is so expensive a one, that it is, as a rule, only followed in preparing land for sugar-cane.

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As regards the second objection, the case of the *ndgar* of Bundelkhand may be as showing that it is by no means indispensable that the drawing power of a plough in this country should be limited to the usual one pair of bullocks. But such a system as that on which the *ndgar* is worked presupposes powers of combination which are rarely possessed and would be only workable when the area to be deep ploughed each year was a very small one. The majority of cultivators cannot afford more than one pair of bullocks, and a plough which is to find favour with them must be of light enough *draught* to be drawn by one pair. It must also be of a light enough *weight* to be carried on the shoulder, cheap, and, if possible, should be easily repairable.

9. None of the English or American ploughs which had been imported fulfilled these requisites. Indeed, the ploughs which were imported previously to 1876-77 and which now for the most part lie useless in the farm store rooms, appear to have been ordered from England without any reference whatever to the *desiderata* of cheapness, lightness, and simplicity of construction. During the past two years several of the lightest description of English and American ploughs have been imported and thoroughly tried by me one against the other. But although the lightest of the American " Eagle " ploughs comes in its draught very nearly down to the required standard, the cost was always prohibitive, being in no case under Rs. 16 per plough. Experiments with a dynanometer gave good ground for the belief that for fairly good cattle, working eight hours a day, the average plough draught should not exceed 126lbs. This belief is not only based on measurements of the average draught overcome by different pairs of the Farm bullocks, when ploughing all day with English or American ploughs, but also on the fact that a very second rate pair of bullocks, getting no gram, worked regularly for 10 hours a day on a gin which turned a fan in the farm workshops, the average draught of which was 100lbs. The limit of price was fixed at Rs. 8, the utmost which could be expected from an average well-to-do cultivator. How far the ploughs experimented on fell short of these requirements may be judged of from the following table, which shows the weight, draught, and cost* (landed at the farm; of some typical ones.

		Weight	*Average draught at 5 inches.*	*Cost,* Rs.
ENGLISH.				
Ransome and Sims' B.F.O.,	...	64lbs.	196lbs.	24
Ditto Eagle,	...	38lbs.	178lbs.	17
Howard's D. Cotton plough,	...	77lbs.	220lbs.	34
AMERICAN.				
Collin's cast steel ...	...	5[illegible]lbs.	180lbs.	25
Watts ...	...	42lbs.	150lbs.	12

The factors which contributed to these wide differences in draught were—

(a.)—The width of furrow slice, which in some cases was rather broader than in others.

(b.)—The weight of the plough itself, which has been proved by experiment to constitute from 33 to 50 per cent, of the draught.

(c.)—Differences in the style of work done, *i.e.*, the furrow slice may be broken and thrown lightly aside as in the case of a short breasted plough of the " Eagle" pattern, or may be turned over in a regular " glazed" line as with a long breasted plough like the B. F. O.

10. It was determined to attempt to adopt from these patterns a plough which, while turning over the soil to the depth of 5 inches, should suffer as little increase of draught as possible from the three causes abovenamed,—breadth of furrow-slice, weight (which aids the ploughman by giving steadiness) and style being sacrificed as far as possible, in order to reduce the draught down to the limit which was fixed on. One of the questions to be decided at the outset was, whether it would not be better to

* The cost is calculated on the published catalogues of the manufacturers, taking Re 1 as equal to two shillings, and adding 35 per cent, on account of freight.

† See a paper [illegible] Cirencester [illegible] in a series published [illegible] Practice, [illegible]

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copy the native plough so far as to use a rigid beam for attaching the body of the plough to the yoke. This was found to be impracticable without adding considerably to the draught. From the nature of this attachment it was found impossible so to regulate the line of draught as to make it pass through the centre of the body of the plough (culled the *zero point)* which is necessary for easy and steady ploughing. In English and American ploughs this is attained by the combination of a horizontal plough beam with slanting traces. If a rigid beam is used as the sole attachment, the line of draught terminates behind the zero point, and (unless considerable force is exerted, which adds largely to the draught; the heel of the plough has a tepdency to be pulled up off the ground, and the plough travels on its point in much the same manner as an ordinary native plough. With the rejection of a rigid beam as the attachment, arose the question as to whether a wheel plough or a " swing" plough was best suited to the country. This was decided in favor of the "swing" pattern, since the extra weight and expense of a wheel were avoided, while the advantages which result from a wheel in this country are not so unequivocal as in England. The ridges which form the borders of the irrigation plots in all irrigated fields prevent steady ploughing altogether where a wheel is used, while the advantage of a wheel in transporting the plough to and from the homestead is very doubtful in a country intersected by the numerous watercourses of an Indian village, especially if the plough itself be light enough to be carried on the shoulder.

11. The plough which was finally adopted is a modification of the Watts' plough already mentioned in para. 9. Its weight is only 30flbs., its average draught turning a furrow 5"x3J" on the farm land (which is a rather light soil) is 1261b*., and its price has been brought down to Rs. 6 if fitted with wrought ironwork, while it can be turned out at the Roorkee Foundry with cast ironwork for R3. 5. Natives will probably prefer wrought ironwork to cast as being more easily repairable. It is fitted with a small cast iron share on a principle which is believed to be a new one, by which the share can be slipped off or on to the frame with great ease. The depth of the furrow can be easily regulated by the length of the rope by which the beam is attached to the yoke. The plough being of so light a weight depends entirely on the correctness of its adjustment for working smoothly and easily, but to regulate the adjustment is a simple matter easily learnt with a few hours practice, and the principle is no new one to native cultivators, who adjust their own ploughs to bullocks of different heights by the use of wooden wedges. Although, before the cattle have become properly trained, an extra man will be needed to drive them, yet as soon as they have become accustomed to the plough the ploughman can easily drive them himself, as is always done now on the farm lands, and in any case the amount of work done by the plough far more than compensates for the wages of a second man.

12. At first ploughs of this description were made up for distribution by a contractor at Cawnpore, and were sold at Rs. 8 a piece. This was not found tu work well, and it was determined to start workshops on a small scale in connection with the farm at which ploughs should be made up, and the shares cast under the supervision of the Superintendent. One advantage of this system was the constant opportunity afforded for making fresh improvements which often suggested themselves in the process of construction. Between April 1st and December 31st, 1879, 322 ploughs of the approved pattern, varying a little in details of construction, were mado up at the workshops, and, including the ploughs which were previously made up by contract, the total number of ploughs sold during the year is 429, besides 8 more which wore given away as samples.

The price of these ploughs has been reduced from Rs. 8 to Rs. 6, since it has been proved that they can be made up at the latter price at a small profit. Messrs. Watts and Co., of Virginia Co., D. S., make a plough still lighter than the one experimented with on the farm, and enquiries have been made from them as to whether they could consent to supply the ironwork alone at wholesale prices. Ware this effected and the woodwork fitted to the ploughs at Cawnpore, an implement of far

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better workmanship than can be turned out in India could be supplied to purchasers at a price which would but little exceed the limit of Rs. 8.

13. The opinions which have as yet been received on the ploughs which have been distributed are of the greatest variety. It is satisfactory, however, to note that the opinion of persons who understand the use of English ploughs, is uniformly in favor of the one adopted. Mr. D. N. Reid of Sarun, Tirhoot, who has given an order for 100 of the ploughs to the Roorkee Foundry, writes—"that it is the only plough of a foreign pattern which he has yet seen cultivators inclined to adopt." Mr. 0. R. Webb of Dhooly, Tirhoot, states, that " he finds the plough -exceedingly useful, and that a number of planters are trying them, and are as well pleased with them as he is." In these provinces, Mr. McConaghey, Collector of Bánda, has used them with great effect in the reclamation of land infected with *kdns* grass in villages under direct management. He writes;—" The ploughs are much lighter in draught, more simple in construction, less likely to get out of order, and more easily repaired, and finally plough as deep and as strong as the English* ploughs. Ordinary bullocks can be worked in them, and can plough nearly au acre a day. Deep ploughing, especially in dry years, would greatly increase «the produce of the land in Bundelkhand, where we have to depend entirely on the rains. * * I have not encouraged men to buy them. They simply bought them because they thought they suited their purpose." Altogether 51 ploughs have been sent to the Bánda district and have been used there: a large number of these have been bought by cultivators, .twelve having been taken in one village.

On the other hand from some districts reports of a discouraging nature have been received, notably from Aligarh and Bulandshahr, each of which rivalled B&nda in the number of ploughs which it purchased. The draught is said to be far heyond the power of the cattle (which in both these districts are exceptionally good), and the efficiency of the plough is to some extent denied. Both of these impressions originate from ignorance of the method of using the plough, of attaching it to the yoke, and of regulating its adjustment. It has been determined in future to distribute no ploughs to native applicants, unless a trained instructor is sent with the ploughs, to explain the mode of using them, and the advantages which result from their use. To supply these instructors, a number of intelligent youths are being trained on the farm under my supervision.

14. It is however on the verdict of the cultivator that the plough depends for its adoption on a large scale, and unfortunately this verdict depends only partially on the real merits or demerits of the implement. In any case, only the most industrious castes of cultivators must bo looked to. The gap which divides the good cultivator of this country from the bad, is at least as wide as that which divides the good cultivator from the scientific agriculturalist, and it is impossible to hope that castes which fail to profit by the example of the Kurmis, Lodhis, and Játs in their midst will pay any attention to the teachings of agricultural science. Unfortunately too the persons whom the ploughs generally reach through the district officers, are the very people who must fail most completely to appreciate them, being the prominent zemindars of a district, who are as a rule notoriously indifferent concerning the agricultural condition of their villages.

2. *Waterlifts.*—The experiments which have been conducted during the past half year by Mr. W. J. Wilson, Assistant Engineer, attached to this department, have shown that the efficiency of the ordinary well bucket decreases very rapidly for depths less than 20 feet below the surface, since the repeated emptyings and fillings of the bucket occasion a greater loss of time than is necessary to rest the bullocks. It has therefore been an object to construct a cheap pump, light in weight so as to be easily carried to and from the well, which could lift water from a depth of from 15 to 18 feet more efficiently than this can now be done with bullock labor. The pattern of pump which seemed most suited for this purpose was that kind of chain pump in

• The English ploughs referred to are Messrs. Ransome and Sim3', B. F. O.

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which the plugs or suckers fit closely in only the lower portion of the pipe, the upper portion being wider so as to save all unnecessary friction, Pumps constructed on this principle (the *Bastiat* pump) were found serviceable in the Abyssinian war, and the greatly advertised *Me Comas' waterli/t* is merely an adaptation of the same principle. Iron pumps of this description had before this been constructed at Koorkee Canal Foundry for this department and gave admirable results. But the price was prohibitive, so far as cultivators were concerned, being from Rs. 103 to Rs. 120.

A wooden pump has now been constructed which when worked eight hours a day by three men will raise more water from a depth of 14 or 15 feet than can be effected by a pair of bullocks and two men. Its cost is only Rs. 18, but 15 feet is the maximum depth at which it can work, while the iron pump constructed at Roorkee worked effectively up to 20 feet. The subjoined table, summarized from the results of Mr. Wilson's experiments, contrast the actual amount of water raised and the efficiency (in H-P.) of the well bucket at 15',* and of the wooden water-lift at 14'.

	Height of lift,	*Labour employed.*	*Cubic feet of water raised per hour.*	*Useful work done,* In foot lbs. per minute.	In H-P.
Well backet ...	1I'	2 bullocks. 2 men.	269*5	2,102	0-069
Pump	H'	3 men.	304*7	4,436	0134

In the wooden waterlift experimented with, rope takes the place of chain and hempen knots the place of wood and leather suckers. The wheel and frame are of wood, and a triangular grove running round the circumference of the wheel ensures the " biting " of the rope. The pipe is a split and hollowed bamboo covered with leather for the upper 12 feet; the lower 3 feet, in which the suckers fit closely, being carefully constructed of wood bound with iron. But it is intended to substitute light iron piping for the bamboo, as soon as this can be obtained of the requisite description, and the slight increase in the cost and weight of the pump will be more than counterbalanced by the gain in efficiency.

(iii)—Experiments on the comparative efficiency of different methods of lifting water.

(Hi)—Experiments on the comparative efficiency of different methods of lifting water.

During the first half of the year measurement tanks and wells were completed. The principal one is 10 feet in diameter and 45 feet deep with a floored bottom. It is situated close to the large tank on the garden from which it can be supplied with water to almost any height by a connecting pipe fitted with a sluice gate, Mr. Wilson was therefore enabled to make a series of careful experiments with most of the different methods of lifting water used in this country, as well as with some new methods, the general adoption of which has been advocated. A full account of their experiments and their results, prepared by Mr. Wilson, is appended to this report.

I have, &c,

J. B. FULLER,

Asst. Director, in charge, Oovt. Experimental Farm.

"Unfortunately the two experiments were not at exactly the same depth, and the results must be therefore accepted as giving only an approximate idea of the relative efficiency of the well bucket and pump.

APPENDIX.

N.teby
Mr. W. J. Wilson,
Asat. Engineer.

Report on experiments with different waterlift s by MR. W. J. WILSON, C.E.

1. THE object of the experiments now in progress is to determine the cheapest and best method of raising water under any given circumstances. With this view the discharges of some of the water-lifts ordinarily used in this country and of some pumps lately introduced have been tested when working at different depths. The results of these experiments are given in the accompanying tables.

2. Some of the terms used in the tables may require explanation. The action of a machine is expressed by multiplying the resistance overcome by the distance moved through; the product being called *work.* Thu3, the work clone in raising a weight of one ft>. through a height of one foot is one *foot-pound;* the work clone in raising a wsight of one ton through a height of one foot is one *foot-ton* ; the work done in raising the weight of a cubic foot of water (= 62f4ft>s.) through a height of ten feet is 624 foot-pounds. The rate of work of a machine may be expressed in units of work (such as foot-pounds) per second, per minute, or per hour. But there is a peculiar unit appropriated to its expression called a *horse-poicer* (H-P) which is equivalent to 33,000 of power foot-pounds per minute or 1,980,000 foot-pounds per hour.

3. The work done by a machine is divided into *useful work* ami *lost work.* The HMMZ work of a machine is that which is performed in effecting the object for which the machine was designed ; the *lost* work is that which is performed in overcoming prejudicial resistances, such as friction. The useful work and the lost work of a machine together make up its total or gross work. For example, in a chain pump worked by men turning a crank, the total work done by the men upon the pump in a given time is the mean effort exerted by the men upon the crank multiplied by the distance described by the crank in that time; the useful work is the weight of water raised in that time multiplied by the height to which it is raised ; the lost work, or difference between the total work and useful work; is expended in overcoming the friction between the plugs and the pipe, the friction between the water and the pipe, and the friction between the axle of the wheel and its bearings, and in raising water which leaks down again between the pings and pipe. In the annexed tables only the *useful work* is shown. The *efficiency* of a machine is a fraction expressing the ratio of the useful work to the total work performed.

4. The best units of work for expressing the action of waterlifts are the cubic foot of water raised one foot high and the foot-ton. The former is easily calculated, the discharge of a waterlift boing usually given in cubic feet per second or per minute. The quantity of water required to flood an acre of land to a depth of one inch is nearly 100 tons (accurately 101*27.) If the average depth of a watering is 2| inches, 250 tons of water will be required at each watering; mutiplying this by the height to which the water is lifted we obtain the number of foot-tons of useful work that must be performed by the waterlift to irrigate one acre of land. If the number of foot-tons performed per hour and the cost per foot-ton are known, the time required to irrigate an acre and the cost of the irrigation can be obtained.

5. The following results of the work done by horses, men, and oxen working eight hours daily in England, are taken from Rankine's Treatise on the Steam Engine.

Kind of exertion.	Foot pounds per minute.	Horse-Power.	Foot-tons daily.
Horse, drawing a cart or boat, walking ...	25,950	0-785	5,554
Horse, drawing a gin or mill, walking ...	18,000	0 545	3,857
Man, turning a crank or winch	2,700	0*082	579
Ox, drawing a cart or boat walking (\ of power of ahorse)	17,2W>	0524	3,703
Ox, drawing a gin or mill, walking	12,000	0-363	2,571

M, ftj. KiUon, At. B.Iglnec, £ r » P '"V be ^ by men turning a crank or by oxen workin* a *in: if ^ , ^ o f the machine is 0-6, the useful work performed in the two causes Jill be

Kind of exertion.	Foot-pounds per minute.	Horse-power.	Foot-tons daily.
Man^ working a pump by turning a crank (-3,700 x	1,020	0·019	341
Ox, working a pump by turning a giu ($i_{2\|00}o_{x0}$ 6)	7,200	0·218	1,043

6. At the Cawnpore Experimental Farm the discharges of the following water-lifts have been tested :—

(i.) lifts worked by manual labour—

a—the basket or fo.j (heights of lift 1'5 to 6'i •

b.-dltenkli (height of lift 15 feet) ;

«.—fhain pumps (height of lift 10-5 to 13 feet),

(ii) lifts worked by bullock labour—

ag single *moth* and inclined bullock run (height of lift 15 to 50 feet) •

b.—c on a vertical axis,

c—chain pump (height of lift 39 feet).

The quantity of water raised was measured in masonry tanks.

7. The results of experiments with the basket arc shown in table I Three men were employed to work the basket; one man resting while two worked; bu 1 e laborers 8aid tlliU:f m be ·fc J^ daily. I wo series of experiments were made, the same men being employed through out each series (except in i. *a,* when one of the men was changed). As the hoiVhtVf l.f decreases, the quantity of water lifted at each throw and the number of throws per minute increase, the former more rapidly than the latter In the fiJJr-« J experiments the basket was most effective (as'a machine) fo!• , i ^ of £ U ^ . » the second series for lifts between 3_h and 5 feet. Between the* lifts the rate If' " work performed was near ly 70 foot-tons per hour.

8' In a note on wells (Famine replies) Mr. Buck states that will, two 3 feet baskets hfts, s,x men can irrigate one acre a day. Hence four men can irr™ to two third

SSarcu^cfcotofwaterraisedbyathrcefeetbasket lift per hour. In a day of fj* hours four men would raise 839-7x8-6,717-6 cubic feet. If this were used toirrWe two-th,rds of an acre the depth of the watering would bo -gi -0 23 feet. This is very ^ e , A ; T raentS0Qwelli ^ ^ ^ during sixTn abut 2½ inches as the

9. With the *dheukli* only one experiment (table III, No. 8) has been made at the Cawnpore Farm. This apparatus is very commonly used for irrigation in the Moradabad district, and 1 tested one at Bachhraon on the 24th November. The results obtained were as follows:-

Height of lift . . . . 13·25

Capacity of earthen vessel (karwala,-Q'25 cubic feet =, V_5Q <,l_m on. 33.

Number of times the kanvala was raised per hour =311

Quantity of water raised per hour -77-8 cubic feet -4 $8_5$4-7 tfc

Useful work performed per minute = 1,076-1 foot-pounds.

Ditto ditto per bour - 28-8 foot-tons.

Ditto ditto per day of 8 hours „ 230·4 foot-tons.

Kate of useful work performed » 0·033 H-P.

One man was employed to work the *dhenkli,* and he worked for four hours without stopping. Two men are usually employed during the day, one raising the water and the other looking after its distribution, but the people at Bachhraon told me that one man could work the apparatus for eight hours a day. Mr. W. J. W'lo, Asst. Engineer.

10. Table II. gives the results of 9 trials with a 2½ inch iron chain pump for 15 feet lift made at Roorkee.

The trials lasted only a short time, and do not give the rate of work that can be kept up daily. I think, however, that four men working eight hours a day can lift 300 or 320 cubic feet an hour to a height of 14·5 feet. The power of the four men usefully applied would then be represented by—

$$\frac{300 \times 62 \cdot 4 \times 14 \cdot 5}{60 \times 33000} = 0 \cdot 137 \text{ H-P.}$$

I have used these figures in Table VII. to find the cost of work performed by the pump. Experiments 6 to 9 (Table II.) were made to determine the leakage between the plugs and the pipe at different speeds; this varied from 150 to 167 cubic feet per hour, and is fairly uniform for all the speeds tried. The efficiency of the pump therefore increases with the speed of the chain.

11. Table III. gives the results of trials with other pumps. Trials 1 to 3 were with a 2½ inch McComa's chain pump for 12 feet lift from Melbourne. The rate of useful work performed varied from 0·149 to 0·157 H-P, the trials lasting only a short time. These results could not be maintained throughout the day, but the average power of four men working eight hours daily would probably be about the same as is obtained in the last paragraph for the same sized pump with a higher lift, or 0·137 H-P.

12. Trials 4 to 7 were with cheaply constructed pumps made up at the Experimental Farm on the principle of the chain pump, rope being substituted for chain, and wooden pipe or hollowed-out bamboo for the iron pipe. The power of three men varied from 0·106 to 0·134 H-P usefully applied, and I think that 0·100 to 0·105 H-P could be maintained throughout the day. In experiments 4 and 5 the plugs were considerably worn and worked loose in the pipe; in experiments 6 and 7 they fitted more tightly. Owing to the difficulty of getting large bamboos the bore of the pipe was made only 2½ inches, and the pump can be worked by three men. If the bamboo is replaced by galvanised sheet iron piping a larger bore can be used and the weight will be very little if at all increased.

13. Table IV. gives the results of experiments made with the single *moth* and inclined run on one of the wells in the Experimental Farm: the experiments were arranged by Mr. W. R. S. Jones, Executive Engineer, in order to find the average amount of work done by one bullock or buffalo. Ten trials were made with bullocks, using a fresh pair every day; four trials were also made with four pairs of buffaloes. The *moth* used in these experiments contained 13·95, or nearly 14 gallons, and was smaller than is generally used. Mr. Wright, C.S., states that in the Cawnpore district the *moth* contains from 14 to 18 gallons. The buffaloes could probably have worked with a *moth* containing 28 or 30 gallons. The means of the 10 experiments with bullocks and of the 4 with buffaloes give very similar results; the power, usefully applied, of one bullock being 0·065 H-P, and that of one buffalo 0·086 H-P. With a larger *moth* the rate of work would have been higher.

14. To compare the quantities of water raised by a pair of bullocks from different depths, eight experiments, the results of which are given in Table V., were made on the blind well at the experimental farm. This well is connected by a sluice with an earthen tank containing water, so that the water in the well can be kept at any required depth from 13 feet to 45 feet below the top of the steining. During the first six experiments a *moth* was used containing about 17 gallons; it burst after the 6th experiment, and was replaced by another containing nearly 21 gallons. The same bullocks were used throughout the experiments.

Notebr Mr. J. Wilson, AsT' Engineer.

15. The quantity of water lifttd per hour decreases as the height o lift increases, but not in the same proportion. With a 15 feet lift the discharge was 269'5 cubic feet per hour, and with a 40 feet lift 195*5 cubic feet per hour. The rate of useful work done increases as the height of lift increases: with a 15 feet lift it was 0'064 H-P., while with a 40 feet lift it was 0-130 H-P. These experiments are incomplete, as they do not give the number of hours that the bullocks can work daily at the rates observed. If with a 15 feet lift the bullocks can work eight or nine hours daily, with a 40 feet lift they may be unable to work more than six hours a day. Complete statistics can be best obtained by recording the quantities of water raised from wells working constantly during the irrigating season. But I think there is no doubt that this method of raising water with single *molh* and inclined bullock-run becomes more effective as the depth of water below the ground increases.

16. An experiment with the double *moth* worked by ropes passing round a drum on a vertical axis gave the following results :—

One buffalo was employed—

Height of lift averaged	45*5 feet
Contents of *,notk*	2·34 cubic feet. (= 157 6 lbs.)

Duration of experiment *= 3 hours.
No. *of moths* lifted per hour=34J.
Discharge per hour=87-2 cubic feet (= 5*441 fts.)
Useful work per hour = 247,579 foot-tt>s.=101-6 foot-tons.
Useful work per minute=4,126 foot-tbs.
Rate of useful work =s 0-126 H-P.

Four trials with buffaloes working the single *moth* gave the rate of useful work performed by one buffalo when height of lift was 49-'3«0'066 H-P (Table IV.) but as mentioned above, the *moth* used was much too small. An experiment on the blind well (Table V.) gave the rate of useful work when height of lift was 45'=0130 H-P,

17. On the 24th November, 1 tested a double *moth* apparatus erected by Mr. D. 11. Smeaton, C.S., at Bacbhraon in the Moradabad district. Three trials were made, and tho results are recorded in Table VII. During the first two trials the apparatus was worked by a single bullock, larger and more powerful than those generally kept by cultivators : the pair of bullocks used in the third trial were similar to those commonly used for ploughing and irrigation. The useful work performed in the three trials was nearly equal. The owner of the well stated that the bullocks could work six hours daily, but required to be relieved every three hours.

18. A 3 inch McComa's chain pump from Melbourne has been erected on tho blind well and tried with the following result:—

Height of lift—39 feet.
Animals employed—two pairs of bullooks.
Duration of trial = 87 minutes.
Discharge per hour=150 3 cubic feet.
Useful work perbour=380,372 foot-lbs = 169'8 foot-tona.
Useful work per minute « 6,340 foot-tbs.
Rate of useful work=0'192 H-P.
Rate of useful work per bullock=0-048 H-P.
Speed of chain = 2'21 per feet per second.
Quantity of water that leaked back again between plugs and pipe per hour • 218*9 cubic feet.

Experiments 6 to 9 of Table II. gave the loss by leakage in a 2\ inch chain pump worked by hand equal to about 160 cubic feet per hour, when tho height of lift was 14·80 feet. Allowing for the increase in the diameter of the pipe and in height of lift the loss by leakage in the large pump was less than in the small one. The four experiments with the latter show that it is not effective when the speed of chain is less than four feet per second, and the same may be said of the larger pump. It will never supersede the *moth* for bullock power for lifts greater than 20 or 30 feet; but would give good results for high lifts if worked by steam-power, as the chain coufd then be driven at a greater speed.

^ ^°j^c^,,o
Asst. Engineer.

19. Table VI. gives the results recorded on some wells working daily during the irrigating season. Commissariat bullocks were used in No. 1, and gave much higher results than have been obtained with ordinary bullocks. No. 2 was recorded by Mr. Beresford, Executive Engineer. No. 3 is the result of numerous experiments by Mr. F. N. Wright, C. S., in the Cawnpore district. The capacity of the *moth* is said to vary from 14 to 18 gallons, so I have used a mean value of 16 gallons or 160 fbs. No. 4 is from data furnished by the Collector of Agra; a large *moth* containing 34 gallons being used, bullocks of corresponding strength are required to raise it; the rate for hiring these bullocks is 14 annas a pair per diem. Nos. 5, 6 and 7 were recorded at the Government Horticultural Gardens, Lucknow; here also large bullocks are used, and tho tate for hiring them would be about 12 annas a pair. No. 8 was recorded at tho Shikohabad Railway Station with an exceptionally high lift, and is the mean of three days working.

20. In all the experiments at the experimental farm only one pair of bullocks at one time were employed to raise the *moth,* the system adopted in the Meerut and Aligarh districts of using two pairs of bullocks and a side run being apparently unknown in the neighbourhood of Cawnpore. Of the trials recorded in Table VI., Nog. 1, 3, 5, 6, 7 and 8 were made with single pairs of animals, while in Nos. 2 and 4 two pairs of animals were used to one *moth.*

21. The following results obtained by the Persian wheel have been furnished by Mr. Sturt, Assistant Commissioner of Jhansi..

Height of lift, 20 feefc.
Discharge for one revolution, 160 HJ3-
Number of revolutions per minute, 1J.
Discharge per hour=205 cubic feet.
Useful work done per minute=4,267 foot-fts.
Bate of useful work*0128 H-P.
Useful work per hour«114'2 foot-tons.
One pair of bullocks can work this for six hours a day.

22. In Table VIII. the cost of the useful work performed by different water-lifts is obtained. To make the comparison complete, allowances should be made for the interest on the original cost of the lift, and for repairs and depreciation, but I have not sufficient *data* to do this. The chain pump for manual labour when lift is from 10 to 15 feet is decidedly more effective than the basket or *beri.* The *dhenkli* is also an effective apparatus for low-lifts, but, as generally worked, the cost is greater than that shown in the tables; one man being required for the distribution of the water and another to work the *dhenkli.* The two men take each work in turns for about 10 hours a day, so that each man actually lifts the water for only five hours a day. As regards the single and double *moth* for bullock-powor the records obtained from wells in atstual work are too few to pronounce definitely, but the trials made show that when the height of lift is about 20 feet the double *moth* is considerably cheaper to work than the single *moth.* Arrangements are in progress to work the two systems side by side, and with similar bullocks at places where irrigation is almost constantly going on. With the single *moth*, as the height of lift increases the cost of tho useful work performed decreases, a result that was anticipated in para. 15. The capacity of the leather bucket or *moth* varies from 14 to 36 gallons, and is regulated by tho strength of the animals employed,.

Note by Mr. W. J. Wilson, Asst. Engine .

23. The city of Jaipur is supplied with water from a stream 2* miles distant, the water being pumped up by steam-power to a height of 120 feet. The total cost of the waterworks was 4| lakhs, but omitting the cost of pipes, &c, for taking the water from the pumping station to the city, the expenditure was nearly as follows:

	Rs.
Weir in river	6,915
Pumps	76,575
Engine house, &c	14,637
Boilers	34,190
Boilei house	8,375
Service reservoirs	43,925
Workshop and godown	6,290
Miscellaneous, gay	10,003
Establishment, say	6,000
Total	...8,02,177
Interest on original expenditure at Rs. 5 per cent. ...	10»,09
Maintenance lor one year ... ... »•	S8>25S
Depreciation at Bs.3 per cent, on engine, pumps, boilers and workshops (B». 1,29,529).	3,886
Total cost for one ye»r ...	4°>2*8

Average quantity of water raised daily *tat* one year-310,514 gallons.

Useful work done daily =»,105,120X ISO

e= 372,614,400 foot-fts.

as 166,846 7 foot-tons.

Cost of 1,000 foot-tons of useful work is " «0,2Mxl6xl,000 / i«,345 7xS65 [illegible]

Major Jacob states that the cost of maintenance is high owing to the high price of coal, which delivered at Jaipur costs Rs. 40 a ton. At Cawnporo coal can be obtained for Rs. 20 a ton, and the yearly charge for maintenance would be reduced by Rs. 9,465. The cost of 1,000 foot-tons of useful work, including maintenance and interest charges, would then be reduced to 81 annas. *(The above detail* have been taken from a paper by Major Jacobin the Professional Papers on Indian Engineering.)*

24. Comparing the results given in para. 5 for English oxen and men with those obtained in the tables, it will be noticed that the former are much greater^ than the latter. A native working a chain pump eight hours daily can perform ('l* =) 242 foot-tons of useful work (Table VIL), while an Englishman would do almost 347 foot-tons or nearly half as much again. The difference between the cattle is still greater, the useful work performed by a pair of the large bullocks employed to irrigate the Taj garden being no greater than should be perfomed by a.single ox in England.

25. A fan in the agricultural workshops is worked by a pair of bullocks turning a gin. Average draught measured by indicating dynanometer about 100 fts. speed of bullocks = 113*2 feet per minute.

Working hours per day, 10.

Gross work done by a pair of bullocks turning a gin-113-25x100x60x10

«= 6,795,000 foot-fts.

=3,033 foot-tons.

From para. 5 the total work done daily by one English ox turning a gin is seen to be 2,571 foot-tons.

W. J. WILSON,
Assistant Engineer.

Table I.-Storcing'remlt of trial, with the lathetlift at Cawnpore Experimental Farm.*

J	2		<	5	6	' i	8	9	-1 "		12 1	13	14	1 »	1 »	15 J »		19
						Quantity of water lifted by one basket.			QUANTITY OF WATEB LIFTED				USEFUL WORK *DOSE* BT THREU MEN WOKKIWO ONE BASKET.					
									Per minute.		Per hour.				In one hour.			
Number of experi-ment.	Date.	Height of lift.	Duration of expe-riment.	Number of baskets lifted.	Quantity of water lifted.	In cubic feet.	In pounds.	Number of times the basket was lifted per minute.	Cubic feet.	Pounds.	Cubic feet.	Pounds.	Foot-pounds per minute.	Horse-power.	Foot-pounds.	Foot-tons.	Cubic feet of water raised one foot high.	Remarks.
			Minutes.		Cubic feet.													
1	12th September ...	6'	70	1,412	510-5	0*36	22-6	20-2	7-29	455*1	4374	27,306	2,275-4	0069	1,36,524	60-95	2,187	All these experi-ments were made by the same three men.
2	14th ditto	4*	45	949	487-3	0-51	32-8	2 M	10-82	675 7	649-2	40,542	2,702*9	0082	1,62,174	72-40	2,597	
3	15th ditto	3'	35	801	520-0	0-65	40*5	22-9	14-86	927*1	891-6	55,626	2,781*3	0 084	1,66,878	74 50	2,675	
4	Ditto	2'	30	726	491-5	0-68	42*2	24-2	16 39	1,022·3	9*834	61,338	2,044-0	0062	1,22,676	54-77	1,967	
5	Ditto	1*5'	27	682	627-4	077	48-3	25*3	19*53	1,218-9	1,171 8	73,134	1,838*3	0-055	1,09,698	48-97	1,758	
1a	4th October	6 0'	90	1710	436 6	025	15-9	190	4 85	302*7	2911	18,162	1,816-2	0*055	1,08,973	48-65	1,747	
2a	Ditto	5-5'	30	600	177*2	0*30	19'7	200	6*91	368*8	354*6	22,128	2,028*3	0-061	1,21,698	54-33	1,950	
1a	27th September ...	5'	60	1.237	491-9	0*40	24*8	20 6	8 20	511-6	492 0	30,696	2,557*9	0-0775	1,53,474	68-52	2,460	
4a	Ditto	4-'5	50	1,082	467-2	0*43	26'9	*216*	9-34	5831	560*4	34,986	2,623-8	00795	1,57,328	70-24	2,522	One set of men employed in all these experiments except No. la., in ^hich one of the men was changed.
5a	28th ditto	4'	45	972	4651	0 43	29-9	21*6	1034	6449	620*4	38,694	2,679*8	0078	1,54,788	69 10	2,482	
6a	Ditto	3' 5	40	874	469-4	0*54	33-5	21-9	11-74	732*3	704*4	43,938	2,562-9	0078	1,53,774	68-65	2,465	
7a	29th ditto	3'	40	921	525-2	0-57	35*6	230	1313	8193	787*8	49,158	2,457-9	0-074	1,47,474	65 84	2,363	
8a	Ditto	2'-5	35	828	477-8	0*58	36-0	23»7	13-65	851*8	819 0	51,108	2,129-6	0065	1,27,776	5704	2,048	
9a	30th ditto	2'0	35	867	529-5	0*61	38 1	24-8	15*13	944*0	907-8	56,640	1,888*0	0057	1,13,280	50*06	1,816	
10a	1st October	1'-75	30	776	472-5	061	380	25*9	1575	982*8	945*0	58,968	1,7199	0 052	1,03,194	46-03	1,654	

Note by Mr. W. J. Wilson, Asst. Engineer.

Table II.—Showing results of trials with a two and a half incJi iron chain pump for 15 *feet lift.*

Number of experiment.	Bate.	Height of lift.	•Deration of experiment.	Quantity of water discharged.	DISCHARGE PER HOUR.		Number of men employed.	USErUL WORK DONE.			Speed of chain in feet per minute.	Quantity of water lost by leakage in cubic feet per hour.	Sum of actual discharge and water loBtby leakage per hour.	Percentage lost by leakage.
					la cubic feet.	In lbs.		Foot-ltis. per minute.	Foot-lbs. per hour.	Horse-power				
			Minutes.											
1	August 5th, 1879 ...	14'«5O	30	221*6	443	27,643	3	*6,680*	400,826	0-20	Not noted...	...	...	...
2	Ditto 6tb, „ ...	14'50	60	401*0	401	*25,022*	3	6,047	362,824	0'18	Do. ...	...	...	...
3	October 1st, „ ...	14'60	20	130*9	39S-7	24,504	3	5,922	365,315	0*18	Do. ...	...	...	...
4	Ditto *'2nd,* „ ...	14"80	80	499-9	«75'O	23,400	4	6,772	346,320	017	Do. ...	...	...	...
5	Ditto, ,? ...	U'*80	80	514-7	386-0	24,086	4	5,941	356,479	0 16	Bo. M.	..«	...	...
6	*Ditto* 3rd, *9?* ...	*U'* 80	80	428-2	321-2	2VU3	4	4,944	296,619	015	416	158*1	479-3	33
7	Bitto, „ ...	*14'SO*	*CO*	527	527	3,288	2	811	48,670	0*025	1-84	160*1	212·8	75
8	Ditto, „ ...	14'*80	5	*Nil.*	*Nil.*	*NIL*	2	*JVUl*	*Nil.*	*Nil.*	1*24	150-4	150-4	100
9	Ditto, „ ...	14"'8O	30	215-4	430-8	26,882	4	6,631	397,852	0*21	517	167 4	598-2	28

Table III.—Showing results of waterlifts worked by manual labour at the Cawnpore Experimental Farm.

1	2	3	4	5	6	7	8	9	10	11	12	13
							Discharge per hour.		*Useful work done.*			
No. of experiment.	Date.	Description of pumps.	Number of men employed.	Height of lift.	Duration of experiments.	Discharge during experiment in cubic feet.	In cubic feet.	In lbs.	In foot-pounds per minute.	In foot-pounds per hour.	Horse-power.	REMARKS.
	1879.				Minutes.							
1	August 1st...	McComas's chain-pump 2½" diameter ...	3	10·90	40	303·8	455·7	28,436	5,166	309,949	0·157	
2	„ 2nd...	Ditto ditto	3	10·10	30	236·25	472·5	29,481	5,455	327,272	0·165	
3	„ 6th...	Ditto ditto	4	11·50	60	410·0	410·0	25,584	4,904	294,216	0·149	
4	„ 4th...	Wooden chain-pump [illegible]" diameter ...	3	14·0	65	270·0	249·2	15,650	3,628	217,701	0·110	
5	„ 5th...	Ditto ditto	3	14·0	90	360·0	240·0	14,976	3,493	209,664	0·106	
6	„ 12th...	2½" chain-pump with bamboo pipe ...	S	14·0	54	274·2	304·7	19,013	4,436	266,186	0·134	
7	Octr. 2nd...	Ditto ditto	3	14·40	90	375·0	350·0	15,600	3,744	224,640	0·113	
8	„ 5th...	[illegible]	1	15	180	186·0	62·0	3,869	956	57,332	0·029	Iron bucket contained 0·384 cubic feet. Number of lifts per hour=161½.

Note by
Mr. W. F. Wilson,
Asst. Engineer.

Table IV.—Showing results of trials with single "moth" and inclined bullock-run on a well at Cawnpore Experimental Farm.

1.	2.		3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	
			Animals employed.				Quantity of water lifted by one moth			Quantity of water lifted per hour.		Useful work done by one bullock or buffalo.					
														In one hour.			
No. of experiment.	Date.		Kind.	No.	Height of lift.	Duration of experiment.	In cubic feet.	In pounds.	Number of moths lifted per hour.	Cubic feet.	Pounds.	Foot-pounds per minute.	[illegible]	Foot-pounds.	Foot-tons.	Cubic feet of water raised one foot high.	Remarks.
	1878.					Hours.											
1	April	1	Bullocks	9	48' 8"	4	2·238	139·6	58	64·9	4,046	1,«*8	0 050	99,451			
2	„	2	Do.	8	49' 3"	5	„	„	57	60·3	3,767	1543	0-i 47	92,591			
3	„	2	Do.	8	49' [illegible]"	4½	„	„	40	101·4	6,278	2,599	0 079	155,8'>8			
4	„	3	Do.	7	49' 9"	3	„	„	43	73·7	4,604	1,8^6	0-057	1.°3,167			
5	„	4	Do.	8	49' 9"	3	„	„	38	71·5	4,464	1,829	0 055	109J39			
6	„	7	Do.	2	49' 8"	3	„	„	42	89·9	5,859	M17	0-073	145 011			
7	„	8	Do.	9	49' 8"	8	„	„	38	84·9	6,30]	2,194	0-066	131,647			
8	„	10	Do.	9	49' 8"	3	„	„	40	88·4	5,580	2 310	0070	138,577			
9	„	11	Do.	9	49' 8"	3	„	„	44	102·8	6,417	2,656	0 080	169,364			
10	„	15	Do.	8	49' 8"	3	„	„	43	96·1	6,999	2,483	0075	148,971			
Average of ten experiments				8	49' 3" ½	—	2,385	139·6	37·6	86·9	5,236	2,158	0-C65	129,432	57-8	2,074	
11	April	14	Buffaloes	9	48' 8"	3	2·235	139·6	43	96·1	6,000	2,483	0 075	148,971			
12	May	15	Do.	9	49' 3"	3½	„	„	40	90·1	5,999	2,4*3	0-075	148,971			
13	„	9	Do.	3	49' 6"	3	„	„	30	67·0	4,181	1,732	0 05*2	103,932			
14	„	11	Do.	9	49' 9"	3	„	„	34	76·0	4,743	1,965	0060	117,791			
Average of four experiments				3	49' 3"	—	2·235	139·5	37·6	83·9	5,331	2,166	0*066	129,916	680	2,082	

Note by Mr. J. W. Wilson, Asst. Engineer.

Table F.—Showing results of trials with single moth and inclined bullock-run on the blind well at Caxonpore Experimental Farm.

1	2	3	4	5	6	7	8	9	10	u	12	13	14	'5	16	17
	Date.	*Animals employed.*		Height of lift.	Duration of experiment.	*Quantity of water lifted by one moth.*		Number of mutha lifted per hoar.	*Quantity of water lifted per hour.*		USEFUL WORK DONB BY ONB BULLOCK*					Remarks.
											Foot-pounds per minute.	Horse-power.	*lv one hour.*			
		Rind.	Number.			Cubic feet.	Pounds.		Cubic feet.	Pounds.			Foot-pounds.	lfoot-tons.	Cubic feet of wter raitc d one foot h gh.	
				Feet.	Hours.											
1	4th September, 1879,	Bullocks..,	s	15	3	2*66	165-9	101 ^	269*5	16,815	2,102	0 064	1,26,114	56-3	2,022	
2	6th ditto ...	Ditto ...	s	20	3	a-73	170-4	79	215-7	13,460	2,244	0-068	1,34,602	60*1	2,157	
3	7th ditto ...	Ditto ...	2	25	3	2-76	172-2	79|	219*9	13,722	2,857	0 087	1,71,529	76-6	2,749	
4	8th ditto ...	Ditto ...	8	30	3	2*76	172-2	69f	192*3	11,998	3,000	0 091	1,79,974	80*3	2,885	
5	Oth ditto ...	Ditto ...	2	35	3	2-76	172-2	71	196*0	12,228	3,567	0*108	2,13,989	95-5	3,430	
6	11th ditto ...	Ditto ...	2	40	3	2-70	1687	72$	195*5	12/201	4,067	0*123	2,44,019	10S-9	3,910	
7	12th ditto ...	Ditto ...	2	40	3	3·34	208'2	61*	204-7	12,772	4,258	0·129	2,55,446	114-0	4,094	
8	13th ditto ...	Ditto ...	2	45	3	3 34	208-2	55	183*6	11,453	4,295	0·130	2,57,703	115·0	4,131	

Table F/.—*Records of results obtained with the single moth and inclined bullock-run wiien irrigation was in progress.*

Number.	Height of lift.	Labor employed. Animals.*	Labor employed. Men at 2 aunas.	Number of working hours in a day.	Quantity of water lifted 6y one moth. Cubic feet.	Quantity of water lifted 6y one moth. Pounds.	Number of moths lifted per hour.	Quantiiyof water hfted per hour. Cubic feet.	Quantiiyof water hfted per hour. Pounds.	Number of moths lifted during the day.	Quantity of water hfted during the day. Cubic feet.	Quantity of water hfted during the day. Tons.	USEFUL WORK PKBFOBMKD. In foot-pounds per minute.	USEFUL WORK PKBFOBMKD. Horse-power.	USEFUL WORK PKBFOBMKD. In foot-tons. Ver hour.	USEFUL WORK PKBFOBMKD. In foot-tons. Per day.	Remarks.
1	35'	k bullocks (Commissariat) ...	1	6	4-73	295*2	66-7	315-4	19,681	400	1,892	527	11,481	0·35	307	1,845	Commissariat mills, Cawnporc.
2	30'	4 buffaloes at 4 annas ...	1	10	5-34	333·2	41*7	2227	13,896	417	2,227	62 0	6,948	0 21	186·0	1,860	Recorded by Mr J. S. Bcresford, Executive Engineer at Atrauli.
3	40'	2 bullocks at 4 „ ...	1	875	2·56	160*0	40·0	102-4	6,400	350	896	25·0	4,266	013	114*2	1,000	Becorded by Mr* F. N. Wright, C.S., in Cawnporc district.
4	60'	4 ditto at 7 „ ...	1	10	5·45	340·0	40*0	218-0	13,600	40O	2,180	60·7	11,336	0-34	303·6	3,035-7	Tāj gardens, Agra.
5	ir'5	2 ditto at 6 „ ...	1	9	3'00	187-2	68*3	204-9	12,787	615	1,645	51-4	3,730	O·il	99 9	899*5	Lucknow Horticultural gardens.
6	22·0	2 ditto at 6 „ ...	1	9	3'00	187*2	63·0	1890	11,794	667	1,701	47-4	4,521	0-14	121·1	1,090-0	Ditto ditto.
7	25·0	2 ditto at 6 „ ...	1	9	3-00	187·2	55*8	167-4	10,446	502	1,506	42 0	4,353	0 13	116-6	1,049*0	Ditto ditto.
8	68·0	2 buffaloes at 4 „ ...	1	6	5·76	365*7	28*75	163 9	10,226	173	996	27 8	11,589	035	314·8	1,8887	Recorded at Shikohabad.

* pay of bullock driver included in the rate allowed for the animals.

Table 8.—Showing the results [illegible] three trials with double-moth apparatus, erected by Mr. [illegible], [illegible] in [illegible] district.

Number.	Date.	Height of lift.	Animals employed.	Duration of experiments.	Quantity of water lifted by one bullock. Cubic feet.	Quantity of water lifted by one bullock. Ponnds.	Number of moths lifted in one hour.	Quantity of water lifted in one hour. Cubic feet.	Quantity of water lifted in one hour. Founds.	Number of working hours in a day.	Number of moths lifted daring day.	Quantity of water lifted in [illegible]. Cubic feet.	Quantity of water lifted in [illegible]. Tons.	[illegible] work performed. In foot pounds per minute.	[illegible] work performed. Ilorse-power.	[illegible] work performed. Per hour.	[illegible] work performed. Per day.	Remarks.
				Hours.														
1	24th No[illegible]r ...	30'·71	1 bullock ...	3	2·96	184·7	97¼	288·1	17,975	6	584	1,7[illegible]	48·1	5,296	0·188	144·9	865·8	
2	[illegible] ...	31'·10	1 ditto ...	3	2·95	184·7	10½	287·4	18,855	6	565	1,404	44·7	6,490	0·184	143·1	878·8	
3	Ditto ...	30'·60	2 ditto ...	3	2·94	184·7	95½	270·3	17,056	6	561	1,640	45·7	5,885	0·177	136·1	836·6	

In the first two trials the apparatus was worked by single bullocks larger and more powerful than those generally kept by [illegible]; the bullocks [illegible] in the third [illegible] similar to those commonly used for ploughing and irrigation.

Note by
Mr. W. A. Wilson,
Asst. Engineer.

Table VUL—Showing cost of work done by different waterlifts.

Number.	Kind of waterlift.	Height of lift.	Labor employed.		Number of working hours in a day.	Cost of labor.		Useful work performed.		Cost of useful work performed.		Bemarks.
			[illegible]	[illegible]		Per day.	Per hour.	Pounds.	Foot-tons daily.	1 horse-power per hour.	[illegible]	
						Annas.	Annas.					
1	Basket or *beri* ... .«	3' to 4'·5	...	4	8	8	*1-0*	0-0S0	565*4	12·5	14·1	See table I.
2	*Dhenkli,* or lever-lift	13'	...	1	8	2	0-25	0033	230-1	7'6	8-7	„ „ III., No. 8.
3	Chain pump	lO'-5tol5'	...	4	8	8	1-0	0 137	968*8	7·3	8'2	„ para. 10.
4	Single moth and inclined bullock-run ...	69'	2	1	6	10	1-67	0*35	1,888-7	4*8	5·3	„ table VI., No. 8.
5	Ditto ditto ditto ...	50'	t*-	1	10	SO	3-0	0-344	3,035-7	8-7	9·9	» „ „ M 4.
6	Ditto ditto ditto ...	40'	2	1	8*75	10	1-14	0·130	1,0000	8*8	10 0	M ft 9> » 3.
7	Ditto ditto ditto ...	30'	4	1	10	18	1-8	0*210	1,860	8-6	9'6	9» it f» >» 2.
8	Ditto ditto ditto ...	20'	ti	1	9	14	1-6	o-iio	1,000*0	12*3	14·0	„ >, Nos. 5, 6 and 7.
9	Double moth	20'to 22'	2	...	6	8	H	0·179	950	7-4	8·4	„ table VH.
10	Persian wheel	20'	2	...	6	8	H	0-123	6858	10*4	1.T	„ para. 21.

* The pay of the driver of the bullocks is included in the rate given,
t These bullocks cannot be hired for less than 14 annas a day.
X Ditto ditto 12 annas a day.

ORD'E'B OF GOVERNMENT,

No. 1252 OF 1880.

FROM

THE SECRETARY TO GOVERNMENT,

N.-W. PROVINCES AND OUDII,

To

THE DIRECTOR, DEPT. OF AGRI. AND COMMERCE,

N.-W. PROVINCES AND OUD£.

Bated Naini Tul, the 19th July, 1880.

^NUE DrALIMENx . SIR,—I am directed to acknowledge-your'letter No. 341 A., dated the 5th June, with which was submitted the annual report on the Government "Experimental Farrn^ Cawnpore, for 1878-79, drawn up by Mr. Fuller, together with Mr. Buck's review thereon.

2. The report, while it gives an interesting account of the experiments with ploughs and water-lifts, 'contains no allusion to the state of the farm and farm operations proper, arid sketches out no programme for the future.

3. The reason given- is that the late Superintendent, though doming with 'a high character, was found to have systematically neglected orders from the very commencement. ,An inquiry made in October ended in his resignation on the 1st November, from which date Mr. Fuller assumed charge. "Agricultural operations are therefore entirely put aside, tis the results professed to have been obtained were obviously not to be depended on. But Mr. Fuller might have given an account, however brief, of the crops actually grown, the objects aimed at, ami their general successor failure,, irrespective of an accurate record of results. The condition of the farm and its appurtenanoes when he took -over charge should also have been placed on record, and the nature of the late Superintendent's shortcomings might have be'en explained, *i.e.,* whether he merely neglected to record results as directed, or misconducted operations. It should also have been stated what is to be dojie in "future, and a-balance-sheet, showing the receipts and expenditure of the' year, and hotv the accounts stand, should certainly have been submitted. The Lieutenant-Governor trusts, however, that now* that Mr. Fuller is in charge, the next report will give a full and satisfactory account of the operations of the year.

4. The subjects- treated of are— '

(1) Experiments in the reclamation of reA-infcctcd land on the Rtiwatpur Court of Wards' estate ;

(2) The adaptation and construction of improved agricultural implements for Indian use, which were conducted under Mr. Fuller's iaitnsdiite direction ; and

(3) Experiments with water-lifts conducted mostly 'by Mr. Wilson.

5. Mr. Buck has prefaced the 'report with a review in which lie describes the history and pivgrses of the inechmical experiments g>in& •on with ploughs, water-lifts, and grain-cleaners. A really improved

plough would no doubt be an immense boon to the agricultural community, and jt would seem has been all but secured. The native plough scratches and moves, but does not invert the soil. The object is to get a plough which will invert the soil in the English way, and at the same time be sufficiently light of draught for an ordinary pair of bullocks to draw, and sufficiently ctieap to be within the means of an ordinary cultivator. An acjnptatiou from an American plough is the one that has been adopted. Its weight is only 30lbs.; its average draught, turniug a furrow 5" x *3\"9* is 126tbs.; and its price with wrought-iron work Ks 6, and with cast-iron work Us. 5- Four hundred and thirty-nine have been sold during the year, and negotiations are in progress for the supply of the iron-work • from America, wlien an article of better workmanship can be turned out than it is possible to produce in India; and at a^ price little in excess *of* T?s. 8, the limit within which it is considered the cost must be kept. But the accounts received of the new ploughs are not satisfactory from all • districts, the difficulty being said to be their heavy draught. This is believed to be due to improper handling, and it has been determined in future not to send them out without "a competent instructor to teach their use, and youths are being trained on the farm to meet this want. There is much truth, however, in what Mr. Fuller says in para. 14, that it is hopeless to expect the classes, who will not profit by the example of good agriculture already set them by several castes, to appreciate an improved plough, and it has yet to be seen whether one can be made up which will supplant the time-honored instrument in use to any large extent.

6. T&e experiments with water-lifts are fully detailed in an appendix by Mr. Wilson, and possess much scientific interest, besides showing the way in which problems connected with Indian agriculture have to be grappled with. The results, so far, are summed up by Mr, Buck in his review. Final conclusions have not yet been -arrived at; but it is believed a chain-pump c-in be successfully used where water is not more than 20 feet from the surface.

7. The experiments in *reh* reclamation were carried on in Q Ualf-acre .plots, and the "processes which, it is hoped, miy be successful to some extent, are:—

^1) Deep cultivation two months before the rains, and again at the commencement of the rains;

(2) Manuring with *maddr* ashes; and

(3) Surface drainage.

It is too early as yet to form any definite conclusion; and, if they are to be of any real value, the cost of the experiments should be compared with the results.

I have the honor to be,

SIR,

Your most obedient servant,

C. ROBERTSON,

Secretary to Government,

JV.- *W. Provinces and Oudh.*

REPORT

ON THE

CAWNPORE EXPERIMENTAL FARM OPERATIONS

DURING THE RABI SEASON, 1880-81.

ALLAHABAD:

HORTH-W ESTERN PBOVINCES AND OUCH GOVERNMENT PBES8.

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:R;EPORT

ON THE

CAWNPOKE EXPERIMENTAL FARM OPERATIONS

During the Eabi Season 1880-81.

No. $\frac{1864A}{LXXXIII}$ OF 1881.

FROM

THE OFFG. DIRECTOR, DEPT. OF AGRI. AND COMMERCE,
NORTH-WESTERN PROVINCES AND OUDH,

To

THE SECRETARY TO GOVERNMENT,
NORTH-WESTERN PROVINCES AND OUDH.

DATED CAWNPORE, THE 21ST JULY, 1881.

SIR,

I HAVE the honor to submit the usual report on the Cawnpore Experimental Farm operations during the rabi season of 1880-81. As in previous reports, these operations are subdivided into (A) field experiments of a purely agricultural nature, and (B) the development and construction of improved agricultural implements.

(A.)—FIELD EXPERIMENTS.

2. During five months of the period under report I was absent on leave *to* Europe, but my departure and arrival were so timed that I was able to supervise the sowing of the rabi crops before I left, as well as their harvesting after my return. Unfortunately it was impossible for Mr. Harrison, who acted for me during my absence, to pay anything but occasional flying visits to the farm, since he was compelled to remain in camp throughout the cold season, and I think that some of the crops suffered in the way of imperfect irrigation from the want of strict supervision.

3. The season was in many respects a very peculiar one. As shown in my report for the preoeding half-year, the rainfall of 1880 was abnormally light, amounting to 4-5 inches between June 1st and August 31st. A fall of 1/4 inches in September showed that Cawnpore caught the skirt of the cyclone which caused such deluges of rain in and near the hills ; but from September 18th to the end of the year the rainfall did not amount to three-tenths of an inch. The rabi crops are sown, as a rule, between October 15th and November 7th, during which period the ground was too dry to allow of germination if the seed was left to natural moisture. It was therefore necessary in every case to irrigate before spwing, and the crops were accordingly sown as well as raised by the help of canal-water. The following table shows the rainfall of the rabi under report: —

	Month.	*Rainfall in inches.*
1830	September	1*45
	October	0 05
	November	0-03
	December	0*2
1881	January	0-02
	February	0*21
	March	0*25
	April	0 0 0
	Total	2-21

There were therefore practically no winter rains, and this is the third year in which they have failed at Cawnpore.

4. Under these circumstances a really good harvest could scarcely have been* expected. Seed sown in soil moistened by irrigation never germinates so regularly or so strongly as if sown in soil naturally moist, since it is extremely difficult to ensure that all portions of the field shall be irrigated alike, and surface irrigation in the deficiency of subsoil moisture cannot be expected to promote strong or healthy root growth. Hence the crops on the fields of good cultivators round the farm compared very badly with those of the rabi preceding, while the average production of wheat on the farm lands (calculated on 11 acres) only amounted to 15 maunds (=20 bushels) per acre, although the whole of the land was three times irrigated in addition to the irrigation necessary for ploughing and sowing. In certain cases^ however, excellent outturns were obtained, amongst which I may mention 22^ maunds and 23 maunds per acre on fields manured respectively with a green crop and with poudrette.

5. The field experiments conducted during the season under report comprise experiments on—

(1) Different manures..
(2) Selection of seed.
(3) Irrigation.
(4) Deep cultivation.
(5) New staples—Cape oats from Australia and American maizes.
(6) Flax.

(1) Experiments on manures.

These may be thrown into two classes according as they were made—(a) with wheat or barley, (&> with sugarcane.

(a> *Experiments with wheat and barley.*

Mention was made in my two previous reports of a series of plots, each containing 400 square yards, which had been carefully marked oat and set aside for the systematic trial of different manures. These plots are 50 in number and comprise two sets, one for the kharif and one for the rabi, each in, duplicate, so as to give two parallel trials of each, manure in each season. To prevent as far as possible all chance of mistakes, a label is attached to each plot with a description of its treatment, and the experiments, if carefully carried out, will furnish in. time a valuable indication of the merits of the different manures which are available in the country, used singly and in combination. Reliable results cannot however be expected for the first two or three seasons until by similar cropping the plots have been reduced to a level and any differences in their previous treatment counteracted. This has as yet been done with only nine plots, which had been marked out and cultivated a year before the others. Their previous treatment, and details of their cultivation during the season under report, irrespective of the manures applied, are given below : —

Treatment on account of crop experimented with.				*Previous treatment.*		
Ploughing.	Seed and rate per acre.	Irrigation.	Weeding.	Year.	Manure.	Crop.
Twice (soil inverted) in October, 18S0.	White wheat, 1J maunds.	Three times from canal in addition to the watering for ploughing and sowing *(paled).*	Once ...	1878-79... 1879-80... 1880 (kharif).	*Nil* ... *Nil* ... Same as now applied.	Barley. Cotton. JVlaize.

The following table shows the manures which were applied during the season tinder report, together with the results obtained :—

Manure and rate per acre.	Cost of manure per acre.	Outturn in lb. per acre.		*Cost of cultivation.	Value of produce.
		Grain.	Straw.		
	Rs. a. p.			Rs. a. p.	Rs. a. p.
3. Crop of indigo ploughed in during October	7 6 0	1,781·7	2,474·8	28 13 0	58 4 3
2. Cattle dung, 240 maunds	12 0 0	1,346 1	1,926·9	33 7 0	44 5 7
3. Cattle dung, 240 maunds (duplicate experiment to the above).	12 0 0	1,255·3	1,775 6	33 7 0	41 3 9
4. Cattle dune, 240 maunds, and gypsum, 240lb.	17 4 0	1,240 3	1,805·8	38 11 0	41 0 5
5. Ashes of 240 maunds dung	12 0 0	1,113 2	1,597 2	33 7 0	36 11 1
6. Poudrette, 240 maunds	12 0 0	1,884 6	2,704·3	33 7 0	62 1 11
7. Bone superphosphate, 225lb.	11 4 0	986·1	1,397·5	32 11 0	32 6 2
8. Bone-dust, 320lb.	4 0 0	795·5	1,228·1	25 7 0	26 11 7
9. *Nil*	...	707·8	1,291·7	21 7 0	24 13 6

Throwing these results into the form of a percentage on the outturn and the profit yielded by the un manured plot, we obtain the following figures :—

	INCREASE PER ACRE.		
	Per cent. in gross outturn.		Actual in net profit.
	Grain.	Straw.	
			Rs. a. p.
Manures yielding nitrogen—			
Green soiling	151	91	26 0 9
Poudrette	166	109	25 4 5
Cattle dung (average of two experiments)[1]	83	47	6 0 2
Cattle dung plus gypsum	75	39	Decrease of Rs. 1-1-1.
Manures not yielding nitrogen—			
Ashes of cattle dung	56	23	Ditto „ 0-2-5.
Bone superphosphate	39	8 Decrease	A net loss per acre.
Bone dust	12	5	Decrease of Rs. 2 2-4.

The most prominent fact brought out by these figures is the great effect of manures containing nitrogen as compared with those which do not contain it. This appears to prove that it is in nitrogenous substances that the soil is most deficient; and since it is a well-known fact that manures only produce their full effect when in proper combination, it follows that, unless nitrogenous manure be added, the application of manures supplying phosphoric acid, potash, or lime can give but little profit. Hence superphosphate of lime in the experiments under notice only increased the outturn per acre by about 280lb. of grain and 100lb. of straw, which was not nearly sufficient to pay for its cost. The excellent results yielded by superphosphate in the *rabi* preceding the one now under report must have been due to the fields having previously had a good dressing of manure, which supplied the nitrogen requisite to draw out the full value of the superphosphate. No nitrogenous manure had, on the other hand, been supplied to the plot now under discussion for the past three years. I may note here that superphosphate unaccompanied by nitrogenous manure has been found to yield equally poor results by Mr. Lawes of Rothamsted, on whose farm the application of superphosphate alone *(though at the rate of* 14 *maunds to the acre)* continuously for 24 years was found only to have increased the outturn by an average of 2½ maunds per acre.

* The head "cost of cultivation" includes the following items :—

	Rs. a. p.
Two ploughings	3 0 0
Clod-crushing	0 10 0
Seed	3 0 0
Sowing	1 11 0
Weeding	2 0 0
Total	10 5 0

	Rs. a. p.
Brought over	10 5 0
Irrigation—	
Canal dues	1 8 0
Lifting (for 3 waterings)	3 6 0
	4 14 0
Rent	6 4 0
Manure	Variable.
Total	21 7 0

6. Other points brought out by the foregoing table is the poverty of cattle dung, as used by the natives of this country, compared with either green soiling or poudrette; while the still smaller return given by the ashes of cattle dung effectual ly disproves the assertion which is sometimes made that the consumption of cattle dung as fuel occasions no real loss to the country so long as the ashes are utilized us manure. This may be true with freshly-cultivated soils which abound in nitrogen, but in the case of the long-cultivated fields of the Doab is absolutely incorrect.

7. The following explanations are necessary concerning the different manures, the effect of which has been discussed in the preceding paragraph.

Green soiling consisted in ploughing in a crop of indigo which had been grown on the plot during the preceding rains. The cost of such a crop is not estimated to exceed Rs. 7-6-0, since no rent can be charged to it, and there would be no need of irrigation in years of ordinary rainfall. The effect of a crop of the leguminous order in fixing nitrogen in the surface soil is well known, though opinions differ as to origin of this nitrogen: some authorities (of whom Ville is the chief) considering that it is actually fixed from the air, and hence is *added* to the soil; while others follow Lawes and Gilbert in asserting that it is merely derived from the subsoil, from which it is drawn up by the long roots of plants of this order. It may be mentioned that *san* hemp (*Crotalaria juncea)* is equally efficacious with indigo for the purpose of green soiling. A parallel experiment was made with hemp on a field belonging to a native cultivator, on one portion of which hemp was grown during the rains and ploughed in during September, while the other portion was left fallow. Wheat was sown in October on both portions, with the following results :—

	Area of plots In square yards.	OITTTURW.			
		Actual.		*Per acre.*	
		Grain.	Straw.	Grain.	Straw.
		flJ.	lb.	lb.	lb.
Portion green soiled ...	200	45-5	80	1,1011	1,936-0
" lefc fallow ...	200	2625	64-5	635 2	1,560 9

Here green soiling increased the outturn of grain by 73 per cent, and of straw by 24 per cent.

Cattle dung was of the same description as that ordinarily used by native cultivators, and is estimated to cost about Rs. 5 per 100 maunds.

Cattle dung and gypsum.—The addition of gypsum positively decreased the outturn. As to the use of gypsum as manure reference may be made to para. 8 following.

Bone superphosphate was estimated to cost Rs. 5 per 1001b. as shown below :—

	Rs.	a.	p.
661b. bone-dust at 11 annas per maund	1	14	0
331b. sulphuiic acid at 2 annas per pound ... — ...	0	2	0
Total ...	5	0	0

8. Other experiments in addition to those detailed above were made to test the manurial value of gypsum and hujnan excreta.

Gypsum (sulphate of lime) has been found to be a valuable manure in some parts of England and America, not only as supplying lime to the soil, but also in virtue of the property which it possesses of fixing the volatile compounds of nitrogen, and so retaining them in the soil instead of allowing them to dissipate themselves in the air. At the suggestion of Mr. Buck I obtained a consignment of gypsum from the salt range in the Paiijab through the courtesy of Mr. Halsey, as well as from quarries in the neighbourhood of Naini Tâl by the assistance of Mr. Lawder, c.E. Gypsum is at present rated absurdly high in the railway tariffs, being included amongst chemicals instead of amongst minerals. If however its use as manure was to become general, I have no dpubt but that it would be reclassified, and in estimating its cost I have therefore assumed that it could be carried by rail at mineral rates. Under this assumption Naini Tâl gypsum oould be landed at Cawnpore for Re. 1-12-0 per maund-

		ies, a. p	
Collection charges ... .•• •••	•••	0 S 0	per maund.
Carriage from Naini Tâl to Bareilly ...	•..	1 0 0	„
„ Bareilly to Cawnpore •••	...	0 4 0	»
Total	r••	1 12 0	

A large number of experiments were tried with gypsum during the season under report, but with the most discordant results. In one experiment (already noticed), in which it was associated with cattle dung, it actually decreased the outturn. The results of other experiments in 'which it was used by itself or with cattle dung in different proportions are given below :—

Number of experiment.	Area of plot in square yards.	Amount of gypsum per acre.	OUTTURN.			
			Actual.		Per acre.	
			Grain.	Straw.	Grain.	Straw.
		R>.	fb.	n>.	ft.	It.
»•{	400	360 ...	85-0	116-5	1,028-5	1,409-6
	400	*Nil* •••	*58-5*	106-75	707-8	1,291-6
M	600	100 ...	217-78	325-5	1,756-5	2,625-7
	600	200 ...	1850	305-5	1,492-3	2,464-3
	106-7	*Nil* •••	40-25	72-25	1.825-7	3,2773
m. {•	605	Gypsum 80 ... Dung, 216 mds. •••	j 105-0	1490	840	1,192
	605	No gypsum ••• Dung, 216 mds. •••	^ 1550	2270	1,240	1,816

In experiment No. I. the use of 3601b. of gypsum increased the outturn of grain by 45 per cent. ; in experiment No. II. gypsum largely decreased the outturn, the decrease being larger with the larger amount of gypsum used ; the result of experiment No. III., in which gypsum was associated with cattle dung, agrees with that of the experiment noted in para. 7, the outturn being considerably decreased.

The experiments will be continued, but it is possible that the large amount of lime which the soil of the farm land contains, and'which shows itself in the formation of numerous kankar-beds, may make the application of a further supply of lime in the shape of gypsum positively injurious.

Human excreta.—A. trial was made of the system of movable latrines on trenches, which has been so often advocated for Indian villages. A piece of poor sandy land *was trenched with the English plough, and a movable grass screen erected, which could be shifted along down the trench as occasion required. A boy was "kept to shift the screen and to draw earth over the *excreta* morning and evening. The experiment could unfortunately ba only continued for 80 days, during which time the screens were used by 11 persons daily. The plot of ground which was thus manured measured 311*6 square yards ; at this rate an acre would be manured in a year by the daily attendance of 37 persons. The plot of ground immediately-adjoining the manured plot was taken, as standard of comparison, being treated in exactly the same manner as regards ploughing, sowing, and irrigation. Both plots were sown with barley and irrigated three times. The result is shown below:—

Area, of plot in square yards.	Manured or unmanured.	OUTTURN.				Value of produce per acre*
		Actual.		*Per acre.*		
		Grain.	Straw.	Grain.	Straw.	
		ft.	lb.	n›.	It).	Rs. a. p.
311-6	Manured ...	182-25	232	2,830-3	3,603 5	66 7 1
146*5	Unmanured ...	55-75	57·75	1.S41-8	1,907 9	40 12 9

The excellent outturn given by the unmanured plot was doubtless owin«r to its having been ploughed up at the same time as the manured plot was trenched, and thus lay in open fallow from May until sowing time. But the produce of the manured plot was by far the best and amounted to 35 maunds to the acre, an astonishing crop from such poor land as that experimented with.

(o) *Manure experiments on sugarcane.*

&. The effect of cattle dung, guano, and bone superphosphate, each in two different proportions, was tried on about four acres of sugarcane. For the purpose of measuring the outturn rectangular plota, representing an average portion of the crop, were marked out in each field, and coarse undrained sugar *(gurh)* was manufactured from the cane produced by them. The method of cultivation, irrespective of manure, is shown in the following tabular form :—

Treatment on account of the crop experimented with.			*Previous treatment.*		
Ploughing.	Irrigation.	Grubbing and weeding.	Year.	Manure.	Crop.
Twice in February, 1880, before crop was sown.	Dung plots six times ; guano and superphosphate plots five times.	Dung and guano plots grubbed and weeded four times ; superphosphate plots three time*. All plots covered with leaves in April, 1880.	1879-80 ...	Guano ...	Maize.

There was therefore a slight difference in irrigation and grubbing, the dung plots getting rather more water than the others and the superphosphate plots being only grubbed three times instead of four.

The variety of cane used on all the plots was that known as *matna.*

The results are shown below :—

MANURE.		OUTTURN.				Cost of cultivation per acre.	Value of outturn per acre.
Kind.	Bate per acre.	Area of plot iu square jarus.	*Actual.*		*Per acre.*		
			Canes.	Sugar.	Sugar.		
	Mds. s		1b.	ft.	lb.	Rs. a. p.	Rs. a. p.
Cattle dung	260 0	388-4	2,940	217-5	2 710-3	53 11 4	[illegible]
	260 0	135	3845	34	1,218-9	53 11 4	[illegible]
		[Average'of ttietwo above plots.			1,964-6	53 11 4	110 7T
	130 0-	315 3	1,194	1,005	1,542-7	47 3 4	86 11 9
Guano	12 35	[illegible]	[illegible]	105·5	2,089-2	166 11 4	117 8 1
	12 35	910	1,450 5	131	3,019 2	166 11 4	169 13 1
		Average of the two above plots.			2,554 2	166 11 4	143 10 7
	3 18	[illegible]	691	74 25	1,848-6	93 2 4	103 15 2
Bone superphosphate	6 24	150	618·25	80-75	2,605·5	51 0 10	146 8 6
	6 24	144	[illegible]	76 25	2,562-8	51 0 10	144 1 9
		Average of the two above plots.			2,584·1	51 0 10	145 5 1
	3 32	113-3	3885	37*25	1,591-3	44 10 10	[illegible] 7 10

The profits per acre yielded by each manure were therefore—

		Mds.	s.	Us.	a.	P.	
Dung	...	260	0	56	10	3	In calculating these profits cost of sugar manufacture has not been allowed for : this amounted to He. 1-5-4 per maund of sugar.
Do.	...	130	0	39	8	5	
Guano	...	12	35	(loss of 23	0	9)	
Do.	...	3	18	10	12	10	
Bone superphosphate	...	6	25	94	4	3	
Ditto	...	3	32	44	11	0	

The heavy yield which resulted from superphosphate is explained by the nitrogenous manure which was applied in the form of guano, 12 months previously, and which allowed the phosphoric acid to exert its full power.

(2) Selection of seed.

10. The effect of this'in the case of wheat was tried in two parallel experiments. The wheat-seed used was procured in the Cawnpore bazaar and was of very inferior quality. Selection was effected by the us© of a grain-separator, which eliminated 25 per cent, of the smaller and more shrivelled grains. Two quarter-acre plots were marked off and each divided into two portions, on one of which seed selected as above was sown, and on the other unselected seed. The same amount of seed was sown in both oases. Each plot w.is irrigated three times. The results are given in the following table :—

Number of experiment.	Seed.	Outturn per acre.	
		Grain.	Straw.
		tb.	tb.
I.	Selected ...	1,0460	1,486-0
	Unselected ...	814-0	3,492-0
II.	Selected ...	1,060-0	1,4340
	Unselected ...	1,020*0	1,574-0

Selection of seed therefore increased the outturn of grain by 29 per cent, in one case and 4 per cent, in the other. The outturn on all four plots was very poor, and had it been larger, the advantage resulting from ^election of seed would doubtless have been more conspicuous.

(3) Irrigation.

11. The effect of different numbers of waterings withoanal water was tried on a series of five plots which were irrigated respectively 4, 3, 2, 1, and 0 times. Each plot measured 400 square yards and was ploughed twice before sowing, in August and October. The crop was cut on April 7th; the results were as follows :—

Number of waterings with dates.	*Outturn per acre.*		*Increase in outturn resulting from irrigation.*				Money value of the increase in produce due to irrigation, which cost at most Rs. 4-14-0 per acre, including canal dues.
			Grain.		*Straw.*		
	Grain.	Straw.	Per acre in It).	Per cent.	Per acre in Ib.	Per cent.	
Four times.	lb.	lb.					Rs. a. p.
Novr. 26th, Jany. 2nd, Feby 4th, March 11th ...	1,603-2	2,910-0	1,352-2	538	2/268-7	353	40 4 6
Three times.							
Novr 29th, Jany. 8th, Feby., 21Bt ...	1,0164	1,911-8	765·4	304	1,270-5	198	26 2 9
Twice.							
Deer 26th, Feby. 6th ...	1,200 9	1,6606	949-9	378	1,079-3	158	29 6 3
Once.							
January 4th ...	1,055 7	1,488-3	801-7	821	8470	132	24 13 0
Not irrigated ...	251-0	641-3	...	...	...	...	...

The money value of the increase due to irrigation is even more disproportionate to the cost of the irrigation than in the case of similar experiments conducted on tho farm during the rabi season of the preceding year: and with regard to the present experiments, it must be remembered that the first watering *(paleo)* on which the plots were ploughed and sown has not been taken into consideration, and that had not canal irrigation been available for this, no crop whatever could have been gathered.

It is noticeable how vastly a watering in March increased the outturn; when this was not given, the difference resulting from the plots having been watered once, twice, or three times is comparatively small.

12. In connection with the subject of irrigation I may mention the extraordinary difference which exhibited itself between the outturn of wheat-fields (a) ploughed up in July, so as to catch in open fallow what little rain fell, and (6) not ploughed up till September. This was especially noticeable in the case of one field which had been originally intended for cotton, and a portion of which had been ploughed up at the commencement of the rains, while the remainder was left unploughed till September, when the whole field was ploughed up and sown with wheat. The strip which had been first ploughed was accurately marked by a broad band of wheat running down the field, almost twice as tall and as thick as on the later-ploughed portions. Two typical plots were marked out in both portions and the crop carefully weighed. The result was:—

	Outturn per acre.		Value of crop per acre.
	Grain.	Straw.	
	ft.	ft.	Bs. a. p.
Portion ploughed in July ,,, ...	1,630*7	2,676·4	55 9 10
,, not ploughed till September ...	983·4	1,493-8	32 13 10

Hence the difference in value of outturn made by early ploughing amounted to over Us. 22 **per** acre. *

(4) Deep cultivation.

13. All the fields on the farm were cultivated with the soil-turning plough as in previous years, but only one experiment was made to test the results of this cultivation as compared with the native system, and this unfortunately was a complete failure. The plots on which the experiment was made were the same as those on which sorgho had been grown experimentally during the rains preceding, and their soil appears to have been exhausted, since the outturn of wheat was extremely small. Only six weeks intervened between the final cutting of sorgho and the sowing of tho wheat, and this was too short a period to allow of the soil recovering itself. The outturns were so small as to be valueless.

Mention may be made, however, of a crop of castor which had been sown in the July preceding on some sandy land sloping down towards the Ganges ravines. Owing to the deep cultivation which the land had received the crop survived the failure of rains, and was the only crop of any kind gathered from land of this description for miles round. The crop was gathered in April, having received no irrigation whatever since it was sown. The result is shown below:—

Area of field in square yards.	*Outturn in castor seed.*		Value of crop per acre.
	Actual.	Ter acre.	
	ft		Bs. a. p.
3,936-1	116*5	1457	5 0 0

This outturn is of course extremely small, but suffices to show the utility of deep cultivation, without which there would bare been no crop whatever.

(5) New staples.

14. The cultivation of two new staples was attempted—of Cape oats and of American maizes.

Cape oats.—Some seed had been obtained from Australia through the courtesy of Mr. O. G. Palmer, C.B., who wrote of it as being the most " profitable hay crop grown in South Australia on the better classes of soils, very free from disease and standing even the Australian droughts." The crop was a complete success : it was watered three times, and treated in every way like an ordinary *rabi* crop, but grew far higher and thicker than the oats ordinarily cultivated in this country. If grown for cattle fodder, it should yield two or three cuttings of green fodder during the cold season, when cattle food is scarcest, the stalks being cut down each time as soon as the ears show signs of appearing. This could not be tried with the crop experimented with, as it was necessary to grow it for seed. The yield in grain and straw was very heavy, the grain amounting to 2,299H>. per acre and the straw to 3,9931b.

American maizes.—In the report for the preceding *hliarif* it was noted that there appeared to be more chance of success in cultivating American large-grained maizes as a cold-weather than as a rain crop. During the *rabi* under report a trial was made of the following maizes :—

American large white corn.
Ditto white flint corn.
American Canada corn.
Country maize from Jaunpur.

The seed of all these American maizes was acclimatized; not imported, having been produced in India from imported seed. Seed of the first-named variety had been raised in the Kbatmandu valley, whence a small quantity was kindly sent for trial by Mr. C. E. Girdlestone, the .Resident. The seed of the second and third American varieties had been raised on the Awa estate during the rains preceding, and hence had probably rather deteriorated in quality. But the results prove sufficiently well that some varieties of American maizes can be introduced into India as a cold-weather crop with great advantage, since if sown in September they will yield a large stock of food in February, at the time when the poorer classes are hardest pressed. The results are shown below, the first table giving details of cultivation and the second details of outturn :—

Treatment on account of crop experimented with.				*Previous treatment.*		
Ploughing.	Manure and rate per acre.	Irrigation.	Weeding.	Year.	Manure.	Crop.
Once in October.	*NU* ...	7 times from canal. American maize from Nepal 8 times.	Twice weeded.	1879-80 ... 1880-81 ... Kharif ...	Dung ... *Nil* ...	Potatos. *Nil* ...

Area of plots in square yards.	Variety of maize.	OUTTURN. *Actual.* Hulled corn.	OUTTURN. *Per acre.* Hulled corn.	Cost of cultivation.	Value of produce.
		lb.		Rs. a. p.	Rs. a. p.
222·2 ...	Large white corn from Nepal.	62*5	1,361-4	18 4 0	20 3 2
272-3 ...	American white flint	140-0	2,488-4	17 2 0	36 14 10
264-3 ...	American Canada corn.	237-0	4,348-2	17 2 0	64 8 7
318*75 ...	Country maize from Jaunpur.	146-5	2,224*5	17 2 0	33 0 2

The American variety known as Canada corn gave therefore a most enormous outturn and can be confidently recommended for cultivation.

15- (6) Plax cultivation.

A large consignment of Dutch flax seed was imported from England, but altogether failed to germinate. Recourse was therefore necessary to what acclimatized seed was in stock, and since the crop from which this had been produced in the year preceding was not a very healthy one, it is probable that its quality was far from being first rate.

Details of the method of cultivation are given below r—

Treatment on account of crop experimented with.						*Previous treatment.*			
Area of plot in square yards.	Ploughing.	Man ure and rate per acre.	Seed.	Irrigation.	"Weeding	Year.	Manure.	Crop.	Cost of cultivation*
									Rs. a. p.
3,122 4	Twice—once during rains and ones in October; also country ploughed before sowing.	Dung, 135 maunds.	Acclimatized flax.	4 times from canal.	Once	1878-79, 1879-80 1880-81, (Kharif),	*Nil* . Dung, 50 maunds *Nil* ...	Wheat, Wheat, *Nil.*	29 13 0

The crop was an unequal one ; in some portions of the field it was excellent, but in other portions much dwarfed, apparently from lack of moisture. The seed was sown after an irrigation from the canal and not on natural moisture, and the irregular germination was, I think, due to unequal distribution of water. The field being on a slight slope, it was very difficult to distribute irrigation water evenly over the surface. In every way the season was against flax cultivation, which requires a damper air than Cawnpore affords, even in a cold weather season when the winter rains do not fail.

The flax was pulled, rippled (t.«., the seed heads stripped off), and retted in exactly the same manner as was done in the preceding rabi. The stalks were broken in a machine invented by Dr. Collyer, which when worked by four coolies can break 200tt>3. of flax daily. Soutching was performed by the farm apprentices and by coolie women, the amount scutched per head per day being about l'6tb. of flax and 8Ibs. of fine tow, which required no further scutching.

The return per acre was—

	lb.			£ *. *d.*
Flax, first quality ...	76	worth in England about	...	1 14 0
„ second „ ...	43	ditto	—	0 9 0
Tow, fine ...	604	ditto	...	[illegible] 0
„ coarse ...	41	ditto	...	[illegible] 1 0
	220*	Total	...	2 13 0

A sample of the flax was submitted to the opinion of experts through the Secretary, Agri. Horticultural Society of Calcutta, and was pronounced to be of good quality and easily saleable in the European markets at good prices.

Little progress has been made, however, towards finally deciding the question whether the production of flax in districts like Cawupore offers any hope of substantial profits. The cost of scutching was extremely high, reaching Rs. 70 per ton, and it will be necessary to adopt some other system for the purpose than that of single hand labour, unless its efficiency is very greatly increased by practice.

(B)— THE DEVELOPMENT AND CONSTRUCTION OF IMPROVED AGRICULTURAL IMPLEMENTS.

16. Ploughs.—The pattern of the Kaisar plough has been somewhat altered, a long beam, after the fashion of the native plough, haying been substituted for the short

beam with which if was previously fitted. This chanςre was not made till after much consideration, since it renders the plough more weighty and cumbrous, but experience has shown that it popularizes the plough and makes its form appear less strange to native eyes. The price remains the same, Rs. 6 apiece. During the half-year under report 86 ploughs were distributed, 8 of which were given away and the rest sold. Out of the 86, 44 were of the newly-adopted pattern.

17. Pumps.—The form of the chain waterlift has been finally decided upon, and 11 were sold during the half-year, 7 of which were for depths less than 15, and the remaining 4 for depths less than 20 feet. As has been stated in previous reports, it is only for depths less than 20 feet that the waterlift is conspicuously more effective than any one now in use in the country.

18. **Winnowers.**— Ad wantage was taken of the last *rdhi* harvest to test by continuous use the pattern of winnower now made in ths Farm workshops. On the whole it did well, though some important modifications suggested themselves in course of work, and when carried out were found to have added considerably to the effectiveness of the implement. Careful comparison was made of the work of *(a)* the winnower imported from England (one of Dell's) at a cost of Rs. *200, (b)* one of the winnowers made up in the workshops at a cost of Rs. 35, and (c) the native method of winnowing. Trials were made on two days—once when a strong gale was blowing from the west, and again when there was only a very light breeze. In the former case the native method of winnowing consisted in merely pouring out the mixed grain and chaff *{bhusa) out* of a basket held up in the air, when the wind blew the chaff on one side, allowing the grain to fall straight down. In the latter case the wind was not strong enough to effect the separation, and the method followed was to make an artificial breeze by waving a sheet backwards and forwards in front of the basket from which the grain and chaff is poured out. The results are given below in tabular form :—

Method of winnowing.	*Labour required.*		*Result* actually obtained.*		*Time and cost of winnowing 100 maunds, as dedu* ced from the results.*	
	Number.	Cost.	Amount of wheat winnowed.	Time token in winnowing.	Time taken to winnow 100 maunds.	Cost of winnowing 100 maunds.
		Annas.	[illegible]	M.	H. M.	Annas.
First experiment in a gale of wind.						
English winnower	4	*e*	561|	80	18 58	15-4
Farm „	3		376	91	32 I*	21-1
Native method	3		537*	113	28 33	18 7
Second experiment in a calm.						
English winnower	4	***eh***	448	70	20 50	16-9
Farm „	3	***H***	410	125	40 39	26-6
Native method	3	10*	503	195	51 41	*67 8*

So long, therefore, as a high wind is blowing cultivators are able to winnow grain after their own fashion at a rate actually cheaper than if they used the farm winnower ; but in a calm matters are very different, and the native method is shown in this case to be extremely tedious and expensive. West winds are undoubtedly prevalent during the season when winnowing is in progress, but long periods of light east winds or no wind at all are far from uncommon, and indeed there was such a period during this last harvest. In cases like this the winnower now being distributed will be of great service.

During the half-year under report 22 winnowers were sold at a price of Rs. 30 apieee.

19. **Windmill.**—Mention may here be made of a windmill, of a pattern known as the "Kewanee," which was imported from America during last cold weather mainly at the suggestion of the Government of India. The price as given by an agent of the manufacturers who was then travelling in India was 54 dollars, but this was incorrect,

and it was necessary to pay the manufacturers 84 dollars, which was the real price of the machine, less customary discount. The whole cost of the windmill landed at Cawnpore was close upon Us. 300.

After numerous trials with different kinds of pumps the machine was fixed on the edge of a tank and attached to a plunger pump with a cylinder 7 inches in diameter and a 4-inch stroke. It was employed to lift water from a depth of 12 feet and to irrigate an adjoining field. The following figures show the results of various experiments made to test its discharge :—

Character of wind, with approximate velocity per hour.	Number of experiment.	Depth to water.	Quantity of water lifted per hour.		*Useful work performed.*	
			Cubic feet.	Bth	In foot lt>. per minute.	Horse power.
		Feet.				
Strong breeze: between 8 and 9 miles	I.	14	125-1	7,806-24	1,821-4	•055
Fair breeze: 6 miles ...	II.	11	74	4,617-6	846-5	•025
Ditto ...	ft	11	76	4,742-4	869-4	•026
Ditto ...		14	64 36	4,016-06	937 08	•028
Ditto ...	V.	14	60-4	3,768 96	97942	•026
Iaght breeze: 5 miles ...	VI.	11-6	62•6	3,906-2	748-6	•022
Gentle breeze: 3 miles ...	VII.	11-5	14•6	911-0	174-6	•005

The experiments are not so satisfactory as could be wished, since it was only- possible to make a rough guess as to the most important factor—the velocity of the -wind.

It may be noted that the discharges obtained in experiments II. to V. are slightly less than those of a lever lift *(dhenkoli)* worked by two men.

The minimum velocity of wind necessary to work a windmill with any degree of effectiveness may be taken as 4 miles an hour. It has been shown in a note by Colonel Brownlow, published in one of the Professional Papers on Indian Engineering (No. 33, July, 1879) that the number of months in which the *average* velocity of wind exceeds 4 niiles an hour in these provinces is comparatively small. Observations at the five principal stations in the North-Western Provinces taken for seven months (November, 1871, to November, 1874) show that the average wind velocity of each month exceeded 4 miles an hour—

At Roorkee	for	2	months.
„ Bareilly	„	7	„
„ Agra	„	16	„
„ Lucknow	„	7	„
„ Benares	„	13	„

But this low average velocity is in great part due to the almost invariable dropping of the wind at night. Taken hour by hour there are many periods in each month during which the velocity reaches a comparatively high figure. The following figures are abstracted from a table appended by Mr. Blandford to the note above quoted, showing the mean velocity of the wind at Agra for eight months, November to June, *i.e.,* the months during which irrigation is chiefly needed :—

TVTont'h.	*Average number of houra per diem in which velocity per hour exceeded*				
	4 miles.	5 miles.	6 miles.	7 miles.	8 miles.
November	7	3	2	...	...
December	5	1	—	...	...
January	9	6	4	2	...
February	9	7	3	1	...
March	9	7	[illegible]	4	...
April	13	10	9	3	2
May	24	19	9	4	1
June	23	16	13	10	5
	99	71	45	24	8

Taking the total number of hours as 192, the number during which the wind was blowing with a certain velocity was—

Velocity per hour.	Number of hours for which this velocity was maintained.
4 miles ... ... — ...	99—71 = 28
5 „	.71-45=26
6 „ ... ... — •••	45—24=21
7 „	.24— 8 = 16
8 „	.8= 8

Experiments with the Kewaneo windmill have shown that with the wind velocity at 6 milds per hour its efficiency (in HP.) was about "026. Taking -C as the measure of the efficiency of the pump which was worked by the windmill, we obtain -04 HP, as the amount of power actually exerted by the mill, which exactly agrees with the figure arrived at by Smeaton on theoretical grounds. Applying this figure ('026 HP.) to the above table, and modifying it for each case according to the square of the velocity, we obtain the following result:—(28 x -Oil + 26 x '018 + 21 x -026 + 16 x •035 + 8X-046) -*-192«-0117 HP.

The efficiency of a *dhenkoli* worked by two men turn and turn about for 8 hours a day is about *028 HP., and the average efficiency spread over the whole 24 hours will be *009, or only slightly less than that of the windmill.

The cost of the windmill together with the pump was Rs. 360, so that its daily cost (on account of interest and wear and tear at 15 per cent.) distributed over the eight irrigating months of the year will be 3·5 annas. To this must be added 1'5 annas as the wages of a boy to look after it, and so the total daily cost will be 5 annas. This is more than the daily cost of a *dhenkoli.*

A small windmill, such as the one experimented with, appears therefore to offer no advantages over the modes of lifting water now known to the country, while it is constantly liable to damage from sudden storms of wind. The windmill experimented with was totally disabled by a dust-storm which swept across the country in May, and repairing it entailed a great deal of expense and trouble.

I have the honor to be,

SIR,

Your most obedient servant,

J. B. FULLER,

Offg Director, Dept. of Agriculture and Commerce*

OEDEES OF GOVEENMENT.

No. 1323 OF 1881.

FROM

THE SECRETARY TO GOVERNMENT,

N,-W. PROVINCES AND OUDH,

To

THE DIRECTOR OF AGRICULTURE AND COMMERCE,

N.-W. PROVINCES AND OUDH.

DATED NAINI TAL, THE 22ND AUGUST, 1881.

REVENUE DEPARTMENT.

SIR,

I AM directed to acknowledge your letter No. 1665A., dated the 21st July last, in which you reported on the Cawnpore Experimental Farm Operations during the rabi season of 1880-81.

2. The report gives a very clear statement of the work and results of the half-year. The problems connected with the improvement of agricultural methods and appliances are being patiently and judiciously studied, and will, it is hoped, before long be satisfactorily solved.

3. A full account is given of the trial of the " Kewanee " windmill imported from America, and the conclusion seems to be that the machine is hardly adapted for general use in this part of India. In G. 0. No. 1119, dated 1st July, 1880, you were asked to report to the Government of the Panjdb the results of the trials of this windmill; and I am to request that if you have not already done so, you will now send the report required.

I have the honor to be,

SIR,

Your most obedient servant,

C. ROBERTSON,

Secretary to Government,
JV.-JV. Provinces and Oudh.

EEPORT

ON THE

CAWNPORE EXPERIMENTAL FARM OPERATIONS

DURING THE KHAR IF SEASON, 1881.

ALLAHABAD:

KOBT H-W KSTEBN FB0VINCBS AKD OUDH GOVERNMENT TRESS.

1882.

REPORT

ON THB

CAWNPOEE EXPERIMENTAL FAEI OPERATIONS

During the Kharif Season of 1881.

No. 41GA OF 1882.

FROM

W. 0. BBNETT, ESQ.,

Offg, Director, Dept. of Agri. and Commerce, 8.-W. P. and Ouih,

To

THK SECRETARY TO GOVERNMENT,

JSorth- Western Provinces and Oudh.

DATKD CAWNPOM, TBB 28TH MARCH, 1883.

I HAVB theTionor to submit Mr. Fuller's report on the kharif harvest on the Experimental Farm at Cawnpore. The delay in its submission has been due entirely to the lateness of the cotton pickings. The greater part of that crop not having been sown till a month after the usual time, the pods continued to be thrown out till after Christmas. After that it was necessary to gin a rather large crop, and to obtain the opinion of experts on the prices which the produce would command in the market, in order to strike the value per acre of the crop.

2. It was a singularly unfortunate year for experiments. The effects of the various kinds of manure were neutralised by the excessively heavy rain in August and September, which, by flooding the lower lands, gave higher-lying fields an advantage quite independent of their manner of cultivation. Moreover, the manure itself was washed from one field and deposited in another tying below it, and injured by excessive wet. The experiments in manures have therefore proved complete failures, and cannot be said to teach anything.

3. The deep and shallow ploughings were in the same way equalised by the very heavy rain, which loosened the soil to the utmost depth required by the cotton with which it was sown. These experiments did however show, what has indeed been repeatedly proved before, the immense advantage of ploughing the land a considerable time before the crop is sown. In the case of cotton it nearly doubled the outturn, raising the value of the produce from Us. 33-5-0 to I*s. 55-3-0 per acre. I think that Mr. Fuller is mistaken in considering that the knowledge of the benefits of early ploughing is confined to the Meerut Division. They are certainly fully appreciated all over Oudh. No doubt the land is far better exposed by the farm plough than by the native implement, and that gives the former a great advantage for this operation. This year's results in no way vitiate the conclusions drawn from last year's experiments as to the immense advantage of deep ploughing in a year of drought.

Th" '*' The outturn of tWs year's cottoa was nearly I62fts. of cleaned cotton to the acre. This is not so good a result as was obtained last year; but, considering that the land was neither manured or irrigated, cannot be considered as otherwise than satisfactory. The provincial average outturn per acre was last year less than 661bs. of clean cotton; and, with one exception, the highest rate of produce (252fts. per acre) was obtained on the Cawnpore farm from country seed. This year's experiments with native and imported cotton point to one interesting fact, though the experience of a single year can hardly be taken as final proof. On light loamy soils the native cotton easily beat the American. Its produce being 195 and 252lbs. of cleaned cotton to the acre, against 106 and 91'5fts.; and this result is confirmed by the fact that the produce of duplicate plots sown with the same seed closely agreed. On a heavy loam, however, the superiority of Mew Orleans over the Kulpahar variety was equally striking : the former yielding 263fts. of cleaned cotton against 126fts. of the latter.

5. The experiments in sorgho sugar were vitiated by a want of proper acquaintance with the means by which it should be manufactured from the juice. The experiments, which have considerable intents, will it is hoped be repeated next year with a fuller knowledge, and consequently more satisfactory results.

6. I think that the Kaiser plough has probably a future in the cultivation of the country. It agam gained the first prize atthe Lucknow exhibition, and very favourable reports are received of Us workmg from such competent judges as the indigo-planters of Tirhoot. Mr. Cabaniss of ff the WI'/A T th8 my beSfc plOUSh for In*an agriculture, with the exception resnectS h t T 7?T ^^ * mUch moro eXpenaive TM&TM* I «* ** in ^ reap cts ,t ,, better su,ted to India than even that. A large number hare been sent to the Panjib, and so of then Tw It 7 Z * 2 o f IndU, In PiUbbit * oaSnall y fouQd a -mindar who had twelve of them working on hi.i*, the majority of whioh he had made up in his own village in imitation of plou as t him from mnd^who w *; r' U * «« « " c^ accidentally came^cross another s^r^rifAt^ It's benefu ... pp-* harvest, and perhaps for two, till they are fully apparent. Its progress therefore must be slow.

7. Another point to be noted is that it is not fitted for every class of soil. Nor indeed could any plough be devised that would be. Where the race of plough-bullocks is exceedingly poor and feeble, its draught is too great for them. But this is not the case with the majority of districts in these provinces. Where again the soil is very hea[vy] it suffers from the opposite defect ... reports that 111. oKta, ,, fte soil a,,,, ,,,,,;«, pioag]M whioh i<rh f m to i m , . The ... lop ... be made that should at the same time be effective, bu. the attention of the department will in the ensuing year be turned to the development of a plough which, without being materially dearer, will answer better for heavy cultivation.

8. Many inquiries are made after the departmental pump, and a ... been sold. Considering its cheapness and effectiveness, I cannot doubt that it will be ... come into very general use. I may pe haps t ... permit[t]ed t0 reCord * CaS6 which ... A common cultivator who h,! ... a pump at work during the exhibiti0n ... W « village blaCk8mith for how much ... one. The man undertook to do it for Rs. 100, the real price of the pump being Rs. 40 only, and constructed an implement with the tube made of tin, with edges at the joints turned inwards. Of course after a few days' use the pump altogether broke up, and the cultivator sued the maker in the Small Cause Court to recover the price. 1

9. The success of the Bihia mill has been due to a large extent *» the intelligent *ay in which its sale has been pushed. Our implemenfe bave boen A~w» ^ck by the difficulty we have experienced in getting trust[worth]y agen*. As 8oon aS tbis di^ty_whioh is not an insuperable one—is overcome, there is l ... ok every prospect of a krge 8ale for tbe pump3 owtain^» and pro*bably for the ploughs.

I have the honor to be.

SIR,

Your most obedient servant,

TV. C. BENETT,

Ofg. Director, Dept. of Agriculture and Commerce,

North. Western Provinces and Oudh.

REPORT ON THE OAWNPORE EXPERIMENTAL FARM FOR THE KHAfiflT SEASON OF 1881.

I.__field experiments.

THE season under report was by no means a favourable one for experimental « > *.*.* « -
The raim commenced early, tbere being a fall of over five inches during the first fortnight o. June. Advantage was largely taken of the opportunity thus afforded of getting the cotton-seed into the ground L l y ; but a break of nearly three weeks, during which the hot winds again commenced blowing, parched up the young plants as they germinated, and the cotton sown on the first burst of rain did not ou the whole do as well as that sown during July, after the rains had set in thoroughly. The rainfall of July and August was abnormally heavy, flooding a great portion of the country, and doing seriom damage in this way to the young cotton and maize ; but the whole season's rain was concentrated in these two months, and by the end of August the rams had practically ceased. Details of the rainfall are given below :—

Month.	Rainfall in inches.	Number of days on which rain fell.
June	5-5	4
July	12-4	15
August	17 3	22
September	0-4	3
October	0 2	1
November	0 0	0
Total	35-8	45
Normal rainfall during this period ...	26-56	...

The raiufall of September anJ October was actually one inch less than it was in the year preceding, when the total rainfall only amounted to between six and seven inches. The shallow-rooted millets and maize suffered severely in consequence, and yielded an outturn much under the average. Unirrigated rice totally failed. Cotton, pulses, and til did not feel the drought so much, and rather benefited than otherwise by the absence of Ojtober rain, which is often very prejudicial to them. But the ground rapidly lost the moisture which it had acquired during the two preceding months, and the rabi sowings germinated very poorly, except where the ground had been previously watered. The average outturn of clean cotton on the farm was 161/8tt>3. on 67 acres; and considering that only one-tenth of this area was manured and none of it irrigated, this return must be considered satisfactory.

2. The excessive rainfall of July and August was especially prejudicial to the experiments, tthich were conducted with different manures, and to test the value of deep cultivation. The experimental delds were covered with water for over a week, and since ihey are situated on a slope, «ie manures must have been in great part washed out of the soil, and carried in solution from one plot to another. Moreover, the plots being on a slope did not all suffer equally from flooding, and this by introducing a second variant into the experiunnt tended of course to obscure the relative effect of the manures. The swamping of the ground also reduced deep and shallow cultivation to a par, since it converted the soil into a quagmire, and made it equally easy of penetration by plant roots, whether the ploughing was deep or shallow.

3. The operations of the season uuder report comprised experiments o n -

(i) Manures.
(ii) Deep and shallow tillage.
(iii) Cottons.
(iv) Sugar manufacture from the Impee or Sorgho *(Sorghum saccharatum).*

4. (i) Experiments on manures.—These were continued on the experimental plots (each of 400 yards square) which have been mentioned in preceding reports as having been marked out for the purpose; and which, having been similarly cropped during the two preceding seasons, must have been tolerably well reduced to a level as regards natural fertility. The results exhibit some

startling discrepancies, due, as has already been explained, to the submergence of a number of the plots for over a week at the end of July, but they are given as they stand below, together with details of cultivation :—

Treatment on account of crop experimented with.				*Previous treatment.*		
Ploughing.	Seed and rate per acre.	Irrigation.	Weeding	Tear.	Manure.	Crop.
Twice with earth-taming plough...	Maize, 6 seers...	*NJ.*	Twice ...	1878-79 ...	*Nil.*	Barley.
				1879-80 ...	*Nil.*	Cotton*
				1880-81— Khaiff...	Same as now applied.	Maize.
				Rabi ...	Ditto.	Wheat.

The land had therefore been cropped continuously for three years, and during the preceding year had borne two very exhausting crops.

The following table shows the manures experimented with and the results they yielded. To indicate the effect of the flooding on these results a column is added, showing the outturn of wheat, which was obtained *from the same plots with the same manures,* though in slightly different proportions, during the preceding rabi season?—.

Manure and rate per acre.	Cost of manure per acre.	Outturn of maize (grain) in ll)s. per acre.	Outturn of wheat (grain) from same plots in the preceding rabi.	Total cost of cultivation, including harvesting and cleaning.	Value of grain produced per acre.
	Rs.	lbs.	lbs.	Rs.	Rs.
Manures yielding nifcropren—					
Poudrette, 180 matinds	90	1,458	1,884 6	22·1	19-5
Cattle-dung, 180 maunds	90	633	1,346-1	21-4	8*5
Cattle-dung, 180 ruaunds, and bone-dust, 360lbs.,	13 5	630	...	25 75	8-4
Cattle-dung, 180 maundy and gypsum, 240Jbs.,	14-25	1,218	1,2403	27·0	16*3
Manures not yielding nitrogen-					
Ashes of 180 maunds cattle-dung ...	9 0	723	1,113-2	21-5	9-7
Bone superphosphate, 240fl>a.	115	213	986-1	23-3	28
Bone-dust, 3601ba.	45	963	795 5	17-1	130
Gypsum, 2401fcs.	5 25	1,038	...	17-9	14·0
No manure	GO	1,239	707 8	12·8	166

While therefore the outturns of the preceding season showed that the efficiency of a manure depended in chief measure on the supply of nitrogen which it yielded, the present outturns, although keeping poudrette as before at the head of the list, indicate that no manure at all is considerably more efficacious than any of the other manures experimented with, whether they are nitrogen-yielding or not. This result is due to the more favourable situation of the non-manured plot which lay at the head of a slope, and was therefore less swamped than the others. Any attempt at criticising results which exhibit such discrepancy would of course be futile.

I may mention that arrangements Lave been completed for continuing these experiments in duplicate in future, which will do much to prevent the re-occurrence of such a failure as this. Under any circumstances, the average of two plots in different situations will be a much mor« reliable guide than the outturn of a single one.

Two double sets of plots—one double set for the *tali* season and another for the *kharl]-~* were marked out a year ago ; but before commencing experiments it was necessary to take a* least a couple of crops off the ground in order to reduce the plots to an equality.

5- (ii) Experiments on deep tillage.—These were continued on the plots (each of 400 square yards) which had been made (he subjects of a similar experiment in the preceding year. The crop experimented with was cotton, that in the preceding year having been sorgho. The plots had not been manured for three years, received no irrigation, but were twice weeded.

No. I. was ploughed with the earth-turning plough two months before sowing, and again at sowing time.

Nos. II. and III. were ploughed once with the earth-turning plough at sowing time.

No. IV. was ploughed twice with the native plough at sowing time (this plot had never been touched with any plough but the native).

The outturns are shown below :—

Number of plot and description of tillage.	Comparative cost of tillage per acre.	Outturn of clean cotton per acre.	Cost of cultivation, including picking and ginning.*	Value of produce per acre.
		lbs.	Rs.	Rs.
I.—Deep ploughed months before sowing and again at sowing	3·0	252	22·4	65·5
II. and III.—Deep ploughed at sowing time ...	1·5	{ 141 166 }	18·0	46·5
IV.—Country ploughed at sowing time	1·0	177	18·5	53·3

The ... therefore under similar circumstances gave rather better results than the ground ... explained before (para. 2) ... swamping of the roots therefore finding soft earth ... saturated with moisture to a considerable depth in either case, and the plant ... to whatever depth they penetrated. The results of the experiments of the previous kharif prove beyond doubt that had the season been one of deficient rainfall, when it is a matter ... every drop of rain should be drunk in as deeply as possible, the results of the trial would have been widely different.

The outturn ... the ... very ... ploughing ... hot months increases outturn. There was no comparison between this field and the others in strength of plants and colour of foliage ... although ... which suffered most from flooding. This result is ... and this corroboration is all the more striking, since it was plot No. II. which was then early ploughed, and not plot No. I. ... the outturn ... in the present case. The improved outturn is not due to any natural superiority of soil. I compare the results of the two seasons below :—

Season.	Crop.	Tillage.	Outturn per acre.	Increase per centum due to early ploughing.
			Green fodder, maunds.	
Kharif, 1880 ...	Sorgho ...	Early ploughed (No. II.) ...	124	106
		Ploughed at sowing time (No. I.) ...	60	
			Clean cotton, lbs.	
Kharif, 1881 ...	Cotton ...	Early ploughed (No. I.) ...	252	m
		Ploughed at sowing time (No. II.) ...	141	

In ... Division the benefits of early ploughing are well known, and advantage is taken of any rain which falls between December and May to plough up fields which are to be sown in the ensuing kharif. This practice appears to be seldom if ever followed in the Agra and ... Divisions, possibly because the occurrence of winter rains is so uncertain as to give the custom no opportunity of taking root. For such a ploughing the earth-turning plough is ... advantageous, since by its use the object of the ploughing, *i.e.*, to loosen the earth and expose it to atmospheric influence, is accomplished far more thoroughly and expeditiously than is possible with the native implement.

6. (III) Experiments with indigenous and imported varieties of cotton.—The total area under cotton during the ... outturn of 161-8 ... acres, which yielded an average ... that no irrigation ... that none of the ... had been freshly manured, and irrigation was used, this result is a satisfactory one, representing as it does an average return of over Rs. 34 per acre, on an outlay of about Rs. 18.

Trials of Central India cotton from Hinganghat, and of the varieties of American cotton known as New Orleans and ... Georgian, were made on two classes of soils,—on a light loam,

*Cost of picking estimated at value of one-twelfth of produce: cost of ginning at 2 annas per ...

which had been lightly manured in the previous year, but had since borne a crop of wheat; and on a heavier loam, which had not been recently manured, but which had lain fallow fora year and a half, and was therefore the stronger soil of the two.

In the first series the imported cottons were tried against two varieties of country cotton,— that grown in Bundelkhand, known as *Kulpahar,* and that commonly grown round Oawnpotifc In the second series they were tried against the *Kulpahar* variety of country cotton only' The method of cultivation followed in each case is shown in tabular form below;—

Number of experiment.	Treatment on account of crop experimented with.					Previous treatment.		
	Ploughing	Seed and rate per acre.	Manure and rate per acre.	Irrigation.	Weeding.	Year.	Manure.	Crop.
I. ...	Once ...	Sown broad-cast at 6 seers.	*Nil.*	*Nil.*	Twice ...	1879-80 ... 1880-81 ...	Guano, 1*2 maunds. Duog, 270 maund9.	Wheat. Wheat.
II. ...	Once ...	Ditto ...	*mi.*	*Nil.*	Once ...	1879-80 ... 1880-81 ...	Poudrette... *Nil.*	Maize. *Jid.*

The outturns which were obtained are shown below;—

Kumber of experiment and class of soil.	Name of variety.	Area of plot.	Outturn in clean cotton per acre.	Cost of cultivation per acre, including picking and ginning.	Value of produce per acre.
		Acre.		Bs.	Bs.
I.—Light loam ...	American New Orleans ...	•12	104*0 } average 108*8	16-8	26 0
	Ditto duplicate plot ...	•11	109-75 }		
	American Upland Georgian ...	•11	9075 } average	16-3	22 3
	Ditto, duplicate plot ...	•10	92-25 }		
	Hingangh&t ...	'09	1235	17"4	29 3
	Kulpahar ...	•10	194-75 } average 1953	19-3	45 2
	Ditto, duplicate plot ...	•10	196-0 }		
	Gawnpore ...	•10	252-0	217	55-3
II.—Heavy loam ...	American New Oi leans ...	•11	263-0	21-8	60-9
	Ditto Upland Georgian ...	•22	137-75	17-6	31-&
	Hinganghat ...	•18	91-5	16-0	2M
	•Kulpahar ...	•21	126-75	17-2	20-3

The results of the duplicate plots in the first series exhibit a most satisfactory correspondence.

The experiments would therefore appear to prove—(1) that for light poor soils the indigenous cotton is by far the most profitable ; but (2) that on better class soils and with careful cultivation American New Orleans cotton can be grown with very great success and profit. That the local variety should be the one best suited for unfavourable conditions was of course to be espected, but it is very satisfactory to have proved that the cultivation of a high class American cotton m these provinces only necessitates a moderately good soil and moderately careful cultivation. About 20 per cent, of the area under cotton in these provinces is land under very high cultivation and there is therefore a wide field for the introduction of American varieties.

The rates on which the outturns of the several plots have been valued are much to the disadvantage of the American varieties, siuce American cotton not being regularly on the Cawnpore market, only commands there a price equal to that of the best Bengal.

Fresh seed of the New Orleans variety was obtained from America and sown during the reason under report, but it germinated very poorly, and only yielded sufficient produce to serve as*seed for next kharif season. It is satisfactory to note however that the quality of American cotton does not appear to deteriorate on acclimatization in this country, since some of the farm produce, grown from seed which had been acclimatized for at least four years, was pronounced by experts fully equal to good American-grown cotton.*

H .*v*.^kperTMents on the manufacture of sugar from sorgho (Sorghum saccharatum).—ltnerto sorgho has only been grown on the farm as a fodder crop, but an attempt was made uring the season under report to follow experiments recently made in America with a view to est its value as a sugar-producer. Sorgho requires less than one-third of the time and expense w.lch are necessary for a crop of sugarcane, and hence its cultivation would appear to promise well, if it can be made to produce a sufficient quantity of the coarse sugar used in the country.

The points to be settled at the outset were—(1) the variety of sorgho which contained most saccharine matter ; and (2) the period of growth at which the saccharine matter was most fully developed, and at which therefore the plant should be cut.

. The extent to which sorgho is cultivated in America has led to the development of a large number of varieties ; but in India there appear to be only two,-the black-seeded, an introduction trom China, and the red-seeded ^or Impee), which has it *habitat* on the east coast of Africa. Unfortunately, only a very small amount of seed of the latter variety could be obtained, and 'experiments were therefore confined to the black-seeded variety.

Eight successive experiments were made at intervals of about a week, in order to discover the age at which the plants should be cut. The juice was expressed by one of Messrs. Thomson and Mylne's small vertical roller-mills, and boiled dowa in a single evaporating pan. The results are shown below:—

Date of sowing.	Date of cutting.	Number of days between sowing and cutting.	Weight of stems.	Weight of sugar.	Percentage of sugar to stems.
			lbs.	lbs.	
June 16th	August 29th ...	74	193	3-75	1-9
Ditto (duplicate experiment)...	Ditto ...	74	171	3-25	1-9
May 4th ...	August 30th ...	118	166	100	6-0
[illegible]	September 5th ...	124	113	4-25	37
	Ditto 13th ...	132	66	6*5	99
	Ditto 20th ...	139	122	7-25	60
Ditto ...	Ditto 27th ...	146	*86*	35	40
June 16th ...	October 4th ...	153	90	25	27

The stems should therefore be cut after from 4 to 4£ months' growth, when the seeds have almost ripened.

The sugar obtained was of the consistency of treacle, and conld not be made to crystallize. It would only command a sale for tobacco sweetening at about Re. 1-12-0 per mannd, and at this rate would yield no profit. This was no doubt in great part due to defects in the boiling process and inexperience of the sugar-maker; but I may mention that the difficulty of effecting proper crystallization has been found the main obstacle to the use of sorgho as a sugar-producer in America, although the recent experiments of Professor Collier, Chemist to the Agricultural Department at Washington, have shown that with certain treatment a fair proportion of sugar crystals can be obtained.

The experiments will bo continued during the following kharif, trials being made with red-seeded as wdl as black-seeded sorgho, and also with a variety which has been proved to be the best in America (Minnesota amber corn), some seed of which has been received from the Government of India. Greater care will be taken in the process of boiling and concentration, and the services of an experienced sugar-boiler will be engaged.

* The Sin cetUi8 Para, was written, the sale of the farm cotton has been completed with exceedingly satisfactory results. ihu£ far!?"1 T o n WttS Purchased by the Muir Mills at Rs. 23 per rnaund, which is 56 per cent, higher than the price of }uf;?r Ka)dBen8al,»--tbMj standard quality of the Oawnpore mirket. The produce of ordinary country seed and oil ,,at ""Ported from Bundelkhand was pronounced by three European cotton merchants as "equal to the finest Ben-tfff "~"a ^uality not ^ the market this year,—and purchase i at Rs. 19-2-0 per maund, which is 18 per cent, higher than, Brt^u Omraauudedb y "Sood Bengal." This difference can only be ascribed to the effect of deep cultivation, since iu< »o otto* respect did the method of cultivation differ from that followed by native cultivators.

•**•—2fo *development and manufacture of improved agricultural implement*'

8. During the half-year an attempt was made to transfer to a private firm the manufacture of the Kaisar plough and the chain water-lift. The object in opening workshops at the farm was merely to provide the requisite facilities for experiments in adapting European or American imple'' ments to Indian requirements, and not to attempt to manufacture''on a large scale for sale to the public. So soon as an implement appeared *primd facie* suited to the country, it was always intended to transfer if possible its manufacture to private hands, and trust to private enterprise rather than to Government agency for pushing its sale. The Kaisar plough and the water-lift have both met with sufficient success to justify a belief that they would fill a want in Indian agriculture, and consequently their manufacture in the Government workshops was stopped, and arrangements made for transferring it to a European firm. The attempt, however, only met with failure; since, although the prices which were fixed allowed of a profit of at least 25 per cent., the workmanship was exceedingly bad, and it is feared that the reputation of the implements may have suffered considerably u» consequence. The attempt is not, however, to be abandoned, but it has been necessary to re-commence manufacture at the farm, whilst opening negotiations with another firm.

The number of ploughs sent out between June 1st and November 30th, 1881, was 216, of which 205 were sold and 11 given away. Out of the 216, 123 were of Government and 93 of private manufacture.

Nineteen of the improved 20ft. water-lifts, all of farm manufacture, were distributed during the half-year, two of which were given away as samples, and the rest sold.

No winnowers were sent out during the half-year, since there was no use for them during the season which it includes,

J. B. FULLER,

Assistant Director, in charge Caumpore Experimental Farm.

REPORT

ON THE

OAWNPORE EXPERIMENTAL FARM OPERATIONS

DURING THE RABI SEASON, 1881-82.

ALLAHABAD:
KOBTS-WBSXEBH PROVINCES AND OUDQ GOVERNMENT PBESS.
1882.

No. ^ OP 1882.

FROM

THE DIRECTOR, DEPT. OF AGRICULTURE AND COMMERCE,

K.-W. PROVINCES AND OUDH,

To

THE OFFG. SECRETARY TO GOVERNMENT.

N.-W. PROVINCES AND OUDH.

Dated Cawnpore, the 28th July, 1882.

SIB,

I HAVE the honor to submit Mr. Fuller's report on the rabi operations at the Cawnpore Experimental Farm. He was throughout in managing charge, holding the same position towards me with respect to the Farm as Messrs. Duthie and Ridley hold with respect to the Botanical and Horticultural Gardens. The post of Overseer was filled by Mr. Spitteler, acting under Mr. Fuller's orders.

2. The main experiments during the season were in wheat cultivation. The results go far to discredit the extremely low estimate which has been accepted of the productiveness of Indian agriculture. The land of the Farm is generally poor and nowhere *of* exceptional fertility. Only one-fourth of the area sown had been specially manured for this crop, and a very moderate amount of irrigation—two waterings to a fourth and three to the remainder of the area—was given. Yet the crop on 16*8 acres averaged more than 23 bushels to the acre, and on one unmanured plot, which had only been watered twice, reached the very high outturn of over 44 bushels.

The only advantage it enjoyed over ordinary native cultivation was the use of a soil-inverting plough, against which should be set the disadvantages in some cases of exceptionally poor soil, unsucoesful experiments, and double-cropping.

3. The danger of error in generalizing from single instances was to a certain extent guarded against by conducting the more important experiments in duplicate on plots situated at some distance from each other in different parts of the Farm. The generally close correspondence of the results adds considerably to their value. The conclusion arrived at from experiments with natural manures, and confirmed by separate experiments with artificial manures on the Ville system and by a scientific analysis of the soil, is, if warranted, one of extreme practical importance. Of the four elements which manure adds to the life of plants it appears that the soil of the Farm is seriously wanting in one only—nitrogen. Omitting nitrogen from the artificial manures, no increase was given by a combination of phosphorus, potash, and lime. When nitrogen to the extent of three-fourths of the requirements of the crop was added, the weight of outturn in grain was two and a half times as great as that of the unmanured plot, and of straw nearly three times. Mr. Fuller classes bone-dust as one of the manures yielding phosphoric acid ; but the superior yield it gave when compared with calcic superphosphate, in which the phosphorus is in a far more available form, points strongly to the conclusion that its fertilizing qualities were due principally to the nitrogen it contains. Allowing 4 per cent, of nitrogen to the constitution of bone-dust, the amount contributed to the reserves of that element already present in the soil by 3601b. of bone-dust would be more than 14lb., or about a third of the whole requirements of the crop. The low outturn secured by 160 maunds of whole dung when compared with the outturn produced by the ashes of the same quantity is explained by the fact that in the dung-manured plots a large proportion of the wheat was consumed by white-ants, for the extirpation of which an earlier watering than could be given is required. A scientific analysis by Mr. Hill, the Meteorological Reporter for these Provinces, showed that while the farm soil has sufficient lime and a larger quantity of potash and phosphorus than typically fertile soils in Europe, it fails in nitrogen only, having 1,4831b. to the top nine inches of an acre, while an average quantity of the same element in Europe is 5,7571b. in the same area.

4. Other facts pointing in the same direction will be found in the report; and if the conclusion is to be accepted as established, it follows that the main problem of practical agriculture in this country is now to supply nitrogen in the form of a cheap manure. Mr. Fuller recommends the use of saltpetre and green soiling by ploughing in a young crop of hemp. There seems to be little doubt that the latter is a very cheap and effective means of fertilization. If saltpetre is of so great a value as these experiments appear to show, it is probable that any artificial restraints on its manufacture act injuriously on the agricultural interests of the country.

5. The great increase in produce which results from early ploughing is almost certainly due to the amount of nitrogen in the form of ammonia which it enables the loosened soil to absorb from the rain, and probably from the air as well. Another conclusion of practical importance is that drainage may do much harm by washing the nitrogen out of the soil. It is not impossible that this may be the cause of the barrenness of ravine tracts, off which the rain drains rapidly instead of being absorbed by the soil,

6. The experiments with different numbers of waterings gave in both series the unexpected result that one watering followed by a weeding gives a higher produce than two waterings, after the second of which the land is allowed to cake. I should however hesitate to- accept the result of these experiments as conclusive. Further waterings up to five give a steadily increasing rate of produce.

That well water produced more than canal is probably correctly ascribed to the greater opportuneness with which the farmer can be supplied. The difficulty of obtaining canal water at the time when it was most required completely ruined the sowings of American maize and English carrots and wurzels, and was the cause of the destruction of much of the dung-manured crop by white-ants.

7. It was found that much saving could be effected by thin sowing, provided that it were possible to guarantee the even germination of all the seeds over the whole plot sown. Where this was secured there was not much difference in the outturn of plots sown behind the plough, or by dibbling in a twelfth part of the same amount of seed, or in plots in which every furrow, or only every second or third furrow, had been sown.

8. Of the foreign crops Cape oats were again very successful. Black and white gram and English wheats and barleys proved to be far inferior to native varieties; but as the results from this year's sowings were better than any in preceding years, it is possible that these crops may improve with further acclimatization. The experiment would be of greater interest if the best kinds of Indian wheat were not already as good as any known. Naked barley seems to be an impostor and *Alfalfa* to be only another name of lucerne.

9. The workshops, which for the greater part of the time were in charge of Captain Clibborn, but which it has since been found necessary to combine again with the Farm, turned out a fair number of ploughs, winnowers, and pumps. Negotiations for the manufacture of the Kaisar plough were undertaken with Messrs. Coen and Co. of Agra and Crowley of Allahabad, but without much practical results. Experiments are being made towards adopting a plough better suited to heavy soil than the Kaisar is, and for the improvement of the Farm pump. The Little Giant (a combined thresher and winnower) imported from America, was very successful, though its expense forbids the hope that it will ever be used, unless, which is not at present likely, a number of cultivators will co-operate. Even then it is doubtful whether, unless its construction be materially cheapened, it can be made to do nearly enough work to pay interest on the capital outlay,

J have the honor to be,

SIR,

Your most obedient servant,

W. C. BENETT,

D., *Dept. of Agri. and Com., N.-W. P. & Oudh.*

REPORT

ON THIS

OPEBATMS AT THE CAWNPOKE EXPERIMENTAL FAR!

During the Rabi Season, 1881-82.

THB operations of the half year may be subdivided into (A) Field experiments of a purely agricultural nature, and (B) Experiments with agricultural implements and machinery.

(A.) FIELD EXPERIMENTS.

2. As has been too commonly the case in late years, the season was marked hy a deficiency in the rainfall. Ample rain fell in Jaly and August and the tillage of fields intended for Tabi crops progressed satisfactorily s but the rain virtually ceased before the commencement of September, and the rainfall of that and of the succeeding month {October) only amounted to -4 and -2 of an inch respectively, against a normal quantity of 5*4 and 1*0 inches* Under the circumstances it was* surprising that the ground retained sufficient moisture to bring about the proper germination of the seed when sowing time came with the middle of October, and in some cases it was considered advisable to irrigate previously to sowing. This was done however with only a small portion of the farm area, aad the crops on high-lying fields, which had lost a portion of the rainfall by surface drainage, suffered considerably from uneven germination. That the natural moisture was sufficient on level land which had been well ploughed as proved by the fact that two adjacent fields, each of about half an acre in extent, yielded crops of wheat at such closely corresponding rates as 1,581lb. and 1,588lb. per acre, although one was sown after irrigation and the other without it, their treatment in **other respects being exactly similar.**

From November 1st till If ay 31st the rainfall did not amount te one inch, and of this only -6 inch fell while the crops were on the ground. This small quantity was of but little practical benefit, being evaporated almost as soon as it fell. The rainfall of the season is shown below :—

Month.	Rainfall in inches. Actual.	Normal.
September	0·4	5·41
October	0·2	1·08
Total	0·6	6·49
November	0·0	0·08
December	0·0	0·18
January	0·0	0·74
February	0·2	0·53
March	0·0	0·25
April	0·4	0·15
	0·3	0·41
Total	0·9	2·34

When there are however facilities for cheap irrigation, such as are enjoyed by the Farm, the occurrence of winter rains is not a matter of importance. Indeed, it is probable that the total absence of fungoid disease (rust, smut, &c.) which characterizes a dry cold weather more than compensates for the expense of having to give (say) three waterings instead of one or two.

3. Measured by the Farm crops the season was an extremely good one, and **the** outturn obtained from unmanured and not heavily irrigated land would have

been surprising to any one who was not convinced of the natural fertility of Indian soil. The total area under wheat was 16-8. acres, not more than one-fourth of whicb had received manure during the preceding year. No field received more than three waterings after sowing and a portion (about 4 1 acres) was only watered twice. Yet the average produce of wheat grain per acre was over 1,3901bs. (=17 mds.j, th& maximum outturn amounting to so high a figure as- 2,820rbor 34 mds (=47 bushels). One of the unmanured fields, which had also only received two waterings, yielded at the rate of 2,6621b. or 32 mds. per acre. The crop was not only large in quantity but of excellent quality, and over 50 per cent, of it stood the test of being twice passed through an English separator and may bfr considered first-class grain. The seed was originally obtained from Muzaffarnagar three years ago and was of the same kind as that which has been largely distributed by this Department during the past two years.

4. The cultivation ef the half year comprised experiments on—

(1) the effect of different manures ;
(2) irrigation ;
(3) thin sowing;
(4) new varieties of seed[1].

The cultivation of American maize as a cold-weather crop, and of English carrots and mangels, formed part of the programme, and these crops were sown in September. Unfortunately however canal water ran short (the canal distributary being closed for repairs), and with the failure of rain all three crops withered and died. The Farm lost in this manner the produce of 3 acres of land, only a portion of which could be resown with wheat. The loss ta an ordinary cultivator would of course have been crushing, and may famish a clue to the reluctance with which many cultivators rely on canal irrigation for crops for which *timely* watering is essential. The cultivation **of flax** must also bo added to the list of experiments. Over an acre of it was grown from Riga seed, and the produce was by no means unsatisfactory. It has not however been broken and scutched as yet, and until these operations have been completed it is impossible to speak with confidence of the quality of the outturn.

4- (i) **Experiments on manures.**—These may be subdivided into (a) .Experiments forming part of a continuous series on plots set aside for the comparative trial of certain manures over a number of years ; (6) Experiments with certain combinations of chemical manures on the lines suggested by M. Georges Ville, the French chemist;. *(c)* Special experiments to test the value of phosphoric acid on the farm soil ; *(d)* Special experiments on green soiling.

(a) ***Experiments forming part of a continuous series.*****—It has been already stated** in previous reports that two series of plots, each in duplicate, had been marked out for the continuous trial of different manures in the kharif and rabi seasons. By continuous heavy cropping the plots had been reduced to a par as regards natural fertility by the commencement of the season under report, and were therefore fit subjects for experiment. Wheat was the crop grown, and the treatment of the plots, irrespective of manure, is shown in tabular form below :—*

Treatment on acsount of crops experimented with.				*Previous treatment*		
Ploughing.	Seed and rate peracre	Irrigation.	Weeding.	Year.	Manure.	Cropa,
Twice, with soil-inverting plough.	White wheat at 1) md.	Once before sowing *ipaleo)* and three times *fterwaids.	Once.	1879kharff ...	Nil	**Cotton.**
				1880 » ...	Nil	**Maize.**
				1881 „	Same as now applied.	**Do.**

It was unecessary to crop both sets of plots with maize in the kharif preceding the rabi under report, and they bore therefore two crops within the year. The effect of this in lessening the rabi produce must not be lost sight of.

The area of each plot was one-twelfth acre. The manures experimented with and the result per acre is shown below :—

No. of plot.	Manure and rate per acre.	Cost of cultivation per acre.*	OUTTURN IN POUNDS PER ACRE. Grain. First series (B.)	Grain. Second series (Al.)	Straw. First series (B.)	Straw. Second series (Al.)	[illegible]	[illegible]
		Es. a. p.	lb.	ft.	ff>.	ib.	R.	Es.
1	Saltpetre 240 fib. ...	9 0 0	1,242	1,605	1,635	2,160	28'0	421
2	Saltpetre 2401b., bone-dust 360 Ib.,	13 8 0	1,395	1,575	1,785	2,124	325	43*8
3	Dung 160 mds. ...	9 0 0	918	738	1,080	915	280	241
4	Dung 160 mds., bone-dust 360 S3.,	13 8 0	846	678	1,155	843	225	22 5
5	Dung 160 mds., gypsum 240 Ib.,	U 4. 0	882	594	1,152	774	23'2	21-7
6	Ashes of 160 mds. dung ...	9 0 0	1,281	978	1,491	1,32G	280	361
7	Bone-dust 360 Ib. ...	4 8 0	1,287	1,422	1,509	1,869	23-5.	39-6
8	Bone superphosphate 240 Ib. ...	14 8 0	1,065	1,170	1,278	1,524	335	32-6
9	Gypsum 240 ft. ...	5 4 0	798	912	1,017	1,233	212	26-4
10	No manure ...	Nil	777	771	1,221	1,113	19-0	232

The first point to be checked in this table is the correspondence between the two sets of plots. With this end I compare below (1) the per cent increase in outturn, (2) the difference in outturn per cent, of each pair of plots and the pair preceding it ou the list.

Manure.	Per cent, increase in grain on outturn of unmanured plot. First series (B)	Per cent, increase in grain on outturn of unmanured plot. Second series (Al.)	Difference between the out' turn per cent* of each plot and that of the plot prerirna it. l'irst series (K.)	Difference between the out' turn per cent* of each plot and that of the plot prerirna it. Second series (Al.)
Gypsum	2	18	...	...
Bone superphosphate	37	51	+ 35	+33
Bone-dust	65	84	+28	+33
Ashes of dung	66	26	+ 1	-5(3
Dung and gypsum	13	23	—53	—3
Dung and bone-dust	8	13	—5	—10
Dunej	18	5	+ 10	—8
Saltpetre and bone-dust	79	104	+ 61	+99
Saltpetre	60	108	—19	+ i.

* The head " cost of cultivation" includes the following items. :—

	Rs. a. p.
Two ploughings	3 0 0
Clod-crushing	0 8 0
Seed	3 0 0
Sowing	1 2 0
Weeding ... ,,.	2 0 0

	Rs. a. p.
Irrigation—	
Canal dues	1 8 0
Lifting (for four waterings) ...	4 8 0
Making Ts'ater beds ...	0 2 0
Eent *	3 4 u
Manure	Variable.
Total ...	10 0 0

t Calculated at the rate of Es. 2 per maund for grain and 5 annas per maund for straw.

It will be noticed that the increase per cent, on the unmanured outturn is as a rule larger in the second than in the first series, but the proportionate increase between one plot and another corresponds in both series with tolerable regularity. Considering that this is only the third season in which the two sets of plots have been similarly manured and cropped and that they are situated at a considerable distance apart, the general correspondence between their outturn speaks strongly for the general accuracy of the results.

Taking now the average of the duplicate plots, the results of each manure which was experimented with may be compared as follows, the manures being classified according to the principal ingredient in plant food which they supply:—

	RESULT PER ACRE.					
	PER GENT, IN GROSS OUTTURN.				ACTUAL ON PROFITS.	
	Increase.		*Decrease.*		Increase.	Decrease.
	Grain.	Straw.	Grain.	Straw.		
					Rs.	Rs.
Manures yielding nitrogen.						
Saltpetre	83	62	...		9·9	...
Dung	7	...	...	15	...	8·1
Manures yielding phosphoric acid.						
Bone superphosphate	44	20	...	...	...	5X
Bone-dust	75	44	—	...	11·9	...
Manures yielding nitrogen and phosphoric acid.						
Saltpetre and bone-dust ...	91	67			6·6	
Dung and bone-dust	...	...	2	15	...	4·2
Manures yielding lime and potash.						
Gypsum	10		...	4		2·0
Ashes of dung	46	20	...	...	b·9	...
Manures yielding nitrogen, lime and potash.						
Dung and gypsum	...	...	5	18	...	5·7

The value of the table is very greatly impaired by the lowness of the outturn yielded by all plots to which dung was applied, v/hich is quite abnormal and due to a special cause. The plots having been cropped in the kharif preceding, it was only possible to apply the manure six weeks before the wheat was sown. It is well known that dung, unless it has lain mixed with the soil through a rainy season, attracts white-ants, and it is for this reason that native cultivators scatter manure on their rabi as well as on their kharif fields before the commencement of the rains. If dung is applied after the rains have ceased, early irrigation is an absolute necessity as a check to the insects, and in the present case, owing to a failure of canal water, this could not be effected. The plots should have been watered by the end of November at latest; but it was not possible to give the first irrigation until December 20th, by which time a large portion of the crops had been destroyed. The outturns of the plots to which dung was applied must therefore be wholly disregarded.

5. Bone-dust and saltpetre stand at the head of the mineral manures, increasing the profits of cultivation by Bs. 12 and Rs. 10 per ncre respectively when used singly, but by less than Rs. 7 when used together. Grounds have been given in previous reports for believing that nitrogen is the element most needed by Indian soils, and saltpetre is specially well qualified to supply nitrogen, which constitutes 12 per cent, of

its weight. The 360ft. of saltpetre applied per acre represent therefore nearly 44ft. of nitrogen, which is about the quantity contained in the grain and straw of a good crop of wheat.

The increase given by bone-dust is not so easily accounted for. The element for which bone-dust is generally valued is its phosphoric acid ; but bone superphosphate also contains this, and in a much more soluble form, without however adding so much to the outturn or even reimbursing its cost. The explanation probably lies in the fact that bone-dust contains, in addition to its phosphoric aoid, a certain amount of nitrogen (about 4 per cent.) valuable to Indian soils for its own sake as well as for enabling the phosphoric acid to exert its full effect, which in the absence of nitrogen it cannot do. If this is the case, the phosphoric acid in ground bones is, so far as Indian soils are concerned, of subordinate importance to the nitrogen which they contain ; and this view is strengthened by the fact that when saltpetre and bone-dust were used together and the value of the latter was confined to its phosphoric acid, the outturn showed but little increase over that yielded by saltpetre alone.

6. Light is thrown on the subject from another side by an analysis of the soil of one of the unmanured plots which was kindly made for me by Mr. S. A. Hill, B.Sc, Meteorological Reporter to Government. The sample was collected after the rabi crop had been cut and cleared, equal quantities of soil being taken from the first, second, aud third three inches of depth and carefully mixed. The sample therefore represents the soil of the upper nine inches of ground. I subjoin Mr. Hill's report, adding columns to show the actual amount in pounds of the mare important ingredients which the analysis indicates as present in the upper nine inches of an acre, and also the quantity which is consumed by a wheat crop of 20 mds. grain and 25 mds. straw :—

The soil when received was moist.* brown in color, and contained a few roots of wheat or some other rereal. When dried in the air its color was light brownish grey. Roughly washed in a very slow stream of water it left about 80 per cent, reddish s xnd with a very few sin til nodules of kankar. By » ~ J^ " ^ ^ ^™ ^ washing a minuf quantity of the dense dark-brown mineral *wolf ran* Ctungatate of iron »^ "anf£ne«) CoU V* be extracted. The spesific granity of a carefully powdered and selected sample was 3 54, or nearly tue same «« that of pure quartz. A chemical analysis of the soil gave the following results :—

		Per cent.	sslb. in the upper 9 inches of an acre.	Amount consumed by a crop of wheat.
			ft.	B5.
Volatile, 3 06	Moisture expelled at 250°F. ...	0 60		
	Combined water expelled at a red heat.	2 03		
	Organic matter ...	0 16		
	Carbon dioxide ...	0 16		
	Ammonia ...	None.		
	Nitrogen pentoxide ...	0-11	5,717-25 (= 1.483 nitrogen.)	173-5 (= 45 nitrogen.)
Soluble in Hydrochloric acid, 12*59.	Chlorine ...	Trace.		
	Sulphur trioxide ...	Do.		
	Silica and tungstic oxide ...	0-13		
	Phosphorus pentoxide ...	0 51	26,136-0 (=11.411-5 phobphorus.)	185 (=8-1 phosphorus.)
	Alumina ...	4-18		
	Oxides of iron and manganese ...	5*56		
	Lime ...	0-90	46,391-4	12-3
	Magnesia ...	0*91		
	Potash ...	0 32	16,335-0	27
	Soda ...	0 08		
Clay decomposed by sulphuric acid 6*29.	Alumnia and oxide of iron ...	2-92		
	Silica ...	3*37		
	Insoluble sand ...	78-10		
	Total ...	100·01		

• The soil appears to have plenty of phosphate, but to be weak in potash and very deficient in organic matter.

It is generally accepted that the only ingredients in plant food with which practical agriculture need concern itselfara, in the order of increasing importance, lime,

• There had been a slight shower of rain two days before the sample -was taken.

potash, phosphoric pentoxide (or acid), and nitrogen. *A* tolerable safe conclusion as to the richness of the Farm soil in the three first named may be drawn from a comparison of the quantities contained by other soils known to bo fertile :—

	* A very fertile alluvial soil in East JTriesland.	f A fertile soil near Gottingen.	•f A loam producing remarkably fine crops of wheat.	The Farm boil.
Percentage contained of lime ...	6-3	2·1	•83	•9
Ditto potash ...	•21	trace	2-8	-32
Ditto phosphoric pentoxide ...	-47	•2	•24	•57

These figures show very clearly that the Farm soil is in no way deficient either in potash or lime and contains considerably above the ordinary amount of phosphoric acid. Phosphatic manures cannot therefore be expected to produce much effect, and this is certainly borne out by the experienoo of the two last years. In the season under report dung ashes produced a larger increase in the outturn than even the costly superphosphate, owing probably to the salts of potash which they contain.

But the analysis shows the Farm soil to be very deficient in nitrogen, perhaps the most essential of all the ingredients in plant food. The nitrogen contained in organic matter is not assimilable in that form, and as the soil contains no ammonia, the only source of nitrogen available is nitric pentoxide. It will be seen that the amount of this substance present in the soil is vastly in excess of the requirements of a single crop, but only a small proportion of the whole assumes a sufficiently soluble form each year to be of practical benefit, and the be3t' indication of the condition of the Farm soil us regards its nitrogen supply will be furnished by comparison with other soils. The presence of nitric pentoxide in Indian soils results from the rapid reduction of ammonia, which is characteristic of a tropical climates ; and in European soils nitrogen is found in most part in the form of ammonia, only a portion of which is reduced each year.

The percentage of ammonia found in nine samples of arable soil quoted in Johnstones and Cameron's Agricultural Geology varies from ·116 to "170, tho average being •144. This is equal to 575761b. of nitrogen per acre, or to over four times as much as is contained *in* the Farm soil. It may also be mentioned that the nitrogen contained in the upper nine inches of soil on a field at the Bothamsted Experimental Farm which had been continuously cropped with wheat for 22 years—unmanured—amounted to 2,5071b , or nearly double the Farm supply. Theory therefore amply bears out the experience that the manures which are most productive are those supplying nitrogen.

7. (&) *Experiments with certain combinations of mineral manures on the Ville system*.— These experiments were suggested by the work of M. Georges Ville entitled "Artificial Manures," which has been recently translated by Mr. W. Orookes, F.B.S. Their object was to discover by actual experiment the direction in which the deficiency of the Farm soil lay, this being effected by using certain manurial substances in varying combinations, so as to be able to judge of the effect of excluding each one of them from the mixture. Tho crop experimented with was wheat, and the general treatment of the plots was exactly similar to that of the plots dealt with in the preceding sectlons. Details of the manures applied and of the results per acre are appended. The size of each plot was one-twenty-fourth of an acre :—

* From Johns tone and Cameron's Agricultural Geology,
t From Sibsou's Agricultural Chemistry.

Number of plot.	Manures applied, with rate per acre.	Plant food substance which the manure represented. Amount supplied by the manure per acre.	Amount consumed by a crop of 20 mds. wheat.	Outturn per acre in pounds. Grain.	Straw.	Increase per cent, on unmanured plot. Grain.	Straw.
	lbs.	lbs.	lbs.				
I.	Calcic superphosphate 180 Ammonic chloride 138, Potahsic sulphate 90. Calcic sulphate 96,	Phosphorus 9 6 Nitrogen 86 0 Potassium 25 8 (=potash 31-1) Calcium 28 2 (=lime 39-4)	8 1 45-0 22 4 (=potash 27-0) 8 7 (=lime 12M)	2,142	3,066	150	185
II.	Ditto less calcic superphosphate.	Less phosphorus.	...	1,896	2,652	121	146
III.	Ditto less aoimonic chloride.	Less nitrogen ...	...	840	1,152	*Nil*	7
IV.	Ditto less potassic sulphate.	,, potassium...	...	1,908	2,778	122	158
V.	Ditto less calcic sulphate,	,, calcium ...	...	1,812	2,412	111	124
VI.	No manure ...	*Nil* ...	—	858	1,074	...	...

It iB very seldom that an agricultural experiment yields such clear and decisive results as are obtained here. It has been noticed before that the four substances conveyed to the soil in these manures are the only ones with which agriculture *need* concern itself. By supplying the crop with nitrogen to the amount of three-fourths of its requirements, the outturn is more than doubled; omit nitrogen and no increase is obtained, although all the other manures may be given. The omission of phosphoric acid from tiie combination causes a decrease of only 12 per cent., of potash 11 per cent., and of lime 16 per cent, in the outturn of grain rand allowing for the disturbing causes which can never be entirely eliminated from field experiments, these figures so nearly agree as to render it probable that the effect of omitting any one of those three substances is much the same.

I may note that this is the second season of the application of these manures, they Laving been used for a crop of maize in the preceding kharif.

8. *(c) Special experiments on the effect of phosphoric acid as a manure on the Farm* aoiZ.—Three experiments were made with the object of testing the value of phosphoric acid when used in combination with nitrogenous manure—that is to say, under the most favourable circumstances. The area under experiment was of considerable size, amounting to nearly two acres. The treatment of the fields, irrespective of manure, is summarized below :—

No. of experiment.	Treatment on account of crop experimented with. Ploughing.	Seed and rate per acre	Irrigation.	Weeding.	Previous treatment. Year.	Manure.	Crop.
I.	Twice; in July and September.	White wheat 1} maund.	Sown dry ; watered three times alter germination.	Once	1878-79 ... 1879 80 .. 1880-81 ..	*Nil* ... Guano in<is. *NiL*	Juar. Wheat, Sorgho.
II.	Three times ...	Ditto ...	Sown after irrigation, and watered three times after germination.	Once	1878-79 ... 1879-80 . 1880-81 ...	*Nil* ... Indigo ploughed in. *Nil* ...	Indigo. Wheat. Sorgho.
III.	Four times ...	Ditto ...	Ditto ...	Once	1878-79 ... 1879-80 ... 1880-81 ...	Dung ... *Nil* ... Guano ...	Maize. *Nil.* Sugarcane.

The manures which were applied and the results obtained were as follows :—

No. of experiment.	Area of plot.	Manure applied and rate per acre.	Outturn per acre in pounds. Grain.	Straw.	Percentage increase on plot which received no phosphoric acid. Grain.	Straw.
	Acre.					
I.	·41	Dung 140 mds. * Bone superphosphate 288lb. ...	1,568	2,491	A slight decrease.	A slight decrease.
	·41	Dung 140 mds. No superphosphate ...	1,588	2,322	...	...
II.	·22	Dung 155 mds. † Mineral superphosphate 358lb. ...	1,978	3,008	24	35
	·47	Dung 140 mds. ... No superphosphate ...	1,584	2,220	...	...
III.	·22	Bone superphosphate 290lb. ...	2,820	Not weighed.	13	...
	·22	Mineral superphosphate 290lb. ...	2,555		3	...
	·50	Nil	2,486		...	...

K • LT<Z?f ange oUttUra i8 remark*ble> *• ^erage of the seven fields being 2,082lb of wheat grain to the acre (=25 mds. or 36 bushels) worth, with the straw, about *Rs. 62.*

The results of the experiments are somewhat conflicting, the application of phosphoric add giving in one case no increase whatever, and an increase in the other case 24, 1 and 3 ... A certain amount of discrepancy must however be expected ... first ... experiments on so large a scale, and from the outturn of the ... conclusion follows that the application of phosphoric ... produced very little if any ... The excess in the produce of the manured plot in experiment No. II. is probably due to other causes. Superphosphate cannot be prepared at Cawnpore at a lower cost than Rs 4-12 per maund, and the application of 3 mds. of it requires therefore an increased at yields of grain and a corresponding quantity of straw per acre merely to reimburse its cost. ... produce of manured plot ... the whole of the increase ascribed to the action of the superphosphate, there would still be a considerable loss on its use.

9\. *(d) Special experiments in green soiling.*—If the conclusion be accepted that the most prominent deficiency in the Farm soil is in its nitrogen supply, The practical question arises as to how this supply can be increased. A certain amount of nitrogen is derived by the soil from the rainfall in the form of ammonia, the number of pounds of nitrogen which an acre annually receives in this way being estimated at 7 in England† but as high as 20 in some parts of Southern Europe. It is probable that in India the amount ... since the ... at some seasons of the year is known to ... highly charged with ammonia. Under these circumstances it is more than ever ... facility ... afforded for the rapid absorption of the rainfall by the soil, and this accounts for the benefit which results from ploughing up land at the very later ... four months ... the heat of India oxidized into nitric acid almost ... it reaches the earth, and since in this form it can be readily abstracted from the soil by water, it is probable that India owes much of its fertility to the absence of subsoil drainage, which is so marked a feature in this country. The annual loss ... in drainage water is estimated in England to amount to 15 or 16lb. per acre, more than double the quantity which is annually received from the rain.‡

* Both the bone and the mineral superphosphate ... die of Calcutta! having been manufactured respectively ... were procured from Dr. Walon ... mineral substances (coprolites) containing phosphoric acid; neither therefore contained any nitrogen.

† The amount of ammonia in the rainfall of England is ordinarily about 1·07 parts per million in country districts and from 3·5 to 9·0 in crowded cities, such as Glasgow and London. Angus Smith notices the exceptionally large proportion of 32·25 parts per million ... of rain water collected from the impure atmosphere of the City of London. A sample ... fell at Lucknow in June, 1882, was ascertained by Major ... to contain ... parts per million.

‡ See a paper on the Rain and Drainage waters at Rothamsted printed in the Journal of the Royal Agricultural Society [Vol. XVIII, Pt. I, p. 53].

Looking at the increase in produce which results from ploughing up land in April and allowing it to lie in open fnrrow throngh the hot-weather months, the conjecture may be hazarded that possibly the soil may be able to absorb ammonia directly from the air when in loose and porous condition, and this wonld still fnrther tend to maintain the continuous fertility of the Indian soil.

Comin* now to the means of artificially increasing the nitrogen supply, the most obvious of existing resources is cattle dnng, the value of which however principally depends on the food which the cattle receive, and is therefore not very great to tne Indian cultivator. In that portion of it which is used as fuel the nitrogen is of course entirely lost, and there is a considerable waste in that portion kept as manure trom exposure to the influence of the sun and rain. A much more effective source of nitrogen is, as has been already shown, saltpetre, which even at its present price will yield a considerable profit. It is very doubtful however whether a cultivator will eyer be indu<fd to purchase his manure, and the manufacture of saltpetre in villages is checked by Customs regulations.

It is possible that a third and much simpler method of increasing the stock of nitrogen may be found in "green soiling"—that is to say, in growing a crop of the leguminous order, cutting it down while green and ploughing it in. According to some authorities plants of this order are able to absorb nitrogen directly from the air, and their tissues become therefore store-houses of atmospheric nitrogen which yield their contents to the soil when allowed to rot in it. Experiments made m the rabi leason of last year appeared to give excellent ground for believing that ploughing in a leguminous crop after this fashion does as a matter of fact greatly add to the outturn, and the experiments were repeated with still more marked results in the season under report. Two parallel plots each one-twelfth of an aore were sown with hemp on August 17th ; the hemp was cut down on September 22nd when about 2 feet high and ploughed in with the English plough, the stalks being laid in the farrows exactly as is done with long strawed dung in England. Since rain failed, the plots were watered on September 27th to hasten the decomposition of the hemp, and again on October 20th, when they were ploughed up and sown with wheat. The total cost per acre was not therefore more than Rs. 4-2-0 :—

		Rs.	a.	p.	
Cost of seed (say)	...	0	8	0	At thirty seers to the acre.
sowing	...	1	2	0	
cutting	...	1	8	0	
?? ploughing iu	...	1	0	0	
Total	...	4	2	0	

One of the plots was manured with gypsum at the rate of 120ft>. per acre when the hemp was cut, in order to discover whether any benefit would result from the property possessed by this mineral of arresting th9 volatile compounds of ammonia givea off in decomposition.

A third plot, situated next to one of these under hemp, had been under lucerne (also a leguminous crop) for the year preceding, and it is interesting to note how excellent was the crop of wheat yielded by it. The lucerne had been sown in September, 1880, and up to September, 1881, when it was ploughed up to make room for a crop of wheat, it had been cut six times, yielding a total outturn of 280 mds. of green fodder to the acre.

Details of the outturn obtained from all three plots are given in tabular form below. The wheat was in each case watered three times after germination and weeded once :

No. of plot	Specific treatment.	*Outturn per acre in pounds.* Grain.	Straw.	Cost of cultivation.	Value of outturn.
				Its	Its.
I.	Green Boiled with hemp ...	1,718	2,328	26 1	50*9
II.	Green soiled with hemp and manured with gypsum at 1201b. to the acre	2,244	3,237	28-9	67*2
III.	Cropped with lucerne for a year previous	1,395	2,127	22-0	42 3

Unfortunately there was no unmanured plot in the same series the outturn of which could be taken as a standard of comparison, since the soil of all the other experimental plots had been somewhat exhausted by a crop of maize in the kharif preceding. There were however two fields at a short distance from the series of experimental plots on which wheat was grown without manure, but otherwise with exactly similar treatment, and the outturn of which may fairly be taken as representing what the hemp plots would have produced had no hemp been grown on them. One of these fields with an area of -12 acre yielded 1,2801b. of wheat to the acre and the other, with an area of -62 acres yielded 1,298lb. The agreement between these outturns is all the more striking since the fields were situated at a distance of at least 200 yards from one another. Taking the average of these two outturns, *viz.,* 1,289tb., as the outturn of unmanured laud, the increase resulting from the use of hemp as manure and from the effects of a crop of lucerne may be represented as follows :—

Treatment.	Result per acre.	
	Increase per cent in gross outturn of grain.	Increase in actual net profit per acre, making rateable* allowance for straw-
		Rs.
Green soiled with hemp	33	9-4
Ditto and manured with gypsum	74	22-9
Cropped with lucerne	8	4·9

The results therefore appear to leave little doubt of the fact that green soiling with hemp does increase the outturn, especially when gypsum is added. It appears certain that the increase is due to a larger supply of nitrogen, although opinions differ as to whether this is actually drawn from the air or merely concentrated in the upper layer of soil, being drawn up from below by the long tap roots of the hemp plant. The result appears of the highest practical importance, and the trials will be continued on a large scale during the current year. The increase which resulted from previous cropping with lucerne must be due to the same cause and is borne out by the practice in English agriculture of growing a drop of clover before wheat, which is said to often add as much as a quarter (4801b.) to the outturn per acre.

10. (ii) Experiments on Irrigation.—Trials were made *(a)* to ascertain the effect of irrigation in increasing the outturn, and (£) to obtain fresh information on the vexed question of the relative merits of canal and of well water.

(a) *Effect of irrigation in increasing the outturn.*—**Experiments were made with** wheat on two series of plots, both of which were sown without previous irrigation. The soil of series A was at the time of sowing the dampest on the farm ; on the other hand the soil of series B was considerably drier than the average. By an41 pfortunate mistake a watering was given to the plot in series B which should have been left unirrigated; so that the outturn of this series of plots merely indicates the result of giving different *numbers* of waterings, and not the result of watering- as compared with that of not watering at all. Both series of plots were ploughed three times before sowino* and weeded once after the first watering. Series B had borne a crop of wheat unmanured in the preceding year, while series A had enjoyed a year's fallow. The size of the plots in both series was one-twelfth of an acre. The results are shown in the two following tables :—

* The produce of straw on the fields taken as standards of comparison was not weighed.

Series A.

Number of times irrigated, with dates.	Cost of irrigation per acre.	Date when weeded.	Outturn per acre in pounds.		INCREASE DUE TO IRRIGATION.		
			Grain.	Straw.	Per cent, on produce of irrigated plot. Grain.	Straw.	Actual in value of produce per acre.
	Bs. a. p.						Bs.
Not watered	*Nil.*	Dec. 19	513	838	..	...	..
Once: Dec. 4th ...	2 12 0		1,671	2,355	*225	181	33-4
Twice: Nov. »5th, Feb. 23rd ...	3 14 0	• 12 7	1,515	2,165	195	158	25·8
Three times: Nov. 25th, Feb. 3rd, March 4 th	5 0 0	*, 7	1,670	2,578	225	207	30-0

A single watering therefore more than trebled the produce and, in addition to paying for itself, increased the profits of cnltivation by over Rs. 33. It is remarkable that one watering should have had so great an effect, but the result is corroborated by the outturn of a neighbouring field which reached the high figure of 32 mds. (=40 bushels) to the acre with only two waterings. That one watering should have given a larger outturn than two is also *primd facie* surprising, but must be explained by the weeding which was given after the first watering and which left the soil of the once-watered plot in open condition right through till harvest, while that of the twice-watered plot was caked by the second irrigation in February. A similar result will be seen in the outturns of the second (B) series :—

Series B.

So. of plot in farm register.	Number of times irrigated, with dates.	Cost of irrigation per acre.	Date of weeding.	Outturn per acre in pounds.		INCREASE DUE TO IRRIGATING MORE THAN ONCE.		
				Grain.	Straw.	Per cent, on produce of once wattred plot. Grain.	Straw.	Actual in net profit per acre.
		Us. a. p.						Rs.
B.b.4	*Once :* Nov. 12th ...	2 12 0	Nov. 25	696	1,158	...	...	...
B.b.5	*Twice :* Nov, 12th, Feb. 20th,	3 14 0	» 25	513	948	Decrease 32	Decrease 41	Decrease 2-3
B.b3	3 *times:* Nov. 12th, Dec. 20th, Feb 28th,	5 0 0	" 25	921	1,635			
B.b.2	4 *times: Nov.* 12th, Dec. 20th, Feb. 1st, Feb. 28th.	6 2 0	" 25	1,104	1,821	58	57	6 4
B.b.l	5 *times:* Nov. 12th, Dec. 20th, Jan. 19th, Feb. 15th, March 4th.	7 4 0	" 25	1,209	1,788	73	54	7 6

This was the third year in which these plots had been cropped with wheat unmanured, and the outturns are in consequence small. Two waterings again gave a poorer return than one, and this fact may be considered finally proved by the coincidence of the results of two independent experiments. It is not usual amongst native cultivators to give a weeding to rabi crops, although the experience of the last three years has taught nothing so clearly as the immense benefit which results from it in saving of water. It will be noticed that each watering over two in number not only paid for itself, but produced a very considerable profit.

11- (6) *Relative merits of canal and well water.*—An excellent opportunity was afforded for contrasting the results of using canal and well water for irrigation by a cultivator's field situated a short distance outside the Farm enclosure, and about 200 yards from the canal distributary, in which there was a *kucha* well regularly used for irrigation. So soon as the field had been sown, an arrangement was made with the cultivator by which he was to v/ater one half of the field from his well when irrigation was required and leave it to the Farm to water the remaining portion from the canal as nearly on the same date as possible. In order to prevent neglect on his part a liberal rate was fixed according to which the produce was to be valued when cut, cleaned and weighed by the Farm. The crop which had been sown was the mixture of barley and gram known as *bejhra* with rape *(sarsori)* in lines. The area of the well-irrigated portion was ·24, and of the canal-irrigated portion ·28 of an acre. The result is given in the following table: —

Plot.	Number of waterings.	Date of watering.	Date of weeding.	OUTTURN PER ACRE IN POUNDS. *Bejhra.* Grain.	*Bejhra.* Straw.	Rapeseed.	Value of outturn per acre.
Canal-irrigated ...	3	November 14th.., December 24th... February 16th ..	November 20	1,109	1,412	101	31-6
Well-irrigated ...	3	November 11th... December 10th... February 16th ..	November 22	1,312	2,031	137	39-6

The result is certainly surprising, and it is unfortunate that it was not possible to arrange for the conduct of a duplicate experiment. If there was any apparent advantage in situation, it was on the side of the canal-irrigated plot. It may be added that the experiment had not even been thought of at the time when the field was being sown.

I attribute the difference without hesitation to the delay of 14 days in givino- the December watering, which arose from the canal supply having failed at that time. The damage which resulted from this failure to the experimental manure plots has been already noticed. A great factor in the influence of water on a growing crop is the *timeliness of its supply,* and it is in this respect that canals are least satisfactory. Hence perhaps the lowness of the rate which cultivators are prepared to pay for canal water compared with either its real value or with the cost of drawing it from a well and hence too the not uncommon occurrence of well irrigation close under the bank of a canal distributary.

12. (iii) Experiments on thin sowing.—The effect was tried *(a)* of dibblin* in wheat seed by hand instead of sowing it in the ordinary way, and 0) of sowin<Ahe seed in every second and every third furrow, instead of in every furrow, as is usually done.

The plot which was sown by dibbling measured one-twelfth of an acre and formed a portion of a field, the remaining part of which (-22 acre) was sown in the ordinary way. In dibbling, the grains were dropped into little holes made with the finger, two grains to each hole, the holes being six inches apart in the same line, and the lines at a distance of one foot apart. In sowing as ordinarily effected the seed was dropped behind a country plough and covered by the earth thrown up from the next furrow -there was therefore a line of plants to each farrow or at a distance of *6* inches apart' In dibbling 5 seers would sow an acre, while for sowing in the ordinary fashion 6O seers are required. Both plots had been manured with 155 maunds dung and 388tb superphosphate to the acre,—were sown after the ground had been moistened by irrigation,—were three times watered subsequently and once weeded. The results were as follows:—

Method of sowing.	*Seed used per acre.* Amount.	*Seed used per acre.* Cost.	*Outturn per acre in pounds.* Grain.	*Outturn per acre in pounds.* Straw.	Value of outturn per acre.
	Seers.	Rs. a. p.			Rs.
Behind the plough in ordinary fashion,	60	3 0 0	1,978	3,008	60-8
Dibbled by hand ...	5	0 4 0	1,986	2,412	57-8

The close correspondence of the outturns of grain is very extraordinary and indicates that the produce represents the real capacity of the field, not to be increased by adding to the number of plants per acre. Dibbling however occasioned a considerable loss in straw (20 per cent.), as indeed was to be expected. Adding the value of the saving in seed (Rs. 2-75) to that of the outturn of the dibbled plot, we obtain Rs. 60'5 as against Rs. 60 0 (the value of the gross produce of the plot sown in the usual fashion), and the net result of dibbling was therefore a gain of eight annas.

The results of sowing in every second and in every third furrow closely agree with the foregoing. In this case it was necessary to sow the seed without previous irrigation, andjrince the soil was not sufficiently moist germination was very uneven. In the portion of the field sown in every furrow as usual the large amount of seed used compensated for the failure of a large portion-of it to germinate, and the result was a crop of 15f mds. of grain to the acre on afield measuring '43 of an acre. On the other two plots the crop was a failure owing to frequent bare patches. Selecting however a small portion of each plot in which germination had been fairly regular, the following results were obtained :—

Method of sowing.	*Seed used per acre.*		*Outturn per acre in pounds.*		Value of outturn per acre.
	Amount.	Cost.	Grain.	Straw.	
	Seers.	Rs. a. p.			Rs.
Every third furrow .., ...	15	0 12 0	1,265	1,943	38-4
Every second farrow	30	1 8 0	1,340	2,027	40-6
Every furrow (as usually done) ...	60	3 0 0	1,295	1,862	39-0

Making allowances for errors of experiment, which were intensified by the small size of the thinly-sown plots, the results are practically identical. There can be little doubt therefore that the amount of wheat seed usually sown per acre is at least ten times in excess of the quantity which would be sufficient if all the grains germinated. The extra expenditure of some Rs. 2-8 per acre in seed may be considered as an insurance against loss from uneven germination either by reason of badness of seed or the unequal distribution of moisture in the soil. It is a question however whether the saving of grain which would be effected would not compensate for the trouble of hand-picking seed and obviating in this way all possibility of loss from the first of these causes, and experiments in this direction will be continued.

The individual wheat plants on the thinly-sown plots were of course much finer than where sprung from thickly-sown seed. Some plants bore as many as 49 stalks with an average of 36 fully formed grains to each ear, or at the rate of over 1,700 fold. I did not notice however that there was any difference in the quality of the *cleaned* grain, though the *average* quality was undoubtedly better.

13. (iv) Experiments with new varieties of seed.—Cape *oats.*—These again succeeded well. The seed was obtained in 1880 from Australia, only as much being received as would fill a small envelope, and a small plot cultivated during the rabi season of 1880-81 gave a return at the rate of 2,219 ft. (=27 mds.) grain and 3,993ft. (=49 mds.) straw to the acre. During the season under report it was grown on a larger scale, sufficient seed being in stock to sow, although thinly, -26 of an acre. The land had been manured with dung at the rate of 100 mds. to the acre, was irrigated before sowing and three times subsequently. One weeding waa given. The yield por acre was 1,706 ft. (=*20| mds.) grain and 2,198 ft. (=261 mds.) straw, which is a very satisfactory outturn, although considerably less than that obtained in the preceding year. The cultivation then was however on so very small a scale (the plot only measuring a few square yards) that its results cannot be upheld as a reliable indication of the outturn per acre, and on the other hand the produce in the season under report would have been larger had the seed been aown somewhat thicker. The purpose for which oats seem to promise best is that of producing green fodder in the cold-weather months rather than as a grain crop. A large quantity of oats is grown with this object in the Meerut Division. There is now sufficient seed of the Cape variety in hand to enable some experiments being made next rabi season and test its capabilities as a fodder plant.

Black and white pram.—The large white-grained variety of gram (known as the "kabuli") and the black-grained gram were tried against the ordinary brown-orained kind with the following results:—

Variety of gram.	Area of plot.	Outturn per acre in pounds.		Difference per cent. from outturn of common variety.	
		Grain.	Straw.	Grain.	Straw.
	Acres.				
White	·01	603	1,204	—68	—40
Black	·02	1,249	1,249	—33	—33
Common	·2	1,862	1,93^	...	...

The plots received two waterings after sowing and one weeding. No manure was used. The outturn of the common variety was extremely good compared with that of the other two kinds, the better quality of which would not compensate for the deficiency in their produce.

English wheats, barleys and oats.—Trial was made of two varieties of wheat, three varieties of barley, and three varieties of oats, specially selected by Messrs. Sutton and Sons of Reading. Plots of wheat from Farm seed and of barley from country seed purchased in the bazar were also grown for comparison. The field had been manured with 100 mds. dung and was irrigated before sowing. The number of waterings given after sowing in each case are shown in the table which follows. One weeding was given. The area of the plots varied from ·1 to ·03 of an acre :—

Name of crop.	Name of variety.	Number of waterings given after germination.	Outturn per acre in pounds.	
			Grain.	Straw.
Wheat ...	English, Bough chaff	5	114	1,230
	English, Eed bearded	4	283	1,385
	farm	3	1,757	2,562
Barley ...	English, Peerless	3	741	2,198
	English, Beardless	3	803	1,843
	English, Golden melon	3	1,000	1,828
	Farm	3	1,591	1,319
Oats ...	English, Black Tartary	4	87	1,866
	English, Lincolnshire Poland ...	4	208	3,889
	English, Early blossom	4	102	3,026

In face of the excellence of indigenous wheats and barleys the attempt to introduce English varieties possesses little practical interest. It is worth noting however that this is the first season in which any produce whatever has been gained from English wheat seed, the trials of the two years preceding having resulted in complete failure. It will be interesting to see whether the acclimatized produce will give a better return next year.

Naked barley (Bordeum gymnodistiehon) from Kotgarh.—A rather imaginative account of tho excellence of this barley was lately sent to the Calcutta Agri.-Hortt. Society by Captain b. Pog&on and printed in the Society's Proceedings for August 25th, ltfbl. The difference between it and ordinary barley lies in the fact that it* flower scales do not adhere to the grain so as to form a continuous husk, but drop off in threshing, leaving the grain naked like that of wheat. There is therefore a less difference between its gross and its net weight. It is known by the vernacular name of « Rasuli" or " Paighambari," indicating apparently its introduction from Arabia. Its ears may bear either two rows *(var.* distichon) or six rows *(var.* hexastichon) of grains. A field of the former sub-variety was grown on the farm in the rabi of 1880-81 and gave an outturn of 21 mds. grain to the acre, which was 50 per cent, less than the outturn of good ordinary barley under similar circumstances. At the suggestion of the Government of India, a fresh trial was made during the rabi under report with seed procured from Kotgarb through Captain Pogson. This turned out to be of tho six-rowed sub-variety, but yielded an outturn of only 10 maunds to the acre, a little more than half of the yield from very indifferent seed of the ordinary kind grown side by side with it under similar treatment.

South American lucerne (Alfalfa).—A. quantity of seed of this well-known fodder plant was obtained through the kindness of H. B. M.'s Consul at Venezuela, bnt turned out to be almost exactly similar to the lucerne, which has become acclimatized in this country. Like many other fodder crops it bears in its own country an extraordinary reputation for resisting drought, but when brought to the test of an Indian hot weather it proved itself much inferior to lucerne from Indian seed, yielding 50 per cent, less green fodder.

(B) EXPERIMENTS WITH AGRICULTURAL IMPLEMENTS AND MACHINERY.

14. During the half-year under report the Agricultural Workshops wero dissociated from the Farm and placed under the orders of Captain J. Clibborn, B.S.C., Executive Engineer then attached to the Department. They have since been retransferred to the Farm. The number of implements sent out between November 1st, 1881 and May 31st, 1882 is shown below:—

Ploughs.			*Winnowers.*	*Pumps.*
Sold.	Given away.	Total.	Sold.	Sold.
168	9	177	9	10

34 of tho ploughs were manufactured by Messrs. Coen and Co. of Agra for the Dep.it-ment, the balance having been up in the Farm workshops. I understand Oat Messrs Coen and Co. have also sold a considerable number independently of this Department. The sale is however very small at present compared with the proveldutility of a plough by which the surface soil is inverted as well as stirred, and the undoubted suitably *oi* the departmental implement for light soils, such as obtain throughout a grea portion of the Provinces. For heavier soils it is probable that ploughs of Enghsh or American manufacture will be superior to anything that can be made up in this country, and during the half year experiments were conducted wh.ch ended in the modification of two Roughs, one English (Ransomo's B. F. O.) and another American (Watt's steel plough), so as to render them more suitable for native requ.rements, and they are now both admirably fitted for ploughing heavy loam or clay lands, provided good bullocks are available, such as are in general use in the districts of the Meerut division. A limited number of ploughs of both these patterns is now in stock for sale.

15. Amongst trials of machinery conducted during the half year, those of threshing and winnowing machines deserve especial notice.

ZWl»n<7.-Repeated experiments have proved that a pair of bullocks driven by a coolie will tread out on an average 2 mds. of wheat grain in a day of eight hours. Allowing 2 annas as the wage of the coolie and 3 annas for the bullocks, which w,ll cover the cost of the extra food they receive when in active work, the cost of threshing out a maund of wheat cornea to 25 annaa. TWa is by no means high, and the drawbacks produce in the season under report would have been larger had the seed been sown somewhat thicker. The purpose for which oats seem to promise best is that of producing green fodder in the cold-weather months rather than as a grain crop. A large quantity of oats is grown with this object in the Meerut Division. There is now sufficient seed of the Cape variety in hand to enable sdme experiments being made next rabi season and test its capabilities as a fodder plant.

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34 of the ploughs were manufactured by Messrs. Coen and Co. of Agra for tho Department, the balance having been up in the Farm workshops. I understand that Messrs. Coen and Co, have also sold a considerable number independently of this Department. Tho sale is however very small at present compared with the proved utility of a plough by which the surface soil is inverted as well as stirred, and the undoubted suitability of tho departmental implement for light soils, such as obtain throughout a great; portion of the Provinces. For heavier soils it is probable that ploughs of English or American manufacture will be superior to anything that can be made up in this country, and during the half year experiments were conducted which ended in tho modification of two ploughs, one English (Ransome's B. F. O.) and another American (Watt's steel plough), so as to render them more suitable for native requirements, and they are now both admirably fitted for ploughing heavy loam or clay lands, provided good bullocks are available, such as are in general use in the districts of the Mccrut division. A limited number o£ ploughs of bath these patterns is now in stock for sale.

15. Amongst trials of machinery conducted during the half year, those of threshing and winnowing machines deserve especial notice.

Threshing.—Repeated experiments have proved that a pair of bullocks driven by a coolie will tread out on an average 2 mds, of wheat grain in a day of eight hours. Allowing 2 annas as the wage of the coolie and 3 annas for the bullocks, which will cover tho cost of tho extra food they receive when in active work, the cost of threshing out a maund of wheat comes to 2·5 annas. This is by no means high, and the drawbacks to the process are (1) its slowness, which leaves the wheat lying for a long time in tho threshing-floor exposed to tho chances of rain or hail ; and (2) the peculiar'earthy smell and flavour which the grain acquires and which is a serious check to its sale in the English market. In order to test the advantages offered by machinery for threshing, an American combined thresher 'and cleaner was purchased, that manufactured by Messrs. Heebner and Sons of the United States and known as the Little Giant No. 3. Its price in America was only 124 dollars, but when landed in Cawnpore its cosfcumounted to Rs. 557. Rs. 180 must be added to this as the price of a four-bullock gin which is required to drive it, but which was already available on the Farm ; so that the total cost of tho machine was close upon Rs. 740. To work it for eight hours a day the following labour was required :—•

	Rs. a. p.	Rs. a. p.
6 pairs bullocks, two for relief ...	© 0 3 0	= 1 2 0
4 drivers	@ 0 2 0	=0 8 0
2 feeders	0 0 2-0	=0 4 0
2 women	@ 0 1 6	=0 3 0
		2 1 O

Four careful experiments extending over 23 hours proved that the machine will £hresh and clean at least 20 maunds in a day ; so that, allowing nothing for interest oa outlay and wear and tear, the cost per maund only comes to 1-9 for threshing *and win* nowmg.* The cost of winnowing by machine as a separate process amounts to 4-7 pie per maund, and the total cost of threshing by bullock-treading and of winnowing will be 2-9 annas per maund. The threshing machine effected therefore a savin* of 1 anna per maund, and it would therefore require to work off nearly 1,800 maunds in order to repay the 15 per cent, on its cost for interest on outlay and wear and tear. The machine was undoubtedly cheap, but was of anything but good materials and workmanship and required constant repairs. On the other hand I believe that its outturn might be increased to at least 30 maunds a day with a little practice. For short periods of a quarter of an hour I have worked it at the rate of 90 maunds a day, but with groat strain on the bullocks and risk to the machinery.

16. *Winnowing,*—Experiments were made to contrast the work of the English machines manufactured by Dell of Mark Lane and Ransome of Ipswrch, costing from Us. 200 to Rs. 250 apiece, with that of the one manufactured in tho Farm workshops and sold at Rs. 35. I should mention however that the Ransome's winnower was of an old pattern and is greatly inferior to the machines now turned out by this firm. The cost of working each winnower was found to be—

	Rs. a. p.	Rs. a. p.
3 coolies	@ 0 2 0«	0 0 0
3 women	<® 0 1 Gss	0 4 6
		0 10 G

The result of the trials is shown below:—

	Maunds of grain cleaned per day of eight hours.	Cost of cleaning per maund.
	Mds.	Pies.
Dell's winnower	36	47
It&nsome's »	16	10 5
Farm ia	19	*8-8*

The Farm implement came out therefore very creditably, and as soon as certain alterations now under trial have been made in its driving gear it will be still more efficient.

J. B. FULLER,

*A**L Dir.,y Dept. of Agri. and Commerce, N.~ W. P. and Oudh,*
In Charge Government Experimental Farm, Caivnpore.

ORDERS OF GOVERNMENT.

No. 1558 OF 1882.

FROM

THE OFFG. SECRETARY TO GOVERNMENT,

N.-W. PROVINCES AND OUDH,

To

THE DIRECTOR OF AGRICULTURE AND COMMERCE,

N.-W. PROVINCES AND OUDH.

Dated Naini Tal, the 2nd September, 1882.

SIR,

DBPARTMBMT. I AM directed to acknowledge the receipt of your No. 1115A., dated 9th August, 1882, with which you submit Mr. Fuller's report ou the rabi operations of the Cawnpore Experimental Farm during the season 1881-82.

2. Mr. Fuller has as usual given a full, .clear, and interesting account of the nature of the experiments conducted and of the results obtained. The operations of the half-year are sub-divided into—(A.) Field experiments of a purely agricultural nature : and (B.) Experiments with agricultural implements and machinery.

3. I'nder (A.), experiments were tried on the effect of—(1) different manures, (2) irrigation, (3) thing sowing, (4) new varieties of seed. The main experiments were made in the cultivation of wheat, and the results go to discredit the low estimate that has generally been accepted of the productiveness of Indian agriculture. The experiments also go to show that the chief requisite for fertility wanting in Indian soil is nitrogen; and if this conclusion prove to be correct, one main problem of practical agriculture in this country would be to supply nitrogen in the form of a cheap manure. The result of further inquiry and experiment will be awaited with interest.

4. Trials were made with irrigation *(a)* to ascertain the effect of irrigation in increasing the outturn, (6) to obtain fresh information on the vexed question of the relative merits of canal and of well-water. Under (a) it was found that a single watering more than trebled the produce. One watering followed by a weeding gave a higher produce than two waterings, after the second of which the land is allowed to cake. You hesitate, however, to accept the result of these experiments as conclusive. Well-irrigated laud gave an outturn per acre of the value of Rs. 39'6, while the value of the outturn of canal-irrigated land under the same conditions was Rs. 31·6 only. The difference is ascribed to canal water not being obtainable at the proper time. Mr. Fuller remarks—" A great factor in the influence of water on a growing crop is the timeliness of its supply, and it is in this respect that canals are leas satisfacttory

Hence perhaps the lowness of the rate which cultivators are prepared to pay for canal water, compared with either its real value or the cost of drawing it from a well; and hence too the not uncommon occurrence of well-irrigation close under the bank of a canal distributary." It must not, however, be forgotten that the remark as. to timeliness of supply may not unfrequently be applicable to some of the land which is irrigated from a well, and for which the cultivator has to wait his turn in using the well.

5. The experiments on thin sowing consisted of (a) dibbling- in wheat seed by hand, instead of sowing it in the ordinary way; and *(b)* sowing the seed in every second and every third furrow, instead of in every furrow as is usually done. In dibbling, five seers of seed are required to sow an acre, if every third furrow is sown 15 seers, if every second furrow is sown 30 seers, and under the ordinary method 60 seers are required per acre. In all the cases the outturn was nearly the same. There seems to be little doubt that the amount of wheat seed usually sown per acre is at least ten times in excess of the quantity which would be sufficient if all the grains germinated. The extra expenditure of seed may be reckoned as insurance against uneven germination, and Mr. Fuller thinks it is questionable whether the saving of grain which would be effected by thin sowing would not compensate for the trouble of hand picking seed, all possibility of loss from badness of seed being obviated. But it may be doubted whether ordinary cultivators will readily be induced to pick their seed, or trust those who profess to sell picked seed, and then to adopt the minute process of dibbling.

6 Of the experiments with new varieties of seed, that with Cape oats seems to have been successful, and those with gram, English wheats and barleys, naked barley, and Alfalfa seems to have been of little practical utility.

7. *Experiments with agricultural implements and machinery.*— One hundred and sixty-eight ploughs were sold and nine given away, while nine winnowers and sixteen pumps were sold during the half-year. Efforts are being made to introduce a plough suited to heavy soils, and trials with an American threshing and winnowing machine gave interesting results. You seem to be doubtful, however, whether the machine is likely to come into common use and to pay expenses, in which case experiment with it is to a certain extent futile.

8. In conclusion, I am to acknowledge the services of Mr. Fuller as manager of the Farm during the half-year. The report will, as usual, be published in the *Gazette.*

I have the honor to be,

SIB,

Your most obedient servant,

J. R. REID,

Offg. Secretary to Government,

N.- W. Provinces and Oudh.

No. 1559.

COPY, with copy of the report, forwarded to the Superintendent, Government Press, for publication in the *Aorth-Western Provinces and Oudh Gazette.*

F. BAKER,

Under-Seey. to Qovt., N.-W. P. and Oudh.

REPORT

ON THE

CAWNPORE EXPERIMENTAL FARM,

FOR THE KHABIF SEASON, 1882.

ALLAHABAD:

KORTH-WBSTEBN PROVINCES AND OUDH GOVERNMENT FRX8S.

188 8.

No. 397 A. oi 1883.

FBOM

THE DIRECTOR, DEPT. OF AGRI. AND COMMERCE,

NORTH-WESTERN PROVINCES AND ODDH,

To

THE SECRETARY TO GOVERNMENT,

NORTH-WESTERN PROVINCES AND OUDH.

Dated Cawnpore, the 17th March, 1883.

SIB,

I HAVE the honor to submit Major Pitcher's report on the Cawnpore Farm for the late kharif harvest. Its submission is unavoidably delayed until the results of the cotton crops have been ascertained.

2. Last year's experiments were spoilt by excessive floods, which obliterated the differences between the various experimental plots, and, in the case of the most important of the new products, by an unavoidable want of experience. No such drawbacks have to be reported this year.

3. Some progress has been made towards eliminating disturbing causes in the plots set apart for the comparison of the effects of various kinds of manure. The original standard plots, having been left entirely unmanured for four harvests in succession, have now been treated with exactly the same manures for five further consecutive harvests. The duplicate plots have nearly attained the same degree of experimental accuracy. But there are so many disturbing causes independent of the mere treatment of the soil, and over which the farmer has little or no control, that experiments of this kind, however carefully conducted, must be extended over a long series of years before their results can venture to claim any conclusive scientific authority.

4. As far as they go, the trials of various kinds of manure confirm the main results of previous years and point to nitrogen as the element in which the soil of the farm is deficient. On four standard plots the average produce given by nitrogenous manures was 2,1381b. per acre, while that given by phosphates and manures not rich in nitrogen only averaged 1,337fc. On the duplicate plots the averages were 1,6951b. and1,014ft. respectively. The increase in outturn was 60 per cent, in the first case and nearly 70 per cent, in the second.

5. The experiments with deep and shallow ploughing for cotton show a decided advantage on the side of moderately deep ploughing even in a year when a copious suppFy of rain diminished the necessity for it. The continued use of the inverting plough on the Farm lends no countenance to the fear, which is not unfre-<iuently expressed, that it may eventually lead to the deterioration of the productive powers of the soil.

6. The advantages of early ploughing are so very generally understood that I agree with Major Pitcher in thinking that this series of experiments may be discontinued.

7. The sowing of cotton in drills was tried for the first time on the farm this year. The result showed an increase of 39 per cent, in cotton and 30 per cent, in seed over a crop raised on the plan which is generally used in these provinces. The experiments will be repeated next year.

8. Another system, which, as far as I know, is never practised by the native agriculturist, yielded most satisfactory results. New Orleans and Upland Georgian cottons rattooned, and in the second year of their growth gave double and half as much again as the produce of plants sown this year. The American cottons maintained their very high price in the Cawnpore market at a time when native cottons were suffering a most serious decline, and realized Us. 23-12-0 per maund while good Bengal only commanded Rs. 13-12*0.

9. The result of sowings in different qualities of soil showed, as they did last year, that while the native Kulpahar pays best on a light loam, it is far distanced by American cotton where the soil is heavier.

10. The ravages of a little-known species of caterpillar, which attacked only the American cottons on the neighbouring estate of Rawatpur, &nd was not found on the Farm at all, were the cause of some anxiety, and the reappearance of the insect will be looked for next year. At first it was feared that the crop might have been almost entirely destroyed; but when I last saw the Manager, he informed me that, though the leaves had been eaten, a very large proportion of the cotton had escaped.

11. The trial of Nankin cotton will be repeated next year. A fibre with a good natural colour, which does not fade, would be of considerable commercial value.

12. Perhaps the most important of the experiments with products were those with different kinds of sorgo. Even in America the exact value of this plant as a sugar-producer has not been finally determined, but its great agricultural importance is widely recognized. It has three great advantages over the cane—in yielding a grain fit for human consumption; excellent fodder for cattle ; and in taking up the land for four months only instead of a whole year. In addition to this, it requires hardly any manure and no irrigation. Of three varieties tried, the amber and the red, while they yielded a rather less proportion of juice and gur to the whole plant than sugarcane, were not inferior to it in the proportion to the cleaned canes. The gur, though not yielding so large a proportion of crystal as ordinary sugar and possessing a peculiar acidity, was well-flavored and commanded a higher price in the market. For eating and various manufacturing purposes it appears to have a good future.

13. The great difficulty is in its manufacture, and this is where failure was encountered last spar. This year Major Pitcher gave every stage of the process his personal attention; and I was much impressed when I was staying at the Farm by the incessant care he devoted to it, and the scrupulous cleanness of the gur turned out. It is possible that his practical knowledge of chemistry may suggest before next harvest some method for reducing the objectionable quantity of glucose; but the present product has a market value which would make the cultivation of the plant very remunerative. Before, however, it can be hoped to spread, it will be necessary to instruct the natives who are to grow it in the proper method of preparing the gur, and this is a subject which will receive attention next year.

14. The experiments in *Ensilage* proved, at any rate, that fodder can be kept in good condition for a long time, and probably from one rainy season to another. In these provinces this is a question the importance of which cannot be over-estimated, and experiments will be continued with the view of ascertaining the cheapest way in which effective silo pits can be made. They may become of the very greatest value in connexion with the scheme of fodder reserves which is under the consideration of Government.

15. The Kaisar plough has gained prizes at a number of agricultural shows, and its merits are beginning to be more generally appreciated than hitherto. More than double the number were sold during this half-year than in the corresponding period last year. Where the soil is heavy and better bullocks and a larger price can be afforded, there can be little doubt of the superiority of the Watts' plough to all Indian adaptations from European or American models; and a considerable number have been ordered in the hope that they may suit the requirements of the Upper Doab.

16. Considerable improvements have been made in the Farm water-lift, and it is possible that a still better Form of plug may be discovered. As it stands, it is a very useful and effective implement; but the new form of exercise it imposes on the native who uses it seems to be an obstacle to its general introduction. It is possible that this may disappear as its advantages are better understood. In the meantime the demand remains about what it was.

17. Major Pitcher has been in charge since the transfer of Mr. Fuller to the Central Provinces in July, and the post of Overseer has been held by Lachman Prashad TCflxmo

I have the honor to be,

SIB,

Your most obedient servant,

W. C. BENETT,

Director.

REPORT

ON THB

CAWNPORE EXPERIMENTAL FARM

For the Kharif Season of 1882.

1.-FIELD EXPERIMENTS.

As compared with the seasons experienced at the Farm for several years past, the kharif season of 1882 may be taken to have been fairly good. The rains commenced early, and with the exception' of a continuous fall in July and long break in August the showers were fairly distributed. The total rainfall closely approximated the normal rainfall as shown below :—

Month.	Rainfall in inches.	Number of days in •which rain fell.
June	11-2	9
July	. 6-8	15
August	69	11
September	15	4
October	•6	1
November	•0	0
Total	26 9	40
Normal rainfall during the period	26 5	...

In July, weeding was somewhat interfered with by the continuous fain. In August, maize 'wffered during the long break from 6th to 21st August, and the village crops around the Farm gave a very poor outturn. The variety grown at the Farm and known as Jaunpur maize flowers later than the ordinary country variety ; it had suffered therefore less by the time that the canal (which happened during the break to be closed for repairs) was again thrown open.

2. The operations of the season comprised experiments on—

(1) Manures.
(2) Deep and shallow ploughing.
(3) Early and late ploughing.
(4) Drill and broadcast sowing.
(5) Cotton.
(«) Sorghum BUgar.
(7) Ensilage.

3. (i) Manures.—The plots on which manures are tested are now arranged in duplicate. Each plot measures one-twelfth of an acre, and the duplicate series provides some check on the results of the standard series.

For the past four years the treatment of both standard and duplicate series has been as under: —

Year.	Season.	Standard plots.		Duplicate plots.	
		Manure.	Crop.	Manure.	Crop.
1878 to 1879	Khaiif ...	Nil ...	NU ...	No record ...	No record.
	Rabi ...	Nil ...	Barley ...	Ditto ...	Ditto.
1879 to 1880	Eharif ...	Nil ...	Cotton ...	Nil * ...	A3
	Rabi ...	Nil ...	Fallow ...	Bone Baperphosphate ...	Wheat.
1S80 to 1881	Kharif ...	"Same as now applied	Maize ...	Nil ...	Fallow.
	Rabi ...	Ditto ...	Wheat ...	NU ...	Ditto.
1881 to 1882	Eharif ...	Ditto ...	Maize ...	Same as now applied ...	Maize.
	Rabi ...	NU ...	Nil ...	Nil ...	NU
1882	Kharif ...	See return ...	Maize ...	See return ...	Maize.

* An exception is the plot which was this year treated with saltpetre ; in 1880-81 it was treated with poudrttie.

For the season under report each plot was treated as under-

Ploughed ... ., ... Three times with Watt*' plough*
Weeded ... ... Twice.
Irrigated ... ... Mf ... Once.
Seed sown ... ,,, ... Maize at 6 seers per acre.

The following table shows the manures experimented with and the results :__.

Manure and rate per acre*	Outturn pee acre.			
	Grain.		Stalk and leal.	
	Standard.	Duplicate.	Standard.	Duplicate.
Manures yielding nitrogen.	lb.	ft.	Maunds.	Maunds.
Cattle-dung, 180 maunds	2,169-0	2,020 5	95-4	*89* 7
Cattle-dung, 180 maunds, and bone-dust, 360 55.	2,434-5	1,845-0	102-9	87-6
Cattle-dung, 180 maunds, and gypsum, 240 ft.	1,758*0	1,704 0	87-6	82-5
Saltpetre, 240 lB.	2,190*0	1,278-0	111-9	93*3
Ditto and bone dust, 360 ft.		1,626*0	•*•	87 6
Manures yielding little or no nitrogen.				
Bone superphosphate, 240 lb.	1,422 0	1,378-5	84-3	81-0
Bone-dust, 36&lb.	1,417-5	844-5	79-8	*56*7*
Gypsum, 210ft.	1,056*0	912-0	58 5	75-0
Ashes of 180 maunds cattle-dung...	1.452-0	922-5	87-3	71-4
No manure ... ... ,,, ...	1,002-0	924*0	74*7	69*0

4. Nitrogenous manures, as may be seen, maintain a very marked superiority in yield as against manures yielding little nitrogen ; and the duplicate plots corroborated fairly the results of the standard plots save in the case of the saltpetre standard plot, which shows a variation due probably to unexhausted poudrette (*vide* note to table of previous treatment).

There is little to be learnt, however, from experiments which have as yet so little continuity; and patience must be exercised until a sufficient number of annual experiments have been carried out to enable us to assert positively that by a certain expenditure on any particular manure corresponding increase in produce can be obtained, returning a fair profit on such expenditure*

5. (ii) Deep and shallow ploughing.—A new field was selected for these trials to which for several years past no manure tad been applied, and which had hitherto been cultivated with the native plough alone. It had further been reduced in fertility by crops of maize and wheat in succession. The field *yr&s* divided into four plots, each measuring exactly one-sixteenth of an acre and separated from its neighbour by a pathway four feet wide. The plots were thus treated—

I. and IV;—Ploughed twice at sowing time with a native plough.

II.—Ploughed once at sowing time with a Kaisar plough to a depth of 5 inches.

HI.—Ploughed once to 9 inches at sowing time with a Collins' plough-

Cotton was sown broadcast, harrowed in and *zpatela* run over the fields.

The crops were weeded twice and were not irrigated.

The yield was as under.

Number of plot.	Detail of ploughing.	Actual outturn,				Outturn per acre.	
		Cotton.		Seed.		Cotton.	Seed.
		lb.	oz.	lb.	oz.	lb.	ft.
I....	Native plough	5	15	12	10	95	202
II. ...	Kaisar ,,	7	0	14	5	112	229-
III....	Collins[1] ,,	6	9	13	6	105	214
IV. ...	Native ,,	6	4	13	0	100	208

It is to be regretted that space was not available for larger plots, and an endeavour will be made next year to secure more ground. The present figures are evidence in favour of moderately deep ploughing rather than ploughing to great depth. Here, however, again we must wait for continuous series of trials before drawing conclusions that can be generally accepted.

8. • ^ ^ar^y and late ploughing.—Two series of plots were prepared for experiments with the maize and cotton respectively. The plots intended for maize came to an untimely end through bursting of a rajbaha in May, which levelled all distinctions.

The cotton plots were four in number. Two fields were selected at some distance from each other and were each divided into two plots.

In each field one plot was ploughad in May and again at sowing time, while the other plots were only ploughed at sowing time. A crop of wheat had been taken off each field in the previous season; no manure was applied nor were the crops irrigated, but each plot was weeded twice.

The following table gives results :—

Number of plots.	Area in square yards.	Actual outturn.		Outturn per acre.	
		Cotton.	Seed.	Cotton.	Seed.
		ft.	Th	m.	tt>.
J.-Rarly ploughed	2,472	83	193 75	162 5	379-3
II.-I.ate ploughed	2,217	65-5	156-0	142-9	340-&
	1,691	53-5	117 3	167 4	356-7
iv - u t e piOughed	2,122	66*75	130-5	152-7	297 6

^ 7 . The advantage of early ploughing is demonstrated from the above, as has been done in previous experiments, but I am not aware that its advantages were ever contested. In Oudh every native is aware of the advantage derivable from the ploughing of unoccupied fields after every good fall of rain between November and the monsoon, and considers each of such ploughings as equivalent in benefit to manuring the land. Even standing green arhur is ploughed between the ^Pws. It seem to be purely a question on the part of the cultivator of leisure, or of bullock power, being available, and I would propose to discontinue this series.

8. (iv)—Drill and broadcast sowing;—In these provinces it is usual to sow cotton broadcast, but in the Central Provinces cotton is sown in drills. The merits of the two systems were put to test side by side in a field divided into two plots, the treatment of which in previous years had been as under:—

Year.	Manure.	Crop.
1879-80-	*Nil*	Mandoa.
1880-81	*Nil.*	*Ail.*
1881-82	*Nil.*	Wheat.

The drills were two feet apart, and the seed was sown at intervals of two feet. The two plots were sown with Kulpahar seed and treated as under :—

Manure.	Ploughed.	Weediogs.	Irrigation.
Nil	Once in May and again at time of sowing.	Two	*Nil*

The area and outturn of each plot were as follows :—

Mode of sowing.	Area in square yards.	Actual outturn*		Outturn per acre.		Increase per aere.	
		Cotton*	Seed.	Cotton.	Seed.	Cotton.	Seed.
		H>.	ft.	ft.	ffi.	ft.	ft.
Drill	3,320	130-12	311-5	189 7	454-1	51-8	106-4
Broadcast	3,654	104-12	262-5	1379	3477	•••	•••

As the price realised for the Kulpahar cotton grown bj the Farm was **Bs. 15-8-0** per bazar maund, and the price of the cotton seed is about Be. 1 per maund, the above experiment shows a profit of about Rs. 9-4-0 per acre in sowing in drills over sowing broadcast.

The experiments will be repeated in future years.

9. (T) Exotic cottons.—The following kinds were experimented with :—

1.—New Orleans.
2.—Upland Georgian.
3.—Nankin cotton.

Two plots sown in July, 1881, were ratooned for a second crop, and six plots where **sown** this year.

The.treatment of these in past years and the present is shown in the following table, toge* gether with the results : —

Number of field.	Area ... yards.	Nature of soil.	Previous treatment. Year.	Manure.	Crop.	Treatment during present year. Manure.	Ploughing.	Watering.	Weeding.	Seed sown.	Outturn.
I.	8,541	Light loam	1879-80 1880-81 1881-82	Guano ... *Nil.* *Nil*	Wheat ... Sorgho. Wheat.	Dung, 100 maunds to the acre.	2	*Nil.*	2	New Orleans,	26
IL	4227	Do.	1879-80 1880-81 1881-82	*Nil.* Dung, *Ml*	Wheat ... *Nil.* Wheat.	*Nil.*	Do.	Do.	Do.	Do.	[illegible]
III.	336	Heavy loam.	1879-80 1880-81 1881-82	Poudrette, *Nil.* *Nil.*	Maize ... *Nil.* Cotton.	*Nil.*	*Nil.*	Do.	Do.	New Orleans ratooned.	190-7
IV.	5,622	Light loam.	1879-80 1880-81 1881-82	*Nil* *Nil.* *Nil.*	*Nil.* *Nil.* Wheat.	*Nil.*	1	Do.	Do.	Upland Georgian.	110-4
V.	5,201	Do.	Same as of No. IV.		...	*Nil.*	Do,	Do.	Do.	Do.	72-7
VI.	1,155	Heavy loam.	1879-80 1880-81 1881-82	Poudrette, *Nil.* *Nil.*	Maize ... *Nil.* Cotton.	*Nil.*	*Nil.*	Do.	Do.	TTpland Georgian ratooned.	144'6
VII.	1,937	Do.	1879-80 1880-81 1881-82	*Nil.* Guano, Boiie superphosphate.	*NU.* Sugarcane Wheat.	*Nil.*	1	Do.	Do.	Nankin*	91*8
VIII.	1,625	Do.	Same as No. VII.		...	*NH.*	*Nil.*	Do.	Do.	Do.	113*

10. Continuous showers in July interferred with the weeding of the crops raised from seed, and the plants were checked somewhat in growth. The ratooned crops, besides being on rich soil, were from their more vigorous growth less affected by the vicissitudes of season. The produce of the New Orleans and Upland Georgian was valued by the Elgin Mills at Hs. 22-tf-0 per maund of 82 1b, equivalent to Bs. 27-7-0 per bazar maund, while last year the valuation was Rs. 25 ; and as the bazar prices of country cotton are lower this year than last, it seems clear that the acclimatised seed has not degenerated.

11. Samples of American and of country cotton cleaned with the Emery saw gin and with the ordinary country charkha were submitted to the Manager, Elgin Mills, for opinion, froi* whom the following report was received : —

«With reference to your letter, dated 11th instant, forwarding samples of cotton, I have the honor t* xeport as follows:—

2. The samples received were—

1. Upland Georgian—saw ginned.
Ditto— charkha ditto.
2. New Orleans— ditto ditto,
Ditto- saw ditto.
3. Kulpahar— charkha ginned,
Ditto— saw ditto,
4. Country cotton—ditto ditto,
Ditto— charkha ditto.

3. After carefully examining the above samples and comparing the cotton ginned with the native charkha MI the ordinary manner -with that ginned with the Burgess 'JSmery) saw gin I have arrived at the conclusion that the staple has not been injuriously affected by the latter process, t.' <?, cut, broken, or otherwise appreciably damaged, while the superiority of the saw gin over the old primitive method is very marked, so far as opening out and cleaning the cotton is concerned; as applying to the first two varieties, &»., Upland Georgian and New Orleans.

The effect of the saw gin on the short-stapled country cotton, however, is that the seed is partially broken ja the process, and small particles adhering to the fibre are passed through the machine, which materially reduces its value for spinning purposes.

I am of opinion, therefore, that the Burgess saw gin, while doing its work admirably on the long-Btapled varieties, is not so well suited for cotton grown in the North-Western Provinces usually known as Bengals.

4. The following are, approximately, valuations of the samples according to the ruling prices of the day :—

Georgian and New Orleans	Bs. 22-8-0	permaundof 82 lb.
Kulpahar and country cotton	„ 16-0-0 and 16-4-0	ditto.

Following the above opinion, the whole of the American cotton was saw ginned, while the country cotton was cleaned by charkha; and the prices eventually realised were Es. 23-12-0 for American, Rs. 15-8-0 for Kulpahar, and Es. 15-4-0 for country cotton per bazar maund respectively.

I may note that a sample of the country cotton cleaned by the saw gin and sent to the Cawnpore market was rejected by the dealers not on account of any supposed injury *to* the staple, but on account of its clean appearance, the dealers suspecting that it was old cotton cleaned with a Behna's bow.

12. Comparing the value of the exotic cottons with the produce of oountry cotton grown •* the Farm, we find as follows :—

Kind of cottoD.	Class of land.	Produce per acre of cleaned cotton.	Value per acre of cleaned cotton.
		lb	RB. a.
Country cotton... ...	Light loam ...	178-6	35 2
Exotic New Orleans and Upland Georgian ...	Ditto ...	92·0	25 *4*
Ditto ditto ditto ...	Heavy loam ...	167*6	45 15

showing, as was done last year, that in heavy loam the exotic cotton is a more paying crop than country cotton, even though the latter were to yield up to 200 ft. per acre; while in light loam *t is country cotton which is most profitable.

The cotton hand-books of Bombay, Madras, and Bengal, together with that for all India, °°nipiled by Dr. Royle, have left little to discover in the way of experiments with exotic cottons, *° far as the English home market is concerned ; and it was established clearly that India could *tever hope to compete * successfully at Manchester with America in American cottons : but since then times have changed, and the question now is whether the exotic cotton cannot be grown for local mills with success and with great profit to the ryot and to the spinning companies.

The Farm experience is so far favourable to an affirmative. At the Rawatpur estate, which ?[8]Ut a short distance from the Farm, the success of American cotton has been very marked : the cultivators are, I understand, beginning to appreciate the high price obtainable, and the cultivation is likely to extend.

13. Last year and again this year the American cotton plants at Rawatpur were stripped of ''teir leaves by swarms of caterpillars, which left the adjoining fields of country cotton absolutely Untouched, nor did they visit the fields on the Experimental Farm.

It seemed at first as if the crops would be damaged, but 1 understand the yield has been fa % good.

As the caterpillar was a stranger to the cultivators of the district, I kept some of the chrysaIkes until a moth emerged and then tried to get the latter identified. The Agri-Horticultural Society of Bengal returned a caterpillar first Bent without being able to recognize it, their only authority having left for England. Then the moth travelled to the Fanj&b and to Simla, and at last found a resting place at Poona, where it was kindly identified by Lieutenant-Colonel Swiuhoe, Assistant. Commissary-General, Bombay Army, who writes as follows to confirm a first opinion:—

Dated 21st February.—" I have to-day received from Mr. Arthur Butler, of the British Museum, the specific name of the little moth you sent me: it is *Glyphodes Multilinealis of Ghienée.* Mr. Butler says it is common and it appears widely distributed.

" The cotton you sent me with your letter, 18th December last, I put carefully though a process of drying and heating, and have succeeded in hatching out three moths, all of one species, and each of them came out of the heart of a separate injured cotton pod; and I can't help thinking that this, is the real insect that has been damaging the cotton. I took it myself out of a cotton-field near Karachi four years ago, and sent specimens of it to the British Museum. It was pronounced to be a new species of the tribe *Tortrices,* family *Nycteolidcn,* and was named by Mr. Butler *JErias tristrigosa.*

I don't mean to say that *Glyphodes Multilinealis* has not been injuring your cotton. Probably both insects have been at your cotton, one in its leaves and the other in the pod."

It may be interesting to others who may come across rare specimens to know that Lieutenant-Colonel Swinhoe has a collection of over eleven hundred species of moths.

14. *Nankin cotton.—OS* this variety it is necessary, in view of the interest lately taken in it, to make a separate note.

To all appearance, in the field before the bolls burst, the plant is the same as that of New Orleans or Upland Georgian, and quite different therefore in growth and leaf to country cotton. It was grown at the If arm some few years ago, but discontinued owing to the unfavourable reports on its staple received from Calcutta. This year some seed was received from the Saháranpur Botanical Gardens and from the Rawatpur estates, where it had been grown, as well as on other estates in the Cawnpore district, for several years past. On the plant the cotton is of a dirty fawn colour mixed with white ; bolls of fawn-coloured lint and of pure white lint being sometimes found on the same plant. After ginning, spinning, and weaving the result is a dark khaki-coloured cloth of uniform tint, admirably adapted for army clothing. The colour can, apparently, be bleached, judging from a coat shown to me at the JDlgiu Mills, but does not appear to fade with ordinary washing and wear. The Mills object to its staple as being difficult to work with machinery, and the English operatives at the Elgin Mills say that on account of this difficulty it is known to the trade in England as " rotten cotton ;" a difficulty, however, which does not seem to be recognised by native weavers.

This cotton is cultivated in Central India and woven into cloth for the regiments of Central India Horse. Lieutenant-Colonel Martin, O.B., in reply to inquiries, has kindly sent two samples of cloth of first and second quality. The Officer Commanding the 23rd Pioneers has sent samples of cloth and cotton from crops raised near Mian Mir by Subadar-Major Natha Singh, A.D.C. ; and from the Government of Madras have been received specimens of the cotton, and of cloth manufactured from it at the Coimbatore jail. From the Cotton Hand-book of Madras it appears that samples of Nankin cotton took prizes at the Madras Exhibition in 1859. The Secretary to the Muir Mills, Cawnpore, writes : —

" This Company has grown for some years crops of this cotton and have manufactured drill from the same. I enclose a pattern of the drill for your examination. We have endeavoured to introduce the cotton among th$ cultivators, but have not succeeded to any extent. We purchase any quantities of the cotton we may have offered to US, but at present very small quantities have been, secured, and we are therefore unable to manufacture cloth for sale of the pattern sent you."

All the samples of Nankin cotton received appear to be of fairly uniform colour save that from the Muir Mills, which is brighter and lighter than the rest, though but a slight shade different *to* the first quality of cloth used by the Central India Horse.

In the report of the Mission to Yarkand, page 479, reference is made to a reddish-coloured cotton sold in the Yarkand bazar and known as *kdrd kiwdz,* which maintains the colour after washin c. Lieutenant-Colonel Gordon, C.B., to whom I sent specimens of the Farm-grown cotton, speaking from recollection, seems to think Nankin identical with *kdrd kiwdz,* and has kindly promised to try to procure seed from Yarkand.

To sum up : Nankin cotton has long passed the experimental stage. It has been grown successfully, has been woven successfully, and is approved of by those who have had good opportunities of observing it in use ; but of value there are not at present sufficient data, as, owing to absence of demand, the market rate has been purely nominal.

The figures for the small quantity grown on the Farm, as shown in the table in para. 9, give an average of 102*8 lb. of clean cotton per acre on good soil, a poorer yield certainly than that of country cotton or New Orleans ; but the crop will probably give another picking in April, and may, on the whole year's outturn, compare more favourably.

15. *Sorghum sugar.*—The attempts of last year to manufacture sugar from sorghum were renewed this year and with better success. Two fields were sown.

(1) was divided into three sections, which were respectively planted with Minnesota early amber, acclimatised red sorghum, and acclimatised black sorghum. The field was manured with farmyard manure at 100 maunds to the acre.

(2) An unmanured plot in which sorgham was planted for cattle-food.

Contrary to expectation, the unmanured plot gave a better crop than the manured plot, This may have arisen from the fact that No. (1) lies lower than No. (2), and was waterlogged for some time in July. In America the general opinion is in favour of a sandy upland soil well drained, but not freshly manured. A professional sugar-boiler (kindly procured for the Farm by Messrs. Thomson and Mylne) could make nothing out of the juice at first, and pronounced it impracticable. One of the Farm apprentices, accustomed to sugar-boiling, then tried his hand on it, and by the use of lime succeeded at last in making gur of fairly good quality from the early amber and the red varieties, but for a long time failed with the black variety: eventually succeeding with that also by adding a very small quantity of carbonate of soda, as well'as lime, to the boiling juice.

16. Samples were sent to Carew and Co., Limited, to Messrs. Thomson and Mylne, and to the Agri-Horticultural Society, Bengal. A sample was also submitted through a native gentleman to a committee of sugar-brokers in Lucknow, the manner and place of its production being carefully concealed. The following opinions were received :—

MESSRS. CAREW AND CO.

" I have now the pleasure to send analysis of your sample of sorghum and to remark—

" 1st.—It is very acid. Having no experience of sorghum juice, I do not know how far this is due to delay or accident in manufacture.

" 2nd.—The amount of glucose is large and is probably due to the acid, which has the effect of converting crystallizable sugar into glucose, if present in a heated solution.

" 3rd.—Each part of glucose present is held iu refining to convert another part of crystallizable sugar, and this with the allowance for ash reduces the available sugar from your sample to 24 per cent,

" As a rule we would decline sugar with so small a result.

" My valuation is of course for refining purposes.

" It is pronounced here less *sweet* to the taste than cane gur; but it seems to me that, in small quantities, reaching the market early, it should bring top prices, *viz.,* Ks. 3-8 to Rs. 4 per maund.

Sugar analysis.

Sample received—November, 13th.
Marked Amber Sorgho Gur, 2oz.
Description,—Gur.
Colour, &c—light yellow—*Very acid.*

Composition.

Cane sugar	61*00
Glucose	23*85
Ash	3-15
Insl. matter—sundibre	0*23
Colouring matter extractive	3*78
Water	7'99
Total	100*00

Available sugar 24-5%."

MESSRS. THOMSON AND MYLNE.

" The sample of gur you sent us is of tho kind made for eating, and is not used for making sugar ; the present highest rates for eatable gur and gur for making sugar are 13 i and 15 seers per rupee respectively, and the value P^t upon your sample is 13i to 12J seers per rupee."

Lucknow and Cawnpore native brokers valued it at 9 to 10 seers per rupee, expressly placing a higher value on it than on what fresh sugarcane gur would fetch a month later, on account of its early appearance in the market, and as a fact sugarcane gur is now selling in Oawnpore (in March) at 14 seers per rupee.

The Agri-Horticultural Society wrote as follows :—

•« The samples above referred to are worthy of consideration, both being products of some value, if properly and carefully prepared.

« The plant is well known—sorgho or sorghum, the seed of which yields a hard food-grain, capable of being ground into good white flour. It is also used for cattle-feeding purposes, the green fodder of the plant being highly nutritious and sweet.

"The sample of gur said to have been prepared from the expressed juice of this plant is very soft, pasty, sticky and devoid of all granulation.

"In its present hard, dry condition it would be saleable in the bazar at about Es. 2-8 or Rs. 3 a bazar maund; but if subjected to a damp atmosphere, or kept during the rainy season, it would quite change its character and become dissolved in the form of molasses, in which state it would Be suitable for distilling into spirit only, and worth about Re. 1 to Rs. 1-8-0 a bazar maund.

" I am however of opinion that with care and cleanliness in boiling the expressed juice, and better manipulation generally, this plant is capable of yielding a good marketable gur; that further efforts should be made to improve upon the sample *now* under consideration, and in doing so that details should be given of the cost of producing it and that a large sample be furnished."

It will be observed that the Society's differs considerably from the professional opinions on this product and from the verdict of the market.

To revert to the professional opinions. Another given later on by Messrs/James Saunders and Co., of Melbourne, of samples from the Farm forwarded to them by the Government of India, runs thus:—

"Memorandum by Messr. James Saunders and *Co.,* of Melbourne, on Sorghum sugars :—

"Sample.—Three samples have been received as folloirs ;-Red sorgho, black sorgho, amber sorgho, and are herewith returned.

« *Mode ofvaluation.-These* were shown to a sugar-broker of 10 years' London experience, and his separate opinion quite agrees with the writer's.

« *London value.-The* amber quality has been taken as a test, and the broker gives *it* a value of £15-10-0 in London.

"Net price to cultivator.-AUowing £1-10.0 a ton for freight, bagging, shipping and commissions, which would fully cover all in case of large shipments direct from port to London, a net balance of £14 per ton remains. From this, London brokerage, 1 £- per cent., and carriage to port of shipment hnve to be taken; the latter omitted, the available money for distribution would be say £ 13-15-0 (about Rs. 6 a maund).

" *Uses.*—These depend on—

(a) quantity of saccharine per cent.

(b) qunntity of crystallising matter per cent.

As it now stands it is most likely to be of use to brewers, as the demand by refiners for low class "Mauritius" and even down to Madras 'jaggeries' compels them to often use crystals.

" *Use in Australia.—The* above remarks apply with even greater force, crystals of low count beincr almost invariably used. There would therefore be strong hope of better price in Victoria, which is the chief brewing centre ; but this would be counterbalanced in part fat least for a time) by higher freight, which with charges would by sail be 55s. to 60s.

" *Proposed trial.*—Regular supply should it be desired to try it in Victoria; one quality should be selected, say 'amber ;' all available information condensed and forwarded with (say) a ton to our firm, on which a report on the market value and experimental use can be made; but it should be borne in mind that, for trading purposes, it is useless to go to trouble and expense, unless a regular and constant supply can be kept up."

17. These points are so far plain that at the present stage of these experiments, the gur" produced is better adapted for eating purposes in India and for export for brewing purposes than for refineries. The best samples have a strong taste of honey, and coming early into the market, it should have a ready sale. As a fact, I may note that a native gentleman of Cawnpore, with whose name and appearance I am quite unacquainted, bought at th6 Farm as much as the Superintendent would sell him at four aunas a seer, and soon after returned to ask for more at the same price. The high price was put on simply because we did not then wish to sell, and at the same time did not wish to disoblige anxious enquirers.

18. The acidity of sorghum juice is far greater than that of cane and constitutes a difficulty. In using lime-water as a preliminary test, as recommended by Dr. Shier, I found the proportion of lime requisite to produce complete neutrality to be about 2oz. to 100 gallons of juice, where Farm sugarcane required about l^oz. ; but in the actual boilings the tempering must be done very carefully, so as to avoid alkalinity, which blackens the juice; and we deemed it advisable to err for this season, considering the small quantity of juice available, on the side of acidity. Next season I propose to try lime sucrate as being more manageable and of more constant quality than rough milk of lime. This is recommended in " Sugar Growing and Refining," a book full of the latest information on the subject, which was received by the Farm rather late for this year's operations.

The greatest care was taken to avoid fermentation. The canes were stripped on the fields before being cut and were pressed as quickly as possible after cutting. An attempt to save labour by pressing the canes with the leaves on (as sometimes practised in America) proved a great failure. The vessels for holding and boiling the juice were carefully cleansed and fumigated daily ^ith sulphur, and the juice filtered, before boiling, through fine flannel. All the operations of pressing and boiling were conducted as with sugarcane. A Bihia mill was used for pressing, a few drops of castor-oil to aid clarification, and lime was used for tempering, as already stated.

19. It remains to note the yield, which is shown in the following table. The cane was throughout much the same in quality, but day's workings were varied by experiments, of which *t is sufficient if what succeeded fairly is noted :—

Variety.	Percentage of clean canes per maund of plants.	Percentage of juice.		Percentage of gur to weight of		
		Plant.	Gleaned canes.	Plant.	Cleaned canes.	Juice.
Amber	43-45	21-45	49*36	3*61	8*32	*16-86*
[illegible]	44-20	23*14	52*35	404	9*14	17*46
B *.	40*22	2164	53*81	3*05	7-58	14 09
Sugarcane, variety chin	58*38	27-78	47*52	4 76	816	17*18

The average produce per acre of the three varieties was as follows:—

	Maunds.
Weight of plant	125-00
Ditto cleaned canes	53*27
Ditto gur	4*44
Ditto grain	3*00

Value of produce per acre—

	Rs.	a.	p.
Gur at Rs. 4 per maund	17	12	0
Grain at Re. 0-12-0 maund	2	4	0
Tops and leaves for fodder at 10 maunds per rupee	9	8	0
Vinegar	1	0	0
	30	8	0

Cost of production per acre-

Manure, 100 mds.	3	0	0
Ploughing twice	1	8	0
Clod-crushing	0	4	0
Sowing	0	12	0
Deed	0	4	0
Weeding	2	0	0
Cutting	3	8	0
Bent for kharif	4	0	0
Sugar-boiling at Be. 1-12-0 per maund of gur	7	14	0
Total	21	2	0

It may be repeated that the crops were exceedingly poor.

No one would claim from the above that any great success had been achieved; but criticism *y be deprecated, either for or against, for several seasons to come. A congress of sorghum-growers and sugar-manufacturers was held in America only so late as January, 1880, at which statements were made showing considerable diversity of treatment of the plant, where all were anxious to promote its cultivation.

Meantime, if in the place of mere criticism others would take up the subject and make known any advance effected, sorghum may yet find a good place amongst Indian crops.

20. Its advantages are that it can apparently be grown as an ordinary kharif crop on poor land year after year without irrigation, and does not require the great labour, expense, and capital requisite for sugarcane. It only occupies the ground four months, and can be grown iu places where sugarcane cannot be grown at all. If too poor a crop for sugar, it is still a most nutritious fodder for cattle, the seed being also good food. If fine enough for sugar, it keeps. the mills going for a month earlier. Cattle eat the *megass* greedily, while they will not eat that of sugarcane. The leaves and tops also go to the cattle. From fermented juice alcohol can be distilled, and from the skimmings of the boiling-pan vinegar can be manufactured. Sorghum may therefore be said to have potentialities.

21. (vi) Ensilage.—Some experiments were made in ensilage about two years ago, when the conclusion was arrived at that the system would never succeed in India, the fodder in the silo on the latter being opened having been found in a high state of putrefaction. It did not however appear from the record that the fodder had in these experiments been packed so as to exclude the air, and in view of the increasing attention which the subject is receiving in Europe and America it seemed advisable to try again.

To avoid all possible elements of failure, one silo was simply a large tin-case let into the ground in which 8£ maunds of fresh-cut green juar stalks were packed ; the juar was cut small with a chaff-cutter and packed by layers, eaoh layer being well trodden down, covered with tarred paper and three inches of earth above to keep out the air. It was left for 48 hours, after which the covering was removed, the fodder retrodden to assist consolidation, and a fresh quantity put in.

Some salt being sprinkled on each layer, a final covering of six inches of earth was given. In this miniature silo there would be no question of failure to carry out instructions.

A larger silo was a disused masonry reservoir, into which 51 £ maunds of green juar were packed in as above described.

The silos were packed between 3rd and 25th September, 1882.

It must be borne in mind that the object sought was, not to show how a silo could be most economically constructed, but to establish whether green fodder could be stored at all.

The intention was to keep the silos closed until the hot weather, and tarpaulin was placed in readiness in case of rain ; but in my absence occurred the heavy rainfalls of January 23rd and 26th, and rain was allowed to soak right through the covering of earth and some six inches of the top layer of fodder.

On the 28th January I had both silos opened. Where rain had penetrated the fodder was rotten and mouldy and white-ants were busy. Below however the fodder was perfectly good, looking green and succulent and with a sweetish vinous odour. The Farm cattle not only eat it greedily, but when placed before them in a basket alongside a basket of ordinary cut chari showed a distinct preference for the silo fodder. Five seers at morning and five seers at evening were given to each of several lean kine until the silo was exhausted. A question was whether cattle could be fed on the fodder entirely with safety. For this an undesirable animal was selected which never kept condition ; no one would take him at a gift, and two attempts to lose him across the Ganges had proved ineffectual, a day or two always finding him back, grazing on experimental crops. Silo fodder alone was given to him, as much as he chose to eat. Next morning he was reported as looking "rather sulky," but nothing worse came of it, and he continued to eat as much as he could get while the silo lasted.

In the case of the large silo the damaged layer was removed and a fresh covering of dry earth laid on. It will be opened in April. Every week in England sees more information added to the ensilage question, and by next season the knowledge now possessed of the subject will be far more complete. Originally it was insisted that the fodder must be free from rain or dew, and cut small, which latter operation constitutes a great expense. Now it is said that .wet fodder uncut ^ay be harvested this way. The oovering with an air-tight material of each layer is dispensed with by some save in the ease of the last layer. For consolidation planks are used, kept down by heavy weights, such as boxes filled with puddled clay. There are roadless tracts of country in these provinces, where more juar stalk is grown than the cattle can consume or the people dispose of, though the cattle are generally numerous in such parts Long before the end of the cold leather the chopped karbi has to be soaked in water to be at all eatable, and by the end of Phagun it is past chopping for. In such situations a cheap mode of preserving fodder green till April, May, and June might be a boon. In other places when all surplus fodder can be sold it is a question whether a cultivator might not employ his money better in maintaining for hot weather fodder a field of mangold-wurzel, lucerne, or Guinea-grass.

It may be noted that the large silo was first tried with ordinary *dhub* grass, butthe first layer in three days resembled in appearance a mass of farmyard manure, and grass was not persevered With.

B.—AGRICULTURAL IMPLEMENTS AND MACHINERY.

22. The following ploughs were received for trial during the season under report:—

A native plough from the Panjab.

Two ploughs made at the Saidapet Farm.

Three Swedish ploughs also from Saidapet.

Two English ploughs frem Messrs. Ransomes and Jeffries.

Two ploughs from Colonel Woodcock, District Superintendent of Police, Sultanpnr.

Of the two English ploughs, one oatalogued as marked P.L.K. is a *very* small one, giving a depth of furrow of 3 inches only ; the other marked W.K.S. is an exact copy of the now discarded form of Kaiser, which was sent to England two years ago. Jt carries with it such faults as the original Kaiser possessed.

The Swedish ploughs are quite unsuitable for cattle of these provinces, being very heavy, both in weight and draught: their price is also excessive, being Rs 18 per plough, exclusive of freight from Madras; while the Watts' American plough can, under recent arrangements with the Manufacturers, be delivered at Cawnpore at Bs. 10, and possibly for less. The ploughs made at the Saidapet Farm are equally in weight and draught unsuitable for these provinces.

Of the ploughs received from Sultanpur, the main difference between them and the Kaiser is in the substitution of nuts and bolts for rivets and of a wooden for an iron standard, which necessitates reduction of the breadth of the beam at a point where strength is required, and in tho breast being more curved, resulting in a cleaner furrow, but at the expense of greater draught.

The Panjab plough is similar to that in use in the Muzaffarnagar district, with a moveable breast. It is heavier than either the Watts or Kaiser, and does not invert the soil.

23. Besides frequent trials at the Farm, all the above ploughs, with the exception of the Panjab plough, were sent for exhibition to Saháranpur, Bijnor, Khairabad, and Bulandshahr. In each case either the Watts' or the Kaiser caught the judge's approval. Sales have somewhat increased this season, as shown in the following statement:—

Name of plough.	Sold.		Given for trial.	
	1881.	1882	1881.	1882.
Kaiser	205	430	11	24
Watts' beam	...	13	...	5
B. F.O. beam	...	23	...	5
Total ...	205	466	11	34

One gentleman, an indigo-planter of Tirhoot, purchased 105 Kaisers. I sent him a Watts' for trial and opinion and received the following reply :—

"I can't say that I approve of it half as much as the Kaiser for indigo land preparations. For not only is the price double and the draught much hea?ier on the bullocks, but it is much too heavy for the ploughman to carry about from place to place, to and from his work, which is most essential for us. I have used some of the Kaiser ploughs now for about two years, and they are as good as new, except the continual wearing out of the shares, which is of course to be expected."

The Collector of Hydrabad, Sinde, in writing for a fresh supply lately of six Watts' ploughs, reported that the plough "has been pronounced by Mr. W, Strachan, Superintendent of the Model Farm,.Hydrabad, to be a complete success. The stilt handle is, however, fully six inches too short for the average Sindhi, who to use it has to walk with his body bent, which soon tirels him. The iron fittings also are of inferior quality."

In the garden of a native gentleman, Munshi Shiu Persh&d, at Bareli, may be seen an example of sugarcane grown under cultivation with the native plough and with Kaiser plough respectively growing side by side, and the difference in favour of the Kaiser is, 1 have been told by the late Collector, very marked.

I have seen a like difference also this year in contiguous fields of barley grown in the Rae Bareli district. The true place for the soil-inverting ploughs is in the early preparation of the soil, particularly in indigo and sugarcane lands. The finishing ploughings and the sowings are best done with the native plough. Its introduction should be confined in the first instance to sugarcane, cotton, and indigo growers. Success with these crops will lead to its extension to other and less valuable crops. Unfortunately much of the so-called absence of enterprise in the people arises from a suspicion that increased production means to the landlord increased assessment and to the cultivator increased rent.

24. Waterlifts.—Some modifications have been introduced. The stand has been strengthened, the diameter of the wheel increased, and for wooden plugs, grooved iron plugs with a leather fitting to the groove and projecting from its edge, so as to fill the tube of the lift, have been substituted.

The result is increased efficiency; but this efficiency, easy to maintain and to demonstrate at the Farm, is not so easily maintained elsewhere, unless those who indent for lifts take care to renew the leathers when worn, and can appreciate the fact that the lift is as efficient, as it undoubtedly is, only when worked at high speed, a method of proceeding which is foreign to native ideas.

Lifts are now constructed for 5', 10', 15', 20', and 30\

The sales of the lifts since May last up to date and for the same period in the previous year were as under :—

Height of lift.	Sold.		Given for trial.	
	1881-82.	1882-83.	1881-82.	1882-83.
5'	4	4	...	1
10'		2	...	1
16'	6	2	2	2
20'	20	21		1
30'	...	3	...	...
Total	30	.	2	5

As encouraging facts, it may be stated that a zamindar from a distant village of Bundelkhand commissioned a bania of Cawnpore to purchase eight pumps, sending oarts for them and clamouring because they were not ready immediately. It seems that he purchased one two years ago and acted on experience. In another case a talukdar of Oudh returned one for repairs which be had managed to break, and also said that it would not work. A mistri was sent back with (ha lift to put it up and explain the working, and then came **a** letter asking **for** another lift to be **sent** as quickly as possible in addition to the first.

25. Winnowers.—For the driving band in the old machines a press-wheel has been substituted with advantage. Six were disposed of between June 1st and November 30th, 1862.

26. Maize-shelling machine—A. very simple and efficient machine was received from Messrs. Heebner and Sons, U.S., at a cost to Cawnpore of Rs. 78. It is worked by one coolie and requires two boys to feed it. As shown in the following table, it is far cheaper than hand labour, and would suit for Tarai cultivation, where maize is plentiful and labour scarce: —

Mode of hulling.	Number of labourers.	Total amount of wages per day.	Quantity of hulled grain per day.	Cost of hailing per maund of grain in annas.
		Rs. a. p.	m.	
Corn-sheller	Two meu and 1 wo boys.	0 7 6	789(	•77
Bj stick	Six boys ...	0 7 6	388	158
„ charpai	Six women ...	0 7 6	109	5-64
9i khurpi	Ditto ...	0 7 6	132	4-65
99 hand	Ditto ...	0 7 6	142	4 30

It was exhibited at Bijnor, Khairabad, and Saharanpur, and seemed to take the fancy **of** the people exceedingly.

27. Emery saw-gin with Dr. Forbes **Watson's Improvements**—One was procured daring tlie year in consequence of a recommendation in its favour received through the Government of Iudia. For cleaning American cotton it is most efficient, giving cleaner cotton at 10 annas per miund than the native churka produces at Rs. 2-8-0 per maund. It is not however adapted for cleaning short-stapled native cotton, as was shown years ago by Sir Walter Cassel in his Cotton Handbook for Bombay,

In conclusion it may be noted that I have merely reported on the Farm operations, and that their initiation was due to Mr. Fuller, while the work **of** carrying out Mr. Fuller's plans waa most efficiently conducted by the Superintendent, Laohman Farshad Banna.

J). G. PITCHER, MAJOR,

Asst. Director for Oudh,

REPORT

ON THE

CAWNPOjRE EXPERIMENTAL FARM,

FOR THE EABI SEASON, 1882-83.

ALLAHABAD:

NORTH-WESTERN PROVINCES AND.OUDH QOTIRKHSNT PRI3S.

1883.

No. $\frac{1007A.}{CXCIV.}$ OF 1883.

FROM

THE DIRECTOR, DEPT. OF AGRI. AND COMMERCE,
NORTH-WESTERN PROVINCES AND OUDH,

To

TEE SECRETARY TO GOVERNMENT,
NORTH-WESTERN PROVINCES AND OUDH.

Dated Caumpore, the 17th Juty, 1883.

SIR,

I HAVE the honor to submit Major Pitcher's report on the rabi harvest at the Cawnpore experimental farm.

% The average outturn of wheat over the whole farm was this year 21*8 bushels per acre, which is 1*36 bushels less than the average outturn in the year before. The crop as a rule was aot finer than that grown by neighboring cultivators, and may be accepted as representing with some fairness an ordinary outturn from cultivation of a normal character on land which is rather below than above the average.

3. The results from the experimental plots agreed very closely with those of last year. In both years saltpetre alone and saltpetre mixed with bone-dust gave by far the largest outturn. The difference obtained by adding bone-dust was very slight on both occasions, and on the last the Plot without it did better than the plot with it. The produce in grain for both years is as follows: —

	Produce in grain.		Per cent, of increase on unman ured.	
	1882.	1883.	1882.	1883.
	Ib.	Ib.		
Saltpetre alone	1424	2,080	84	102
Sj petre with bone-dust	1,485	2,000	92	94
Whlly unmanured	774	1,032	...	...

It is doubtful, with these figures, whether bone-dust contributed at all to the superior productiveness. If it did it was certainly not in any proportion to the additional expense of Rs, 4-8-0 per acre which its application involves. It may further be remarked that saltpetre does not as yet show any sign of exhausting the soil, and a farther confirmation is given to the view that, at least for the production of cereals, nitrogen is the one great want of soils like that of the farm.

4. Last year bone-dust gave a much larger return than bone superphosphate. This might probably be explained by some disturbing cause such as no single experiments can be sure of escaping. This year bone-dust and superphosphate were almost exactly equal. Similar results ^ere obtained last year when both bone and mineral superphosphates were tried. There is nothing in the experiments as yet to show any great need of phosphoric acid ; that lime should ^e wanted in the greater part of tjiese provinces is nearly incredible. In neither year has gypsum made any appreciable effect on the yield, and it seems very doubtful whether there is any use in continuing this part of the experiment. It may be of some advantage in the case of leguminous crops, but it seems to be of little direct use to cereals.

5. Another form of applying nitrates is by ploughing in some leguminous crop, an Operation which has probably a further advantage in the mechanical opening up of the soil. The result this year was that the outturn of grain of six plots so treated averaged 1,653 ft, while that on six plots similarly situated but unmanured was 1,271 ft. The additional 382 ft per

acrfr were obtained at a cost of at the outside Rs. 2-8-0, and, being worth nearly Rs. 10, gave a very handsome profit on the outlay.

6." The advantages of deep ploughing were very strikingly shown. By inverting the soil to a depth of nine inches the produce wa's nearly doubled, a depth of five inches increased it by 32 per cent, and in both cases only two ploughings were given, to four by the ordinary native plough. In fact, the superiority of moderately deep ploughing on all ordinary soils has long been placed beyond question.

7. The experiments with well and canal water were continued ; the results, omitting straw, in the two years being as follows :—

	Canal. ft*	Well. ft.	Per cent, increase of well over cunal.
1882	1,110	1,449	30
1883 ... ., ...	1,227	1,380	12

The experiments have not been carried on long enough to enable us to conclude with certainty that well water is in itself a better fertilizer than canal water. The advantage it has in the greater opportuneness with which it can be applied was alluded to ia last year's report; on the other side must be put its greater expense.

8. The English barleys gave rather a better yield this year than they did last, producing on an average 1,077 ft per acre against the former average crop of 848 ft, They are still far inferior in productiveness to the ordinary native variety, which again continues to yield about twice as heavy a crop as the Kotgarh barley. Cape oats show no sign of deterioration, and this year have yielded as much as 2,02(5 ft to the acre. English wheat does not promise to succeed. It is far too slow in arriving at maturity.

9. An attempt to supply unprepared linseed fibre for the purpose of paper manufacture disappointed any expectations that may have been formed of it. A white variety of linseed, not generally known in these proviuces, was imported from Jahiun and yielded an oil of exceptional-purity and brilliancy, which might become a valuable article of commerce.

10. The ensilage which had been partly damnged by the rain in January was closed up again and not re-opened till May. The fodder was considerably fermented, but not so injured as to make it unfit for cattle food ; and the possibility of keeping green fodder from the end of one rainy season to the beginning of the next was clearly demonstrated. The subject is a new one, not only here but in England and America, and there are many questions of detail which arc waiting for solution. Major Pitcher's suggession to scatter boosa between the layers of oipen stalk, and to use it instead of earth as a top covering, is one that appears to deserve trial.

11. Among the new implements experimented with, there are two which promise to be of use to Indian agriculture. A cheap and efficient hand-threshing machine, which only cost Rs. 128-9-0 when imported, and might probably be made up for less in thia country, was found to be much more expeditious and more cleanly in its action than the ordinary method of treading out by oxen. A new form of sugar evaporator, imported from America, promises to be a still more valuable addition to the existing stock of implements. It is cheaper than the apparatus of iron pans which is now in use, it is incomparably more rapid and simple in its operation, and it produces a finer quality of rāb. At the various agricultural shows where it was exhibited it attracted much attention, and copies are behig made for the sugar manufactory at Rosa, and for Pandit Ajodhya Pras&d of Indalpur, whose agricultural experiments have lately been in the main concentrated on the production of sugar.

I have the honor to be,

Bip,

Your most obedient servant,

W. C. BENETT,

Dir, Deft, of Agri. and Commerce, iV.- *W. P. and Oudh.*

REPORT

ON THE

CAWNPOKE EXPERIMENTAL FARM

FOR THE RABI SEASON OF 1882-83.

1- *Character of the season.*—The season was again abnormal in character. In September and October last only two inches of rain fell instead of 6'49 inches the normal quantity, and, as a consequence, the moisture in the soil so necessary for the rabi sowings was barely sufficient for Proper germination. Between the 1st October and the 25th January only -5 inches of rain fell, and matters began to look very threatening for all those cultivators who had no canal water at their service. On the farm lands, two waterings had been given to most of the crops, and to some had been given three waterings, when, on January 25th and following days, three inches of rain fell accompanied by very high wind. The most forward and most promising crops being then in flower, they necessarily suffered from the effects of the storm to a greater degree than crops less advanced, and but for this accident the yield in some of the manured experimental plots would have been higher than what is shown against them. A general result on the yield was a greater proportion of straw to grain than usual.

One advantage of experimental stations is the test they afford of the true character of the Reason's outturn, Last year the maximum outturn of wheat per acre on the farm amounted to 2>820 ft (47 bushels). This year it in no case exceeded 2,181 ft (36*3 bushels); while on 16-8 acres the average was 1,390 ft (23*16 bushels) last year against 1,309ft (21*8 bushels) this year, this gauge of the season's yield is, I find, in accord with the estimate current amongst the zamindars.

Again, when I was out in camp, complaints were rife of the great damage done to mustard crops by blight. Returning to the farm I found that our loss from the same cause amounted to some 50 per cent.

In March a hailstorm of some severity passed over the city of Cawnpore leaving the farm comparatively untouched. Had the farm lain in its track, I should say, judging from the size of the hailstones, that the result would have necessitated the remission of a considerable portion of this report. Owing to the damage caused to vineyards in France by hailstorms, considerable attention has been given to their occurrence by scientific men, and amongst others M. Arago held that by intercepting the electricity of the passing cloud and conducting it to the earth, the hail would fall innocuous as rain. Factory chimneys, as he showed in the case of Manchester, have an effect in ^ia way in increasing the rainfall. It will be interesting to observe, as time goes on, whether the increasing number of factory shafts in Cawnpore seem to attract rain to it. Already as I write the increased quantity that has fallen in the city, as compared with what has fallen on the farm three miles away, has been very marked.

It was noticed that after the hailstorm the grain of some of the barley lost its brightness, and eventually when threshed out it was classed in the bazaar as old grain, and priced lower in consequence.

2. *Operations of the season.—The* following experiments were planned :—

(1) Experiments with manure.
(2) Ditto in ploughing.
(3) Ditto in irrigation,
(4) Ditto in thin sowing.
(5) Ditto with varieties of seed.

The experiments with manures comprised—

(a) The standard series of wheat plots manured with nitrogenous and non-nitrogenous manures in duplicate.

(6) That known as the " Ville " series.

(c) Various.

The treatment of the plots of the standard series for the past four years and for the present year has been as under: —

Previous treatment.				*Treatment during the season.*			
Year.	Season.	Manure.	Crop.	Ploughing.	Seed per acre.	Irrigation.	Weeding.
1878	Kharif	Nil.	Nil				
1879	Rabi	Do.	Barley				
2879	Kharif	Do.	Cotton				
1880	Rabi	Do.	Nil				
1880	Kbarif	Do.	Maize				
1881	Rabi	Do.	Nil				
1881	Kharif	As now applied.	Maize				
1882	Rabi	Do.	Wheat				
1882	Kharif	Nil.	Nil				
1883	Rabi	As now applied.	Wheat	Three ...	120 ft ...	Twice ...	Once.

The following table shows the results obtained with the various manures :—

Manure.	Amount in ft. per acre.	OUTTURN PEB ACHE.			
		Grain,		*Straw.*	
		Standard.	Duplicate.	Standard,	Duplicate,
		lb. oz.	lb. oz.	lb.	lb.
Potassic nitrate	240	1,978 8	2,181 0	3,636	3,906
Potassic nitrate ... and Bone-dust	240 360	1,944 12	2,055 12	3,690	3,834
Farmyard manure ...	14,400	1,713 0	1,623 0	3,126	2,958
Farmyard manure and Calcic sulphate	14,400 240	1,761 0	1,886 4	3,270	2,778
Farmyard manure and Bone-dust	14,400 360	1,584 0	1,400 10	2,634	2,412
Farmyard manure (reduced to ashes) ...	14,400	1,383 0	1,417 8	2,412	2,436
Bone superphosphate	240	1,347 12	1,271 4	2,040	2,100
Bone-dust	360	1,032 12	1,433 4	1,704	2,424
Calcic sulphate	240	996 0	1,152 0	1,554	1,824
No manure	...	1,065 0	999 0	1,764	1,704

The high proportion of straw to grain, as compared with last year's results and to which allusion has already been made, may be traced in the first six plots.

It will be interesting to note as time goes on how far potassic nitrate alone unaided by cinereal (or mineral; manures will suffice to maintain fertility. The use of nitrous earth as a manure is freely resorted to by native cultivators in the shape of a top dressing to poppy tobacco, wheat, jetia sawan, and sometimes I believe to maize.

Mr. Warrington writes* : " As the whole object of artificial manuring is to supplement the deficiencies of the soil, it is highly desirable thfit a farmer should ascertain by trials in the field what is the actual amount of increase which he obtains from the manure he purchases. A few carefully made experiments will teach him what his land and crops are really in need of. Should he add superphosphate with the nitrate of sodium for his wheat ? What dressing of the nitrate is most economical? Is superphosphate alone sufficient for his turnip crop, or should guano or nitrate be employed as well? What is the smallest quantity of superphosphate sufficient for the crop? Will it pay to use potassium salts for his seeds or pasture ? These and many other questions can only be answered by trials on his own fields, and on the farmer's knowledge of such facts will depend the economy with which he is able to use purchased manures."

* Chemistry of the Farm.

This extract explains in clear language what we are attempting to do at the farm, *viz.,* to arrive by degrees at some sort of estimate as to how far the wheat crops of these provinces may be benefited by the application of manures which will pay for their purchase, at the same time maintaining fertility and not simply exhausting it. Variations will be made as experience suggests. For instance, we are now able to see pretty clearly how useless the application of calcic sulphate by itself is for a cereal crop, though the addition of it to farmyard manure appears to produce some increase in the effect of the latter, owing no doubt to its converting part of the insoluble nitrogenous humus into soluble ammonia compounds. But the plot is in no wise thrown away. Calcic sulphate has a marked and important effect in the growth of leguminous plants, and its proper place towards cereal crops is in aiding in the growth of a leguminous crop such crop to be ploughed in for wheat. Under this treatment the plot in question may take a higher place next year. So also with the superphosphate plot, it will for next year be used for a nitrous superphosphate manure experiment.

The following table shows the cost and profit of applying each manure during the season under report. I may note that the calcic sulphate (or gypsum) was obtained very cheaply at four annas a maund, as the waste product of soda-water manufacture. Considering the unquestionable evidence from England and America as to its good effect on leguminous crops, it is worth more notice than it seems to have received hitherto from indigo growers. Large natural beds of gypsum exist in the hills both of the North-Western Provinces and of the Punjab.

Manure.	Cost per acre.	Value of produce per acre. Standard.	Value of produce per acre. Duplicate.	Average value of produce.	Profit on manured over unmanured plot.	
	Rs. a. P.	Rs. a. P.	Rs. a. P.	Rs. a. P.	Rs. a. P.	
Potassic nitrate	7 8 0	69 1 0	75 11 6	72 G 3	29 8 6	
Ditto and bone-dust... ...	12 0 0	68 5 9	71 15 10	70 2 9	22 13 0	*
Farmyard manure	9 0 0	59 11 3	56 8 10	58 2 0	13 12 3	
Ditto and calc. sulphate ...	10 0 0	61 9 9	63 0 9	62 5 3	16 15 6	
Ditto and bone-dust ...	13 8 0	54 2 7	48 3 8	51 3 1	2 5 4	
Ditto ashes only	9 0 0	47 11 7	48 12 8	48 4 1	3 14 2	
Bone superphosphate	14 8 0	45 4 4	43 6 8	44 5 6	5 8 3	Loss.
Bone-dust	4 8 0	35 4 1	49 2 10	42 3 5	2 5 8	
Calc. sulphate*	1 0 0	33 10 3	39 0 4	36 5 3	0 0 6	Loss.
Unmanured...	...	36 6 2	34 5 4	35 5 9	...	

B.—THE VILLE PLOTS.

(6) *The Ville plots.*—These were a repetition on the same plots of last year's work illustrates by growing crops on the land how a practical analysis of the soil may be made. It must be admitted though that experiments of this sort run too great risk from the chances of weather to be very largely adopted in practice and that they are more interesting than practical.

The treatment of these plots during the past four years and during the present year has been as follows :—

Year.	Previous treatment. Season.	Previous treatment. Manure.	Previous treatment. Crop.	Treatment during 1882-83. Ploughing.	Treatment during 1882-83. Seed per acre	Treatment during 1882-83. Irrigation.	Treatment during 1882-83. Weeding.
1878 to 1879 ...	Kharif ... Rabi ...	Nil.	Nil. Barley ...				
1879 to 1880 ...	Kharif ... Rabi ...	Nil. "	Cotton ... Nil.				
1880 to 1881 ...	Kharif ... Rabi ...	Nil. "	Sorgho ... Nil.				
1881 to 1882 ...	Kharif ... Rabi ...	Same as now applied.	Maize ... Wheat ...				
1882 to 1883 ...	Kharif ... Rabi ...	As in table...	Nil Wheat ...	Three ...	120 ft. ...	Twice ...	Once.

The following table gives this year's results, in considering which the qualifying effect of the January storm must be borne in mind. The effect, however, of withdrawing the nitrogen in the case of a cereal crop is still plainly enough marked :—

Number of plot.	Manures and rate per aere.	Outturn per acre.		Difference between the outturn of each plot and that of plot No. I.		Remarks.
		Grain.	Straw.	Grain.	Straw.	
		lb. oz.	lb.	lb. oz.	lb.	
I. ...	Calcic superphos, 180 lb. Ammo, cloride, 188 „ Potass sulphate 90 „ Talc, sulphate 96 „	1,726 8	2,772	...	...	The most advanced when the rain fell and therefore most injured.
II. ...	Do. less calc. superphosphate	1,771 8	3,252	45 0	480	Gain.
III. ...	Do. „ ammo, cloride ...	1,192 8	1,824	534 0	948	Loss.
IV. ...	Do. „ potass, sulphate ...	2 076 0	3,936	349 8	1,164	Gain.
V. ...	Do. „ calcic, sulphate ...	1,641 0	2,388	85 8	384	Loss.
VI. ...	No manure	1,045 8	1,428	681 0	1,344	Loss.

C— Various Manures.

Under this heading come chiefly experiments in green-soiling. Fairly large fields were taken up and divided into manured and unmanured portions, and changes were rung on hemp and on indigo refuse. Two plots will be found of cinereal manares very common and very commonly neglected, *viz.* brick kiln refuse and ashes of weeds. The following table shows the treatment of the fields during past seasons as well as in the present season :—

Number of plot.	Previous treatment.			Treatment during 1882-83.				
	Year.	Manure.	Crop.	Manure.	Ploughing with earth-turning plough.	Seed and rate per acre.	Irrigation.	Weeding.
1	1878-79 1879-80 1880-81 1881-82	Nil ... Dung ... Dung ... Nil ...	Wheat ... Ditto ... Wheat and flax Cotton ...	A portion with hemp, another left unmanured.	Four ...	Wheat 120 lb.	Twice ...	One.
2	1878-79 1879-80 1880-81 1881-82	Nil ... Guano ... Dung ... Nil ...	Maize ... Wheat ... Ditto ... Cotton ...	A portion with hemp, another with hemp and poudrette and the remaining portion left unmanured.	Four ...	Ditto ...	Ditto ...	Ditto.
3	1878-79 1879-80 1880-81 1881-82	Same as No. 2...	Same as No. 2...	A portion with hemp, and another left unmanured.	Four ...	Ditto ...	Ditto ...	Ditto.
4	1878-79 1879-80 1880-81 1881-82	Nil ... Nil ... Nil ... Nil ...	Barley ... Linseed ... Wheat ... Wheat ...	Ditto ...	Four ...	Ditto ...	Ditto ...	Ditto.
5	1878-79 1879-80 1880-81 1881-82	Nil ... Nil ... Dung ... Nil ...	Juar ... Nil ... Wheat ... Mung and Til...	Ditto ...	Three ...	Ditto ...	Ditto ...	Ditto.
6	1878-79 1879-80 1880-81 1881-82	Nil ... Nil ... Dung and gypsum Nil ...	Juar ... Nil ... Wheat ... Wheat and gram	A portion with fresh indigo refuse and lime, another with last year's refuse and lime, a third with last year's refuse only, and the fourth unmanured.	Three ...	Ditto ...	Ditto ...	Ditto.
A.	1878-79 1879-80 1880-81 1881-82	Nil ... Nil ... Nil ... Hemp and gypsum	Barley ... Cotton ... Juar ... Wheat ...	Hemp and gypsum,	Three ...	Ditto ...	Ditto ...	Ditto.
B.	1878-79 1879-80 1880-81 1881-82	Nil ... Nil ... Indigo ploughed in Hemp ...	Barley ... Cotton ... Wheat ... Ditto ...	Hemp ...	Three ...	Ditto ...	Ditto ...	Ditto,
C.	1878-79 1879-80 1880-81 1881-82	Nil ... Nil ... Nil ... Nil ...	Barley ... Cotton ... Juar ... Wheat ...	Unmanured ...	Three ...	Ditto ...	Ditto ...	Ditto.
D.	...	Not known ...	...	Brick-kiln refuse...	Three ...	Ditto ...	Ditto ...	Ditto.
S.	...	Ditto ...	...	Ashes of weeds ...	Three ...	Ditto ...	Ditto ...	Ditto.

The following table shows the result obtained :—

Number of fields.	Particulars of manure applied during the year.	Area in square yards.	Actual outturn. Grain.		Actual outturn. Straw.		Outturn per acre. Grain.	Outturn per acre. Straw.
			It	oz.	It).	OZ.	ft.	m.
1	Hemp ploughed in ...	4,400	1,743	9	3,993	12	1,917*9	4,3931
1	•No manure	4,010	1,515	5	2,630	4	1,828 9	3,174-6
2	Hemp and gypsum	851	325	9	466	12	1,851*6	2.654*6
2	iJemp	1,759	640	14	1,064	12	1,763-4	2,929*7
2	No manure	2,387	630	1	1,116	15	1,277-4	2,264-7
3	Hemp	2,415	838	15	1.402	4	1.679-2	2,310-3
3	No manure	2,496	520	6	823	8	J,009*0	1,596-8
4	Hemp	3,654	915	1	1,957	0	1,212 0	2,592-1
4	No manure	3,375	565	6	1,204	0	810 7	1,726 6
5	Hemp	2,581	943	4	1,854	12	1,766-8	8,478-1
5	No manure ...	2,073	514	7	788	0	1,198*2	1,835*3
A.	Hemp and gypsum ...	400	153	10	310	5	1,858 8	3,754 8
B.	Hemp	400	113	8	183	7	1,373 3	2 219-6
C.	No manure ...	400	88	0	145	13	1,064 8	1,764-3
D.	Brick-kiln refuse	400	124	15	217	11	1,511-7	2,634-0
E.	Ashes of weeds	400	112	11	200	14	1,363-5	2,430 6
6	Fresh indigo refuse and lime	1,661	554	4	1,019	0	1,615 0	2,969*2
6	Last year's indigo refuse and lime	797	194	10	285	0	1,181 9	1,730-7
6	Last year's indigo refuse	785	182	11	301	5	1.126 3	1,857 7
6	No manure ...	1,532	240	5	308	8	759-2	974-6

Green-soiling with hemp* appears to be so cheap and so effective that there mast be some good reason for its not being more systematically adopted. It is very commonly practised in some Parts of Oudh, particularly near the city of Lucknow, but the cultivators tell me that they only P^otise it occasionally when the land is out of heart and when they cannot afford to purchase Poudrette. It is only used by them for cereal crops and the objection against perennial use of it is Qot quite clear. Possibly the land after a time lapses into a condition analogous to that of clover ^ckness, and it is worth while putting this to the proof.

The cost is very trifling and is no more than the cost of seed, of sowing it broadcast and of Pulling the plants and laying them in furrow, the ploughiug would come in any case. The Oudh cultivator is still more economical in levelling the plants with a heavy log dragged across the fields by bullocks and then ploughing in the levelled plants. Per acre the cost is -

	Rs.	a.	p.
Seed 30 seers at Be. 1-4-0 per maund ...	0	15	0
Sowing ...	0	1	0
Cutting and laying in furrow ...	1	8	0
Total ...	2	8	0

In the case of indigo refuse the cost is necessarily regulated by the distance of the vats from the fields, and the material is bulky.

Natives have, I believe, a prejudice against using the refuse during the season immediately following indigo manufacture, on the score of its being too heating, and only use it in the following J©ar. Their idea of heating is quite correct, for left in heaps a strong fermentation is developed with great heat leading to great loss of ammonia, and the refuse (or *sit)* left contains nitrogen in Very insoluble form. In the indigo districts of Bengal I understand the prejudice against fresh has long disappeared from the European factories, and when carted out fresh and buried into arPows *sit* is considered a good dressing for three years or so. The addition of caustic lime with view to assisting decomposition forming soluble ammonia compounds, correcting the acidity of the organic acids and in freeing ammonia to be oxidised in the soil and to form nitrates for the use of a cereal crop, seems advisable, and is supported by the figures in the table given. There should of course have been a plot manured with fresh refuse without lime for a fair comparison, but unfortunately it was overlooked. That lime should have had little effect on old refuse was no more than was expected.

• The "hemp" referred to is *sanai* (crotalaria juncea).

The following table shows pecuniary results :—

Number of fields.	Manure and rate per acre.	Cost of manure per acre.	Value of produce per acre. Grain.	Straw.	Total.	Net increase over the unmanured.
		Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1	Hemp ...	2 8 0	52 10 0	17 13 8	70 7 8	4 14 5
1	No manure ...	...	50 2 11	12 14 4	63 1 3	...
2	Hemp and gypsum 160 lb ...	3 2 0	50 12 8	10 12 7	61 9 3	14 3 [illegible]
2	Hemp ...	2 8 0	48 6 1	11 14 6	60 4 7	13 8 7
2	No manure ...	...	35 0 9	9 3 3	44 4 0	...
3	Hemp ...	2 8 0	46 1 2	11 6 9	57 7 11	20 13 S
3	No manure ...	...	27 10 11	6 7 9	34 2 8	...
4	Hemp ...	2 8 0	33 4 1	10 8 10	43 12 11	12 0 3
4	No manure ...	...	22 4 5	7 0 3	29 4 8	...
5	Hemp ...	2 8 0	48 8 4	14 2 2	62 10 6	19 13 4
5	No manure ...	...	32 13 10	7 7 4	40 5 2	...
A	Hemp and gypsum 240 lb ...	3 8 0	51 0 3	11 3 3	62 3 6	22 5 4
B	Hemp ...	2 8 0	37 10 9	9 0 4	46 11 1	7 12 11
C	No manure ...	...	29 3 6	7 2 8	36 6 2	...
6	Fresh indigo refuse* 120 maunds and lime 6 maunds.	6 0 0	44 5 4	12 1 1	56 6 5	25 9 10
6	Last year's refuse and lime 6 maunds ...	7 3 3	32 6 1	7 0 6	39 6 7	7 6 9
6	Last year's refuse ...	6 0 0	30 14 4	7 8 9	38 7 1	7 10 6
6	No manure ...	...	20 13 3	3 15 4	24 12 7	...

3. *Deep and shallow ploughing.*—A new field was selected this season and was divided into four sections by wide paths. The sections were treated as follows : —

First—Ploughed to a depth of nine inches, once in the rains and onoe at time of sowing.

Second—Ploughed to a depth of five inches, once in the rains and once at the time of sowing-

Third and fourth— Ploughed with the ordinary native plough, twice in the rains and twice at the time of sowing.

Last year plots I. and II. were ploughed to the depth of five inches, but plots III. and IV. were ploughed in the usual manner with the native plough.

Wheat was sown broadcast in all the plots.

The results are shown in the following table :—

No. of plot.	Area in square yards.	Actual outturn. Grain.	Straw.	Outturn per acre. Grain.	Straw.
I. ...	373	79 14	131	1,036-4	1,699
II. ...	293	46 15	73	775-3	1,206
III. ...	373	45 6	71	588*7	921
IV. ...	355	42 14	69	584*5	940

The plots were admittedly smaller than is desirable, but it is difficult to find space on the farm which has not been cultivated with an improved plough. In explanation of the generally low yield, it may be explained that the field had been heavily cropped for the past two years, and that no manure was used. Deep ploughing it may be remarked has never been advocated *sA* the farm as beneficial regardless of the nature of the sub-soil, but only when a depth of good soil warrants its application.

4. *Irrigation.*—Six plots each i-tji of an acre are set out along the canal bank and arranged with a view to the value of more waterings than one being tested. The storm in January interfered too much to render the results of great value; the outturn was in all cases necessarily very low as no manure was used, and the ground had been purposely exhausted for three years previously by double cropping without manure. The diminished outturn is indeed instructive as to what can be done in the way of robbing land of its fertility.

		Rs. a. p.
* Cost per 100 maunds of fresh refuse	... ...	4 0 0
Ditto old ditto	... ...	5 0 0

No. of Field.	No. of waterings.	Outturn per acre.		Increase per acre on each watering over the unwatered plot.		
		Grain.	Straw.	Grain.	Straw.	
		lb. oz.	lb.	lb. oz.	lb.	
I. ...	Nil ...	330 0	585	...		
II. ...	One ...	412 8	666	82 8	81	
III. ...	Two ...	481 8	801	151 8	216	
IV. ...	Three ...	651 8	1,050	321 8	465	
V. and vi. ...	Four ...	698 4	1,312	368 4	727	

The result, so far as it goes, is to show a much greater proportionate increase in the third Catering than in the rest, but still an increase on each. Whether the increase on waterings over tnree covers the cost, will always depend on the extent to which the crop has been manured. Whether manured or not, the cost of irrigation would be the same, and with fields so depleted °f fertility as these, all that can be done is to demonstrate the ratio of increase. Cost cannot be fairly brought into comparison.

Another series tried was well *versus* canal irrigation.

Three plots of 1/12 of an acre eaoh and lying in a row were taken. The two outer plots are each close to tanks of equal capacity, one of which can be filled from the canal and the other from a well. The centre plot was unirrigated and the outer plots were irrigated with measured quantities from their respective reservoirs.

The yield from the unirrigated plot was practically nil. The results from the other plots may be gathered from the following table :—

System of irrigation.	Outturn per acre.		Value of produce per acre.		
	Grain.	Straw.	Grain.	Straw.	Total.
	lb. oz.	lb.	Rs. a. p.	Rs. a. p.	Rs. a. p.
well	1,380 12	2,118	37 14 2	8 9 9	46 7 11
canal	1,227 0	2,293	33 10 8	9 5 5	43 0 1

Here the well irrigation shows to small advantage over the canal as regards fertility, but when the question of cost is imported into the comparison, canal irrigation has the best of it. On the farm the calculation is—

For lift-irrigation from the canal (one lift) including labour, three waterings, canal dues, cost of baskets, &c, per acre=5-9-0.

For well-irrigation from a depth of 30 feet and giving three waterings, per acre= 9-3-0.

And to this latter calculation must be added some unknown quantity, as interest on capital sunk in well and on bullocks, a charge which is included in canal dues.

5. *Thin sowing.*—A field of fair size was divided into four parts—

(1) was sown in the ordinary way in every furrow,

(2) was sown in every second farrow,

(3) was sown in every third furrow,

(4) the seed was dibbled in by hand a foot apart each way.

The treatment of the field during the past four years and during the present year was as under—

Previous treatment.			Treatment during the season under report.					
Year.	Manure.	Crop.	No. of plot.	Manure.	Amount of seed per acre.	Ploughing.	Irrigation.	Weeding.
					lb			
...	*Nil.*	Sorghum ...	1	Green-Boiled with hemp.	103	Three ...	Two ...	One.
1879-80 ...	Guano.	Wheat ...	2	Ditto ...	41	Ditto ...	Ditto ...	Ditto.
SSS ...	*Nil.*	Ditto ...	3	Ditto ...	21	Ditto ...	Ditto ...	Ditto.
...	*Nil.*	Flax ...	4	Ditto ...	18	Ditto ...	Ditto ...	Ditto.

The following table shows the area and outturn of each plot—

Number of plot.	Area in square yards.	Actual outturn.		Outturn per acre		Decrease.	
		Grain.	Straw*	Grain	Straw.	Grain.	Straw.
		lb. oz.	lb	lb.	lb.	lb.	lb.
1 Every furrow	1,144	377 2	713 0	1,595-5	3,016-5	...	...
2 Every 2nd do.	1,122	293 15	58 [illegible]	1267 9	2,506 2	327-6	[illegible]
3 Kvery 3rd do.	1,156	323 12	612 0	1,355-4	2,562 3	240 1	454-2
4 Dibbled in by hand	1,173	214 5	366 0	884-2	1,510 1	711-3	1,506-4

These experiments, conductedon a larger scale than the similar series of last year, give rather different results. From close personal observation of the plots the only- conclusion I can draw is, that for improving seed selected grain should be sown, dibbled in on well-manured plots of known even fertility throughout, and the crop reserved for sowing in the ordinary way in the following year, and that sowing in the ordinary way has an advantage in the suppression of weeds, which is very important, seeing that the introduction of the seeds of these weeds, some of which are no doubt bitter, might very materially damage the character of a consignment for milling purposes. I noticed in our thinly-sown crops this year an abundant growth of a diminutive bind-weed which only appeared when the stalks were high and strong enough to afford it support, and it was then impossible to weed it out.

6. *Neio varieties of seed—Oats.*— Cape oats and three varieties of English oats, all from acclimatised seed, were sown on parallel plots marked out on a field which had been green-soiled with hemp, and were irrigated three times. The English varieties were so late in ripening that it was hopeless to expect much of a crop. The greater part of the crop was accordingly cut while still green and ensilaged.

The Cape oats, of which we were able to make so favourable a report last year, did still better this year, and the whole of the seed of this and of other plots has been distributed without our being able to satisfy all the indents received. The produce on the experimental plot measuring 1,386 square yards was equivalent to 2,026 ft of grain and 3,303 ft of straw per acre.

Barley.—A field green-soiled with hemp was sown with parallel plots of country barley three English varieties (acclimatised seed) and Kotgarh naked or *rasuli* barley.

The area and outturn of the several plots is shown below :—

Variety.	Area in square yards.	Actual outturn.		Outturn per acre.	
		Grain.	Straw.	Grain.	Straw.
	lb.	lb. oz.	lb. oz.	lb.	lb.
Golden *) English	377	97 4	209 0	1.248	2,683
Beardless > English	406	74 1	237 0	883	2,825
Peerless) English	394	90 9	227 0	1,112	2,788
Rasuli	286	66 4	145 8	],121	2,462
Country	829	345 10	417 8	2,018	2,437

The country barley outdid its competitors, but it may be that the acclimatised English varieties, which did much better this year than last, may improve as time goes on.

As regards the *tasuli* barley, which has long been grown in Oudh as a curiosity, it so plosely resembles wheat, that our farm sample passed inspection with skilled valuers in the Cawnporo market as true wheat. This supplies the strongest argument against promotion of its cultivation, as it might, if it could be grown so profitably as has been lately asserted, be used for adulteration to the detriment of the Indian wheat trade.

What.—In afield green-soiled with hemp the ordinary farm seed (Muzaffarnagar white wheat) was tried against two English varieties (acclimatised). One of these latter was so hopelessly backward, that it was deemed best to consign it to the silo and the other was a case of mucli straw and little grain.

The following table gives results—

Variety.	Area in square yards.	Actual outturn.		Outturn per acre.	
		Grain.	Straw.	Grain.	Straw.
		ft. oz.	'ft.	ft.	ft.
Jough ch iff (English)	173	16 14	86	472	2,405
* arm wheat	328	110 0	148	1,623	2,i 83

Gram.—The three varieties tried last year, white, black, and red or ordinary country gram, were again tried this year, with the results tabulated below. The field had received no manure for two seasons but had lain fallow during the past kharif. The plants were somewhat touched ty frost, and though gram is not ordinarily irrigated, it was found advisable to give the fields two "Waterings :—

Variety.	Area in square yards.	Actual outturn.				OxUturn t>er acre.	
		Grain.		Straw.		Grain.	Straw,
		Ib.	oz.	ft	oz.	ft.	Ib.
^hite	233	31	12	33	8	6595	695 S
Bl*ck	813	82	12	86	8	492*6	514-9
... ...	618	123	0	133	0	963 3	1080-7

The grain in all three varieties was very fine, but the red variety would appear to be that best suited to the Dn&b.

Linseed.—Two sets of experiments were carried out—(1) for fibre as a paper-making material, (2) to test the oil-yielding properties of two varieties.

Land was selected which had lain fallow daring the kharif and had been unmanured for two years. Contiguous plots were sown (for fibre) thickly with Riga (acclimatised) and country linseed Respectively. The Riga seed germinated very unevenly, and although on an average the Kiga crop stood 24 inches against 15 inches in the country variety, the stems of the former were less bulky *&d the yield in consequence much lighter.

As soon as the crops commenced to flower, strips were cut from each plot and the produce was sent to the Lucknow paper mills for trial. Similar strips were cut at later stages and despatched, and finally from the last strips the stems were sent after the ripe seed had been extracted.

Of course had the stems been steeped and scutched at the farm and the flax alone been sent, it would have been easy enough to make paper from it; but the object in view was to test a statement that has been widely published, to the effect that the paper maker will take the stems without previous preparation, and forthwith reduce them to his purposes.

So far this has failed in proof, the insolubility of the lignose or " boon" proving a not ^expected difficulty.

(2) The varieties tested for oil were the ordinary blue-flowered and brown-seeded linseed of the Du&b and a variety of white linseed from Jalaun, the flower of which is also white. The area and outturn of the plots sown is shown below:—

Variety.	Area in square yards.	Outturn of seed.		
		Actual.		Per acre.
		Ib.	oz.	Ib.
5K*	1,211	79	14	319
*	1,858	129	0	336

Frost struck both plots when in flower, thus both lessening the yield considerably and rendering a comparison of yield as to seed impracticable.

Eight pounds were taken of each and were put into a native oil press with the usual proportion of water and with the following result :—

Number of trial.	Variety.	Weight of seed.	Weight of water added.	Weight of oil.	Weight of oil-cake.
		ft.	lb.	It).	lb.
1	White	8	1*	2-75	4-5
2	Ditto	8	1*	2-87	4-19
3	Farm red ...	8	1*	2-5	5 19
4	Red purchased in bazaar ...	8	H	2 37	5-37

It was not only in quantity that the oil from the white variety excelled, but in quality also, being much brighter and of finer colour. In the bazaar the "white" oil was valued as 15 per cent, better than the " red ;" a better test of course would be extraction with ether, but I have not yet had leisure for carrying it out.

7. *Nankin Cotton.—As* noted in the kharff report, a further picking of 41*2 ft. was obtained in April and May, giving a total of 144 lb. clean cotton to the acre. The plants have been ratooned and seem very vigorous. A larger extent of ground has been prepared against next year.

8. In the rabi report for last year it was noted how white ants had spoilt some of the experiments by attacking the farmyard manure. White ants on unoccupied ground seem to perform a service for agriculture similar to that performed by the earthworm in England. At the same time they are often a pest, especially to sugarcane growers, and have put a stop to sugarcane growing in some parganas. I may mention therefore a remedy which Mr. Ridley of the Lucknow gardens has put to test. Kerosine oil will not of itself mix with water, but if first shaken up with milk it will amalgamate with that, and can be then diluted with water to any desired extent, a little of it going a long way and proving a very effective insecticide. Mr. Ridley found a mixture of two parts of oil to one of sour milk " churned" together to mix completely. Diluted to *the* extent of one wineglass to four gallons of water, it was in no wise injurious to plants or grass.

9. *Ensilage*—Tn the report on the kharif harvest, I gave details of the attempt that had been made to gain some experience on the subject applicable to India. The farm silos were packed in September, following some rather ancient directions taken from the " American Agriculturist," which were all that I dould, on taking charge, find available. On the 18th October a letter appeared in the *Times* newspaper from Professor Thorold Rogers on the advantages, of ensilage, and from that period may be said to date the great interest taken in the subject in England. The first hand-book published in England was one by Mr. Rogers in December last, which was followed in February and March by pamphlets issued by Mr. T. Christy, and by the *H\eld* office respectively. These pamphlets have added a good deal to what was previously known on the subject, but still leave points for settlement as regards India, which can only be set at rest by practical experiments. It may be again mentioned that the farm silos were damaged by very heavy rain in January, under circumstances which it was impossible to foresee or to guard against, save by an expenditure which would, with all previous experience of the force of our Duab winter rains, have been unwarrantable. After removing that portion which the rain had damaged, the remainder of the fodder in one of the silos was again covered over until the 2nd May. On reopening the pit, it was found that the fodder was not so good as when seen in January, having somewhat advanced in fermentation. Still it was readily and almost greedily eaten by the farm cattle. Noticeable differences were that the odour had changed from that of vinous fermentation to that of spenttan ; the fodder had darkened in colour, and in the plac e of being quite dry was, towards the bottom, reeking with sap liquor. The liquor was absorbed by a quantity of *bhusa* being thrown on it, and the cattle ate the latter just as readily as they had eaten the fodder. In March a quantity of green oats and corn was cut and ensilaged, but instead of being reduced by the chaff cutter to small pieces, an inch or so in length, the plan was tried (said to have been proved successful by some American experimentalists) of putting in the grass whole, and of heavily weighting the mass by baskets of stone and earth on a platform of planks and using *no* airtight covering. This silo was also opened in May, after lying for two months ; but although the cattle ate the fodder, it was not, in appearance and odour, suggestive of success. True, I have subsequently seen it asserted that no silo should be opened until three months have elapsed, but

I doubt whether fodder can be ensilaged whole with success unless very green and soft, and think that it should be cut small whenever practicable.

A small quantity of lucerne (6£ maunds) was chopped, mide airtight with a covering of earth, and weighted as well, for two moaths. On uncovering it the olour of ammonia was quite overpowering, but soon passed off. In Mr. Christy's pamphlet is mentioued the fact that a sample of ensilaged clover from France was pronounced at an English Custom House to be fine American tobacco, which exactly describes the appearance of this lucerne. Only one animal could be educed to eat it, and he a Cabul donkey.

For the benefit of any who may purpose experimenting this season, ani who may not have seen the pamphlets already alluded to, I may note a few points.

Salt is not now considered necessary.

Cut straw has been mixed with the fodder to absorb moisture, but whether this is an advantage or not is still undetermined.

In opening a large silo the air near the opening should be tested in the usual way, with a light, for carbonic acid.

Packing about two feet in depth daily is considered better than a rapid filling. The importance of compacting the fodder is strongly enforced.

One experimenter mentions " rubber blankets, tarpanliaes, canvas or coarse cloth painted with boiled oil" as excellent for excluding air, while another uses a covering of six inches of straw before laying on weights on a plank platform.

Opinions as to the weight sufficient vary from 100 ft to 300 ft per square foot.

At the farm where *bhusa* is plentiful, it is proposed this year to sprinkle it plentifully as packing proceeds, and to cover the whole with bhusa a foot deep or so after weighing the fodder well until all air has been pressed out. Bhusa forms a good airtight covering and will at the same time all come in with the ensilage as fodder.

A chaffoutter appears to be a necessity, and hitherto such implements have been rather expensive; but a cheap form has recently been introduced in England, of which a trial will be made.

10. *Agricultural Implements.*—Further experience with the winnowers has determined me in removing the riddle frame and its belongings from the machine, and in concentrating the whole power on the blast. But without cogs 1 feel some doubt as to being able to multiply power in a way that shall rival in lasting effect that of an English winnower. When the wind fails in April and May it is singular how strong the desire for a winnower is; but with the rising gale the cultivator thinks ruefully of his money and votes the winnower an expensive toy.

The new plugs adopted for the pumps having in practice revealed defects, have been further modified and the following results have after continuous trials been obtained :—

Height of lift.	Description of lift.	Labour required.	Average quantity of water lifted per hour.	Useful work performed per minute in foot lbs.	Efficiency of the implement assuming the standard work of a man=2,700* ft. lbs. and of a bullock a 12,000 ft. fbs.
Feet.			Cubic feet.		
5	Chain pump*	4 men	1,600	8,320	•77
10	owing basket	4 men	464 7	2,416	-22
15	Chain pump	4 men	535	5,564	•51
	Ditto	i men — ...	315	4,914	-45
20	Dhenkli	1 man	62	967	•36
	Chain pump	4 men	272	5,657	•52
25	Single mote and inclined bullock.run	2 bullocks and 2 men ...	2157	4,486	•15
	Chain pump	4 men	197	5,122	•47
50	Single mote and inclined bullock-run*	2 bullocks and 2 men ...	219 9	5,717	•19
	t/hain pump	4 men	125	3,900	•36
	Single mote and inclined bullock-run	2 bullocks and 2 men ...	192 3	6,000	•20

* Taken from Raukine's treatise on steam engine. The labour on this lift was not so continuous as that on the other lifts owing to the rapidity with which the tank was filled. The figures given therefore are probably too high, and further trials will be made on a different system of measuring.

Ploughs.—A valid objection to the improved ploughs which have up to date been introduced in these provinces has been their inability to supersede the ordinary native plough for sowing purposes. Ordinary cultivators cannot afford at present, prices to purchase an improved plough and maintain it in addition to the native one necessary for sowing purposes.

Following up a suggestion from the Commissioner of Agriçulture for the Panjab, a new form of plough has lately been devised in the farm workshop which promises well.

Taking the form of plough most commonly used all over the provinces in which the sole is moveabie, and is for use fixed in by a wedge a second sole is supplied which can be attached at will, and can be made up for two rupees. On this extra sole is a fixed iron breast, and by its use a clean furrough of five to six inches in depth is obtained, and the soil completely inverted. Several of the new pattern have been made up, and will be distributed for trial during the coming kharif season.

Hand threshing machine.—One was forwarded during the half-year from Messrs. Mayfarth and Company, Frankfort. In principle of action it resembles our large American thresher, and has like it the disadvantage in the eyes of the native of rejecting about 60 per cent, of the straw whole instead of reducing it to " bhusa."

The cost of the thresher in Germany was £ 6 and by the time it was set up at Cawnpore it had cost Rs. 128-9-0.

The following table gives the results of machine-threshing by hand and in the native fashion by treading out under cattle. In the case of the thresher the straw was reduced to bhusa by » hand-worked chaffontter, the cost of which was originally Rs. 71.

Manner of threshing.	Labour required.	*Average amount threshed ptr day in maunds of* 82115. Grain.	Straw	Cost of threshing per mauud of wheat.	Cost of cutting *W* chaff per maund of grain.
				Rs. a. p.	Ks. a. p.
Hand thresher	5 Men	19*1	30	0 0 6*3	0 0 72
By bullocks ... ,.. ...	3 Bullocks 1 Man 1 Woman	225	375	0 2 9-3	

With an area, then, of (say) 15 acres yielding 240 maunds, the work of threshing and of reducing the straw to chaff would take 12*5 days at a cost of Us. 16"89. To this must be added Es. 24 as interest on the capital sunk in the two machines, giving a total of Rs. 40*89. Using cattle, the work would take 107 days at a cost of Rs. 41*5. It is true that some of the bullocks must always be kept for ploughing or for work at the well, but it may be questioned whether in the place of treading out corn the bullocks might not be more economically employed in raising water for the irrigation of a crop of green forage against the hot weather.

Another advantage in favor of the hand-thresher is the saving effected in the winnowing. The grain requires very little winnowing after leaving the machine, and is free from the earthy and manurial contaminations which are now laid to the charge of Indian wheat. The thresher *is* very strongly made and is well adapted to rough work. It was shown at the Khairabad and Bahraich agricultural shows, exciting everywhere most lively interest. The chaffcutter is always useful on the farm for cutting up winter fodder, and is likely to be more in demand if ensilage comes more into vogue. As already mentioned a new and cheaper form of chaffcutter has beeo ordered for trial.

Possibly with the development of the wheat trade, the advantage of getting clean wheat quickly into the market will dawn on the bucolic mind.

Sugar evaporator.—This machine, the credit of ordering which from America is due *t°* Mr. Fuller, arrived too lato for trial with either sorgho or sugarcane at the farm, nor as a matter of fact could I have seen to it properly at tho time, being away on other duties*

At my request Mr. E. Macalister of Messrs. Carew and Co., Ld., very kindly undertook trials, the results of which are shown below:

Description of apparatus.	Juice boiled in 12 hours.		Amount of rab.	Labour required.	Fuel.	Cost.			Cost per maund of rab.
	Gallons.	Maunds and seers.				Labour.	Fuel.	Total.	
			M. a. c.		M. c.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Evaporator	177*	23 11	4 1 0	2 men and 1 boy.	11 4	0 7 0	2 12 6	3 3 6	[illegible]
Karahi (one flat shallow pan)...	55	7 9	1 11 4	1 man and 1 boy.	5 19	0 4 0	1 6 0	1 10 0	[illegible]
Bel C5 pairs	83	10 36	1 39 0	1 man and 1 boy.	7 32	0 4 0	1 15 3	2 3 3	[illegible]

Mr. Macalister adds the following notes :—

" The rab produced from Cook's evaporator was all of best quality, light in colour, grainy, and with a minimum of molasses. The ease with which the natives worked, unassisted, and the uniform good quality of the outturn, are much in its favor."

From Rosa the machine was sent to the Gola Gokur Nath fair held in the Kheri district, on the 9th April and following days, in the heart of a good sugar-producing tract. Most of the country cane had been cut, and what was left was so acid and dry as to be no longer workable for sugar with the ordinary native apparatus.

In the evaporator, however, which was worked continuously through the fair as fast as six kolhu mills working simultaneously could supply it with juice, rab of first quality was turned out to the manifest astonishment of the zamindars and cultivators, who constantly crowded round to watch, and who now and again roundly accused our men of using masalah. Pandit Ajudhia Pershad offered to take four for his own estate alone, if they could be produced at Rs. 100 each.

From Gola it was sent to the Fyzabad agricultural show on April 17th, which I was unable to attend. Major Barrow, Officiating Deputy Commissioner, writes as follows :—

"It worked very well indeed, and was highly approved. The rab that was made was eagerly bought up at ten seers per rupee, whereas other rab was selling at twelve and fourteen seers. The cleanness of the rab attracted most attention; some critics said the rab was "pkika" (less sweet than ordinary rab (possibly owing to the inferior cane left at so late a period of the season). I heard no other adverse criticism. The machine itself was much admired, and I could have sold four had they been available."

The evaporator is made of sheet metal, galvanized iron or copper, ours being of galvanized iron. At intervals of about 6 inches ledges run across the bottom of the pan (which is oblong and ...v and the alternate ends of the ledges being open, there is a continuous channel from one end of the pan to the other. These ledges are in the case of Cook's pan (the one imported) hollow and open at the bottom, which gives much more heating surface. The sides of the pan extend beyond the area of the furnace, so as to give a cooling surface for the collection of scum.

For portability it is constructed with a light iron furnace on rockers to admit of the pan being placed at any desired slope.

The cane juice is allowed to trickle in at the upper pan, and winding down round the ledges is clarified, defecated and evaporated in its course, arriving at the outlet in the state of consistency ... Wilfully managed the operation is almost continuous. The method of working it is ... learned, and where economy is an object, a clay furnace, which answers well, can ... rigged out to take the place of the iron portable furnace.

The cost of this evaporator amounted to Rs. 330-15-0, a similar apparatus made up in this country should not cost more than ... 100; or of the pan alone Rs. 60 or so. Measures are being taken for manufacture.

11. During the past year samples of farm produce and of improved implements were sent to the agricultural shows at Bijnor, Sah&ranpur, Aligarh, JBulandshahr, Meerut, Gola Gokurn, Khairabad, Fyzabad and Bahraich, and in each case medals, certificates, or prizes, were obtained in fair competition.

12. The correspondence of the year has been somewhat varied, extending to stations in every province of India as well as to some in native States.

13. Luchman Parshad Barmah has held the post of Superintendent and has zealously carried out the work with great intelligence and conscientiousness.

D. G. PITCHER, MAJOR,

Asst. Director for Oudh, in charge Exp. Farm, Cawnpore*

OEDERS OF GOVERNMENT.

No. 2209 OP 1883.

FROM

THE OFFG. SECRETARY TO GOVERNMENT,

N.-W. PROVINCES AND OODH,

To

THE OFFG. DIR. OF AGRICULTURE AND COMMERCE,

N.-W. PROVINCES AND OUDH.

Bated Camp Lucknow, 19th October, 1883.

Revenue Department.

SIR,

I AM directed to acknowledge the receipt of your letter No. 1274A., dated the 14th September, 1883, with which you submit your report on the operations of the Cawnpore Experimental Farm during the rabi season of 1882-83.

2. The management of the farm appears to have been satisfactory, and the results of the operations of the half-year are clearly set forth in the report. I am to suggest that special attention be given to the best methods of cultivating wheat, and the best varieties to be sown, as the development of the Indian wheat trade with Europe has become a matter of the greatest importance to the country.

I have the honor to be,

SIR,

Your most obedient servant,

J. R. REID,

Offg. Secretary to Government,
N.-W. Provinces and Oudh.

EEPOET

ON THE

CAWNPORE EXPERIMENTAL FARM,

FOR THE KHARIP SEASON, 1883.

ALLAHABAD:

NORTH-WESTERN PROVIDES AKD OUDH GOVKBMMENT PRESS.

* 18 8 4.

No. 540 OF 1884.

FROM

THE DIRECTOR, DEPT. OF AGRI. AND COMMERCE,
NORTH-WESTERN PROVINCES AND OUDH,

To

THE SECRETARY TO GOVERNMENT,
NORTH-WESTERN PROVINCES AND OUDH,
GENERAL AND REVENUE DEPARTMENT,
NAINI TAL.

Dated Cawnporc, the 844 *April,* 1884.

SIR,

I have *. honor to »taii M.iorrUcl,.r', report ,,,, the H-* hr-» - *e Cawnpore Farm for 1884. It has been delayed owing to the unusual amount of work which was pnt upon that officer by the Calcutta Exhibition.

1 Th, ™» ... both «* -* BJ***4. •* «- • — » °» ttara consequence fess than that of last year.

3. Being convinced of the futility of applying non-nitrogenoas enures by themselves to the soil of the farm, Major Pitcher has mad, a change m the ^ ^ ^ the experi- cental plots, adding saltpetre to the plot that was formerly manured ^phate only, *»d. b J H « B to those which used to be manured with bone-dust and gypsum. The comparison * now be with nitrogenous . « ™ * ^ the same manures reinforced with gypsum, bone-dust, or superphosphate. Tnongh it is muoli too «riyto torn a definite opinion, the follow- ing table would seem to indicate lhat as yet there » no reason to b.li^e th at the addition ^Kenous manures makes any addition to the we** of the gnun, or a' any rate any a dditioa comparable wilh the increased cost. For each year the mean yveld in gram of bo* the dap. * w given:-

	1884.	1883.
Nitrogenous.		
Cow-dung alone	2,095	1,316
Saltpetre alone	1,734	940
Nitrogenous m combination.		
Saltpetre and bone-dust	1,626	1,519
Saltpetre and bone tuper phosphate		1,216
Cow-dung and calcic sulphate	1,731	1,312
Cow-dung aud bone dust	2,140	1,549
Sheep-dung and bone-dust	...	1,353
Sheep-duog and calcic sulphate	...	1,413

4. The very low yield obtained this year from saltpetre alon e is nofc explained, and as a ^ein8tanceiti8notofmuchvalae• ^ ^ ^ ^ ^ave a larger outturn alone than , 4 combined with S ^ Combined Witb bone dU9t> a la r h a ^e n obtained from any manure whatever in ^cic sulphate, and a much larger outturn than has been ooiaiue the harvest now reported.

5. ; ,, ploughing for cotton conHrm those for last year, and show The results from deep and shaUow^ might have been ejected, that the advantage , though not perhaps to the extej^ that ^ ^ ^ ^ & ^ rf ^ of a moderately deep ploughing is even greate»j« a ,, H dr oar like ^ proportions of the yield —»7 ramtall. Taking 100 as the yield from two snaiiow p ounm ,, , i to that obtained by one ploughing at different depths have been as follows:-

	Year.	Shallow.	6 inch.	9 inch.
Farm	1882	100	114·8	107·6
	1883	100	118·1	118·9
Common cultivator	1883	100	110·8	112·8

*6. It was found last year that sowing cotton in drills gave an increase of 39 per cent, in cotton and 30 per cent in seed over the ordinary method of sowing broadcast. This year the further experiment has been tried of sowing on ridges 3 feet apart. The following are the results, the produce being given in pounds :—

Cotton.		Ridges.	Line.	Broadcast*
Nankin	Cotton	120	100	56
	Seed ...	347	301	157
New Orleans	Cotton	94	87	*86*
	Seed „	213	209	207
Country	Cotton	66	54	81
	Seed ...	167	145	227

It must be admitted that no safe conclusion can be drawn from these figures, and thufct the teachings of the plots on which ratooned and new-sown crops have been compared are almost equally indecisive. The largest yield, which was at the rate of 188--3ft. of cleaned cotton to the acre, was obtained from selected acclimatized New Orleans seed sown on ridges.

7. The manufacture of sorghum sugar was attempted for the first time and without success in 1881. In 1882 a small quantity of *gur* was made, and at the last harvest very considerable quantities both of *gur* and *rab* were produced without difficulty. It has now, in fact, been established beyond a doubt that this crop can be grown for sugar with the prospect of a fair profit. It remains to be seen whether it is likely to compete with sugarcane proper in ordinary cultivation. Its advantages are very great, and though the net profit, as calculated in the farm books, does not equal that of sugar cultivation, it is probably as great as that of many other crops which like it do not require the labour, skill, and long use of the soil demanded by sugarcane. As it comes into the market at least a month earlier than sugarcane *gur,* it for that time commands a fancy price like what is paid for winter strawberries, and the first lOQft- sold by the farm realized at the rate of Rs. 6-10-8 per maund in the Oawnpore market. Altogether nearly 20 maunds of *gur* or *rab* were manufactured.

8. In the ensilage experiments the most important result, which agrees with some obtained by Major-General Sir Herbert Maopherson at Allahabad, was the success of pits without any interior coating whatever to protect the fodder from damp or white ants. The question of cost will be taken up in the report on the present *rabi;* but there appears to be no reason why, if plain earthen pits without any masonry lining will serve the purpose, this method of storing fodder should not come into universal use.

9. Some slight improvements have been made in the Kaisar plough, which has, as usual, been very successful at all the local agricultural shows, and further attention has been paid to the pumps, winnowers, and cotton-gins; but the most important introduction in the line of agricultural implements is a sugar evaporator imported from America. This appears to promise a very great saving, both in the original cost and in the expense of manufacturing *rab,* on the existing systepi of iron pans, and it is not unlikely to have as good a future as the Behea mills. Pandit Ajudhya Prasad of Indulpur speaks of it in the highest terms; and Mr. Nicholls, O.8., who worked one on the Awa estate, reports that it found much favour among his cultivators. It can be made up for less than Rs. ftO, and is therefore free from the objection of costliness which is fatal to most improved implements.

I have the honor to be,

SIR,

Your most obedient servant,

W. 0. BENETT,

director.

REPORT

ON THE

CAWNPORE EXPERIMENTAL FARM

FOB TEE KHARIF SEASON OF 1883.

THE monsoon commenced late, and the first shower of importance was that of July 6th, when 2'4* fell. From that date up to the 26th July the season seemed propitious. From the 26th July to the 17th August an unlucky break brought injury to the late-sown maize; the showers were still light up to the 20th, and had it not been that the canal distributaries were opened on the 15th August, the loss would have been serious.

The return given below shows the amount of rain and the number of days on which rain fell both at the farm and at the city. Comparison with the normal amount shows how singularly deficient the season proved :—

Month.	*Rainfall in inches.*		*dumber of days on which rain felL*	
	At the farm.	At the city	At the farm.	Aft the citj.
June	35	•60	2	2
July	812	9-80	12	11
August	2*82	4-10	6	4
September	2-12	2-70	7	*
October	...	•«	...	...
November	...	...	...	...
Total ...	1341	1,7 20	27	25
formal rainfall for the period ... «•• *•	26-50		IH	

The operations of the season comprised experiments on-

(1) Manures.

(2) Cotton—

(a) Deep and shallow ploughing.
(J) Broadcast *versus* sowing in drills and on ridges.
(c) Cropping the plants a second year.
(d) Exotic cottons.

(3) Sorghum and sorghum sugar. %

(4) Ensilage.

(1) Manures.—This year the duplicated series of plots was completed up to 10 in each series, and the plots which last year were mspeotively manured with bone-dust, bone superphosphate, and calcic sulphate alone, this year received in addition nitrogenous manures.

The manures applied and crops obtained on these plots for the previous 5 years are shown in the accompanying table :—

Number of plot.		1879-80. Manure.	1879-80. Crop.	1880-81. Manure.	1880-81. Crop.	1881-82. Manure.	1881-82. Crop.	1882-83. Manure.	1882-83. Crop.	1883-84. Manure.	1883-84. Crop.
I.	Standard ...	*Nil.*	Cotton	Dung ...	Maize & wheat.	Dung ...	Maize	Dung ...	Maize	Dung ...	Maize,
	Duplicate ...	Ditto	Ditto	Ditto ...	Ditto ...	Ditto ...	Ditto	Ditto ...	Wheat	Ditto ...	Ditto.
II.	Standard ...	Ditto	Ditto	Dung and bone dust.	Ditto...	Dung and bone dust.	Ditto	Dung and bone-dust.	Maize	*Dung* and bone-dust.	Ditto.
	Duplicate ...	Ditto	Ditto	Ditto ...	Ditto...	Ditto —	Ditto	Ditto .	Wheat	Ditto ..	Ditto.
III.	Standard ..	Ditto	Ditto	Dung and calcic sulphate.	Ditto ...	Dung and calcic sulphate.	Ditto	Dung and calcic sulphate.	Maize	Dung and calcic sulphate.	Ditto.
	Duplicate ...	Ditto	Ditto	Ditto ...	Ditto ...	Ditto ...	Ditto	Ditto	Wheat	Ditto ...	Ditto.
IV.	Standard ...	Ditto	Ditto	Ashes of dung.	Ditto ...	Ashes of dung	Ditto	Ashes of dung.	Maize	Ashes of dung.	Ditto,
	Duplicate ...	Ditto	Ditto	Ditto ...	Ditto ...	Ditto ...	Ditto	Ditto ...	Wheat	Ditto ...	Ditto.
V.	Standard ...	Ditto	Ditto	Poudrette ...	Ditto .	Poudrette ...	Ditto	Potassic nitrate.	Maize	Potassic nitrate.	Ditto.
	Duplicate ...	Ditto	Ditto	Ditto ...	Ditto ...	Ditto ...	Ditto	Ditto ...	Wheat	Ditto ...	Ditto.
VI.	Standard ...	Unknown	Unknown	No manure ...	Fallow...	No manure ...	Fallow	No manure,	Fallow	Potassic nitrate and bone-dust.	Ditto.
	Duplicate...	No manure	Cotton	Potassic nitrate and bone-dust	Maize & wheat.	Potassic nitrate and bone-dust.	Maize	Potassic nitrate and bone-dust.	Wheat	Ditto ...	Ditto.
VII.	Standard ...	Ditto	Ditto	Bone superphosphate.	Ditto .	Bone superphosphate.	Ditto	Bone superphosphate.	Maize	Potassic nitrate and boue superphosphate	Ditto.
	Duplicate...	Ditto	Ditto	Ditto ...	Ditto...	Ditto ...	Ditto	Ditto ...	Wheat	Ditto ...	Ditto.
VIII.	Standard ...	Ditto	Ditto	Bone-dust ...	Ditto ...	Bone-dust ...	Ditto	Bone-dust,	Maize	Sheepdung and bone-dust	Ditto.
	Duplicate ...	Ditto	Ditto	Ditto ...	Ditto ...	Ditto ...	Ditto	Ditto ...	Wheat	Ditto .	Ditto.
IX.	Standard ...	Ditto	Ditto	Calcic sulphate	Ditto...	Calcic sulphate	Ditto	Calcic sulphate.	Maize	Sheepdung and calcic sulphate.	Ditto.
	Duplicate ..	Ditto	Ditto	Ditto ...	Ditto...	Ditto ...	Ditto	Ditto ...	Wheat	Ditto	Ditto.
X.	Standard ...	Ditto	Ditto	No manure ...	Ditto ...	No manure ...	Ditto	No manure,	Maize	No manure	Ditto
	Duplicate ...	Ditto	Ditto	Ditto ...	Ditto ...	Ditto ...	Ditto	Ditto ...	Wheat	Ditto . .	Ditto.

During the season under report the treatment has been as follows:—

Ploughing—twice.

Weeding—twice.

Irrigation—twice.

Seed per acre—maize 15tb.

Manure—as in table.

The outturn is showa below, the figures for last year being also given :—

Manure and rate per acre.	Year.	OUITURCV PER AORR. Grain. Standard.	Grain. Duplicate.	Stalk and leaf. Standard.	Stalk and leaf. Duplicate.
		ft.	ft.	Mds.	Mds.
Cow dung, 180 mds.	1883 ...	1.462-5	1,170*0	42 9	313
	3882 ...	2,169-0	2.020-5	95 4	89'7
Ditto, 180 mds , bone-dust, 360 lb ...	1883 ...	1,7205	1,377*0	47 3	37 9
	1882 —	2.434-5	1,845*0	1029	87-6
Ditto, 180 mds., calcic sulphate, 240 ft. ...	1883 ...	1.644*0	979-0	45-5	32-2
	1882 ...	1,758 0	1,704-0	87 6	825
Ashes of 180 mds., cowdung	1S83 ...	1,073-25	712-5	38 6	28-4
	1S82 ...	1,452 0	922-5	87 3	71-4
Potnssic nitrate, 240 lb.	1883 ...	1,068 0	829-5	45 3	28 3
	1832 ...	2,190 0	1,278-0	1119	93 3
Ditto, 240 ft, bone-dust, 360 ft. ...	1883 ...	1,793*25	1,244-25	47-6	32*3
	1882 ...		1,626-0	[illegible]	87-6
Ditto, 240 ft., bone superphosphate, 240 ft.	1883 ...	1**385 25	1,047*75	45-4	C4 6
Superphosphate, 240 ft only	1882 ...	1.422-0	1.378-5	843	81 0
Sheepdung, 120 rods bone-dust, 360 ft.	1883 ...	1,79775	909-0	425	271
Bone-dust, 360 ft. only...	1882 ...	1,417-5	844*5	79-8	56 7
Sbeepdung, 120 imK, calcic sulphate, 240 ft....	1883 ...	1,485 0	1,341-0	35·3	34-4
Calcic sulphate, 240 ft. only	1882	1,056 0	912*0	58 5	75 0
No manure ... — ...	1883 ...	990-0	801-75	34-7	32-S
	1882 ...	1,002 0	9240	747	[illegible]

Attention may be directed to the increase given by bone-dust where combined With a nitrogenous manure.

Some naturally poor and artificially exhausted soil was divided off into a fresh series of plots, in two of which some refuse from the Oawnpore Woollen Mills was tried, with so far negative result, the material not having had time to decompose. The past and present treatment of the other plots is shown below, following which is given the outturn :—

Previous treatment.			*Treatment during* 1883.					
Year.	Manure.	Crop.	Number of plot.	Manure and rate per acre.	Ploughing.	Weeding.	Watering.	Seed and rate per acre.
1879-80 ...	Guano ...	Wheat ...	1	Brick-kiln refuse, 120 mds.				
1880-81 ...	Sheepdung ...	Ditto ...	2	Poudrette, 120 mds,		2	2	Maize 15 ft
1881-82 ...	No manure ...	Cotton ...	3	No manure ...				
1882-83 ...	Ditto ...	Wheat.						

Number of plot.	Manure.	*Outturn per acre.*	
		Grain.	Stalk.
		tt>.	Mds.
3	Brick-kiln refuse, 120 mds.	748*5	22-3
2	Poudrette, 120 mda.	874·5	31*9
3	No manure	546*0	20-1

(2) Cotton-—*(a) Deep and shallow ploughing*—The experiments of last year were repeats' this year on the same four plots.

In addition a new field giving a much larger area, and which had been tilled by the ordinary method for the past five years, was leased from a neighbouring cultivator and was divided into three parts. They were treated as under—

(1) Ploughed twice with a country plough.

(2) Ploughed onoe to five inches.

(3) Ditto to nine inches.

No manure was applied and country cotton seed was sown broadcast.

The outturn from all these plots is shown below, and the outturn of last year for comparison. Though the results of the five inches ploughing and nine inches *ploughing vary* somewhat, the net result is in favour of ploughing deeper than what the ordinary cultivator practises.

Number of Plot.	Detail of ploughing.	Area in square yards.	OUTTURN PER ACBB.				INCRRASB PER AC BE OVER COUNTRY PLOUGHING.			
			In 1883.		*In* 1882.		*In* 1833.		*In* 1882.	
			Cotton.	Seed.	Cotton.	Seed.	Cotton.	Seed.	Cotton.	Seed.
»• 4.			Ib.	Ib.	ib.	ft.	Ib.	ft.	Ib.	Ib.
**ot i.	Twice with country plough ...	300	110·9	249-0	95	202	...	...	...	
» II.	Once with Kaisar plough 5" deep ...	300	141-1	308 5	112	229	21·6*	49·4*	14-5*	24·0#
» III.	„ Watta* plough 9" deep ...	300	136*1	304-5	105	214	16*6*	45-4*	7-5»	9-a*
.. IV.	Twice with country plough ...	300	128·0	269·2	100	208	...	...	...	...
^•ic« *B.*										
*lot I.	Twice with country plough ...	1.820	93-4	198 7	...	...	...	...	...	...
» II.	Once with Kaisar plough 5" deep ...	1,775	104*9	232 4	...	...	11-5	33 7	...	...
» III.	„ Watte' plough 9" deep ...	1,790	114*7	238·4	...	...	21-3	39 7	...	

' Over the AYerage of the two plots ploughed with country plough.

(6) *Drill versus broadcast.*—Seven fields were divided off into plots which were sown with cotton—

(1) broadcast,
(2) in drills,
(3) on the top of ridges,
(4) on the slopes of ridges.

Observation in the previous year had shown that cotton plants were far stronger and healthier when growing on the interior slopes of the field boundaries, and this without reference to light or aspect: hence the establishment of the 4th method of sowing.

Nankin, New Orleans, and country cottons were sown, and the following table gives details:—

Number of field.	Manner of sowing.	Manure and rate per acre.	Ploughing.	Weeding.	Watering between July and November.	Seed and rate per acre.
1	On top of ridges 3' apart ... ... In lines %' apart ... ... Broadcast	Foudrette 200 mds.	2	2	2	Nankin cotton 3 Ib. Ditto 3 Ib. Ditto 12 Ib.
2	In lines 3' apart; the plants ridged when 6" high. In lines 3' apart; plants not ridged ...	Ditto ...	2	2	2	Ditto 3 ft. Ditto 3 Ib.
3	In lines 3' apart ... ... Broadcast	Ditto...	2	2	2	Ditto 3 Ib. Ditto 26 Ib.
4	In lines 3' apart ... ... Broadcast	Ditto ...	2	2	2	Ditto 3 Ib. Ditto 26 Ib.
5	On tops of ridges 3' apart ... ... On slopes of ridges 3' apart ... ... In lines 3' apart ... ... Broadcast	Ditto ...	2	2	2	New Orleans 3 ft. Ditto 3 Ib. Ditto 3 Ib. Ditto 12 Ib.
6	On tops of ridges 3' apart ... ... On slopes of ridges 3' apart ... ... In lines 3 feet apart ... ... Broadcast	Ditto...	2	2	2	Ditto 3 ft. Ditto 3 ft. Ditto 3 ft. Ditto 12 ft.
7	In lines 3' apart; subsequently ridged up ... In lines	Ditto ...	2	2	2	Ditto 3 ft. Ditto 3 ft.
8	On tops of ridges 3' apart ... ... On slopes of ridges 3' apart ... ... In lines 3' apart ... ... Broadcast	Ditto ...	2	2	2	Ditto 3 ft. Ditto 3 ft. Ditto 3 ft. Ditto 12 ft.
9	On tops of ridges 2' apart ... ... On slopes of ridges 2' apart ... ... In lines 2' apart ... ... Broadcast	No manure		2	2	Country cotton 5 ft. Ditto 5 m. Ditto 5 ft. Ditto 12 ft.

The cost of making ridges 3' apart =»Rs. 2-10* per acre, and of dibbling in seed 3' apart on the ridges 9f annas per acre.

		Rs.	a.	p.
* One pair of bullocks with ploughman @ 10 annas a day for 2 days ...	=	1	4	0
Three men @ 2 annas a day for 2 days	=	0	12	0
Four women @ 1 anna 3 pies per day for 2 days	=	0	10	0
Total ...	=	2	10	0
† Two men @ 2 annas per day	=	0	4	0
Four women @ 1 anna 3 pies per day	=	0	5	0
Total ...	=	0	9	0

In drills the cost is Re. 1-1-0 per acre for lining and sowing.

In sowing broadcast the cost is 10 annas per acre.

Taking the market value of each class of cotton as under—

	Per maund.
New Orleans	Rs. 20
Nankin	„ 16
Country	„ 12

The following table shows outturn and value of each method :—

No. of field.	Manner of sowing.	Area in square yards.	Actual outturn. Cotton. lb. oz.	Actual outturn. Seed. lb. oz.	Outturn per acre. Cotton. lb.	Outturn per acre. Seed. lb.	Value of produce per acre. Cotton. Rs. a. p.	Value of produce per acre. Seed. Rs. a. p.	Value of produce per acre. Total. Rs. a. p.	Increase in value by sowing in lines over broadcast. Rs. a. p.	Increase in value of produce by ridging. Over lines. Rs. a. p.	Increase in value of produce by ridging. Over broadcast. Rs. a. p.
	A.—Nankin cotton fields.											
1	On top of ridges 3' apart	791	15 8	45 0	94·8	275·3	18 7 [illegible]	4 3 1	22 10 10	...	4 1 11	9 11 3
	In lines 3' apart ...	882	14 2	41 2	77·5	225·7	15 1 11	3 7 0	18 8 11	[illegible]	...	...
	Broadcast ...	2,023	22 12	65 14	54·9	157·6	10 9 2	2 6 5	12 15 [illegible]	...	...	...
2	In lines 3' apart; subsequently ridged up ...	2,197	65 10	190 [illegible]	144·5	419·5	28 3 1	6 6 2	34 9 3	...	4 0 9	...
	In lines 3' apart ...	2,000	52 3	160 [illegible]	126·2	388·2	24 9 11	5 14 7	30 8 6	...	...	...
3	In lines 3' apart ...	1,737	49 10	147 14	138·2	412·0	26 15 5	6 4 5	33 3 10	17 2 7	...	...
	Broadcast ...	1,302	18 5	49 13	68·0	185·1	13 4 3	2 13 0	16 1 3	...	...	...
4	In lines 3' apart ...	1,362	16 14	50 5	59·9	178·8	11 10 11	2 11 3	14 6 2	[illegible] 8 5	...	...
	Broadcast ...	1,582	14 15	41 15	45·7	128·3	8 14 [illegible]	1 15 2	10 13 9	...	...	...
	B.—New Orleans cotton.											
5	On top of ridges 3' apart	457	12 2	30 14	128·4	326·9	31 5 0	[illegible] 15 7	30 4 7		Decrease. 0 11 10	4 1 7
	On slopes of ridges 3' apart	546	15 12	38 14	139·6	344·6	34 0 9	[illegible] 4 0	39 4 9	...		
	In lines 3' apart ...	369	10 [illegible]	26 14	136·0	352·5	33 2 8	[illegible] 5 10	33 8 6	4 13 5	...	...
	Broadcast ...	571	14 1	37 [illegible]	118·5	314·6	28 14 5	[illegible] 12 8	88 11 1	...	...	...
6	On tops of ridges 3' apart	851	16 14	37 10	95·9	213·8	23 [illegible]	[illegible] 4 1	26 10 3		Increase. 2 13 8	< 1 1
	On slopes of ridges 3' apart	376	6 12	15 0	86·8	193·0	21 [illegible]	[illegible] 15 0	24 1 8	...		
	In lines 3' apart ...	861	14 6	32 13	80·8	184·4	19 11 [illegible]	[illegible] 13 0	22 8 3	3 3 5	...	...
	Broadcast ...	480	6 14	15 10	69·3	157·5	16 14 [illegible]	[illegible] 6 5	19 4 10	...	...	...
7	In lines 3' apart; subsequently ridged up.	400	6 10	14 2	80·1	170·9	[illegible] 8 7	2 9 6	22 2 1	...	3 11 7	...
	In lines 3' apart ...	426	6 13	13 6	66·0	151·9	[illegible] 1 [illegible]	2 5 0	18 6 6	...	...	...
8	On tops of ridges 3' apart	592	[illegible]	16 15	63·8	138·4	15 8 11	2 1 9	17 10 8	...	Decrease. 0 13 1	Decrease. 1 6 5
	On slopes of ridges 3' apart	543	7 4	15 14	64·6	141·5	15 12 1	2 2 6	17 14 7			
	In lines 3' apart ...	537	7 7	16 9	67·0	149·2	16 5 5	2 4 3	18 9 8	Decrease. 0 9 4	...	...
	Broadcast ...	562	8 1	17 6	69·4	149·6	16 14 9	2 4 3	19 3 0	...	...	...
	C.—Country cotton.											
9	On tops of ridges 2' apart	750	10 13	27 4	69·7	175·8	10 3 1	2 10 4	12 13 5	...	Increase. 2 0 9	3 2 3
	On slopes of ridges 2' apart	750	9 10	24 10	62·1	158·9	9 1 4	2 6 7	11 7 11			
	In lines 2' apart ...	750	8 6	22 9	54·0	145·C	7 14 5	2 3 6	10 1 11	5 3 0	...	...
	Broadcast ...	750	12 9	35 3	81·0	227·0	11 13 7	3 7 4	15 4 11	...	...	...

Allowing in each case for the cost of preparation, it was found that where other conditions were equal the ridge system gave a decided gain over the simple drill, and both again gave better results than broadcast sowing. Where this was not the case the experiments were marred by difficulties in applying irrigation with impartiality— difficulties which would not have occurred had the rainfall been sufficient.

(c) *Cropping the plants for a second year.—One* field of New Orleans and two of Nankin cotton were left standing over from last year and a portion of each was ratooned.

The following table shows the results in juxtaposition with those for 1882. In quality the cotton was inferior to the produce of the same plots last year. The value of woollen refuse in the case of these plots seems very marked, but it is too early yet to say what its value is and what quantity should be used. It is different to the refuse of English Mills in not having been subjected to the ammoniacal bath which makes the latter so valuable :—

No. of field.	Particulars of sowing and ratooning.	Manure and rate per acre. 1882.	1883.	Grubbing.	Weeding.	Watering.	Area in square yards.	Outturn from October, to February, 1884. Actual. Cotton.	Seed.	Per acre. Cotton.	Seed.	[illegible]
								lbs. oz.	lbs oz.	lbs.	lbs.	lbs.
1	A.—Sown broadcast in June, 1882, with New Orleans cotton and ratooned in July, 1883.	Dung. 100 lb.	...	[illegible]	[illegible]	[illegible]	1,680	24 7	57 12	70-4	166-3	y H<
	B.—Sown broadcast in June, 1882, and not ratooned.	Ditto,	...	[illegible]	[illegible]	[illegible]	1,728	47 2	118 15	131*9	333-1	
[illegible]	A.-Sown broadcast with Nankin cotton in June, 1882, and ratooned in June, 1883.	No manure.	(a) Woollen refuse and lime, 10 mds. to the acre.	1	[illegible]	[illegible]	272	6 9	13 10	116-7	242*4	
			(b) No manure ...	[illegible]	[illegible]	[illegible]	507	9 10	18 4	91-8	174 2	113*
	B.—Sown broadcast with Nankin cotton in June, 1882, and not ratooned.	Ditto	(a) Woollen refuse and lime, 10 mds, to the acre.	[illegible]	[illegible]	[illegible]	280	7 3	15 1	124*2	260*3	
			(b) No manure ...	[illegible]	[illegible]	[illegible]	462	10 15	21 2	114-5	221-3	
[illegible]	A.— Sown broadcast with Nankin cotton in June, 1882, and ratooned in June, 1883.	Ditto,	(a) Woollen refuse and lime, 10 mds. to the acre.	[illegible]	[illegible]	[illegible]	283	6 1	11 10	103-6	198-8	
			(b) No manure ...	[illegible]	[illegible]	[illegible]	585	5 9	10 3	46·0	84-2	91*
	B.-Sown broadcast with Nankin cotton in June, 1882, and not ratooncd.	Ditto,	(a) Woollen refuse and lime, 10 mds, to the acre.	[illegible]	[illegible]	[illegible]	283	6 11	15 6	114-3	262·8	
			(b) No manure ...	[illegible]	[illegible]	[illegible]	644	7 4	14 12	54*4	110-8	

(d) Exotic cottons—Fresh New Orleans seed was imported from America and was sown in the fields which have already been noticed under the headings of drill and broadcast.

Two other fields were sown with acclimatised New Orleans seed which has been cultivated continuously on the farm for the past six years. One of these fields has already been noticed under drill and broadcast. The other was ridged and sown with carefully-selected seed.

The results appear in the following table :—

Number of field.	Manner of sowing.	Area in square yards.	Actual outturn. Cotton.	Seed.	Outturn per acre. Cotton.	Seed.
			lb. oz.	lb. oz.	lb.	lb.
1	Sown on tops of ridges 3' apart with selected acclimatised New Orleans cotton seed.	1,216	47 6	124 14	188-5	497·0
2	Sown on tops of ridges 3' apart with acclimatised seed.	457	12 2	30 14	128-4	326 9
	Sown on slopes of ridges 3' apart ...	546	15 12	38 14	139-6	344 6
	Sown in lines 3' apart ...	369	10 6	26 14	136·0	352-5
	Broadcast ...	574*	14 1	37 5	118·5	314*
3	Sown on tops of ridges 3' apart with fresh New Orleans seed.	851	16 14	37 10	95·9	213'9
	Sown on slopes of ridges 3' apart ...	376	6 12	15 0	86-8	193·0
	Sown in lines 3' apart ...	861	14 6	32 13	80*8	134-4
	Broadcast ...	480	6 14	15 10	69 3	157-5
4	Sown in lines 3' apart, subsequently ridged up, with fresh seed.	400	6.10	14 2	80-1	170*
	Sown in lines 3' apart, subsequently not ridged.	426	5 13	13 6	66·0	151*9
5	On tops of ridges 3' apart with fresh seed,	592	7 13	16 15	63-8	138j
	On slopes of ridges 3' apart ...	543	7 4	15 14	64 6	141 1
	In lines 3' apart ...	537	7 7	16 9	67·0	149 2
	Broadcast ...	562	* 1	17 ft	69 4	149 [illegible]

The high outturn of 18851b. of clean cotton on a field, the soil of which was distinctly inferior, indicates the commercial value of selected seed.

Nankin cotton. In addition to the fields already noticed 10 fields were sown with Nankin cotton. A large quantity of seed was received from Central India very late in the season and was sown wherever space could be found for it.

The yield varied from 144a5tb. of clean cotton on good soil accessible to irrigation to *5'lfo. on land when the conditions were most unfavourable.

(3) Sorghum.—A quantity of seed of the Minnesota amber cane was imported from America, with which four large fields were sown, while a fifth field was sown with farm acclimatised seed.

To portions of each of the last four fields cowdung manure was applied at the rate of 100 maunds per acre. Past and present treatment of these fields is shown below: —

Number of field.	*Previous treatment.*			*Treatment in* 1883.				
	Year.	Manure.	Crop,	Manure.	Ploughing.	Weeding.	Irrigation.	Seed and rate per acre.
1	1880-81	Dung	Sugarcane	Nil	2	1	1	Amber sorgho 12 lb.
	1881-82	*Ntl*	Lucerne					
	1882-83	*NU*	Tobacco					
2	1880-81	Guano	Sugarcane	Half manured with dung at the rate of 100 maunds to the acre.	2	1	1	Ditto.
	1881-82	Cowdung	Wheat and tobacco					
	1382-83	*Nil*	Juar in kharif and gram in rabl.					
3	1880-81	*Nil*	Fallow	Ditto	3	1	*Nil.*	Ditto.
	1881-82	*Nil*	Ditto					
	1882-83	*Nil*	Wheat					
4	1880-81	*Nil*	Fallow	Ditto	2	2	*Nil.*	Ditto.
	1881-82	*Nil*	Millets					
	1882.89	*Nil*	Barley					
5	1880 81	*Nil*	Pulses and til	Ditto	2	2	1	Red sorgho 10 it.
	1881.82	Dung	Cereals					
	1882-83	Hemp	Ditto					

Up to the break in the rains these crops were remarkably fiae; but the long brehk told heavily, specially in the crops grown on the manured sections-

Sugar manufacture commenced on the 15th October and lasted till the 10th November, The juice was carefully strained and fumigation with sulphur of vessels and mills was freely resorted to, to avoid *inversion* through fermentation.

GUT was made by the ordinary native method, and *tab* in an "evaporator."

The following table gives results and averages, the figures obtained at the farm in working up sugarcane juice being also given for the sake of comparison :—

	SORGHO.									Sugar-cane.
	Field 1.	Field 2.		Field 3.		Field 4-		Field 5.		
	Unmanured.	Unmanured.	Manured.	Unmanured.	Manured.	Unmanured.	Manured.	Unmanured.	Manured.	
Area in square yards ...	4,324	[2,155	2,414	1,726	1,735	1,215	1,720	1,545	400	1,717
Actual weight of cleaned cane 1b ...	5,550-5	2,914	2,438	1,905	1,755	934	1,337	1,992	433	11,158
Ditto dry and worm-affected canes, lb. ..	1,541 5	410-5	710-751	421	520	331-5	493	506	125	...
Ditto leaves and tops, excluding the weight of grain, lb.	2,605·5	1,255	1,160-25	762	615	585 5	610-f-	1,094	278	4,440
Total outturn of canes and leaf, lb. ...	9,697*5	4,579 5	4,309	3,088	2,890	1,901	2,440-5	3,592	836	15,598
Actual weight of grain, lb. ...	198 5	180	124	74 5	76 75	53	68	106	37 25	...
Ditto of juice of which *gur* was made, lb.	1>153 5	519	846	183-5	208-75	453	639	925	193	$8f
Ditto of which *rab* was made, lb. ,,,	1,516*25	927·5	226 25	727 25	649-25	...	...	...	...	5,069
Total juice ...	2,669·75	1,446*5	1,072-25	910 75	858	453	639	925	193	5,753
Weight of *gur* made, lb.	136-5	76-5	125-5	2875	30-5	73 5	107	140-5	34-25	90 7
Ditto of *rab* made, lb.	376-0	18475	42	13375	1230	...	...	...	...	783 0
Weight per acre of cleaned cane, lb. ,,,	6,213	6,545	4,888	5,342	4,896	3,920	3,762	6 240	5,239	31,452
Ditto dry and worm-affected canes, It). ...	1,725	922	1,425	1,180	1,450	1.321	1,387	1,58;5	1512	...
Ditto leaves and tops, lb.	2,917	2,818	2,326	2.137	1,716	[illegible]	1,718	3,427	3,364	12,516
Ditto total weight of cane and leaf, lb. ...	10,855	10,285	8,639	8,659	8,062	7,573	6,867	11,252	10,115	43,968
Ditto seed	222·1	404-2)	248·6	208*9	214·1	211·1	191-3	332-0	750 71	...
Ditto juice	2,988-3	3,248 7	2,149-8	2553 8	2393*4	1,804-5	1,798 1	2,897-7	2,335-3	16,216 9
Ditto *gur* if all the juice were turned into *gur*, ID.	483·1	478-8	313·9	400·1	349·6	292 7	301-0	440-1	414-4	2,151-5
Ditto *rab* ditto *rab*, lb. ...	543-9	6471	399-0	469-6	453·4	...	...	...	...	2,505
Percentage of juice over cleaned cane, lb. ...	48*1	49 6	43-9	47 8	48·8	46-	47-7	46 4	44 5	51-5
Ditto *gur* over cleaned cane, lb. ...	7-7	7*3	6·5	7·5	7·1	7·4	8·2	7'0	7*9	6'*
Ditto *gur* over juice, lb.	36·1	14·7	14-8	15*6	14·6	16 2	16·7	15·1,	17-7	13-2
Ditto *rab* over cleaned cane, lb. ...	8-7	9·8	8·1	8·7	9·2	...	...	...	...	7·9
Ditto *rab* over juice, IB.	18-2	19·91	18 5	18 3	...	...	...	...	...	15*4

The total amount of gur made amounted to 8031b., of which 373ft. were sold in open market at Oawnpore at*Rs. 2-13-9 per maund of 82ft.; of the rest 100ft. were sold at Rs. **6-10-8 per** maund at the beginning of the season, before sugarcane gur had come to market. The remaining quantity was reserved for distribution and exhibiting at the various agricultural shows. 759-5 ft. of rab were made, which realised Rs. 2-8-0 per maund of 82ft.

Annexed are analyses kindly undertaken by Carew and Co., Limited, Rosa :—

***Analysis of two samples of sorghum svgar received from the Government Farm, Cawnpore, March 12th,* 1884.**

	Rab.	Gur (last year's).
Crystallzed sugar	62·50	63 08
Glucose	18·54	17-75
Ash	1·80	3·87
Insoluble ash...	1·65	1·75
Colouring matter and extractive	5·31	6*79
Wate#	10·20	6 76
	100-00	100-00
Available sugar ...	37 66	31·79

• Rate of sugarcane gur on the same day—

	Rs.	a	p.
1st quality	3	6	0
2nd do.	2	12	3
Arerage ...	3	1	1 5

The following tables give full particulars of average production, value, cost and profit as compared with sugarcane :—

I.—Table showing average outturn, of amber sorgho on the unmanured fields and of sugarcane per acre.

	Sorgho.	Sugarcane.
	lb	lb
Average outturn of cane and leaf	8,395	43,968
Weight of cleaned cane	6,833	31,452
Ditto of worm-affected canes and leaf	4,065	12,516
Ditto of gur	445·4	2,151-5
Ditto of grain	500	...

II.—Table showing value of produce per acre of sorgho and sugarcane.

	Sargho.	Sugarcane.
	Rs. a. p.	Rs. a. p.
* Value of gur per acre at Rs. 4-3-4 per maund of 82lb.	22 13 8	110 6 7
† Value of leaves and dry canes at Rs. 15 per 100 maunds	7 7 0	...
‡ Value of grain at Re. 1 per maund of 82lb.	3 2 6	...
Total	33 7 2	110 6 7

* Average of the last 4 years' prices prevailing at the Cawnpore market.
† Last year the value of leaves was calculated at Re. 1 per 10 mds. This year fodder has been very dear, and Re. 1-8 is the average of what was paid for the jowar purchased for ensilage.
‡ Last year the value of grain was taken at 12 annas per maund of 82lb., but this year the rate of Re. 1 per maund was obtained.

III.—Table showing cost of produce per acre of sorgho and sugarcane.

	Sorgho. No.	Sorgho. Cost.	Sugarcane.¶ No.	Sugarcane.¶ Cost.
		Rs. a. p.		Rs. a. p.
Ploughing	2	1 8 0	8	6 0 0
Clod-crushing	2	0 4 0	6	0 12 0
Sowing		0 10 0		1 14 0
Watering*		1 4 0	7	13 9 0
[illegible]	2	4 0 0		12 0 0
Weeding and hoeing	...	0 12 0	...	2 0 0
Watching ‖	...	4 0 0	...	...
Cutting and cleaning ‡	...	...	...	[illegible] 0 ...
Seed	...	0 4 0	...	6 0 0
Rent	...	4 0 0	...	12 0 0
Sugar boiling at Re. 1-6 per maund of *gur*	...	7 12 0	...	36 1 0
Total	...	24 6 0	...	96 4 0
Value of produce		33 7 2	...	110 6 7
Net profit		9 1 2	...	14 2 7

* Only two out of the four fields whose average is calculated were watered.
The cost of one watering, including canal dues, is Rs. 2-8-0 : hence Rs. $\frac{2\text{-}8\text{-}0}{2}$ = 1-4-0.
† Last year the cost of weeding was only Rs. 2 per acre as the fields were weeded only once.
‡ Last year the cost of cutting was given at Rs. 2 per acre, and the cost of cleaning included in the cost of sugar boiling, which was given at Re. 1-12.
§ No manure applied to fields of which average was taken.
‖ Was omitted last year.
¶ The following items of expenditure differ from those given in Part I., "Field and Garden Crops":—

		Farm	"As given in Field and Garden Crops."
		Rs. a. p.	Rs. a. p.
1.	Ploughing	6 0 0	8 0 0
2.	Watering	13 9 0	12 fi 0
3.	Weeding and hoeing	12 C 0	9 9* 0
4.	Cutting	...	2 8 0
5.	Seed	6 0 0	8 0 0
6.	Rent	12 0 0	10 0 0

The differences are thus explained—

1. Ploughing—The farm field was ploughed only 8 times ; in "Field and Garden Crops" the number of ploughings is 12.
2. Watering—Also due to a difference in number.
3. Weeding and hoeing—Ditto.
4. Cutting—Cutting and cleaning usually done by men who get the tops of cane and not paid in cash ; as the value of these is not taken into account in the produce of the field, the cost of cleaning and cutting should not be entered.
5. Seed—Due to difference in rates.
6. Rent—Calculated at Rs. 8 per acre for 19 months, the time occupied by cane.

(4) **Ensilage.**—Juar and sorglium were separately ensilage 1 in masonry vats and juar alone in three simple earthen pits dug in waste soil near the bank of a nullah. All were thatched over. It was thought very probable that in the earthen pits the fodder would be attacked by white ants, but this was not the case. The juar was cut small by two men, who with a chaff-cutter delivered 4 maunds per hour. The amount cut daily was trodden down in the evening by farm labourers as extra work at wages of 2 pice each. A layer of 2 inches of *bhusa* was spread over it and weighted with baskets of broken bricks (giving 66ft. of weight per square foot) and left to sink for 48 hours. This was continued till the pits were full.

The cost of cutting and filling came to Be. 1-2 per 100 maunds.

In the first pit opened 13,262ft. of green fodder were filled in by the 21st October. I* was opened on the 2nd February, 1884, and 10,658ft. of fodder taken out, of which 9,854ft. was in most excellent condition. The waste consisted of the somewhat mouldy surface layer. There were no traces of white ants.

The whole of the fodder was fed off to the farm cattle and evidently much relished. Cultivators from the neighbouring villages who came to see the pit opened seemed surprised at the results and stated that they should try a silo on their own account next season.

The question of cost will be gone into in the rabi report, by which time the whole quantity stored, or 44,586ft., will have been fed off.

IMPLEMENTS.

Ploughs.—The Duplex plough, mentioned in the last rabi report, was altered in such particulars as further experience suggested, the principal being the substitution of an iron sole and step in the place of wood. The alterations were made for the sake of strength, as well as to add weight to the plough, to steady it when ploughing deep. Two of these ploughs are kept constantly at work on the farm and six of the latest pattern have been sent out for trial to different persons interested in agricultural matters. Up to 30th November 57 Duplex ploughs of the original pattern were sold and 35 distributed for trial. It was exhibited at the Bulandshahr, Meerut, Sahâranpur, and Aligarh Exhibitions. At Bulandshahr it got the first and a special prize ; at Meerut it was awarded a certificate of merit; and at the last two exhibitions has been reported as deserving a first prize had exhibits from outside districts beep admitted to competition for prizes.

The Kaisar plough was also exhibited at these exhibitions. At Meerut it headed all the ploughs offered for trial and it was well reported on at the other exhibitions; 154 were sold daring the season.

Waterlift.—The 5' chain lift, trials of which were noticed in the last rabi report *to* be not so satisfactory as those for other depths, was subjected to a different mode of trial suggested bj Mr. W. J. Wilson, C.E.

The results of these experiments and the details of the labour employed are shown below :—

Labour employed.	Average quantity of water lifted per hour.
	Cubic feet.
4 men—two working at a time and relieved after every 2 hours	1,451·6
2 men and 2 women—one man and one woman working at a time and relieved after every 2 hours	3,363·5
4 women—two working at a time and relieved after every 2 hours	1,250·0
2 men working for 4 hours continuously and then working again after a recess of 2 hours at noon	1,313·8

14 pumps were sold during the season.

Winnowers—To the friction wheel a spiral spring has been added, so as to maintain pressure This has so far proved satisfactory. Six of the improved pattern have been sold. During tb* coming rabi harvest one of the improved pattern will be given a continued trial at the farm.

Cotton $̇wi.—The saw gin reported in the last report having been found to affect injuriously the short staple of the indigenous cotton, efforts were made to make a cheap roller gin at'.the farm after the model of Dobson's knife gin. A difficulty yet to be overcome is the crushing of the seed, the admixture of fragments of which lowers the value of the lint.

Evaporators or mgar-boiling.—The evaporators having found so much favour at the agricultural shows last year, manufacture was taken up at the farm. An evaporator of galvanised iron sheet for setting up on a *kachha* brick or clay furnace, together with iron ladle, strainer, and iron grating for furnace, can be made up for Rs. 40. A clay furnace costs about Rs. 1-8 and answers admirably. Four evaporators have been sold and have all been reported on as giving satisfaction. Rai Ajudhya Prasad of lndulpur writes : —" The evaporator worked very nicely. I prepared about 60 maunds rab in it. The result I will enter in my annual report.

The Farm Superintendent, Lachhman Parshad Barma, has had much extra work to do during the past season in preparing collections of grains, fibres, and models of implements for the Calcutta Exhibition. His careful, intelligent management of the farm is therefore all the more to his credit. The collections referred to have won medals and certificates of merit at the Exhibition, of which details will be given in the next report. It is to this extra work that is due such delay as has occurred in preparing the figures for the report

D. G. PITCHER, MAJOK,
Assistant Director for Oudh,
In charge of Farm.

PRINTED AT THE N.-W. P. AND OUDH GOVERNMENT FBESS, ALLAHABAD.

EEPORT

ON THE

CAWNPORE EXPEEIMENTAL FARM

FOR THE BABI SEASON, 1883-84.

AHAHABAD:

NOBTH-VTI8TIBK PROVINCES AND OTIDH GOVERNMENT FRIBS.

18S4

No. 1058A OF 1884.

FROM

THE DIRECTOR, DEPT. OF AGRL AND COMMERCE,

NORTH-WESTERN PBOVINCES AND OUDH,

To

THES CHIEF SECRETARY TO GOVERNMENT,

NORTH-WESTERN PROVINCES AND OCDH.

Dated Cawnpore, the 4Ah October, 1884.

SIR,

I HAVE the honor to submit Major Pitcher's report on the Cawnpore Experimental Farm for the rabi season of 1883-84. The season has differed materially from that of 1882-83. No rain fell from the sowing up to the harvesting of the rabi* The crop was dependent entirely on artificial irrigation.

2. *Outturn of wheat.*—The maximum outturn of wheat of the farm was 3,06 libs or 51 bushels, as against a corresponding maximum of 2,181ibi or 33˙3 bushels last year. It is the largest maximum outturn of wheat which has yet been obtained on the farm. The average outturn also is in excess of any previous average outturn obtained. The land was ploughed five time3 and irrigated (after sowing) four times. Last year the land was ploughed three times and irrigated twice. This goes to show that thorough ploughing and timely sufficient irrigation are after all the most important factors in production.

3. *Experimental manuringa.*—The experimental manurings in the serie3 of plots which have been maintained for the past five years appear to yield two important results—

(*a*) that bone superphosphate combined with a nitrogenous manure yield the highest return ;

(6) bat that cowdung is the cheapest and relatively the most fertilizing manure which the cultivator can use.

Cowdung is the most easily procurable and the least expensive manuie. The net Result of applying it was a crop exceeding in value the crop raised on the unmanured plot by Rs. 8JL-0 per acre or nearly 16 per cent.

4. *Ville series.*—In the Ville series of plots the experiment^again show that for a cereal crop soluble nitrogen is essential. Previous experiments had already established this fact. Further demonstration does not appear to be needed, and this series of experiments may now be dropped.

5. *Green soiling.*—Green soiling with hemp was continued. It is established that the fertilizing effect of hemp is not exhausted in a single year, and as a consequence that a field into which green hemp has been ploughed for two years yields a larger Crop than a field to which it has been applied for the first time. There appears some ground for believing (Table VII of Report) that hemp which has itself been manured w^k gypsum is a more powerful fertilizing agent than unmanured hemp. Tae increases in value of produce obtained in plots la, Ila, and Ilia, to which the gypsum-manured hemp was applied, are Rs. 11, 177, and 44*2 respectively.

6. The experiments with indigo, hemp-water, indigo-water, and indigo refuse, although not of very great importance, may be continued. The results of the rotation of wheat with lucerne grass are more likely to be useful.

7. *Fertilization of tisar.*—The experiments in fertilizing lisar were scarcely calculated to be successful or conclusive. The treatment was rather too much of a nursery nature to be of much utility. The depth of the soil in the boxes was—so far as I could judge—not more than eight inches, and the boxes were about three feet by

two feet. If usar is to be treated it must be treated *in situ* and not u> boxes of gathered soil. The experiment, however, is a really useful one, and will be continued on a wider basis. The Superintendent of the Farm has selected four blotched plots in a neighbouring lisar plain and experimentally treated them with gypsum. Crops of barley, peas, and gram have been sown. The result will be an interesting one. No effort will be spared to find some means of reclaiming the vast usar and reh plains. A cheap and easy means of reclamation would be invaluable to the provinces.

8. *Beepploughing.*—The experiments in deep ploughing are perhaps the most conclusive and useful of all. It appears to be established, as far at least as the soil of the farm is concerned, that a th orough up-turning and exposure of the soil is sure to yield in return a high crop. The increased rate of productiveness which followed the deep ploughings may be said to be almost in the direct ratios of the depths of the ploughings. Probably in 90 per cent, of the soil of the Doab of the North-Western Provinces a similar result would follow deep ploughing. No effort shouid be spared to inculcate this on the cultivators of the provinces.

9. *Irrigation experiments.*—The experiments in irrigation were of a twofold character—;*first,* to test the minimum number of waterings necessary to give a maximum amount of produce; *second,* to test the relative values of canal and well water. The first set of experiments do not appear to add anything to the knowledge* which the cultivator at piesent has, and prove, if anything, that no fixed rule is possible. The second set appear to establish that well water is *per se* better than canal water near Cawnpore. It is doubtful, however, whether the result can ever have any appreciable effect in practice, especially as the extra cost of well irrigation swallows up all the increased return.

10. *Jethro Tull method of cultivating wheat*—The Jethro Tull method of cultivating wheat was tried side by side with cultivation in the ordinary way. It consists in sowing on ridges—similar to the well-known method of potato cultivation and to the ridge and trench cultivation of sugarcane in the West Indies. A certain amount of success was achieved in so far that the crop on these unmanured ridges was equal in quantity to that on the most highly manured land in the farm. • Possibly wide ridges, narrow furrows, slightly thicker dibblmg, and a cropping of the furrows, with gram or peas, might end in the entire field yielding a high gross return not inferior to that of manured land. It does not appear that the cost of cultivating in ridges would exceed the cost of ordinary manuring. If it does not, the experiment will be well worth continuing. *It will be repeated on a larger scale in the coming season. The want of the enterprising farmer is certainly a serious drawback. But perhaps means may yet be found to meet this want.

11. The experiments with oats, barley, linseed, and poppy are encouraging, and will be continued.

12. *Silos.*—The plan of storing green fodder in silos has proved successful; and in my opinion there can be no reasonable doubt that the silo system of storage may yet be turned to excellent account in the province. The nutritive and stimulating qualities of the fodder are preserved, and cattle not only take to it but unmistakeably thrive on it. A good deal, however, remains to be done to adapt the dimensions and form of the silos to the resources and habits of the cultivators. The pressing of the fodder in the silo is an element of difficulty which cannqfrbe overlooked. In the faim bricks and stones are used to keep the fodder tightly pressed down. But bricks and stones are not to be had everywhere, although a heavy pressure is absolutely necessary to keep the fodder in condition. We must have silos of a size and at a cost and weighted with a material suitable to the resources and habits of the people. The experiments will in future be modified, so as, if possible, to compass this end.

13. *Duplex and Watt's ploughs.*—The Duplex plough, which is an implement devised to serve both as a weeder and cultivator and as a soil-inverting plough, appears to be more likely perhaps than any other to find favour with the ploughmen of the province. The convenience of the implement is, that it can be fitted up either as a plough or as a weeder and cultivator very rapidly and very simply. There are neither screws nor rivets, but only a big wrought-iron bolt which can be removed by a blow or two from a hammer or any heavy thing which may come handy ; so that when a cultivator wants to root the grass, weeds, or jungle roots from his field, all he has to do is to knock the bolt out, take out the plough fittings, put the weeder in its place, and bolt it on. The whole thing does not take more thfei a couple of minutes.

This and the Watt's plough seem at present the most promising implements on the farm.

14. *Water lifts.*—Not much has as yet been accomplished in water lifts. But they will be persevered in.

15. *Winnowers.*—In regard to winnowers I have my doubts/ They are, comparatively speaking, too costly for the irregular services which they are destined to render. Anything that will reduce the cost, such as application of direct friction instead of the complicated and expensive cog-wheel contrivance, will be of advantage.

16. *Fairs.*—The farm was usefully represented at a number of fairs throughout the provinces during the season. This is one excellent channel, although not perhaps the best, by which the benefits of the farm operations may be spread.

17. *Necessity of now endeavouring to get the cultivators of the 'province to adopt the improved methods and implements which have been proved to be suited to the country.*—I would remark in conclusion that in the past five years during which the farm has been, carried on certain practical improvements in the manner of treating the soil, in the kind of implements used, and in rotation of crops, appear to have been completely established. But these interesting and important improvements have for very obvious reasons not gone very far beyond the four corners of the farm itself. They have not reached the mass of cultivators, for whom they are intended, and for whom they ttiay be of very great value indeed. Such simple and inexpensive improvements as green soiling with hemp, manuring with brick-kiln refuse, deep-ploughing, cultivation of wheat in ridges after lucerne, the simple and efficient Duplex ploughs are of very real agricultural importance. Efforts should now be made to disseminate far and wide a correct knowledge of these improvements and to obtain by every possible means their adoption by the mass of cultivators. The money spent in the exj ariments of the past five years will have been absolutely wasted unless effectual means be now taken and money spent in inducing the cultivator to appropriate the results and put them in practice on his land. Neither pains nor money should be grudged. This matter is, however, scarcely perhaps pertinent to the present report, and I shall take an early opportunity of laying my proposals before His Honor the Lieutenant-Governor for accomplishing this object—an object which I regard as of paramount importance.

18. Bâbu Lachhman Parshfid deserves great credit for the care and patience with which he has conducted the farm operations during the season. He is quite alive to the great importance of bringing the improvements to which I have alluded into currency among the people, and I am sure that he will do all in his power toward*fcis end,

I have the honor to be,

Silt,

Your most obedient servant,

D. M. SMEATON,

Offg. Director.

REPORT

ON TIMS

CAWNPORE EXPERIMENTAL EARM

FOB THE RABI SEASON OF 1883-84.

1. *Character of the season.—The* season has as usual to be characterised aa abnormal. Last year an unusually heavy fall of rain in the middle of the season was the chief disturbing cause. This year not a single shower fell between 19th September and the 9th May, 1884.

As a consequence the rabi crops were entirely dependent on artificial irrigation from seed time to harvest, and where irrigation was impossible the crops failed. The advantages of having canal water adjacent were never more apparent. It was all the greater pity, therefore, that for some reason or other the canal w^s closed for three weeks in February, just when high and dry winds were in full force shrivelling to some extent the ripening grain.

Much as such a season increased the labour and anxiety to the cultivator involved in continuous irrigation, it afforded a great advantage in the entire absence of rust and fungoid diseases, and in less damage than usual from frost. The area at the farm under wheat, the average outturn, and the maximum outturn, for the past three years, are shown below :—

					Area in acres.	A [illegible]	Maximum [illegible]
						lbs.	H>9.
1883-84	••• .	•••	...	—	17'6	1,453	3,061
1882-83	...	—	...	•••	16-1	1,309	2,181
1681-82	...	...	...	.-	16 8	1,390	2,820

2. *Operations of the season.*—These comprised experiments on—

(1) Manure.
(2) Ploughing.
(3) Irrigation.
(4) Improved methods of cultivation.
(5) Outturn of certain crops.
(6) Ensilage.
(7) Improved implements.

Experiments on manures.—These may be sub-divided into—

(a) The series in duplicate which have now been maintained with a few modifications for five years past.

(6) The Ville series illustrating by practical proof the respective and comparative value t9 a cereal crop of such chemical elements as are necessary in combination to maintain fertility.

(c) Experiments in green soiling.

(d) Miscellaneous.

(a) In the last rabi report it was pointed out that quite sufficient evidence had been adduced to illustrate the well-known fact that non-nitrogenous manures used singly are of small avail for cereal crops; the plots then which were formerly manured with bone dust, calcic sulphate, and bone superphosphate, *viz.*, VII, VIII, and IX, in Table I, were this year each reinforced by the addition of a nitrogenous manure, and as may be observed the superphosphate plot so reinforced has now taken the highest place. Table I illustrates the manure applied to the several plots and the crops raised in them during the past five years :—

Table 1.

No. of plot.		1879-80.		1880-81.		1881-82.		1882-83.		1883-34.	
		Manure.	Crop.	Manure.	Crop.	Manure.	Crop.	Manure,	Crop.	Manure.	Crop.
I.	Standard ...	Nil	Cot-ton,	NO.	Maize.	Dung ...	Maize & wheat.	Dung ...	Wheat..	Dung ...	Wheat.
	Duplicate ...	Do.	Ditto	Do. ...	Ditto	Ditto ...	Ditto ...	Ditto ...	Maize ...	Ditto ...	Ditto.
II.	Standard ...	Do.	Ditto	Do.. ...	Ditto	Dung and bone dust.	Ditto ...	Dung and bone dust.	Wheat...	Dung and bone dust.	Ditto.
	Duplicate	Do.	Ditto	Do.. ...	Ditto	Ditto ..	Ditto ...	Ditto ...	Maize ...	Ditto ...	Ditto.
III.	Standard ...	Do.	Ditto	Do....	Ditto	Dung and calcic sul-phate.	Ditto ...	Dung and calcic sul-phate.	Wheat..	Dung and calcic sul-phnte.	Ditto.
	Duplicate,»,	Do.	Ditto	Do....	Ditto	Ditto ...	Ditto ..	Ditto ...	Maize «.	Ditto ...	Ditto.
IV.	Standard ...	Do.	Ditto	Do....	Ditto	Ashes of dung.	Ditto ...	Ashes of dung.	Wheat...	Ashes of dung.	Ditto.
	Duplicate ...	Do.	Ditto	Do....	Ditto	Ditto ...	Ditto ...	Ditto ...	Maize ...	Ditto ...	Ditto.
V.	Standard -	Do.	Ditto	Do....	Ditto	Potassic nitrate.	Ditto ...	Potassic nitrate.	Wheit...	Potassic nitrate.	Ditto.
	Duplicate ...	Do.	Ditto	Do....	Ditto	Ditto ...	Ditto ...	Ditto ...	Maize ...	Ditto ...	Ditto.
VI.	Standard ...	Do.	Ditto	Do....	Ditto	Potassic nitrate and bone dust	Ditto ...	Potassic nitrate and bone dust.	Wheat...	Potassic nitrate and bone dust.	Ditto.
	Duplicate....	Do.	Ditto	Do....	Ditto	Ditto ...	Ditto ...	Ditto —	Maize ...	Ditto ...	Ditto.
VII.	Standard ...	Do.	Ditto	Do....	Ditto	Bone su-perphos-phate.	Ditto ...	Bone su-perphos-phate.	Wheat.	Potassic nitrate and bone su-perphos-phate.	Ditto.
	Duplicate..	Do.	Ditto	Do....	Ditto	Ditto ...	Ditto ...	Ditto ^	Maize...	Ditto ..	Ditto.
VIII.	Standard ...	Do.	Ditto	Do....	Ditto	Bone dust,	Ditto ...	Bone dusty	Wheat...	Sheepdung and bone dust.	Ditto.
	Duplicate ..	Do.	Ditto	Do....	Ditto	Ditto ...	Ditto ..	Ditto ^	Maize ...	Ditto ...	Ditto.
IX.	Standard ...	Do.	Ditto	Do.-.	Ditto	Calcic sul phate.	Ditto ...	Calcic sul-phate.	Wheat...	Sheepdung and calcic sulphate.	Ditto.
	Duplicate ...	Do.	Ditto	Bo....	Ditto	Ditto ...	Ditto ...	Ditto ...	Maize ...	Ditto ...	Ditto.
X.	Standard ...	Do.	Ditto	Do....	Ditto	No manure	Ditto ...	No manure,	Wheat...	No manure.	Ditto.
	Duplicate ...	Do.	Ditto	Do....	Ditto	Ditto ...	Ditto ...	Ditto ...	Maize ...	Ditto ...	Ditto.

The treatment during the past season has been as under : —

Ploughings—Five.

Weeding — One.

Irrigation (exclusive of that necessary before the field could be sown). } Four times.

Seed—Soft white wheat, Muzaffarnagar variety, 120lbs per acre.

Manure—As in table.

Table II shows the outturn per acre :—

Table II.

Manure and rate per acre.	Grain.		Straw.	
	Standard.	Duplicate.	Standard.	Duplicate.
	lbs.	lbs.	lbs.	lbs.
Cowdung, 180 maunds ... — ...	1,427 8	3,031·0	2,329-2	4,988-0
Ditto, 180 „ bone dust 360959 ...	1-,3431	2,S73-7	2,456 3	5,1122
Ditto, 180 „ calcic sulphate, 240H?s ...	1,364-2	3,0>>3*8	8,408-1	4,G94 8
Ashes of 180 maunds cowdung ...	1,134*3	2,323*2	2,311-1	3,817'5
Potassic nitrate, 240115s ...	1,3552	2,707-0	2,41')-9	5,64i'6
Ditto, 24Gffi9 bonedust 36()I&s ...	1,252-3	2,91109	2,068 0	6,7-26-3
Ditto, 240lb«i bone superphosphate 240lba...	1,984-4	3,061-3	3,8175	6,8624
Sheepdung, 120 maunds bone dust 36<<Ibs ...	1,143 4	2,389 7	1,887-6	4,434*6
Ditto 120 „ calcic sulphate 2401&3 ...	1,337-0	2,601-5	2,323-2	4,4709
No manure ... — ...	1,031-5	2,280 8	2,093-3	3,672*3

In the above it cannot fail to be remarked how greatly the outturn of the duplicate plots exceeds in every case that of the standard plots. This was partly due to the standard plots having borne the full brunt of the damage resulting from the canal being closed in February last, while the duplicate plots happened to be just irrigated in time and partly to the advantage which the duplicate plots enjoy over the standard plots in being cropped with kharif and rabi alternately—*viz.*, a fallow of 12 months every other year when maize has followed wheat. The effects of this plan, which was started in 1881-82, are only now perceptible. Nevertheless the general correspondence in values comes out clearly, and one series proves the other.

In the last rabi report it was stated that the plot manured with calcic sulphate alone would this year be green soiled in addition, but the point was accidentally overlooked in drawing out the rabi scheme, and sheepdung as may be seen was the form in which nitrogen was supplied. This, however, was of less consequence since au experiment in green soiling in a field dressed with calcic sulphate was undertaken on another part of the farm {*vide* Table VII>

Table III shows the value of the increase in outturn set against the price of the manure applied. Necessarily, however, the market price of farmyard manure is much above the actual cost of that which the cultivator usea :—

Table III.

Manure.	Value of outturn per acre. *			Cost of manure.	Net increase over the uninanured.
	Standard.	Duplicate.	Average.		
	Bs.	Bs.	Ks.	Bs.	
K Cowdung	44·3	94-2	69*2	9·0	8*1
2. Cowdnng and bone dust	42 7	90-9	66-8	13·5	1-2
3. Cowdung and calcic sulphate... ...	43 1	92 3	67·7	10·0	6·6
4. Ashes of cowdung	S7·»	72·2	64-6	9·0	6·5 loss
5. Potassic nitrate	42*9	88*9	65·9	7·5	6·3
6. Potas^ic nitrate and hone dust ...	41·4	94·0	67'7	12·0	3*6
7. PoUsnic nitrate and bone superphosphate,	63 9	90 5	81-2	22·0	7·1
S. Sheepdung and bone dust '	35 6	76 3	65-9	13·5	9·7 loss
9. Sheepdung and calcic sulphate ...	42·0	81*6	61·8	IO'O	·3 loss
10. No manure	33·7	70-5	62·1	...	...

This table shows that by the results of this season superphosphate fortified by a nitrogenous manure gives the highest yield, but that cowdung is for the cultivator the cheapest manure to use.

The figures given below show the comparative yields for the past three years of potassie nitrate (saltpetre)† alone and combined with bone showing that ... one of little benefit:—

† Crude unrefined nit«.

* Grain at Rs. 9 per maund. } Average rates prevailing at Cawnpore for the past month.
Straw at 5 maunds per rupee. }

Table IV.

Designation of plot.	Manure.	1883-84.	1882-83.	1881-82.
Standard	Saltpetre ...	1,355·2	1,978-5	1,242-
	Saltpetre and bone dust ...	1,252-3	1,944-7	1,395'
Duplicate	Saltpetre ...	2,707 0	2,181-0	1,605-
	Saltpetre and bone dust ...	2,900 9	2,065-7	1,575-
Average	Saltpetre ...	2,031- i	2,079-7	1,423·5
	Saltpetre and bone dust ...	2,076·6	2,000-2	1,485'0

With reference to the plots to which sheepdung was added an unavoidable omission was that of a plot for sheepdung alone. More plots have been formed for the coming year.

(6) *The Ville series.*—The treatment here is that followed during the past two years.

Table V gives the treatment pursued during the past and present years :—

Table V.

Year.	*Previous treatment.* Season.	Manure.	Crop.	*Treatment during 1883-84.* Ploughing.	Seed per acre.	Irrigation.	Weeding.
1879-80	Kharif ...	*Nil*	Cotton				
	Rabi ...	Do.	*Nil*				
1880-81	Kharif ...	Do.	Sorgho				
	Rabi ...	Do.	*Nil*				
1881-82	Kharif ...	Same as now applied	Maize				
	Rabi ...		Wheat				
1882-83	Kharif ...	...	*Nil*				
	Rabi ...	Do.	Wheat				
1883-84	Kharif ...	...	*Nil*				
	Rabi ...	AB in Table	Wheat	Three ...	120lbs wheat.	Four ...	Once.

Table VI gives results from which it is shown how a cereal crop suffers in the absence of soluble nitrogenous compounds :—

Table VI.

Number of plot.	Manure and rate per acre.	*Outturn per acre.* Grain.	Straw.	*Increase over the unmanured plot No. VI.* Grain.	Straw.	Decrease over plot No. 1. which received all manures.	
I.	Calcic superphosphate, 180lbs; Ammonic chloride, 130; Potassic sulphate 90; Calcic sulphate 96 ...	1,777-1	3,388-0	1,014-8	1,911-8		
II.	Ditto less calcic superphosphate ...	1,417-2	3,267-0	654-9	1,790-8	359-9	121·0
III.	Ditto less ammonic chloride ...	1,001·2	1,597 2	238-9	121-0	775-9	1,790-8
IV.	Ditto less potassic sulphate ...	1,497-3	3,025·0	735-0	1,548-8	279-8	363-0
V.	Ditto less calcic sulphate ...	1,323 4	2,637-8	[illegible]	1,161-6	453·7	760-2
VI.	No manure ...	762-3	1,476·2	...	...	1,014-8	1,911-8

(c) *Green soiling.*—These comprise—

(1) Determination of the value of ploughing in a crop of hemp.

(2) Ditto of applying fresh and old indigo refuse.

(3) Ditto of the value of ploughing in hemp against ploughing in indigo, and of each as against hemp and indigo water and indigo vat refuse.

(4) Determination of the value of following a crop of lucerne with wheat.

Green soiling with hemp.—Two fair-sized fields and two experimental plots which last year were also green soiled with bemp, received this year similar treatment, save that in the case of the fields, a portion of each that was last year green soiled was this year left unmanurod. This was done in order to assay the unexhausted fertility remaining over from the green soiling of the previous year. The outturn is noted in Table VII-

Table VII.

Number of plot.	Manure.	Cost of manure.	Outturn per acre.		Increase over the unmanured.		Increased value of produce, deducting the cost of manuring.
			Grain.	Straw.	Grain.	Straw.	
		Us.	lbs.	lbs.	lbs.	lbs.	Ba.
la.	Green soiled with hemp, manured with calcic sulphate in 1883, as well as in 1882.	3-5	1,612*2	2,353-4	580-7	72-6	WO
U.	Green soiled with hemp in 188') as well as in 18S2.	25	1,385-4	2,081-2	353*9	— 199-6	6-3
Ic.	No manure in >883 aa well as in 1883,		1,031-5	2,280-8	...	...	
Ila.	Green soiled with hemp, manured with calcic sulphate in 1883, as well aa in 1882.	"3-5	1,860·6	3,(1 • 8 2	715-7	914-6	17-7
HA.	Green soiled with hemp in 1883 as well as in 1882.	2*5	1,792-6	3,082 3	647-7	978-7	17-2
tic.	Green soiled with hemp in 1883 for the first time.	2*5	1,7562	3,054*3	611-3	950-7	16-2
Hd.	No manure in 1883, green soiled with hemp in 1882.	...	1,263-8	2,098*3	118*9	- 95-3	2'5
He.	No manure in 1883 as well as in 1882.	.	1,1449	2,103-6	...	...	...
Ilia.	Green soiled with hemp manured with calcic sulphate in 1883 as well as in 1882.	"3 5	2.340-3	4,209*9	1,487-5	2,826J	44'2
HI*.	Green soilel with hemp in 1883 as well as in 1882	25	1,449-4	2,947'9	596-6	1,564-1	18-4
Hie.	Green soiled with hemp in 1883 for the first time	2'5	1,262-2	2,256-7*	409-4	872-9	10-9
Hid.	No manure in 1883, green soiled with hemp in 1*82.	...	1,119-0	2,177·6	266 2	793-7	9-7
HI*	No manure in 1883 as well as in 1882...	...	852 8	1,383-8	...	...	...

The figures for the present year show—

(1) That calcic sulphate (gypsum) has a marked effect through its influence on the growth of hemp—4 result corroborated in the figures of the preceding two years:—

Table VIII.

Number of series.	Manure.	Outturn of wheat per acre.		
		1883-84.	1882-83.	1881-82.
M	Hemp and Gjpsum	1,612*2	1,856-8	2,244
	"enip	1,385-4	1,373 3	1,713
n. 1	Hemp and Gjpsum	1,860*6	1,851-6	...
	Henip	1,792-6	1,763-4	...
m.{	Hemp and Gypsum	2,340-3	...	...
	Hemp	1,449-4	...	...

(2) That the portions which were green soiled with hemp in the present as well as in the preceding year gave a greater increase than the plots green soiled for the first time in the same series*

Table IX.

Kumber of series.	Detail of manure.	Outturn of wheat per acre.
II. ... {	Green soiled in 1883 a* well a§ in 1882	1,792-6
	Green soiled in 1883 only	1,766-2
III. ... {	Green toiled in 1883 as well as in 1882	1,449-4
	Green soiled in 1883 only	1/262-2

(3) That the effect of green soiling with hemp extends over more than one year.

Table X

Number of series.	Detail of manuring.	Outturn of wheat per acre.
II.	Unmanured in 1883, green soiled with hemp in 1882	1,263-8
	Unmanured in 1883 as well as in 1882 ...	1,144*9
III.	Unmanured in 1883, green soiled with hemp in 1882	1,119 0
	Unmanured in 1883 as well as in 1882 ...	852 8

The average increase due to green soiling with hemp, with hemp manured with gypsum, and that due to the unexhausted fertility of hemp ploughed in a year previous is noted below* The increase obtained in the preceding year is also noted.

Table XI.

	Increase per acre in the outturn of wheat.	
	[illegible]	1682-83.
Average increase due to green soiling for the first time ...	[illegible]	443-4
Average increase due to green soiling in the land which had been green soiled in the preceding year also.	[illegible]	308-5
Average increase due to green soiling when manured with calcic sulphate.	[illegible]	6841
Average increase due to green soiling effected in the preceding year.	[illegible]	...

* Average of the results of Series II and III.

Indigo refuse.—The experiments were repeated in the same 6eld as in the preceding year. Each of the portions which were then manured was divided into two, one of which received the same treatment as in the preceding year, and the'other was left unmanured, while, the portion which was not manured in the preceding year was now divided into three parts, one of which was kept unmanured and the other two treated with old and fresh refuse. The outturn of the several plots and the increase of the manured over the unmannred portions are noted in Table XII.

Table XII.

Number of plot.	Year.	Manure.	Quantity per acre.	*Outturn per acre.* Grain.	Straw.	*Increase over the unmanured.* Grain.	Straw.
			Mds.				
I.	1883-84 ...	Freeh indigo refuse	120	1,961«9	3,404-9	1,355-2	2,238*5
	1882-83 ...	Lime	6				
II.	1883-84 ...	Fresh indigo refuse only	120	1,828-7	3,236-2	1,222a	2,069-S
	3882-83 ...	Old indigo refuse	...				
III.	1883-84 ...	Lime ...	120	2,080*4	3,705-2	1,473-7	2,538*
	1882-r>3 ...	Old indigo refuse only	6				
IV.	1883-84 ...	Old indigo refuse	120	2,030-6	3,522*1	1,423*9	2,3557
	1882-83 ...	Fresh indigo refuse	...				
V.	1883-84 ...		120	1,482-4	2,680*7	875-7	1,614-8
	1862-83 ...	No manure	6				
VI.	1883-84 ...	Old indigo refuse	120	1,265-7	2,200*6	659*0	1,0342
	1882-83 ...	No manure	...				
VII.	1883-64 ...	No manure	...	1,1760	1,982*0	568 3	815*6
	1882-83 ...	Fresh indigo refuse	120				
VIII.	1883-84 ...	No mnnnre	...	8581	1,8985	2514	7321
	(882-83 ...	Old indigo refuse	120				
IX.	1883-84 ...	No manure	...	6067	1,1664	...	...
	1882-83 .		...				

in ino present year old inrliV^ [illegible]

•while in the previous [illegible]

[illegible] >earires.Ji refuse gave much the largest increase. Tha differ-enoo seems probably due to the fact that in the absence of a full rainfall the fresh refuse had not had time to become properly decomposed.

(3) To determine the comparative value of ploughing in a crop of hemp against ploughin£ in green indigo and of applying hemp water- and indigo water and indigo vat refuse nine plots were made out as follows :—

-*No. 1.*— Green soiled with hemp, which had been manured with gypsum, six maunds to the acre.

No. 2.—Green soiled with indigo, manured with gypsum at the rate of six maunds to the acre.

No. 3.—Green soiled with indigo without any application of gypsum.

No. 4.—Hemp water to a depth of 1 inch or 3,630 cubic feet to the acre.

No. 5.—Indigo water to a depth of 1 inch or 3,630 cubic feet to the acre.

No. 6.—Fresh indigo refuse 120 maunds and lime 6 maunds to the acre.

No. 7.—Old indigo refuse 120 maunds to the acre.

No. 8.—After a crop of indigo, the indigo plant being cut and sold in open market.

No. 9.—No manure.

Besides manure all plots received the following treatment:—

Ploughing—Five times.
Watering—Five times.
Weeding—Once.
Seed—1201bs to the acre.

Their outturn is shown in Table XIII. Plot No. VII, *to* which old indigo refuse was applied, not only gave a greater outturn than the plot manured with fresh refuse, but also greater than plots II and III, green soiled with indigo plant. This was probably due to the cause already noticed, vi«., the cessation of the rains and the consequent delay in the decomposition of the fresh refuse. To this may also be ascribed the increase in outturn of wheat being so small in the case of plot No. II (indigo ^vhich was manured with calcic sulphate, gypsum) over plot No. I11 (indigo which was not so manured), for the outturn of plot No. II in indigo plant exceeded the outturn of Plot No. I11 by 38-8 maunds per acre, the outturn of the two plots being 179-3 and 140-5 maunds per acre respectively, and it was expected therefore that the plot in which manured indigo was ploughed in would give a corresponding greater outturn of wheut. The outturn of plots manured with indigo refuse and indigo water was almost as great as of the plots green soiled with indigo-r-an interesting fact, as showing that by extracting the dye indigo loses but little of its manurial ingredients, and also that the water which contains its dissolved parts is as beneficial as the refuse.

Table XflL

No. of Plot.	Specific treatment.	*Outturn per acre.* Grain.	Straw.	*Increifie over tk* unmanured.* Grain.	Straw.
I.	Green soiled with hemp, which had been manured with calcic sulphate, six Tiinunda to the ncre.	2,260*4	4,847-5	745-7	2,215-8
II.	Green soiled with indigo, manured with calcic sulphate at the rate of six maunds to the acre.	2,395*8	5,003'3	881M	2 37T6
III.	Green soiled with indigo, without any application of calcic sulphate.	2,357*9	4,723-0	843 2	2,093-3
IV.	Hemp water to a depth of one inch or 3,630 cubic feet to the acre.	2,169-6	4,396*3	6519	1,766-6
V.	Indigo water to a depth of one inch or .%630 cubic feet to the acre.	2,060*0	3,430*3	545 3	798 6
VI.	Fresh indigo refuse 120 maunds and lime six muunda to the acre.	2,8360	4,846-0	821 8	2,2143
vn.	Old indigo refuse 120 maunda to the ncre	V>60 3	4,G43»3	1,065 6	2,011-6
Vin.	Aft r 6o e id UCrOPOf indiRO> thciudigoplaiJt beiDS Cllt aDd	1,590-3	2,8O2	76'6	1815
IX.	No manure	1,514-7	2,631-7	...	...

In the case of hemp water it was expected that it would give as good results as hemp plants, since after steeping and extracting the hemp as is done for fibre, little beyond the fibre is removed from the vat. Caution, however, must be exercised before drawing inferences from the figures of a single year's results, and we must wait patiently for more facts. The outturn of the plot in which wheat was sown, after a crop of indigo had been removed, appears considerably les« than the outturn of the plot in which indigo was ploughed in; but if the value of indigo sold be taken into account, then the practice of following *heat after indigo is more to be commended from a financial point of view than ploughing in the crop green as shown below :—

Table XIV.

Specific treatment.	Value of produce.			
	Wheat.	Straw.	Indigo plant.	Total.
Indigo ploughed in	57 5	19-2		767
Following a crop of indigo	38'8	1P4	409	91-1

(4) *Determination of value of following a crop of lucerne with wheat.*—This was tried (!) in a plot in which wheat had alternated with lucerne since 1880, and which in 1882-83 had borne lucerne till September, 1883, and (2) in a field half of which had been cropped with lucerne in the two years immediately preceding and the other half been lying fallow since March, 1883. The lucerne in both plots was disestablished in September, 1883. Both the fields were—

Ploughed—Four times.
Watered—Four times.
Weeded— Once.

The outturn of both the plots is shown in Table XV and compared with adjoining unmanured plots similarly treated. Taking an average the two plots in which wheat followed lucerne gave an increase of 781"5tbs over the unmanured plot. In 1881-82 the outturn of the plot in which wheat had followed lucerne amounted to 1 395rt>s but there was no unmanured plot at that time with which its outturn could be fairly compared.

Table XV.

Number of plot.	Specific treatment.	Outturn per acre.		Increase over the «n-manured.	
		Grain.	Straw.	Grain.	Straw.
Ia.	Lucerne up to September, 1888	2,017-6	3,472*7	986-1	1,191-9
Ib.	No manure	1,031-5	S,28O 8	...	...
IIa.	Lucerne up to September, 1883	2,55] -5	4,9865	6*76-8	909-4
IIb.	No manure	1,9 74-7	4,077-1	...	...

Miscellaneous.—Under this heading may be enumerated the following.—

I.—Comparative trial of saltpetre, ammonic chloride (sal ammoniac) and sodium chloride (salt).

II.—Jeye's purifier.

III.—Value of the silt collected in clearing out annually the canal distributaries.

IV.—Comparative trial of the following manures—

(1) Brick-kiln refuse.
(2) Woollen refuse.
(3) Perished carrot seed.
(4; Ditto indigo seed.
(5) Ammonic chloride.
(6) Ashes of weeds.
(7) Ditto top dressed with saltpetre.
(8) No manure.

V. - Experiments with tisar soil.

Nos. I, II, III, and IV were each tried in separate fields. The results are ohown in TaUe XVI.

Table XVI.

Number of series.	Number of plot in the series	Manure and amount per acre.	*Outturn per acre.* Grain.	Straw.	*Increase over the unmanured.* Grain	Straw.
I.	*a.*	Saltpetre, 24"fl>9	1,974-7	2,671-5	613-5	316-2
	b.	Animonic chloride, 24OR53	2,057-1	2,905-8	695 9	650'5
	c.	Sodium chloride, 240lbs	1.MO'2	2,435 3	24»'O	80'O
	d.	No manure	1,361-2	2,355*3	...	...
II.	*a.*	Soaked in Jeye's purifier	,529 0	3,558-8	208-6	122-0
	b.	Not soaked ditto	1,320*4	3,436 8	...	...
HI.	a.	Silt 1,000 maunds	1,322*0	2,7»8 8	56*7	961'9
	6.	No manuie — — ...	1,265 3	1,856 9	...	...
IV.	1	Brick-kiln refu.e, 120 mnunds	2,598*4	4,259 2	946 8	1,621*4
	2	Wooden refuse and lime, each 6 maunds ...	1,P63"2	3.158-1	31 1*6	520 3
	3	Perished carrot seed, 1 2 maunds	5?,366 4	4.38O-2	7O4-8	1,742-4
	4	Ditto indigo „ 12 „	2,096 3	3,702-6	444*7	1,064-8
	5	^ahes of ISO maur.ds weeds	1,760 5	3,206-5	10H-9	568-7
	6	Ditto top dressed with Saltpetre, 240lbs ...	2.184-O	6,094-1	632-4	2,456 3
	7	Ammonic chloride, 24o)t>s	2,005*5	3,388-0	353 9	76U-2
	8	No manure ... — ...	1,651 6	2,^37*8	...	...

No, I. Aminonic cholride (sal ammoniac) gave a little increase over potassic nitrate (sal pet re), but the amount is so very small that is it scarcely worth noticing, while its price (Rs. 23·4 per maundj is considerably more than the price of saltpetre.

No. II. *Jeye's purifier or misdSble creasote.*—Before sowing the seed was soaked in a solution containing 1 pint of purifier to 12 gallons of water, or in proportion of 1 to 96. The increase in outturn though small in quantity is great in comparison to the cost of the application which is almost nominal, one gallon, the cost of which at Gawnpore amounted *to* Rs. 10*3, being sufficient for soaking seed, which would sow at least 10 acres of land ; and it deserves a more extended trial. The effect is to preserve the seed from animal depredations and possibly, as claimed for it, to produce a healthier plant. It is also said to be a fertiliser, but I am unaware as *to* how it acts in that way.

No. III. *Silt.*—Pond silt, especially where singharas *(trata natans)* are grown, is freely resorted to in Oudh wherever it can be had close at hand : its cost consisting of the cost of digging, carrying, and pounding, all of which operations the cultivator does himself.

No. IV. *Brick-kiln refuse* gave the largest increase; a top dressing of saltpetre on the plot manured with ashes of weeds increased its outturn by 423*5fbs per acre. Perished carrot seed gave an increase of 260*libs per acre more than perished indigo seed. The use of. the latter is pretty common in the district of Farukhabad and near the city of Lucknow, where it is plentiful at 8 to 12 annas per maund. The use of perished carrot seed is novel, and came about through a large quantity being handed over to the farm by Government for experiment. The seed was bought for the Unao district in anticipation of possible scarcity in 1880, but was happily not required. To auction it would have been to tempt the danger of its being resold as vital, hence its appearance here. A large portion of it, it may be observed, was used for feeding cattle, and, though the cattle at first rejected it, they subsequently took to it kindly and throve on it.

Experiments with lisar sail with a view to render it, if possible, fertile.—For these experiments 32 boxes, each 3' by 2' by *1'* were taken, filled wjth powdered lisar earth obtained from the worst description of lisar, and treated with the following substances, the boxes being in duplicate. In one series small holes were drilled in the Bides of the boxes to allow of drainage, while the other remained comparatively undrained, an arrangement corresponding to situations where kankar underlies the lisar plain—

No. 1. No manure.
99 2. Slaked lime.
99 3. Slaked lime and solution of common salt.
9> 4. Milk of lime.
9) 5. Fresh unslaked lime.
%% 6. Ditto and indigo refuse.

K*o. 7. Sand and lime (unslaked).
99 8. Sand.
99 9. Salt and lime (unslaked).
99 10. Brick-kiln refuse and lime (unslaked).
99 11. Calcic sulphate and lime (ditto).
„ 12. Calcic sulphate.
„ 13. Decayed lucerne (refuse from ensilage pit).
„ 14. Poudrette,
„ 15. Rotted indigo plant.
„ 1G, Ditto hemp do.

After exposure to the air for four months barley was sown in all of them- The seed germinated in all, but in none did the plants grow to more than one or two inches, save in the boxes treated with sulphate of lime in which the plants attained a height of fully six inches when they withered and died.

Barley, it may be remarked, was only sown as the season happened to bo passing, and it was not expected that any effect would be noticeable for at least six months of weathering under lime. Nor, may it be remarked, was success expected from several of the methods of treatment shown ; the only object in trying them being to avoid to some extent the inevitable question of " why did not you try this or that ?" Sand, freshly slaked lime, with or without nitrogenous matter, and calcic sulphate, were what I hoped to succeed with.

It was somewhat singular as a coincidence that only tho other day, long after tho last stalk of barley had succumbed, I received a letter from Mr. R. Warrington, F.C.S., the author of the " Chemistry of the Farm," and engaged at Rothamstead under Sir J. B. Lawes, expressing an opinion that calcic sulphate would be found tho best dressing for lisar soil. Further experiments will be made, but sulphate of lime, or calcic sulphate or gypsum, as it is variously called, will have to be much more plentiful and cheap than it is at present, before it can be applied to any useful extent to úsar plains.

Deep and shallow ploughing.—The experiments were repeated on the four plots tried last year. In addition to these a large field was taken up and divided into plots. The details of ploughings and the outturn of each is shown in Table XVII. The outturn obtained last year being quoted for comparison. The results obtained in the year under report corroborate those obtained in the preceding year :—

Table XVII.

dumber of plot.	Detail of ploughing.	*Outturn per acre.* In 1883-84. Grain.	Straw.	In 1882-83. Grain.	Straw.	*Increase per acre.* In 1883-84. Grain.	Straw.	In 1882-83. Grain.	Straw.
Series A. Plot I.	Ploughed to a depth of 9" one© in the rains and once at the time of bowing.	1,226-1	1,758-5	1,036-4	1,699*0	758-9	822-6	449-8	768*5
" II.	Ploughed to a depth of 5" once in the rains and once at the time of sowing.	6791	1,374-4	775-3	1,206*0	211·9	438-4	188-7	275-5
„ HI.	Ploughed with the ordinary native plough twice in the rains and twice at the time of sowing.	492*4	996*9	588-7	921-0	...	...	...	...
n IV.	Ditto ditto	442-0	876-2	584*5	940-0	...	...	...	...
Sei ies B. riot J.	Ploughed to a depth of 9" once in the raina and once at the time of sowing.	1,304*0	2,406-9	...	...	575-7	1,264-6	...	...
„ II-	Ploughed to a depth of 5" once in the rains and once at the time of sowing.	1,006-6	2,005-9		...	278-6	803-6	...	...
„ in.	Ploughed with the ordinary native plough twice in the laius and twice at the time of sowing.	728-3	1,2023	...	...	...	...	...	...

Irrigation.—Two series of experiments are annually tried under this head—

(1) to determine the variations in outturn brought about by an increase in the number of waterings ;

(2) to test the comparative merits of well and canal water.

The experiments under (1) were repeated on the same six plots as last year. The number of waterings applied, ranged from one to five. One plot was kept unirrigatfed. Other treatment of the plots besides watering was—

Xlanuring—Nil.
Ploughing—Five times.
Weeding—Once.
Sowing—Wheat 120ft>s per acre.

" The utility of irrigating depends on the season. In the preceding year, due to the heavy rains of January, it was not possible to apply more than four waterings, and the fourth watering, though it produced some increase, was not much wanted. It was that the third watering produced the greatest effect. In the present year, however, the air was extremely dry, and very high and hot westerly winds were prevalent just when the grain was ripening ; consequently, timely and copious irrigation saved it from shrinking; and so the fifth watering produced the largest increase in the weight of grain, "while the application of three waterings only, which failed to save the grain from shrinking, gave little increase over two waterings.

Table XV111.

Number of watering.	*Outturn of grain per acre.*		*Increase due to each watering over the preceding one.*	
	1688-84.	1882-83.	1883-84.	1882-83.
	359-9	3.30 0	...	
One	768 9	412-5	409-0	82-5
[illegible]	b14 b	481-5	45 9	69*O
3'bree	b4ti*5	651*5	31-7	170O
*Our	998 2	698 2	151-7	46*7
ilv e	1,252*0	...	253-8	...

{2) The comparative merits of well and canal water.

These experiments were repeated on the plots of the preceding year and on two since laid out in order to duplicate the experiment. The outturn of the two series is noted in Table XIX. The well water, as in the previous years, gave a larger outturn than that of the caual, but the increase hardly covers the increase in cost of watering from well.

Table XIX.

Number of plot.	Detail of irrigation.	*Outturn per acre.*		*Increase per acre.*	
		Grain.	Straw.	Grain.	Straw.
Series A,					
I.	From well	864	1,836	144	S16
IX.	From caual	720	1,6*0	...	...
Series B.					
I. *	From well	1,824	2,746	245	82
11.	From cunal	1,679	2,UG-L	...	...
	Average increase due to well watering.	...	...	1945	149

	11.*
Value of average increase due to well watering	5 *
Increase in the cost of watering four times from well over watering four times from canal,	*•?

*For details of coat, *vide* report of 1382-83, page 7.

New methods of cultivation.— The system of cultivating wheat first devised by Jethro Tull has of late been reattracting attention in England; and in an article by Mr. Bernard Dyer in the *Agricultural Economist* for September, 1883, the system was clearly described as one in which a field is divided into strips alternately raised and depressed. On the raised strips the crop is planted while the depressed strips are, during the growth of the crop, constantly cultivated. In the following year the strips change places, the cropped strips of one year becoming the fallow strips of the next. Thus half the field is cropped each year and half remains fallow, and the fallow portions may with advantage be occasionally * grown on a leguminous crop.

In this way Jethro Tull claimed that full crops of wheat could be grown year by year on the same field without manure.

It was resolved to give the system a trial on a field of fair size which was divided off into two portions. One section was sown after the native fashion behind the plough, while the other was divided off into raised strips four feet wide with the fallow strips five feet wide. Wheat was dibbled in on the raised strips in three rows, one foot apart, so that actually but one-third of the entire area was urnler crop. The field was not manured, it may be observed, in the previous year beyond being green soiled with hemp after which it was cropped with wheat.

Both the native cultivated plot and the Jethro Tull raised plots were weeded once and irrigated five times ; irrigation in the case of the latter being applied to the fallow-spaces which were cultivuted four times with an American hand-hoe. It may also be noted that before dividing off the field for experimont it was ploughed with a Watt's plough four times. The crops on the raised strips at one time looked as fine as any on the farm, but the exposed situation of the corn thinly sown on narrow strips lead to much of the seed being thrashed out by high winds which sprung up just when the grain was ripe and before it could be reaped*

The ears of wheat and the grain were undoubtedly the finest on the farm, but oddly enough while the grain on the native-sown plot retained its natural colour (white) that on the Tull plots was tinged red.

The following table shows the outturn :—

Table XX.

Specific treatment.	*Outturn per acre.*		Remarks.
	Grain.	Straw.	
Sown on beds	988-2	1,378-4	Taking the whole area of the plots into account.
	2,964 6	4,185-2	Calculated on the area actually under crop.
Sown in the ordinary way ...	1.376-2	2,642-4	

Thus while on the whole field the onttnm was small the outturn on the area actually cropped was almost equal to the highest yield obtained by liberal manuring on on any other part of the farm.

Mr. Dyer contends, in the article referred to, that Tull's system would in time greatly impoverish the soil, owing to the active nitrification set up by the constant tillage and the loss again of nitrates so formed by drainage, thus rapidly exhausting the "inavailable nitrogen;" but I opine that cropping the spaces with peas or lucerne in alternate years would to some extent meet this objection.

The raised plots and drill sowing will be so managed next year as to leave fully half the area under wheat.

It may seem somewhat Utopian, but still it is by no means impossible, that by this system of growing wheat the cultivator can till outlying lands for which at present he can afford no manure with as much profit as his manured lands. The pity is that so great an issue should hang on a stray field at Cawnpore, and that there is not, as there would be in America, hundreds of farmers ready to test fully and practically any such idea that presented any glimmer of progress accepting cheerfully as inevitable that in experimental woik there must be more disappoiutment than success.

Sowing with a treble drill as practised in the Central Provinces.—One of these drills was kindly supplied from Nagpur by Mr. Fuller, who sent a man also from the Nagpur farm to explain its use.

The drill possesses the advantage of sowing three rows at once instead of one as is the case with sowing after the plough practised in these Provinces, but it requires a very powerful pair°of bullocks. At the farm it was used with two pairs of bullocks which drew it with difficulty. Another point of difference in this drill is that ils delivery tubes are rather wider apart than in the ordinary plough furrows. The lines of the former are much straighter, but it does not sow the seed as deep as when sown behind the plough. The plots sown in the two ways formed part of one field and were treated exactly alike in every other way.

The outturn is noted in the table below :—

Table XXL

Detail of sowing.	Outturn per acre.	
	Grain.	Straw.
Sown with Central Provinces' drill	1 353 3	2,099-5
Sown behind the plough	1,219*9	2,348*5

Outturn of certain crops.—Among these may be mentioned—

1. Cape oats. | 3. Riga linseed.
2. English barleys. | 4- White linseed.
5. Poppy.

Cape oats.—This is the fourth year of our experience of Cape oats at the farm. The method of treatment of the three fields on whioh this variety was sown during the year under report and the outturn are noted in the Table XXII.

Table XXII.

Number* of plot.	Area of each plot.	Specific treatment.	Outturn per acre.	
			Grain.	Straw.
I- ...	1,343	Manured with poudrette at the rate of 100 maunds to the acre.	3,018*2	6,384-1
	2,307	Ditto ditto	2,756-9	6,429*5
& ::	2,177	Fallowed after m.-iize which was manured with poudrette 100 maunds to the acre.	1,952-0	6,233-4

The average outturn in the present year exceeded the outturn obtained in any- previous year, although more than one-third of the area had borne maize in the kharff immediately preceding.

Year.	Area on which average was struck. Acres.	Outturn per acre. Grain. Bis.	Straw, lbs.
1883-84	1·10	2,507	5,327
1882-83	·28	2,026	3,303
1881-82	·26	1,706	2,198
1880-81	Very small area sown with a handful of seed.	2,219	3,993

English barleys—TrivA of the four kinds of barleys experimented with during the previous two years were repeated in a field which had borne American cotton up to August, Ib83, when it was cleared and the field manured with poudrette at the rate of

100 maunds to the acre, and the following varieties of barley sown. The field was ploughed four times with the earth-turning plough, weeded once, and watered four times:—

Golden. | Peerless.
Beardless. | Kotgarh.
Desi (country barley.)

The outturn of all the acclimatized varieties was much better, it may be observed, than that obtained in any previous year : still for grain the country barley continues to hold its own.

Table XXIII.

Variety.	*Outturn per acre.*					
	1883-84.		1882-83.		1881-82.	
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.
Golden	1,751·3	3,822·1	1,248	2,683	1,000	1,828
Beardless	1,438·9	3,020·5	853	2,855	803	1,843
Peerless	1,[illegible]4·6	2,9[illegible]9·7	1,112	2,788	741	2,198
Kotgarh	1,760·0	3,15[illegible]5·4	1,121	2,462	820	not noted
Country	2,465·6	2,857·0	2,018	2,437	1,591	1,319

Riga linseed—Was again grown on the same field as in the previous year. Its treatment during the year is noted below :—

Manure—Poudrette 100 maunds to the acre.
Ploughings—Four.
Weeding—One.
Waterings—Four.
Seed—Seed scattered broadcast at the rate of 1£ maund to the acre*

It was sown principally with the object of utilizing the stalks for paper material ;. a portion of it therefore was reaped when the seed was quite unripe, another when the seed was nearly ripe, and the third when it was fully ripe.

Pretty large quantities of stalks gathered at all three stages were sent to the Manager, Paper Mills, Lucknow : the results have not yet been communicated. The outturn of stalk and seed gathered iu the three stages of ripening are noted below :—

Table XXIV.

	Outturn per acre.	
	Seed.	Stalk.
Cut when the seed was quite unripe	[illegible]	2,381-7
Cut when the seed was nearly ripe ... ... — ...	[illegible]	2,913-5
Cut when the seed was dead ripe ... ... — ...	[illegible]	2,666-5

White linseed—Was tried in a field of some size, off which a crop of sorgho was taken in October, 1883, when it was cleared and treated as follows :—

Manure—Poudrette 100 maunds to the acre.
Ploughings—Four.
Weeding—One.
Waterings—Four.
Seed—40lbs. to the acre.

The crop was again frost-bitten in February when in flower, yet the outturn exceeded that of the previous year :—

	Outturn per acre.	
	1883-84.	1882-83.
Seed	€24*9	319·
Stalk	1»156'7	887'

PPly~*-With a view to test the produce, two small plots and one fairly big strip of land was sown with poppy. The two plots had been lying fallow for two years, and on the long strip cotton was grown up to September, 1883. The treatment of all three plots was as follows :—

Manure—Cowdung 100 maunds to the acre.
JHoughings—Four.
*Weeding**— Two.
Waterings—Four.

The plants on all the three plots were much finer than those on any poppy field in the neighbourhood, but owing to strong winds by day and cloudy nights, just when incisions were made in the poppy-heads, the outturn was considerably reduced, especially of the large field the plants on which failed in yield after the second incision.

Table XXV.

Number of plot.	Outturn per acre. Opium.	Seed.
	lbs.	lbs.
I.	15 3	265-5
... ...	15-6	327'4
... ...	6-8	259*3

The opium which was gathered was placed in the highest class by the Sub-Opiuna Agent attached to the Benares Division,

ENSILAGE.

In the last kharif report mention was made of ju&r fodder having been ensilaged in three earthen pits and ju&r *{sorghum vulgare)* and sorgho *{sorghum saceharatnT/i)* in two masonry pits. One of the earthen pits had been opened and its contents fed off to the farm bullocks at the time the kharif report was written. The other silos were subsequently opened and found equally successful. Their contents were fed off to bullocks, six of which were selected for experiments along with a buffalo, a mare, and a cow. These animals were fed for a month on such dry ju&r fodder as was available in the neighbourhood, and for an equal period on ensilaged fodder. At the end of each week each animal was carefully weighed on a platform weighing machine; while the milk of the cow, the quantity of fodder fed, and the droppings of the animals during the night were also carefully weighed. All these particulars are noted in tables at the farm, but for the purposes of this report averages have been struck as noted in the following tables ; the work performed for the two months during which the animals were kept under trial is also noted. These tables show—

(1) that the weight of the animal continually decreased so long as fed on dry fodder alone.

Table XXVI.

Animal.	Work performed by the animal.	Weight before put to feed entirely on dry juar.		Weight when fed on d>yjuc 'r taken at the end of the 1st week.		2nd week.		3rd week.		4th week.	
		Mds.	s.	Mds.	s.	Mds.	s.	Mds.	s.	Mds.	s.
Bullock No. 1 ...	Floufrhing	7	33	7	26	7	28	7	21	7	16
Ditto „ 2 ...	Ditto	7	36	7	33	7	29	7	13	7	11
Ditto „ 3 ...	Woi king bucket ...	10	11	10	3	9	38	9	27	9	20
Ditto „ 4 ...	Ditto	9	36	9	26	9	23	9	29	9	8
Ditto „ 5 ...	Diiving cart ...	9	2	8	39	9	1	8	37	8	31
Ditto „ 6 ...	Ditto	9	21	9	15	9	16	9	13	9	8
Buffalo ...	Cartin, night soil ...	11	21	11	13	11	13	11	6	11	4
Cow	Nil ...	6	3	5	33	6	28	5	20	6	18
Mare	Nil ...	5	16	5	11	5	7	5	8	4	39

(2) when fed on ensilage their weight increased for two weeks, after which it decreased. The animals then showed a desire for change and ate less food.

Table XXVII.

Animal*	Work performed by the animal.	Weight before put to feed entirely on ensilage.		Weight when fed on ensilage taken at the end of							
				1st week.		2nd week.		3rd week.		4th week.	
		Mds.	s.	Mds.	s.	Mds.	s.	Mds.	s.	Mds.	s.
Bullock No. 1	Ploughing ...	7	16	7	31	8	6	7	34	7	29
Ditto „ 2	Ditto ...	7	11	7	30	7	32	7	31	7	28
Ditto „ 3	Working bucket ...	9	20	9	25	10	8	9	37	9	32
Ditto „ 4	Diito ...	9	8	9	16	9	22	9	17	9	10
Ditto „ 5	Driving cart ...	8	31	9	3	9	3	8	38	8	36
Ditto „ 6	Ditto ...	9	8	9	16	9	17	9	6	3	39
Buffalo ...	Carting night soil ...	11	4	11	14	11	22	11	8	11	7
Cow ...	Ml ...	5	18	5	32	6	36	6	37	5	27
Mare ...	Nil ...	4	39	5	9	5	16	5	6	5	4

(3) ™ith the cow the quantity of milk decreased when fed on dry jufir and increased when fed on ensilage :—

Table XXXVIII.

Period,	Average quantity of milk per day	
	When fed on dry juār.	When fed on ensilage.
	Seers.	Seers.
1st week	1-72	1-41
2nd week	1-50	1·89
3rd week	1*43	1·82
4th week	1-34	1-93

(4) The amount of food by weight in the case of every animal when fed on ensilage was more than treble the quantity consumed when feeding on dry jufir, but the droppings showed too corresponding increase, save to some extent in the case of the cow and mare.

Table XXIX.

Animal.	Average amount consumed daily.		Dry droppings.	
	Dry jufir.	Ensilage.	When fed on juār.	When fed on ensilage.
Bollock No. 1	4-9	17-4	1-2*	1-3*
Ditto „ 2	5-6	17 0	1·0 *	M *
Ditto „ 3	5-9	20-8	1-8*	1-5*
Ditto „ 4	6-7	19-6	1·1 *	1-5*
Ditto „ 5	6 ?	1 5·0	1-2*	1-3*
Ditto „ 6	5*8	16-4	1-1*	1-6*
Buffalo	4-0	22*2	1-1*	1-3*
Cow	4-7	16·2	1-5f	2'2f
Pony	4-5	12-3	[illegible]	1-9f

The quantity of water drunk by each animal, though not measured, was observed to be considerably less when they were feeding on ensilage. During the latter period none of the animals showed signs of indisposition.

* During the night only.
t Ditto night and day.

The cost of digging silos and of roofing them in must necessarily vary with their dimensions. Figures for one of the pits whioh contained 163 maunda fodder and the cubical contents of which were 450 cubic feet are given below :—

	Ra.	a.	p.
Cost of digging at Re. 1-12-0 per 1,000 c. ft.	O	12	6
Cost of mud plastering at annas 6 per 1,000 square feet	o	11	s
Cost of tiling at Ks. 6 per 400 square feet —	11	8	O
Cost of supports	1	O	O
Total ...	is	15	9

Allowing interest on this at 6 per cent., and for repairs eight annas every year, the cost per annum due to construction may be taken at 13 annas per 100 maunds of fodder ensilaged.

The cost of cutting with the chaff-cutter per 100 rnaunds amounted to Be. 0-12-6 and cost of filling and treading amounted per 100 maunds to Re. 1-2-0.*

Thus the total cost of ensilaging 100 maunds juár amounted to fta. 2-11-6.

Thejuárat the time it was ensilaged was selling at about Us. 10 per 100 maunds ; allowing 20 per cent, for the quantity in the top-layer which was rejected as mouldy the cost per 100 maunds of ensilage amounted to Rs. 15-14-8. In the hot months when the silo was opened the dry juár fodder could with difficulty be had for Rs. 25 per 100 maunds in Oawnpore, and nearly one-fourth of this was rejected by the animals as uneatable.

In May last, I was present when a silo was opened at Bara Banki, which had Wn prepared under the directions of Major Noble, Deputy Commissioner. For the silo an old lime-kiln had been utilised, and the fodder was juár, about 75 maunds. Notwithstanding the fact that in the sinking process the descent of some portion of the weight had been arrested, the experiment was a decided success. From nine to ten maunds were considered unfit for use, constituting the usual mouldy top-layer. The whole of the rest was readily eousumed by bullocks, though it was found that they eat it better, after a time, when mixed with bhiisa, and this was the farm experience.

IMPLEMENTS.

Opinions regarding the working of the duplex plough distributed during last cold season have not yet been received for inclusion in the present report, but there seems to be little question about the plough being a success. The neighbouring cultivators, who have shown a steady front against all improved implements used at the farm, came forward last month to borrow the duplex for ploughing and sowing their kharif fields. Those in use at the farm continued to work satisfactorily and no further Modification has been found necessary. This plough was exhibited at the last Bahraich exhibition and was awarded a silver medal.

The chain water-lifts made at the farm have of late found favour with native owners of indigo factories, two of whom purchased eight pumps during the last month. The short lifts for raising canal water seem to be gradually winning appreciation from Native cultivators, several of whom borrowed lifts during last season to water their Tvheat and indigo crops. In the case of a cultivator whose fields were about two miles from the farm a fee of one anna per day was imposed as a test of sincerity* •the cultivator accepted the terms and used the pump for one month, paying one anna a day for the whole time. Trifling as this may seem, it is a beginning of a sort which is preferable to absolute indifference.

Winnowers.—Eight winnowere were issued during the season; but though the ones lately devised are superior to any of previous patterns, and work well for a time, it has not been found possible as yet to make them sufficiently solid and strong to stand continuous and heavy work, and until something more satisfactory has been devised their manufacture will be discontinued.

* In t*lc Ktuurif Heport for 1883, page 10,/or •• the coBt of cutting and tilling came to Kc. 1-2 0,*' «the cost of treading and filling came to I-2-0 "

A weeder received from America was tried for hoeing the empty spaces between the rows of wheat sown on Jethro TuU's Bystem, and in the fields of guinea grass planted from two to three feet apart. It completely pulverized the soS and cleared' out the weeds. The cost of cultivating with the implement amounted to 12 annaa per acre; weeding with a native hoe costs from Re. 1 to Rs. 2 per acre, according to the amount of weeds. The work of the native hoe cannot compare with the American weeder, as the latter not only outs the weed from the root, but buries it down completely, and pulverizes the soil as much as a native plough would do. It sells in America for *$5,* but its cost at Oawnpore amounted to Rs. 32.

Cornsheller.—A very simple and effective cornsheller has been devisefl and patented by Mr. W. B. Wishart, of the firm of Messrs. Begg, Sutherland, & Co. In principle it differs little from the American cornsheller in use at the farm, but has the merit of great simplicity and is much cheaper. Iron cog-wheels have been dispensed with and the fittings could be repaired or replaced by a good native mistri. Its price is said not to exceed Rs. 25. The machine was brought for trial very late in the season, at a time when it was difficult to get good cobs in any quantity • hence the trial was short.

The following table gives the results compared with the American pattern, bearing in mind that in Mr. Wishart's pattern only one cob is operated on at a time, while the American pattern is double-barrelled.

Table XXX.

Mode of shelling.	Detail of labour.	Time taken per lOOBs of grain shelled.	Cost of shellingper lOOlbs of shelled grain.
I. Shelter devised by Mr. Wishart.	1 man to feed 1 man to drive 1 boy to supply fresh cobs for shelling and to remove shelled cobs. 4 boys for removing Btruggling grains in the shelled cobs.	1st shelling 19-7 minutes, 2nd shelling 11-7 ditto. Removing [illegible] hand. ditto.	2-46 pice.
II. American shelter	2 men to feed ... 1 man to drive ... 1 boy to supply fresh cobs for shelling »"<* to removing shelled cobs. 4 boys to supply fresh cobs for shelling and to remove shelled cabs,	2 st shelling, 17*4 minutes 2nd shelling, not required. Removing struggling grains by hand. 17·4 minutes.	1-99 pice.
III. Shelling by stick, which is the cheapest mode of shelling among the natives ascertained in 1882.	6 bays	129-7 minutes	7-73 pice.

The farm was represented during the year at the agricultural shows at Aligarh Bnlandshahr, Sahâranpur, Meerut, Bahraich, and Partâbgarh, at all of which awards were gained for implements and produce.

The farm has remained under the superintendence of Bâbu Lachhmnn Parshad Barma, who has managed it with great care and intelligence, striving at all times his best to graft what appears valuable on to the indigenous system of agriculture.

D. G. PITCHER, MAJOR,
Assistant Director for Oudh,
In dung of Experimental Farm, Catvnpore.*

PBPNTBD AT THE H.-W. P. AND OUDB OOTKRMMttXT PUSS, [illegible]

REPORT

ON THB

CAWNPORE AGRICULTURAL STATION

FOR THE KHARIF SEASON, 1884.

ALLAHABAD:

MORTH-WE8TEBN HOVIN0ES AND OBDH GOVERNMENT PRESS.

1885.

No. 520A. OF 1885.

FROM

THE DIRECTOR, DEPT. OF AGRICULTURE AKD COMMERCE,
NORTH-WESTERN PROVINCES AND OUDH,

To

THE CHIEF SECY, TO GOVT., N.-W. P. AND OUDH,
REVENUE DEPARTMENT,
ALLAHABAD.

Dated Cawnpore, the 10th of March, 1885.

SIR,

I HAVE the honor to submit, for the perusal and orders of His Honor the Lieutenant-Governor and Chief Commissioner, the report of the Cawnpore Agricultural Station for the kharif season 1884.

2. The manure experiments show that for kharif orops as for rabi cow-dung is perhaps after all the cheapest and most profitable fertilizer, as it is most certainly the manure most readily procurable by the Indian cultivators.

3. In this kharif as in the last rabi a thorough inversion of the soil has proved decidedly advantageous compared with the mere piercing of the land with the native implement. It is in the end cheaper and gives a larger outturn for the labour worked.

4. In the experiment Ridge-sowing *versus* Broadcast-sowing of cotton the country method comes off best. But a further testing must be applied before a final verdict can safely be given.

5. It appears plain that, under existing conditions of Indian cultivation, it is a distinct disadvantage to take two crops of cotton from the same plant. It is better to take the one crop and then plough up the land in the spring either for another kharif crop or a cereal in the following spring.

6. New Orleans cotton failed. But there are other varieties which remain yet to be tried, and the successful introduction of an exotic cotton of a more marketable kind than the indigenous variety is not to be despaired of.

7. In regard to maize, which is a very important crop, it is proposed to attempt, in the coming kharif, the American method of sowing in " hills " or " squares," The secret of the success of this process lies in the free ventilation and sunlight secured to the plants. The success of the " hill" or " square " cultivation in America has been remarkable.

8. The ensilage experiment is still on its trial. If the fodder proves really serviceable'to working cattle, there seems every reason to hope that ensilage may yet become an institution in Indian farming. The whole cost of the silo up to packing and closing it is less than the cost of digging and lining an ordinary kutcha well, so that on the score of expense the cultivator cannot well complain.

9. The matter of ploughs is not an easy one. The same fashion of plough does not suit all soils and all sorts of cultivation. Experience, however, is being gained, and the Duplex plough will shortly be put to a practical test elsewhere.

10. Babu Lachman Prasad carried on the kharif operations at the Station in kU usual careful and discriminating way.

I have the honor to be,

SIB,

Your most obedient servant,

DONALD SMEATON,

Offg Director.*

REPORT

ON THB

CAWNPORE AGRICULTURAL STATION

FOR THE EHARIF SEASON OF 1884.

THE crops suffered this year considerably from heavy and inopportune falls of rain at the time of cotton and sorghum being in flower. The only crop which benefitted was juar on sloping ground of poor soil, which ordinarily would have given but a poor crop.

The following table shows the rainfall at the Station compared with that in the city adjacent to it and compared with the mean of the past 15 years :—

Month.	RAINFALL IN INCHES.		
	At the Station in 1884.	At the city.	
		In 1884.	Mean of 16 years.
June	2·67	2·2	2·61
July	8·11	6·4	9·60
August	2·47	26·6	7·80
September	9·32	9·6	8·81
October	[illegible]·17	6·6	1·06
November	...	...	...
Total ...	50·64	51·3	26·66

The following experiments were carried out :—

(1) Manures.
(2) Ploughings.
(3) Sowing in drill and on ridges against broadcast
(4) Cropping cotton a second year.
(5) Exotic cottons.
(6) Sorgho.
(7) Outturn of indigenous plants.
(8) Ensilage.

(1) Manures.—(a) *Experiments in a series of duplicate plots.*—The number of plots in each series was this year increased to 13, three new plots being added to each, one for sheep-dung alone, one for poudrette, and one for ashes of dung top-dressed with saltpetre.

The manures applied to each plot during the last five years and the crops raised therefrom are noted in Table I.

Table I

Number of plot.		1880-81.		1881-82.		1882-83.		1883-84.		1884-85.	
		Manure.	Crop.	Manure,	Crop.	Manure.	Crop.	Manure,	Crop.	Manure.	Crop.
I	Standard ...	Dung	Maize and wheat.	Dung	Maize ...	**Dung**	Maize	Dung	Maize ...	Dung	Maize.)
	Duplicate.	M7	Maize ...	Do.	Maize and wheat...	Do. ...	Do.	Do.	Wheat ...	**Do.**	Do.
II	Standard ...	Dung and bone-dust ...	Do. and wheat.	Dung and bone-dust ...	Maize	Dung and bone-dust	Do.	Dung and bonedust...	Maize ...	Dung and bone-dust	Do.
	Duplicate ...	*Nil*	Maize ...	Do.	Maize and wheat,..	Do. ...	Do.	Do.	Wheat ...	Do.	Do.
III	Standard ...	Dung and calcic sulphate.	Maize and wheat.	Dung and calcic sulphate.	Maize ...	Dung and calcic sulphate	Do.	Dung and calcic-sulphate.	Maize ...	Dung and calcic sulphate.	Do.
	Duplicate...	***mi***	Maize ...	Do.	Maize and wheat...	Do. ...	*Do.*	Do. ...	Wheat ...	Do	Do.
IV	Standard ...	Ashes of dung	Maize and wheat.	Ashes of dung	Maize ...	Ashes of dung ...	Do.	Ashes of dung ...	Maize ...	Ashes of dung ...	Do.
	Duplicate...	*Nil*	Maize ...	Do.	Maize and wheat...	Do. ...	Do.	Do.	Wheat ...	Do. ...	Do.
V	Standard ...	Poudrette	Maize and wheat.	Poudrette	Maize ...	Potassic nitrate	Do.	Potassic nitrate ...	Maize ...	Potassic nitrate ...	Do.
	Duplicate...	*Nil*	Miize ...	Potassic nitrate	Maize and wheat...	Do. ...	Do.	**Do.**	Wheat ...	Do. ...	Do.
VI	Standard ...	No manure	Fallow ...	No manure	Fallow	No manure ...	Fallow	Potassic nitrate and bone-dust.	Maize ...	Potassio nitrate and bone-dust.	Do.
	Duplicate...	*Nil*	Maize ...	Potassic nitrate and bone-dust.	Maize and wheat...	Potassic nitrate and hone-dust.	Maize	Do. ...	Wheat ...	Do. ...	Do.
VII	Standard ...	Bone superphosphate...	Maize and wheat.	Bone superphosphate ..	Maize	Bone superphosphate...	Do.	Potassic nitrate and bone superphosphate.	Maize ...	Potassic nitrate and bone superphosphate.	Do.
	Duplicate...	*Nil*	Maize ...	*Do.* ...	Maize and wheat...	Do. ...	Do.	Do.	Wheat ...	Do.	Do.
VIII	Standard ...	Bone-dust	Maize and wheat.	Bone-dust	Maize ...	Bone-dust ...	*Do.*	Sheep-dung and bone-dust.	Maize ...	Sheep «dung and bone-dust,	Do.
	Duplicate...	*Nil*	Maize	*Do.*	Maize and wheat...	*Do,* ...	Do.	Do.	Wheat ...	Do,	Do.
IX	Standard ...	Calcic sulphate	Maize and wheat.	Calcic sulphate	Maize	Calcic sulphate ...	Do.	Sheep dung and calcic sulphate.	Maize ...	Sheep-dung and calcic sulphate.	Do.
	Duplicate...	*Nil*	Maize ...	Do	Maize and wheat,..	Do. ...	Do.	Do.	Wheat ...	Do. ...	Do.
X	Standard ...	No manure	Maize and wheat.	No manure	Maize	No manure	Do.	No manure ...	Maize ...	No manure ...	Do.
	Duplicate..,	*Nil*	Maize ...	Do.	Maize and wheat...	Do. ...	Do.	Do.	Wheat	Do.	Do.
XI	Standard ...	Do.	Pulses ...	Dung ...	Cereals	Green soiled with hemp	Barley ...	**Do.**	Sorgho	Ashes of dung **and** saltpetre.	Do.
	Duplicate...	Do. ...	Maize ...	No manure	Cotton	No manure	Juar and gram.	Ashes of dung and saltpetre.	Sorgho and wheat.	Do.	Do.
XII	Standard ...	Do. ...	Pulses ...	Dung	Cereals	Green soiled with hemp,	Barley ...	No manure ...	Sorgho	Sheep-dung	Do.
	Duplicate...	Do.	Maize	No manure	Cotton ...	No manure	Juar and gram.	Sheep-dung ...	Sorgho and wheat.	Do.	Do.
XIII	Standard ...	Do.	Pulses ...	Dung	Cereals	Green soiled with hemp	Barley ...	No manure ...	Sorgho	Poudrette	Do.
	Duplicate ...	Do.	Maize ...	No manure	Cotton	I No manure	Juar and gram.	Poudrette ...	Sorgho and wheat.	Do.	Do

Other treatment of the 26 plots was as follows : —

Ploughings—Three.
Weedings—Two.
Irrigation—*Nil.*
Seed and rate per acre—Maize, six seers to the acre.

The outturn of grain and stalk during the present and the preceding year obtained from each plot is noted in Table 1L

Table II.

"Si 1 i	Manure and rate per acre.	Year.	OUTTURN PER ACRE. Grain. Standard.	Grain. Duplicate.	Stalk and leaf. Standard.	Stalk and leaf. Duplicate.
			Ib.	Ib.	Mds.	Mds.
i	Cow-dung, 180 maundfl ••• •••	1884	1860*0	1580-4	89-6	75-2
		1883	1462 5"	1170-0	42-9	31-3
2	How-dung, 180 mauuds; bone-dust 3601b...	1884	1632 0	1508 4	76-8	8R6
		1883	1720-5	1377 0	47 3	37 9
*	Cow.dung, 180 maunds ; caleic sulphate, 2401b	1884	1914 0	1524-0	96 0	80-8
		1883	16440	979'0	45*5	32-2
4	Ashes of 180 maunds dung ... .*.	1884	12300	806 4	69 6	48*8
		1883	1073 25	712-5	38-6	28 4
5	Potassic nitrate, 2401b	1884	1608-0	876 0	776	58 4
		18a.J	IOGS'0	829-5	45-3	•28 3
6	Ditto bone-dust, 360» ... —	1884	1644 0	12000	• 73*6	56-8
		18b3	179325	1244-25	476	32-3
7	Ditto bone superphosphate, 2401b....	1884	1260-0	852 0	760	£5-2
		1883	1335 25	104775	45 4	34*6
8	Sheep-dung, 180 maunds ; and bone dust, 360 lbs.	1881	1518 0	1062 0	80-8	53*6
		1883	1797*75	9 '9 0	42*5	271
9	Ditto and calcic sulphate, 2401b. ...	1884	1359-6	10740	70-4	584
		1883	3485-0	1341 0	35-3	34-4
10	No manure — —	1884	1044*0	5640	70-4	43 2
		1883	9900	801-75	34-7	32 3
II	Ashes of ISO maunds dung and potassic nitrate 240ft.	1834	15144	11340	73'6	68-*
		1883	...	...		
12	Sheep-dung, 180 maunds ...	18St	1316-4	1167 6	"*73 6	"69-6
		1833	...	...		
13	Poudrette, 180 maunds — ...	1881	1932*0	1728-0	"'96-8	"86-4
		1883	...	...		•••

The outturn of tho standard plots in every case is in excess of the duplicate plots. This is due to the fact, that the standard plots are cropped every year with maize, *> that they enjoy a fallow of more than seven months before they bear a crop, while in the duplicate plots maize follows whpat, and thus the fields remain fallow for three Months only.

Poudrette in each case heads the list and cow-dung seems to be more suited for maize than sheep-dung.

Saltpetre, which in the case of wheat gave almost as good results as dung, does not appear to as great an advantage with maize. In the duplicate plots the addition of bone-dust to saltpetre gave a good increase, in others, bone-dust as well as gypsum ^ are not of much use.

(ft) *Experiments to determine the comparative value of certain animal manures and *<*ltpetre.*— These were tried in a field divided into eight plots. The manures applied and the crops raised daring the previou* five years and in the present year are shown ia Table I1L

Table III.

Number of plot.	1879-80. Manure.	1879-80. Crop.	1880-81. Manure.	1880-81. Crop.	1881-82. Manure.	1881-82. Crop.	1882-83. Manure.	1882-83. Crop.	1883-84. Manure.	1883-84. Crop.	1884-85. Manure.	1884-85. Crop.
i.	Guano.	Wheat	Sheep-dung.	Wheat.	*Nil.*	Cotton.	*Nil.*	Wheat.	Woollen refuse.	Maize and barley.	Woollen refuse.	Maize.
ii.	Do. ...	Do. ...	Do. ...	Do. ...	Do.	Do. ...	Do.	Do. ...	Do.	Do. ...	Sheep-dung.	Do.
iii.	Do. ...	Do. ...	Do. ...	Do. ...	Do.	Do. ...	Do.	Do. ...	Brick-kiln refuse.	Do. ...	Cow-dung.	Do.
iv.	Do. ...	Do. ...	Do. ...	Do. ...	Do.	Do. ...	Do.	Do. ...	Poudrette.	Do. ...	Poudrette.	Do.
v.	Do. ...	Do. ...	Do. ...	Do. ...	Do.	Do. ...	Do.	Do. ...	*Nil* ...	Do. ...	Horse-dung.	Do.
vi.	Do. ...	Do. ...	Do. ...	Do. ...	Do.	Do. ...	Do.	Do. ...	*Nil* ...	Do. ...	Pigs dropping.	Do.
vii.	Do. ...	Do. ...	Do. ...	Do. ...	Do.	Do. ...	Do.	Do. ...	*Nil* ...	Do. ...	Saltpetre.	Do.
viii.	Do. ...	Do. ...	Do. ...	Do. ...	Do.	Do. ...	Do.	Do. ...	*Nil* ...	Do. ...	*Nil* ...	Do.

Other treatment of the plots during the year was as follows :—

Ploughings—Three.
Weedings—Two.
Irrigation—*Nil.*

Seed and rate—Maize, six seers to the acre.

The outturn of each plot is noted in Table IV.

Table IV.

Number of plot.	Manure and rate per acre.	Outturn per acre. Grain.	Outturn per acre. Stalk and leaf.
		lb.	Maunds.
1	Woollen refuse, 120 Maunds	1,604·4	126·4
2	Sheep-dung, 120 "	924·0	79·2
3	Cow-dung, 120 "	1,128·0	86·6
4	Poudrette, 120 "	1,560·0	101·6
5	Horse-dung, 120 "	1,104·0	81·6
6	Pigs dropping, 120 "	918·0	80·0
7	Potassic nitrate (saltpetre), 3 maunds	780·0	71·2
8	No manure	684·0	62·4

As this is the first year in which this field was brought under these experiments, no conclusion can safely be drawn. It is satisfactory to note, though, that woollen refuse, which last year was a failure chiefly because it had no time to rot, has this year topped the list and given a higher outturn than even poudrette. Its price on the spot is four annas a cart-load, or Rs. 1-4-0 per 100 maunds, which is only half the price of poudrette charged by the Cawnpore Municipality.

(c) *Brick-kiln refuse and ashes of weeds.*—For these a field was divided into four plots. Past and present treatment are noted in Table V.

Table V.

Number of plot.	Past treatment. Year.	Past treatment. Manure.	Past treatment. Crop.	Manure.	Present treatment. Ploughing.	Present treatment. Weeding.	Present treatment. Irrigation.	Present treatment. Crop.
I. ...	1881-82 ...	Dung ...	Wheat and barley.	As in table VI.	2	2	*Nil.*	Maize.
II. ...	1882-83 ...	Green soiled with hemp.	Oats ...					
III. ...	1883-84 ...	*Nil.*	Sorgho ...					
IV. ...	...	...	...					

The outturn obtained from each plot is noted in Table VI.

Table VI.

Number of plot.	Manure and rate per acre.	Outturn per acre. Grain.	Stalk and leaf.
		lbs.	Maunds.
1	Brick-kiln refuse, 120 maunds ... ... —	864-5	83*4
2	Ashes of 120 maunds weeds ... — ...	874-0	67 7
3	Ditto and potassic nitrate, 3 maunds	965-6	81-1
4	No manure	587*5	74*1

(2) Ploughing,—These experiments were repeated on the two series of plots experimented upon last year, which were ploughed as below :—

Series A., No. 1.—Ploughed twice with country plough.
,, ,, 2.—Ploughed once with earth-turning plough 5" deep.
,, ,, 3.— Ditto ditto ditto 9" ,,
,, ,, 4.—Ploughed twice with country plough.
Series B., ,, 1.— Ditto ditto.
,, ,, 2.— Ditto once with earth-turning plough 5" deep.
,, ,, 3.— Ditto ditto ditto 9" ,,

No manure was applied ; all plots were weeded twice.

The outturn obtained in the present year is shown in Table VII along with the outturn obtained in the two previous years.

Table VII.

Number of plot in the series.	Detail of ploughing.	Outturn per acre in 1884. Cotton.	Seed.	Outturn per acre in 1883. Cotton.	Seed.	Increase per cent, over country ploughed in 1884. Cotton.	Seed.	Increase per cent, over country ploughed in 1883. Cotton.	Seed.
Series A.		lb.	lb.	lb.	lb.				
Plot I.	Twice with country plough ...	36-8	78-4	110-9	249-0	...	...	...	...
" II.	Once with earth-burning plough 5",	48*0	96*0	141-1	308-5	22	12	18	19
" III.	Ditto ditto 9",	6H-8	324-8	136-1	304-5	55	45	14	17
" IV.	Twice with country plough ...	416	92-8	1280	269*2	...	...	...	...
Series B.									
Plot I.	Ditto ditto ...	31-2	60*6	93*4	198*7	...	...	...	...
II.	Once to 5" with earth-turning plough.	34*8	70-2	104-9	232 4	11	15	12	17
III.	Once to 9" with earth-turning plough.	37-2	76-8	114-7	238-4	19	26	22	20

(3) Broadcast *versus* drill.—This was tried in five fields, two of which were sown with country cotton, two with Nankin and one with New Orleans cotton ; the last, *however*, came to grief, being covered with water for several days. Each field was divided into four plots and sown as follows :—

(1) On tops of ridges.
(2) On slopes of ridges.
(3) In lines.
(4) Broadcast.

Other treatment and outturn of the fields are noted in Table VIII.

Table VIII.

Number of plot in the series.		tō c IS S	Manure.		tic ja G*	Seed.	Detail of sowing.		Outturn per acre in 1884.	
									1 8	
Series A. No. 1	...	2	Nil	...	2	Kul pahar cotton.	On top of ridges	...	75 6	159 4
Ditto „ 2	...	2	Nil	...	2	Ditto ...	On slopes of ridges	...	72 0	144·0
Ditto „ 3	...	2	Nil	...	2	Ditto ...	In lines	...	67*3	139 3
Ditto „ 4	...	2	Ai/	...	2	Ditto ...	Broadcast	...	93-7	196-5
Series B. „ 1	...	2	Cow-dung, 20U maunds to the acre.		2	Ditto ...	On top of ridges	...	49·0	1129
Ditto „ 2	...	2	Ditto	...	2	Ditto ..	On slopes of ridges	...	44 2	100 4
Ditto „ 3	...	2	Ditto	...	2	Ditto ...	In liues	...	40*6	92-6
Diito „ 4	...	2	Ditto	...	2	Ditto ..	Broadcast	...	56-8	1147
Series C. „ 1	...	2	Poudrette, 200 maunds to the acie.		3	Nankin * cotton.	On top of ridges	M«	51 1	169 4
Ditto „ 2	...	2	Ditto	...	3	Ditto ...	On slopes of ridges	...	4G 2	15S-6
Ditto „ 3	...	2	Ditto	...	3	Ditto ...	In lines	...	[illegible]	[illegible]
Ditto „ 4	...	2	Ditto	...	3	Ditto ...	Broadcast	...	52-2	174-8
Series D. „ 1	...	2	Ditto	...	3	Ditto ...	On top of ridges	...	41-9	146-8
Ditto „ 2	...	2	Ditto	...	3	Ditto ..	On elopes of ridges	...	28-9	91·1
Ditto „ 3	...	2	Ditto	...	3	Ditto ...	In lines	...	27-0	100-0
Ditto „ 4	...	2	Ditto	...	3	Ditto ...	Broadcast	...	48-1	168-7

Ridges as in the last year were made by running a plough in opposite directions. Sowing on tops of ridges gave a better yield than sowing either on slopes or in lines, but sowing broadcast gave this year the largest outturn. This WHS due to the heavy rains resulting in a rapid growth of weeds amongst the ridges and lines, which in the moist state of the ground could not be removed fast enough. In the portions sown broadcast the plants, being much closer than in other plots, served to keep down the weeds, while in the otheVs the plants themselves were quite overpowered by weeds.

(4) Cropping the plants for a second year-—One field of New Orleans and one of Nankin cotton were left standing over from last year and a portion of each was ratooned. Their treatment and outturn are shown in Table IX.

Table IX.

Number of plot.	Particulars of sowing and ratoouing.	*Manure and rate per acre.* 1883-	18S4.	•M S o	c I	ei JB 1	*Out urn per acre* CottOD.	Seed.	*Outturn per acrt in preceding year.* Cotton,	Seed.
							lb.	lb.	lb.	lb.
1a	Sown in lines ID July, 1S83, and ratooned in April, 1884.	Poud rette. 200 mannds to the acre.	Woollen Fe-fuse, 50 maunds to the acre.	I	2	*Nil*	24 9	44-6	126	388-2
Ib.	Do., uot ratooned.	Ditto ...	Ditto ...	1	2	*Nil.*	14-8	38*4		
11a	Sown on ridges in July, 1883, and ratooned in A|>nJ, 1884.	Ditto ...	Poudrette, 100 raaunds to the acre.	1	2	*Nil.*	49-1	93 3	188 5	497-0
116	Do., not ratooned,	Ditto ...	Ditto ...	1	2	*Nil.*	37·7	73 7		

The cotton gathered from each field was inferior in quality to that gathered from the same fields in the preceding year and to the cotton gathered from fields sown this year with similar varieties of cotton. The value of cotton seed is so very smalt and the labour so very cheap in this country that no advantage seems to be gained by keeping the crop on the ground for a second year and losing the advantage of ploughing up the land in March or April and leaving it in open furrows.

(5) Exotic cottons.—New Orleans has already been noticed as having completely failed owing to excessive rain, and it may be noted that both in the Duab and in Bundelkhand the cotton crop failed more or less. In some parganas it was ploughed under and rabi sown.

Nankin cotton : three varieties of Nankin cotton were tried in the present year: —

(1) Procured from Yarkand.

(2) Received from China through the Government of India.

(3) Acclimatized in Station.

There is a marked difference in the habits of the three varieties. Nos. 1 and 2 appear to be of the oriental variety, having few bunches and small deeply indented leaves similar to the ordinary cotton of these provinces. No. 3 is distinctly occidental or similar in growth and habit to American cotton. The China seed was, under orders from the Government of India, distributed to the neighbouring cultivators to cover about 20 acres of ground and about five acres of Station land were sown with similar seed. Germination was very irregular.- Field's sown at the rate of 18 to 20 seers of seed per acre had not as many plants as fields sown with 3 seers of the acclimatized variety. The plants wejre very stunted ; most of them died before October and those which survived bore scarcely any cotton. The fate of plants raised from the Yarkand seed was not much better. The fields sown with acclimatized seed fared comparatively well. The treatment and the outturn of these fields are showa in Table X.

Table X.

Number of field.	Manure.	Ploughing.	Weeding.	Manner of sowing.	Area.	Outturn per acrt.	
						Cjottun.	Seed.
					Acre.	Tbs.	Hi*.
I-a ...	Poudrette, 200 maunds to the acre.	2	3	On top of ridges.	•18	51-1	169'4
^ ...	Ditto ...	2	3	On slopes of ridges.	•18	4G-2	358-6
c ...	Ditto ...	2	3	In lines ...	•18	43 0	15^ V*
d ...	itto ...	2	3	Broadcast,	·18	52 2	171 S
II-a ...	Ditto ...	2	3	On top of ridges.	•18	41*9	14t> 8
b ...	Ditto ...	2	3	On slopes of ndg«*i.	•20	28 9	91-1
e ...	Ditto —	2	3	In lines ...	·on	27 0	100-0
d ...	Ditto ...	2	3	Broadcast,	•20	4S 1	35C17
III ...	Dnnpr, 100 maunds to the acie.	2	2	Do. ...	1-16	S8 7	115-9

It is to be noted here that the season for picking this cotton is not yet over ; the plants are still laden with bolls and about ome-third at least more than what has been gathered may yet be realized^

(8) Sorghum.— Red and amber varieties of sorghum were sown in ovor threo acres of land. The plants had attained a height of over 6 feet in September, whea. the heavy rains and strong winds of that month laid the crop flat beyond recovery, It was, therefore cut and used ior fodder.

(7) Outturn of indigenous plants.—To determine the average produce the following crops were selected for this season :—

1. *Knknn* (Sehiria italica).
2. *Sanwaii* (Panicum frumentacenm).
3. *ALarua* (Eleusino coracana).
4. *Kodon* (Puspalum scrobiculatura).
5. *Bajra* (Penicillaria spicata).
6. *Juar* (Sorghum vulgare).

7 *Mung* (Phaseolns mungo).
8 *Moth* (Phaseolus aconitifolins).
9 *Lobia* (Vigna catiang).
10 *Ord* (Phaseolus radiatus).
11 *Sanai* (Crotalaria juncea).
12 *San* (Hibiscus cannabinus).
13 *Maize* (Zea mays).

All these crops excepting maize, sanai and patsan were tried in two series of plots; one of these series was manured with cow-dung at the rate of 120maunds to the acre and the other kept unmanured. Both consisted of light soils. The soil of the series kept unmanured was, however, the poorer of the two, but it possessed the advantage of good drainage, and so, notwithstanding the natural poverty of the soil and want of manure, in many cases these plots gave better yield than the plots which enjoyed comparatively better soil, and had received manure.

Sanai and patsan were sown in light soils, but maize was sown in rich heavy loam.

The treatment and outturn of these plots are shown in Table XI.

Table XL

[illegible] plot.	Crop.	Manure and rate per acre.	[illegible]	[illegible]	Outturn per acre.. Grain.	Outturn per acre.. Straw.
					lbs.	Mds.
1a	Kakun ...	Dung, 120 mds.	2	1	602-4	38-2
16	Ditto ...	*Nil*	2	1	644-4	43*0
2a	Sanwan .,,	*Bung,* 120 mds.	2	1	354-0	34*8
26	Ditto ...	*Nit*	2	1	192-0	19-3
8a	Mania ...	Dung. 120 mds.	2	1	639 6	33 9
36	Ditto ...	*Nil*	2	1	578 4	36 3
4a	Kodon ...	Dung, 120 mds.	2	1	606-0	21*3
46	Ditto ...	*Nil*	2	1	708-0	16*3
5a	Bajra	Dung, 120 mdi.	2	1	738*0	102 0
56	Ditto ...	*Nil*	2	1	444·0	89*3
6a	Juar	Dung, 120 mds.	2	1	531-6	85 2
66	Ditto ...	*Nil*	2	1	564 0	115-6
7a	Mung	Dung, 120 mds.	2	1	102-0	53-4
76	Ditto	*Nil*	2	1	1800	57-0
8a	Moth	Dung, 120 mds.	2	1	1152	40-2
86	Ditto ...	*Nil*	2	1	204-0	47-8
9a	Lobia	*Dung,* 120 mds.	2	1	576·0	42-7
96	Ditto ...	*Nil*	2	1	636·0	44*5
10a	Urd.	Dnng, 120 mds.	2	1	438*0	43-6
106	Ditto ...	iVi7	2	1	366·0	25*5
11	Sanai	Dang, 120 mds.	2	.1	548-4	...
12	Patsan ...	Ditto	2	1	348·0	[illegible]
13	Maize, country ...	Poudrette, 120 mds.—	3	2	• No. of cobs, 16,911 Weight ... 1,668-7tb	169-0
	Ditto Jaunpur ...	Ditto	3	2	* No. of cobs, 13,140 Weight ... 2642-1 lb	152-2
	Ditto Kashipur ...	Ditto	3	2	• No. of cobs, 17,823 Weight ... 385331b	170-3

• Cobs kept for seed and so not shelled.

(8) Ensilage.—Fodder was this season ensilaged in 10 earthen pits and three masonry pits, the crops ensilaged being juar, sorghum, Guinea-grass and common grass. The first three were grown at the Station and the last purchased from grass-cutters at one anna per 82 lbs. The grasses were cut while going to flower. The sorghum and a portion of the juar were also cut while in flower, but most of the juar was cut when the cobs were fully formed and ripe enough to allow of their bein^ cut and stored ; the stalks were quite green, though they had lost a good deal of moisture. Juar, sorghum and a portion of the Guinea-grass were chaffed before packing, while the common grass was packed entire. The earthen pits were all either elliptical or circular in form, a little broader at the top than at the bottom, so as to give a slope to the walls, and of varied capacity. Seven of the pits were provided with "*cfiappars*" to shelter them against the rain, and over three only a sloping mound of earth three feet high was made similar to the way in which heaps of cow-dung fuel are preserved in villages. A silo of this description has been made by neighbouring cultivators in which they haro

ensilaged about 100 maunds of juar. In the case of the larger pits an opening was cut at one of the sides to allow passage to a bullock for treading down the stuff. The silos, as in previous years, were filled by suocessive layers; each layer after it was trodden down was sprinkled over with a little salt and covered over with *bhusa* about two inches in thickness. The intermediate layers were weighted with pieces of bricks and the final layer with a layer of earth two to three feet deep.

Details of cost and the quantity ensilaged are shown in Table XII.

Table XII.

Number of silo.	Form of silo.	Cost of digging.	Cost of *chhapar*.	Pillars.	Cost of chopping.	Cost of filling, treading and weighting.	Fodder filled in
1	2	3	4	5	6	7	8
		Us. a. p.	Rs. a. p.	Rs. a p	Rs. a p	Rs. a. p.	Mds.
1	Circular, 6' diameter, 10' deep ...	0 8 0	0 6 0	...	2 2 3	0 15 6	Juar ... 71
2	Ditto ditto ...	0 8 0	0 5 0	...	1 12 6	0 10 6	Juar ... 74
3	Ditto ditto ...	0 8 0	0 5 0	...	2 9 3	0 13 0	Juar ... 62 Sorgho ... 23
4	Ditto 6' diameter 10' deep...	0 8 0	0 11 6	...	1 6 6	0 8 0	Juar ... 61
5	Ditto 6' diameter 20' deep...	2 0 0	G 13 6	...	4 13 0	1 10 3	Juar ...180
6	Ditto 10' diameter 6' deep ..	0 12 0	2 8 0	...	5 3 6	1 8 0	Juar ...171
7	Elliptical, longest diameter 18' shortest diameter 10', depth 10'.	3 12 0	21 4 0	6 6 0	Not chopped.	3 8 9	Common grass 725
8	Ditto ditto ...	3 11 0	20 7 0	6 6 0	13 13 0	2 8 0	Juar ...490
9	Ditto longest diameter 25' shortest diameter 10', depth 12'.	6 8 3	22 7 0	7 6 0	20 1 6	4 11 0	Juar ...756
10	Ditto longest diameter 30' shortest diameter 18', depth 13'.	13 9 0	39 10 6	15 13 0	43 13 3	7 14 3	Juar 1,417 Guinea-grass, 416
11	Square 10' by 10' depth 5' ...	Disused masonry pits.			Not chopped,	1 11 0	Common grass, 58
12	Ditto		Ditto.		ditto.	2 4 0	Ditto .. 212
13	Ditto		Ditto.		ditto.	2 1 0	Guinea-grass, 191

It is to be noticed that the cost of digging would have been much less but for the Kalpi Railway line, which engaged almost all the labour of the neighbourhood, and labourers for digging could not be had for less than three annas a day at the time these silos were being made. The cost of chaffing also would have been much less bad the chaff-cutters ordered from England been received earlier, as in their absence most of the fodder ensilaged had to be out by country choppers. Chaffing, however, had to be resorted to in any case whether the fodder is ensilaged or not, and its cost, therefore, should not be taken into account in connection with the silos.

IMPLEMENTS.

Ploughs.—For working heavy soils Duplex ploughs were made after the " Watts" pattern and on trial were found to work with great ease. Further modifications are under contemplation to strengthen the stilt and get rid of the step, so as to assimilate the pattern more to that of the plough used in the Meerut Division than that of the plough used in the lower Doab.

Pumps.—Iron wheels have been substituted for wooden ones, being greatly preferred by zamindars. In Rohilkhand 14 were sold through an agency, while in the neighbourhood of the Station the short lifta were freely borrowed by cultivators.

American sugar evaporators.—Pans have been sent to the Shâhjahânpur district in charge of an apprentice, to be worked practically in view of the cultivators. The result will be noticed in the rabi report.

I was absent on leave during the time that the greater portion of the CM ops were being harvested. Babu Lachman Prasad, the Superintendent, has had the whole responsibility, carrying on the work under some difficulties, as he has had to conduct at the same time the statistical work of the Assistant Director, North-Western Provinces. He deserves great credit for the way in which he has carried out his work.

D. G. PITCHER, MAJOR,
Assistant Director for Oudk,
In charge of Agricultural Station, Cawnpore.

REPORT

ON THE

CAWNPORE EXPERIMENTAL STATION

FOE THE.EABI SEASON, 1884-85

ALLAHABAD:

HOBT«.\V KSTESN FBOVINOBS AND OUDH 0 0 V B R H H T, K T FE.ISS

' I 8 8 5 .

No. 1581A OF 1885.

DEPARTMENT OF AGRICULTURE AND COMMERCE, N.-W. P. AND OUDH.

DATED CAWNPORE, THE 15TH OCTOBER, 1885.

FROM

DONALD SMEATON, ESQ., M.A., C.S.,

OFFG. DIR., DEPT. OF AGRI. AND COMMERCE,

N.-W. PROVINCES AND OUDH,

To

THE CHIEF SECRETARY TO GOVERNMENT,

N.-W. PROVINCES AND OUDH.

SIR,

I HAVE the honor to submit the following report by Mir Muhammad Hosein of the results attained in the Cawnpore Experimental Station during the past *rabi* (1884-85) season.

2. The character of the season of 1884-85 differed widely from that of its predecessor. In 1883-84 the rains ceased after the middle of September, and fields had to be watered before sowing. In 1884-85 heavy rain fell late in October ; the land was for a time water-logged ; when sowing time came the soil was too wet for vigorous, healthy germination : consequently the plants came up rapidly and sickly. A little later on, when irrigation became necessary to strengthen the young crop, the canal supply was found insufficient and it came too late. The result has been a considerable falling off in outturn. Wheat, which yielded 24·2 bushels on an average in 1883-84 and 21·8 bushels in 1882-83, only yielded 17·7 bushels in the year under report. Season.

3. In the series of duplicate plots saltpetre gave the largest yield of all the single manures. The results of applying this fertilizer appear to be always, or nearly always, certain: and for cereals it would appear undoubtedly the best. The increase which it has given, compared with ordinary cowdung during the last four years, is as follows:— Manures.

	Increase per cent, over unmanured land.	
	Saltpetre.	Cowdang.
1881-82	83	7
1882-83	101	61
1883-84	22	34
1884-85	84	42

Among the combined manures bone superphosphate yielded fair results when applied in combination with saltpetre. It is doubtful, however, whether this manure can ever at present prices coma into ordinary use by the Indian cultivator.

In the *Ville Series* the results of the present season confirm tho'se of previous years, *viz.,* that for a cereal crop a soluble nitrogenous manure is essential. This fact is now completely established. The series will therefore be dropped.

4. *Application of excrement of different kihds.—The* series appears for the first time. Poudrette heads the list. Sheep-dung comes last

5. *Green soiling.*—Indigo ploughed in green yielded a net increase of Rs. 27-8 per acre, against Rs. 19 obtained last year. This difference in favour of the present season is chiefly due to the heavy late rains, which thoroughly rotted the green plants and allowed of rapid and easy assimilation of the fertilizing ingredients.

Uiar.

6. Usar soil in the vicinity of Cawnpore was treated *in situ* with calcic sulphate in the rains of 1884. Barley, -gram, and peas were sown, but the land evidently had not time to be pulverized, and the plants, after coming up a few inches above the ground, withered and died. Samples of soil from the usar plain where these experiments were tried have been analyzed, at my request, by Dr. Romains, Chemical Examiner, British Burma. He is of opinion that the fault lies more in the mechanical texture than in the chemical nature of the soil. The report which Dr. Romains very kindly prepared is appended.

Deep ploughing.

7. *Deep ploughing.* -Taking the average of all the experiments, deep plouging gave an increase over the ordinary shallow country ploughing of 53*5 per cent, when the land was ploughed 9 inches deep and 43*5 per cent, when ploughed 5 inches deep, although the number of shallow ploughing^ was twice as many as of the deep ploughings. In order to give practical proof of the wisdom of deep ploughing, ploughmen from this experimental station, under the charge of apprentices, have been sent out to five selected districts with the new (duplex) plough, and are now touring about in these districts, ploughing for cultivators wherever they get a chance. It is no use exhibiting a new plough when ploughing operations are over. The important matter is to catch the people while ploughing is going on and drive the new plough in the fields side by side with the common country implement. The work done thus in ordinary course naturally draws the attention of the cultivator. If we are ever to get deep ploughing into the heads of the people, this, it seems to me, is the only way. The district officers of the five selected districts and some of the selected zamindars and talukdars have cordially co-operated. The reports of progress received up to date are encouraging.

Irrigation.

8. *Irrigation experiments.*—The two series of experiments tried last year under this head were repeated in the present year. The one was to ascertain the maximum number of waterings requisite to obtain the maximum quantity of produce. As observed in the review of the last year's report, it is not possible to say what is the exact number of waterings

nece ssary under all circumstances. The number must vary with thedryness of the season and with the nature of the manure applied. Last year the 5th watering gave an increase of Us. 6 over the 4th watering, and the latter an increase of Rs. 3*7 over the 3rd watering; while this year the 5th and 4th waterings gave an increase of Rs. 2'9 and 1-6 only over the 4th and 3rd waterings respectively. Thus, if the cost of watering be taken into account, any watering after the 3rd would seem to have been hardly remunerative in the present year, while in the previous year it paid the cost more than three times over. The 2nd set of experiments was to ascertain the value of well against canal water. This year the well water gave a net increase of more than Rs. 6 over the canal-watered plot.- Last year the increase was almost entirely absorbed by the greater cost of watering from the well.

Effect of soil on color of wheat.

9. Clay soils appear to have a tendency to redden the colour of ''wheat.

The JethroTull method

10. This experiment was a little modified in the present year, inasmuch as the ridges were made wider and alternate furrows were sown with peas. The produce was superior in quality ; but for quantity the ordinary method is best when the entire area of the field is taken into calculation. The furrows and ridges must be alternated for a few years, *&d a number of crops must be taken off the corresponding plot sown in the ordinary way before a final opinion can be arrived at.

Acclimatised and imported seed.

11. The outturn of Cape oats during the year showed a falling off of ^J 14 per ceift. in comparison with last year. This is satisfactory, seeing that wheat declined by 27 per cent.

Outturn of certain mixed crops.

12. These experiments were undertaken at my desire. The addition of gram as well as peas to wheat and barley crops seems to result in a large aggregate yield. This explains why the Indian farmer is so fond of mixtures.

Remarks.

13. So far as experiments on the experimental station are concerned, the results have been very satisfactory. Similar experiments have been started in several districts through private agency. The ^sults are awaited with interest and will be compared with those obtained here.

14. The rabi operations under review were under the charge of Babu Lachman Parshad, who conducted them with his accustomed care and vigilance. The report is altogether the work of Mir Muhammad Hosein, who has taken pains to make it as complete as possible.

DONALD SMEATON,

Offg. Director.

REPORT

ON THE

CAWNPORE EXPERIMENTAL STATION

FOE, THE RABI SEASON OF 1884-85-

ON the 6th of February last I joined the department, and about the ond of March the farm was placed under my charge, but being away from the station on duty I could not return to head-quarters till the last month of the season, and did not find opportunity to attend to the works on the farm till the beginning of the present kharif season. * In fact, the rabi crops had been sown before my joining the department and harvested when I was out in camp. Under such circumstances I cannot do better than to frame this report on the plan of the last one and with the materials supplied to me by the Superintendent of the Farm.

2. *Character of the teason.-The* complaint about the unfavourableness of the season is as usual. It is said to have been worse than any experienced at the farm for several years past.

The rain at the end and after the rainy season was unusual and abnormal, with hardly any break long enough to allow the flat land of the farm to dry up sufficiently for obtaining good tilth for rabi. Rain late in October is considered a plague to the *heat crop/even a slight shower spoils the unsown fields. About that time the fields nre just ready for being sown. If any rain falls the pulverized and loose soil gets silted up, and provides a pasty bed for the seed, which in case of wheat is by no mean, favourable. Wheat thrives best in a cold climate, but requires dry soil.

The seed sown on the farm germinated too quickly and the first blade which appealed wtunullly long and*weak. A fortnight after the plumules commenced turning pale and sickly.

Water-Wed or highly saturated subsoil does not allow free access to heat and uir S a t most essenll for dry crops (especially wheat) at the fame of germi-

ot their food accumulated in ™» »««•

'oo forward soon perished from want of nourishment in their tender state

Similar complaints are made by samindars who aided in the wheat:forecast

I noticed inSaharanpur and Musaffarnagar that the, fields which had been watered before Christmas rains suffered a good deal by tbe excess of moisture.

The crop in them in comparison to'that grown in *khaki* or unirrigated land looked shrivelled up, pale and unhealthy.

3. ***At the timeof need canal u>ater „«* not available*>-While Nature on one hand** has been extravagant in giving wator, but untimely, unfortunately on the other band the artificial'source of the supply of water, the canal, proved to be inadequate at the time of need. The supply of canal water continued scanty throughout the season Except the .experimental plots, which are close to the canal dxstributary, other fields m the farm with difficulty received water twice and some only once.

4. *So diseases* appeamf.-Fortunately there has not been any noticeable complaint about the fungoid diseases of wheat which generally appear m a wet season,

otherwise the crop would have suffered still more. Only one plot was attacked bv mildew, the others remained quite safe.

5. *Average yield per acre.*—The outturn of wheat on an area of 14%7 acres *v»s 1,0611b = 17-7 bushelsvper acre against 1,453ft « 24-2 bushels in 1883-84 and 1,3091b *» 21*8 bushels in 1882-83. A very good average in England is about 30 bushels per acre.

FIELD EXPERIMENTS.

6. *Operations of the season.*—The programme of experiment for the season stand thus—

Experiment on the effect of—

(a) The various kinds of manure.
(6) The ploughing.
(c) The watering.
(d) The sowing.
(e) The soil on the color of wheat grain.
(/) The outturn of certain mixed crops, pulse and oilseeds.
(g) The outturn of acclimatized and imported seeds.

7. For the sake of having a result thoroughly confirmed and of determining, by applying a certain manure in the same field year after year, at what point its effect becomes stationary or what residue the manure leaves for *he succeeding crop*, ant[1] &o forth, most of the above experiments are necessarily kept unaltered.

8. By growing foreign or imported seed side by side with the indigenous ones and keeping both of them subject to the same treatment, their vitality or productive power is estimated.

9. *Suggestion for new trial.*—In connection with the determination of the above-mentioned chemical, physical and mechanical effects in favor of the ordinary crops, I must suggest that a series of experiments respecting the economy "of farming would be worth while trying : certainly it is a natter of the first importance too.

10. *A.* Manures.—These are classed into—I, experiments on a series of plot? termed " standard and duplicate" with nitrogenous manure applied singly and combined with non-nitrogenous fertilizers ; II, experiments in determining the wants of the soil for maintaining its fertility—in other words, finding out what constituent of plant-food gets exhausted after a crop of wheat and is to be supplied artificially ; III, experiments to ascertain the comparative manurial value of certain animal excrement and saltpetre ; IV, green manuring ; V miscellaneous.

11. /—*Experiments with nitrogenous and non-nitrogenous manures.*—For tli. last six years, twenty plots have been reserved for these experiments. They are divided into two series, one of which is called the " standard" and is cropped every year with wheat, the other is termed " duplicate" and js cropped one year with maize and the year following with wheat. To each of the series three mgre plots have been added in the year under report—

(1) For sheep dung alone.
(2) For ashes of (lung and saltpetre.
(3) For bonedust.

The treatment during the season under review has been as under— *m*

Manure as in the following table :—
Ploughings .-• 4
Waterings ... 4
Weeding ... 1

The outturn per acre of the season and of two preceding ones i ...... following table —

Table I.

Number of plot.	Manure and rate per acre.	Year.	OUTTURN PER ACRE.				Remarks.
			Grain.		*Straw.*		
			Standard.	Duplicate.	Standard.	Duplicate.	
			lb.	lb.	lb.	lb.	
1	Cowdung, 180 maunds ...	1884-85	900-2	1,466-5	1,318 9	1,Gf>9-8	
		1883-84	1,427-8	3,031 0	2,329-2	4.988'0	
		1882-83	1,713 O	1,623 0	3,126'0	2,958'0	
2	Cowdung and bonedust, 36015 ...	1834-85	1,016 4	1,516-1	1,4278	1,742-4	
		1883 84	1,343*1	2-873 7	2,456*3	5,112-2	
		1882-83	1,584-0	1.400-6	2,634-0	2,412 0	
3	Cowdung and grypsum, 240R5 ...	1884.85	88G 9	1,396*3	1,464 1	1,718 2	
		1883-84	1,364*2	3,0038	2.4O8 1	4,694 8	
		1882-»3	1,76 JO	1,886*2	3,270 0	2,778-0	
4	Ashes of 180 maunds dung ...	1884-85	704 2	1,089*0	1,-2 22-1	1,4*8-*	
		1883-84	1,134 3	2.323-2	2,311-1	3,817-5	
		1882-63	1,383 0,	1,417 5	2,412-0	2.436-0	
5	Saltpetre, 24OB5 ...	1884-85	1,323-7	1.741-1	1,899*7	2.-J71-G	
		1883-84	1,355*2	2,707 0	-2,410*9	5,641-6	
		1882-83	1,978-5	2,i8i-0	3,036'0	3,!JO6-O	
6	Saltpetre and bonedust, 3601b ...	1884-85	1,170-0	1,6-23-8	1,6-21-4	2,565-2	
		:883-84	1,25*2-3	2,900-9	2,668'0	6,726*3	
		1882-83	1,944-7	2 -J557	3,690*0	3,8 '14 0	
7	Saltpetre and bone superphosphate, 2401)5	1884-85	1,508*8	2,007-3	2,081-2	2,795*1	
		1883-84	1,984-4	3,0^1-3	3,817-5	5,8622*4	
		1882-83	...	...	...	...	
8	Sheep dung and bonedust, 3601b	1884-85	826-4	1,615-3	1,258-4	1 936·0	
		J8*3-84	1,143·4	2,389-7	1,867-0	4,434 6	
		1892-83	...	...	...	...	
9	Sheep dung and gypsum, 240%...	1884-85	756-2	1,276-5	1,391-5	1,899-7	
		13$3-84	1,S37-O	2,601*5	2,323-2	4,470-9	
		1882-83	...	...	...	...	
10	No manure	1884-85	635-2	1,024-8	1,004*3	1,452-0	
		1883-84	1,031-5	2,280-8	2,093-3	3,6723	
		1882-83	1,0650	999-0	1,764 0	1,704*0	
11	Ashes and saltpetre^ 2401b ...	1884-85	1,149'5	1,686-3	1,669 8	2,057-0,	
		1883-84	...	...		...	
		1882-83	...	...		...	
12	Sheep dung, 180 maunds ...	1884-85	889-3	1,4*4S-3	1,51)0-4	2,"153-8	
		1883-84	...	...	...	...	
		1882-83	...	...	...	...	
13	l*oudrette ...	1884-85	1,074-4	1^491-9	1^06-8	1,730*3	
		1883-84	...	...	...	...	
		1882-83	...	...	...	...	

The above table (1) shows—

(a) the comparative effects of several manures;

(6) the advantage of rotation.

12. (a) *Single manures.*—From the above table it is seen that saltpetre during the season again gave the largest yield of all the manures applied singly. It has always given a good outturn.

The most efficacious manures for wheat are those classed nitrogenous. " The cereal crops generaiy find the supply of nitrate in the soil insufficient for their full growth, and the supply of phosphates more or less inadequate. " Fhosphatic manure for wheat is, though beneficial, yet not indispensable ; moreover, wheat has the power to avail itself more or less of the potash and phosphoric acid from the natural stores in the soil. Further, wheat takes its nitrogen from no other sources but nitrates.

Owing to all these circumstances it is evident that saltpetre supplies the most Necessary requisite to a wheat crop and in a most ready and available form*

13. *Manurial ingredients in saltpetre.—Saltpetre* contains two essential ingredients of plant-food, nitrate and potash ;" of course, by its application alone and forcing vegetation thereby, the natural store of phosphate in the soil will be exhausted sooner or later, then the crop will fail. It is to be seen how long the soil itself is capable of continuing the supply.

14. *Top-dressing good in wet season.*—Instead of manuring the field with nitrate of potassium (saltpetre;, which is a dift usable manure, top-dressing, just at the time

when the plants arc ready for it, is most advantageous and economical, especially in wet countries. The difference of the two processes is worth finding out, and will be estimated next season, though it has begun from last year.

15. *Why the saltpetre isfiot-tised by native farmers.*—The only obstacle to its not being used at all, or as freely as one would like, is, that for saltpetre the cultivator has to pay, while the other manures in his use do not cost him anything perceptibly. 3f he were to purchase all his manures, he would, no doubt, decide in favour of saltpetre.

If the manufacture of saltpetre for manorial purposes is allowed to farmers unhampered with excise law rules, the *use* of it in the shape of manure will soon make its way throughout the country.

16. *The result of saltpetre compared with cattle dung.*—Its result compared with cattle dung or farm-yard manure during the past four years is noted below. The figures represent outturn per acre :—

Year.	Standard.		Duplicate.	
	Saltpetre.	Cattle dung.	Saltpetre.	Cattle dung:.
	lb.	lb.	lb.	lb.
1884-85	1,323·7	90(T2	1,741*1	1,466-5
1883-84	1,355*2	1,427-8	2,707-0	3,031-0
1882-H3	1,978-5	1,713-0	2,181-0	1,623-0
1861.82	1,242*6	918*0	1,605-0	738-O

17. *Combined manures**—Of all the combined manures bone superphosphate with saltpetre gave a ,<jood increase. But tho cost of this manure in India, owing to the high price of sulphuric acid (which is a constituent in disolved bone) is so great that it ibsorbs the profit which its application produces. The following table shows the results of the last two seasons :—

Year.	*Increase per acre by addition of hone superphosphate to saltpetre.*		Value of increase per acre.	Cost of bone superphosphate.	Net result.
	Grain.	btraw.			
	lb.		Rs.	Rs.	Rs-
18S4-P5	225-6	302*5	68	14-5	—7-7
1883-84	491-8	8137	15-3	14-5	+ 0-8

18. *Bone superphosphate is not a handy manure to Indian farmers.*—It is doubtful whether this manure can ever be .of much use to, and within the reach of, Indian farmers. Because, 3stly, it is more especially of use to pastures, grasses, and root crops, which form no part in the rotation of the Inclian farming; and, 2ndly, supposing that tho difficulty of the scarcity of the acid might be overcome, still it is impossible to find tho very cheap thing " bone " enough for Indian agriculture. In England, where the bone in various forms is imported from the different Darts of the world the supply is not equal to the demand. Tn a vegetarian country like India, whence could it be got ?

19 *Coprolile can be of some use.*—The rumour of the discovery of coprolite up at Mussooree and of the fossil bones in the alluvium of the Jumna if, fortunately, it be true and they contain more than 50 per cent of trioalcic phosphate, the supply would then become abundant and the use of the superphosphate can advantageously be made for stimulating vegetation, especially in the proposed fodder reserves.

From the agricultural point of view, a thorough investigation of this discovery and analysis of the samples are matters worthy of attention.

20. *The result and advantages of cow dung compared with otlitr manures**—*Cow dung* applied x 180 maunds per acre in the shape of farm-yard manure) yielded more than—

(1)" Unmanured by 42 per cent.
(2) Dung and gypsum by 4 per cent.
(3) Ashes of dung by 32 „
(4) Sheep dung by 1 „
(5) Ditto gypsum by 16 „

From the above figures it is deafly seen that—

(i) well seasoned farm-yard manure is better than gypsum, bonedust, ashes of the dung, &c.

(ii) Manured land in every case has advantage over unmanured land.

(iii) Ashes of dung are not so beneficial as the dung itself. It is, of course, due to the loss of ammonia by burning. It is to be regretted that the farmers cannot keep this sure and cheap fertilizer solely for the use of their fields instead of burning it.

21. *Experiments to be tried neat season.*—Experiments in the use of fresh dung and of the folding of cattle and sheep in field is worth trying. In the coming season attention will be paid to it.

One thicg more deserves experimenting, *i.e.*, a field always manured with cow dung should be top-dressed with saltpetre at about 1 cwt. per acre. This will prove (1) when the effect of the dung or of the poudrette reaching a certain point becomes stationary and the increase of their amount does not increase the yield, how far they can be stimulated by the addition of the potaasic nitrate. (2) Saltpetre alone is of course very expensive, to use it in addition to dung and to see how far its effect can be economized in this way. In the next season's programme a place will also be given to the above experiments.

22. *Sheep dung and gypsum.*—Sheep dung although in India considered a richer manure than cattle refuse, yet it has not proved to be so on the farm : there can be two reasons for this—(1) the sheep are being kept entirely on grass, while the cattle have received some concentrated food during certain part of the year ; (2) cistead of folding sheep in the field by which both solid and liquid excrements are supplied, rotten dung alone was used. However, it is yet to be seen which is the better of the two. Gypsum and bonedust did not prove of much benefit on the farm, Gypsum is most favourable to leguminous crops, hence perhaps its effect on wheat was not visible. The effect of bonedust is very slow. Before being prepared for the use of plant-food, it has to undergo several reactions in the soil. It perhaps might show some result in future.

23. *Which is the most handy and economical manure ?*—Now the question is, which of the manures is most economical and available or handy to the farmers ? No doubt, as it has already been proved and said before, it is the " farm-yard manure." If the farmer by some means can find and secure enough of it, no doubt it would add a good deal to his prosperity. This is a general manure and indispensable in farming, When its effect has reached its highest point, then some other " forcing " artificial manure would be necessary.

The following table will show the value of the increase of outturn set against the price of the manure applied. In this season the profit is quite nominal, but it is due to the low produce on account of the bad season. The last column of the table added from the repoit of the season before last gives a fair example, and the report in favor of the Manure in question says " superphosphate fortified by a nitrogenous manure gives the highest yield, but that cow dung is for the cultivator the cheapest manure to use."

" Necessarily, however, the market price of farm-yard manure is much above the actual cost of that which the cultivator uses. "

Indeed, to the majority of the cultivators who do not live in the neighbourhood of a large town, the cost of this manure is, as a matter of fact, nothing.

Table II.

Manure.	Value of outurn per acre. Stand-ard.	Dupli-cate.	Aver-age.	Cost of manure.	Net increase over the unmanured. 1884-85.	1883-84.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Cowdung	27-2	42 5	34-8	9 0	+0·6	+ 8-1
Cowdung and bonedust	30 6	44·0	37*3	13'5	-1-4	+ 1-2
Cowdung and calcic sulphate	27-5	41-0	34 2	10-0	— 1·0	+ 5-6
Ashes of cowdung	22·1	32*6	27-3	9-0	— 6*9	—6-5
Ashes of cowdung and saltpetre	34*8	47 0	40-9	16*5	-0-8	.
Potassic nitrate	39*9	52·0	46-9	7'5	+ 13·2	+ 6*3
Potassic nitrate and bonedust ...	35*1	50·0	42-6	12 0	+5-3	+ 3 6
Potassic nitrate and bone superphosphate ...	46·2	60-2	52 7	22·0	+ 5 5	+ 7 1
Sheep dung	27-8	44*0	85 9	9 0	+ 1-7	...
Sheep dung and bonedust	25-1	47-2	36·1	13-5	- 2 6	—9-7
Sheep dung and calcic sulphate	24-0	38·8	31-£	10-0	— 3 8	—0 3
Poudrette	31-5	43 4	37*4	10-4	+ 1-8	...
No manure	19-6	30-9	25 2	...	...	...

24. (6) *Advantage of rotation.*—The table I above referred to indicates that almost with every kind of manure the duplicate plots in which maize and wheat are sown in alternate years gave again in the season under report much larger yield than the standard plots in which wheat is sown every year. Of course, both of the series have been treated similarly. A full year's bare fallow alone is not sufficient to account for this, but also here the scientific theory that the roots of one crop are beneficial to, and accumulate prepared nourishment for, the succeeding crop (if it is of a different nature) holds good.

25. *II.— The Ville series or experiments on determination of what constituents of plant-food get exhausted by cropping wheat in succession.—In* the absence of the chemical laboratory for finding out what essential ingredients are exhausted by sowing a crop over and over in the same land, the experiments after the method of what is called the Ville series is very good indeed for practical purposes.

It is conducted with a series of plots, sowing in one of them a mixture of manures, in each of which a known substance of plant-food preponderates, and the manures are withheld one by one while applied in other plots of the series.

This experiment on the farm is four years old now. The treatment and yield are shown below—

Treatment—

Ploughings	4
Waterings	4
Weeding	1

Table III showing manures and outturn.

Plot	Manure.	Outturn per acre in 1884-85. Grain.	Straw.	Increase over the unmanured plot VI (unmanured) Grain.	Straw.	Decrease over plot I, which received all manures. Grain.	Straw.
		lb		lb.	lb.	lb.	lb.
1	Calcic superphosphate ... 80 lb. / Ammonic chloride ... 130 / Potassic sulphate ... 90 / Calcic sulphate ...	1,459·2	2,480-5	701-8	1,318·9	...	...
2	All except calcic superphosphate	1,452-0	2,146 7	694 6	1,685-1	—7-2	+266-2
3	All except ammonic chloride	808 2	1,427-8	40·8	266-2	—651*0	—1,052-7
4	All except potassic sulphate	1,398-7	2,250*6	641-3	1,089-0	- 6 0 5	—229-9
5	All except calcic sulphate	1,210-0	2,178·0	462 6	1,016*4	—249-2	—302'6
6	No manure	757-4	1,161-6	...	...	— 701-8	—1,318-9

The present results confirm whot were obtained in previous years, *viz*, the chief want of the farm soil for cereals lies in nitrogen.

	Outturn of grain per acre. 1884-86.	1883-84.	1882-83.
	lb.	lb.	lb.
Obtained by application of all manures ...	1,469*2	1,777-1	1,7*26*6
Obtained by applying all except ammonic chloride	808-2	1,0Jl -2	1,192-5
Obtained by applying no manure	757*4	762-3	1,045*5

The importance of nitrogen in case of wheat and the necessity of providing it by means of manure has already been briefly stated in the foregoing paragraph. In one word again, wheat comparatively has less power for availing itself of the nitrogen in» the soil, though it does not require the element more in quantity than many other crops do,

26, (777) *Experiment on ascertaining comparative manurial value of saltpetre and of certain animal refuse.—'This* experiment was tried in a field divided into eight plots which had borne a crop of maize in the preceding kbarif, with the same manures as now put in. Barley was the crop sown in these plots.

Besides manures all the plots received the following treatment : —

(1) Manure as in the succeeding table
(9) Floughings 3
(3) Waterings ... ••• ... — ••• 3
(4) Weeding ... ... — ... ... 1 *

The outturn is shown in table IV.

Table IV.

No. of Mot.	Manure.	*Outturn per acre in 18*4-85.* Grain.	Bhusa.	*Increase over the un-manured.* Grain.	Bhusa.
		m.	ft.	ft.	m.
1	Woollen refuse ••• ••• •••	892·3	1,113-2	372 0	435*6
2	Sheep dung ... ••• ...	689-7	774-4	169-4	96'8
3	Cow dung ••• ••• •••	810-7	943-8	290 4	266-3
4	Poudrette ••• ••• ...	995*2	1,210-0	474-9	532'4
5	Horse dung	822*8	919'6	302'5	242-O
6	Vigs droppings	798-6	965-9	278-3	278-3
7	Saltpetre	1,082-9	1,427-8	662*6	750*
8	No manure	620 3	677-6	...	• ••

The above results have proved true to the long-established scientific theory, *© the increase in the outturn is proportionate to the amount of *available* nitrogen in the substances applied as manure.

27. *Woollen refuse.*—Woollen refuse has given more yield than sheep, cow, horse and pig dung. Of course shoddy contains much more nitrogen than any of the dungs ; about 5 to 10 per cent, unwashed wool contains about 4 per cent, of potash. Both of these are the essential constituent of plant-food, as its effect is not quick, and it requires certain changes before being available to crops, therefore it did not give any larger yield, which otherwise it might have done. But its effect will spread over several years, perhaps next season it may show a still better result.

28- *Sheep dung.*—Sheep dung here, again, has not shown any difference against the one noted above. The cause might be considered to be the same.

29. *Horse and pig dung.*—Horse dung has shown a very little increase against tho cow excrement, though generally the horse is fed on highly concentrated food. It shows that the horse makes the best use of his food as the pigs decidedly do. JQence foe manures of these two animals are poor. Poudrette is the best of all the animal excrements and saltpetre best of all kinds of manures.

30. *Poorer manures yielded more gtain than straw.*—One thing here is worth noticing, that all these manures have shown different effects on straw. The poorer

manures have given in proportion larger increase in grain, and among them sheep dung heads the list in this respect. While the richer manure made the straw more luxuriant, and in this case saltpetre is at the top of all.

31, *(IV.) Green Manuring.*—Experiments were tried in four series (a, 6, *c₉ d)* of 19 plots.

Series (d\ contained 9 *plots.*
Ditto *(b)* „ 2 *99*
Ditto (c) „ 3 *99*
Ditto *(d)* „ 5 „

The treatment and the description of the experiments together with the produce will be seen from the following tables :—

Table V.

Treatment.	a.	b.	c.	*d.*
Manure	*Vide* Table. VI.			
Ploughings	3	4	4	4
Waterings	4	4	4	4
Weediug	1	1	1	1

Table VI.

Number of plot.	Manure.	*Outturn per acre in 1884-85.* Grain.	Straw.	*Increase over the un-manured, per acre.* Grain.	Straw.
		Ib.	*m.*	Ib.	Ib.
A. series.					
I	Green-soiled with hemp manured with gypsum,	1,476*2	2,577-3	853*1	1,452-0
2	Green-soiled with indigo manured with gypsum.	2,159.8	2,940-3	1,636*7	1,815 U
a	Green-soiled with iudigo without any application of gypsum.	1,944*4	2,492-6	1,321*3	1367-3
4	Hemp water to a depth of 1 inch or 3630 cubic feet per acre.	994·6	1,585-1	371*5	459 8
5	Indigo water to a depth of 1 inch or 3630 cubic feet per acre.	934*1	1,476-2	311-0	350-9
6	Fresh indigo refuse, 120 maunds.	1,581·4	2,262-7	958-3	1,137 4
7	Old indigo refuse, 120 mauuds	1,430-2	1,869-4	807 M	744·1
8	After a crop of indigo	1,107-1	1,778 7	484-0	653-4
9	No manure ...	623·1	1,125-3	...	...
B. seiicB.					
1	Hemp ploughed in	1,399*6	2,553-1	670 9	1 500-4
2	No manure ...	728 6	1,052-7	...	...
C series.					
1	Hemp and gypsum	1,431-3	3,026-7	841*0	1,956-8
2	Hemp ...	1,353 7	2,722-2	763*4	1,662 3
3	No manure	590*3	1,069-9	...	...
Z>. series,					
1	Fresh refuse and lime	1,363-3	2,354*3	925-3	1,267-5
2	Fresh refuse only	1,1160	2,323*2	678·0	1,236'4
3	Old refuse and lime	713-8	1,404-4	275·8	317-6
4	Old refuse alone	811 6	1,506-8	373-8	422*0
5	No manure	438·0	1,086 8	...	...

32. *Indigo, perhaps, is best for green-soiling.*—From the above table it appears that indigo ploughed under as green manure gave the larger and mixed with gypsum the largest increase. This shows (1) that probably it is a fact that among all the green manures indigo is the best fertilizer : *(2)* that gypsum, though directly is of little U&B to wheat, yet through the medium of indigo or some leguminous crop it can be made beneficial.

33, *Hemp and indigo water.*—Hemp *BJid* indigo water have been giving a fair increase over unmanured plots. The wheat fields near indigo factories and near the ditches where hemp stocks are steeped can be profited by the water which commonly is wasted.

34. *fresh and old indigo refuse.*—Fresh indigo refuse yielded more than the old etqff. This result does qot agree with what was obtained last yepr. Perhaps the difference

in the character of the two seasons is a reason for this. In 1883, rains were scanty so the fresh refuse could not putrify quickly and nitrification did not take place in due time. This year heavy rains helped the rotting and made the manurial property available in time.

Wheat, after a crop of indigo, has given a very fair increase too. By this the advantage of rotation is apparent.

35. *Bare fallow is not necessary.—'Ab* any rate, the income to a farmer, taking two crops in a year (indigo and wheat), would be greater than that of one who takes only one crop of wheat after a bare fallow ; therefore by all means it seems advantageous that by the aid of manure if available, and good farming, land should be kept under crops and must not be left fallow or useless.

- It is a wrong notion that the land does require a fallow. If at all necessary it is for foul land, which in this province is scarcely seen.

If manure is available, weak land must be kept particularly under cropping. This "will add humus to the soil and will improve it; it is far more beneficial than giving a bare fallow to raise its strength.

But the question would be. Have all the farmers got erfough manure ?

36. *V Miscellaneous.*—This comprises a trial of the following manures on ordinary and special kinds of land (the usar). The experiments may be classed in the following series:—

(a) *Result of*—

1. Brickkiln refuse.
2. Silt.
3. * Perished carrot seed.
4. * Ditto indigo seed.
5. Ammonic chloride,
6. Ashes of weeds.
7. Ditto top-dressed with saltpetre.
8. No manure.

(6) Slaked lime, gypsum, &c, applied to usar soil in boxes.

ic) Gypsum in four plots each of a quarter acre made in usar soil.

37. *A. series.*—For this one field was divided into eight plots.

Treatment and result are shown below—

1. Manure as in the following table.
2. Ploughing three times
3. Watering four „
4. Weeding once

Table VII.

Number of plots.	Manure and rate per acre.	*Outum per acre in 1884-85.* Grain.	Straw.	*Increase aver the unmanured.* Grain.	Straw.
		lb.	lb.	lb.	lb.
1	Brickkiln refuse, 120 maunds	1,176·1	1,808 9	296-6	284 3
	Silt, 1,000 maunds	1,058-7	1,591-1	179-1	66-5
a	Perished carrot seed, 12 matmds ...	1,101-1	1,802-9	2215	378 3
4	Ditto indigo seed, 12 „	1,282*6	3,020-7	403*0	496*1
	-Ashes of 120 maunds weeds	1,082-9	1,730-3	203 3	205-7
	Ashes, 120 maunds weeds and saltpetre, 2-ftolb	1,303 1	1,936 0	423-5	411·4
	Ammonic chloride, 240lb	1,448 4	2,190*1	568-8	665*5
	No manure	879*6	1,524*6	...	...

Ammonic chloride.—Ammonio chloride gave the largest increase in produce, next came top-dressing with saltpetre, and third, perished indigo seed.

• Why the cariot and indigo seeds are need as a manure is explained in the last year's report.

The above, being nitrogenous manures, acted as they generally do.

Brickkiln.—Brickkiln refuse contains a good deal of ammonia, as large particles of ammonium carbonate remain mixed in it, also ashes and brick powder absorb ammonia: hence the refuse acts as a fertilizer. Near towns, if this can be had in sufficient quantities and carted cheaply, it can be advantageously used by farmers. But whether its continuous use is advisable is a question.

Silt.—Silt has given the least increase of **all.** As its value depends on various circumstances, therefore it cannot be determined fairly by a trial in one place. The silt composed of the denudation from stony hills or primary rocks must be very rich, and no doubt will act as one of the richest manures in valleys or at the bottom of the hills. But the further it is taken away by the water the weaker it is sure to become. Silt from all hills and places can of course not be of the same value ; silt left by the current of water on the banks of rivers makes the sand productive. But this fertilizer is provided more by natural than by artificial means, hence it may not be classed as a manure for the plains of this country. In valleys it can be utilised advantageously. By a silting up process pieces of usar land have been made fertile near canal banks, but the cost of the same was found to be too great.

Weeds ashes.—The application of green weeds will answer better than their ashes, because in the former state beside the ash constitnents they will supply nitrogen also to the soil. Those weeds that are a pest should be burnt or be used in making compost.

38. *Experiments on usar land*— Experiments b. and c. were made with slaked lime, gypsum, &c, on usar soil in boxes and *in situ.*

Four plots each a quarter of an acre were made in usar, in two of these in the proceeding rains gypsum was applied at 50 maunds per acre, and in the other two at 25 maunds per acre.

In the *(b)* series the boxes treated with gypsum and poudrette produced a handful of corn ears ; the plants in the other boxes died before bearing any ear. In *(c)* the land was not sufficiently pulverised. It resumed its original texture by the time the sowing season approached. The manure could not therefore have produced any result. A few ears appeared here and there, and this was all.

Researches for fertilizing usar land are important, but there is no space for discussing the subject here. There is every reason to hope of the usars becoming productive.

Sowing wheat after lucerne had not been tried this year, as the lucerne is kept on the ground for two years,

• 39. ***B.* Determination of the result of deep and shallow ploughing.—**Theso experiments continued on the same series *(two* in number) which were under the same test in previous years.

Their treatment and outturn are as follows :—

Treatment-

Manure, *nil.*

Ploughing as in next table.

Watering four times.

Weeding once.

Table VIII.—Outturn.

	Area in square yards.	Particulars of ploughing.	Outturn per acre.		Increase per cent, over shallowploughing.	
			Grain.	Straw.	Grain.	Straw.
A. series.				lb.	tt.	ft.
1	300	Ploughed 9" twice	721-2	1,113-2	35	39
S	300	Ditto b» ,, ...	850'2	1,274-5	59	60
3	300	Ploughed with country plough 4 times ...	572*7	903*5	...	...
4	300	Ditto ditto ditto ...	495-2	693*7	...	...
B. series.						
1	2,362	Ploughed 9" twice	736*0	1,118*8	72	89
2	2,588	Utto b" ,, ...	546·1	884·0	28	46
3	2,579	Ploughed 4 times with country plough ...	427-3	593*0	...	...

40, *Deep ploughing produce more, as usual.*—Deep ploughing by improved plough, in comparison to shallow ploughing with indigenous implement produced more, as usual, but, on the whole, the yield is small. It is perhaps partly due to the unfavourableness of the season and partly to the want of manure, which the fields have not received for the last five years, and after each cropping are becoming exhausted more and more.

41. *Number of ploughing* not being sufficient.*—The Superintendent is of opinion that the number of ploughings (two in case of deep and four in case of shallow ploughing) are insufficient for a wheat crop. He says—notwithstanding the regular weeding, grass is increasing every year in these plots.

42. *Results differ in different series.*—From the above table it appears that two series with similar treatment have given results quite different. In series A the plot ploughed up nine inches deep yielded only 35 per cent, more grain than the plot under the country plough, and that ploughed only five inches deep gave an increase of 59 percent. On the other hand, in B series, the plot tilled nine inches deep produced 72 per cent, more than the plot worked *hy* ordinary plough, and the plot ploughed up only five inches deep yielded about as much as the one ploughed nine inches in the A series. Last year the results have been somewhat proportionate.

43. *No rule can be made from these results.*—However, with these results there cannot be made any rule, but they prove in favor of the theory that the result of the deep and shallow ploughings depends on the nature of the soil and subsoil. No doubt subsoil impregnated with obnoxious matter or deficient in nutritive substances will do harm by being turned up on the surface.

Deep ploughing by itself (with no manure) does not seem to do much with the improvement of impoverished or exhausted land.

44. *C.* Watering.—Two series of experiments were tried under this head—

(1) to ascertain the increase in produce by the increase in the number of waterings ;

(2) to determine the value of well against canal water.

(1) *Influence of water on the increase of produce.*—No. (1) was repeated in a series of six plots which have been under this experiment for the last five years.

Their treatment and outturn are noted below :—

Manure, *nil.*

Ploughing three times.

Watering as in the next table.

Weeding once.

Table IX.

Number of waterings	Area in square yards.	Outturn per acre.		Increase in grain due to each watering over the preceding.				Increased cost of irrigation over the preceding plot.
				In weight.		In value.		
		Grain.	Straw.	1884-85.	1883-84	1884-85.	1683-84.	
		m.	tto.	ft.		Hs.	Ks.	KB.
*H ...	400	3O2-6	960-1					
IJne ...	400	598-9	1,O89'0	296*4	409·0	"*7-2	9*9	ft
Two ...	400	661*8	1,185*8	62-9	45-9	1-5	1-1	
Ibree ...	400	951'O	1,294-7	289*2	31-7	7·0	0-7	1-1
four ...	400	1,016-4	1,827-1	65-4	151-7	1·6	3 7	1-1
Five ...	400	1,125*3	1,876-5	108-9	253-8	2-7	6-2	1-1

In comparison with the yields of the last two years, the outturn, on the whole, seems to have a tendency to fall off.

It may be due to a want of manure, which has not been applied since the time the plots have come under this operation. Each additional watering has added something to the produce.

45. *Water in itself has manurial property.*—No doubt water in itself has a manurial value. It has been proved that if the water be made to run over land at a velocity of about two inches per hour in regular and short intervals, no other manure will be necessary for the land. Irrigation in colder parts of the European countries is simply made for the sake of its manurial quality. Thousands of acres of pure sand in Belgium (Neerpelt) France (county Siene) and all over Germany have been made fertile by this process. Water meadows are good proof of this.

46. *Without some concentrated manures no good outturn of seed can be expected.*—But here one fact attracts the attention, *i. e.,* without a concentrated manure (on an impoverished land) the quantity of fodder or straw would be abnormally large in proportion to the grain, and the grain cannot reach the highest point in good quality. For example, on the farm unwatered and unmanured plot produced 324 per cent, straw compared with the quantity of the grain. The seed shrivelled up, did not become plump and full, hence the quantity of straw weighed considerably more. And the crops with no manure, but forced up by means of aqueous stimulant, had their succulent parts more benefited by it. One of the crops with five waterings yielded 166 per cent, straw against the grain : one with four waterings produced still more, while the crop which received four waterings and the poucirette and saltpetre as manures yielded straw only 112 and 144 per cent, on their grains respectively *(vide* Table I). This *shows* that the manure without water or *vice versâ* is deficient in doing thorough good. The full effect of the one depends on the other.

47. *Whether water manured crops are perfect in their chemical composition is a question.—Whether* the grain or the straw produced simply by the influence of water are as good and perfect in their chemical composition and in the amount of the nutritious substances as the crops raised with the aid of manure and watering, is a question. There not being a chemical laboratory handy we cannot enter into these minute details. However, from the fact that water meadow grasses (especially when green) are poorer in nutritive value than the lawn and the pasture grasses of the kind, there is reason to believe that the crop in question may not be ad perfect and true in its quality as the other is.

48. *Well against canal water.*—This was tried in the same plots which were under this experiment in previous years.

The treatment and outturn are as follow :—

Manure, *nil.*
Ploughing four times.
Watering three times.
Weeding once.

Table X.

	Detail of irrigation.	Area in square yards.	Outturn per acre. Grain.	Outturn per acre. Straw.	Increase over the canal watered. Grain.	Increase over the canal watered. Straw.	Value of increase per acre.	Increase in cost oi watering per acre.
1	2	3	4	5	6	7	8	9
			m.	lb.	ft.	ft.	Bs.	Rs.
A. series.								
1	From well	400	1,028*5	1,476-2	387·2	496-v	11-4	3-6
2	From canal	400	641-3	980-1	...	...	...	...
B. series								
1	From well	400	1,205*1	2,032-8	289-2	314*6	8-4	3-6
2	From canal... ...	400	916-9	1,7182	...	...		...

49. *Well water is more beneficial than canal water.*—The excess of **the** produce from the well watered plot over **the** plot watered from canal is greater this year than in any

previous years. The general treatment, the number of waterings, and the quality of land were the same in both series, but the number of waterings was less in each case than that of the last year.

This is a recognized fact that well water is more beneficial to vegetation than canal water, but why it is so is perhaps not clear yet.

Canal water may be supposed to carry more manurial ingredients in suspension than the well water, but the latter as a matter of fact does more good. Perhaps this may be due to its gradually permeating the land, and advancing slowly from one bed to another and thus not disturbing the texture and not increasing the tenacity of the soil, while the rush of the canal water makes the fine particles of a pulverized field clog together, and by choking up the surface soil when dry the work of the atmospheric agencies in favor of providing nourishment to the plants ceases.

50. *D.* **Sowing.**—*Jethro Tull or Lois Weeden system of sowing.*—The cultivation of wheat by the Tull system was repeated this year in the same field in which it was tried last year, and in two more fields, one of which consisted of poor soil not manured for some years past and which was rented at the low rate of Rs. 4 per acre. In every alternate fallow strip of the two fields added this year, peas were sown,

51. *Where this system can be of some use.*—This is a very old system of cropping, perhaps hardly in practice now in any part of Europe. They now consider it better making use of the whole land by the aid of the artificial means than leaving it uselessly lying in bare fallow. Very likely in India, where the sources of artificial fertilizers are scarce, the system of the sowing in question might prove advantageous but only in those fields which may be at some considerable distance from the population and where manure cannot be reached easily.

The treatment and outturn are shown below:—

Manures	*Nil.*
Ploughing	3 times
Watering	3 „
Weeding	once
Grubbing fallow strips of plots sown after Tull ...	3 times

Table No. XI.

Number of field.	Manner of sowing.	Area in square yards.	Actual outturn, Grain.	Actual outturn, Straw.	Outturn per acre calculated on the total area of the plot. Grain.	Outturn per acre calculated on the total area of the plot. Straw.	Outturn per acre calculated on the cropped area alone. Grain.	Outturn per acre calculated on the cropped area alone. Straw.
			lb.	lb.	lb.	lb.	lb.	lb.
15 a	Tull's ...	Under wheat 1,080 Fallow ... [illegible]	257-7	425 0	653 7	1,078 1	[illegible]	[illegible]
		Total ... [illegible]						
16 ft	Ordinary...	... [illegible]	291 5	459-5	712 5	1,123-2	...	...
1 1	Tull's ...	Under wheat 200) Wheat	61 0	80 0	738-1	1,040-6	984-1	1,387 5
		Under peas 100. Fallow 100.) Peas	36 5	45 0	441-6	544	588 8	[illegible]
		Total ... 400						
A 2	Ordinary...	... 400	82-7	150-5	1,000-6	1,821-5	...	...
84-a	Tull's ...	Under wheat 848) Wheat	220'0	451-0	608-1	1,246'6	820'3	1,681-7
		„ peas 460 Fallow 453 Peas	176 0	200 0	486-5	552-8	656-2	745-7
		Total ... 1,761						
84 6	Ordinary...	... 1,669	395-0	580 0	1,145-5	1,681-9	...	...

The results are more favourable on poor and exhausted soils than on pretty good ones, which can support a larger number of plants than the other.

The system is worth a trial on poor soil where manure cannot reach, and which consequently grows less profitable crops such as bajra or some kharif pulses.

52. E.—Effect of the soil on the color of wheat grain.—This experiment was made at the instance of the Bengal Government, which had referred to us for verification of the statement made by one of the Bengal District Officers, that the color of white wheat when sown on clay soil turns red.

A quantity of hand-picked pure white wheat seed was sown in clayey soil close to the farm.

On threshing, the grain did not present an appearance as white and shining as the seed possessed, but none of the grains had turned quite red. The same seed will be repeated for the next two or three years, and the changes in color, if any, will be noticed.

In order to confirm this fact, the Collector of Hamirpur, which is a noted stiff clay district, was asked to try the experiment. Pure white Muzaffarnagar wheat was sent to him for seed which was grown in five different places. The samples of the produce which the officer has been kind enough to send to us, show quite a change in three and marked differences in two cases. He remarks as follows:—"Portions of the white wheat sent by him were sown in the stiff clay of tahsils Muskara and Hamirpur. Five specimens of the produce are enclosed with a sample of the seed, whereby it will be seen that in every instance the produce is very much redder in color than the parent seed."

The upper ... wh[illegible] he was purchasing wheat in Muzaffarnagar (the best white wheat growing district) he found there to be a [illegible] custom among the cultivators of the village Baral, which has clayey soil, to import every fourth year their wheat seed from Rajpur, a village close by, and the reason for this which every one of them gave was that after three years their wheat becomes *gojar*, (red and white mixed) by the influence of the soil. Hence, to produce pure white grain, they are obliged to import seed from Rajpur.

... the effect of the soil on the color of the produce is a recognized fact. As clay soil is generally richer in iron compounds, hence probably the color is affected.

The treatment and outturn of the plots experimented on are—

1. Manure	...	*Nil.*
2. Ploughing	...	4 times.
3. Watering	...	0 "
Outturn per acre	...	[illegible] of grain.

53. F. Outturn of (1) certain mixed crop, (2) pulses and oilseeds, &c.—The mixture tried in three series, *a*, *b* and *c* are—

1. Wheat-barley.
2. Wheat-gram.
3. Wheat-peas.
4. Barley-gram.
5. Barley-peas.

Their treatment and results are as follow;—

Treatment.

	Series (a)	Series (b)	Series (c)
Manure			
Ploughing	[illegible]	[illegible]	[illegible]
Watering	3	3	[illegible]
Weeding	[illegible]	3	[illegible]
	1	1	1

These mixtures were sown exactly after the native way.

Table XII.

Number of plot.	Crop.	Area in square yards.	OUTTURN PER ACRE — Grain. — Outturn of each crop.	OUTTURN PER ACRE — Grain. — Total outturn.	OUTTURN PER ACRE — Straw. (Total).	Money value per acre.
A series.			ft.	ft.	ft.	Rs.
1	Wheat	750	882*2	882-2	1,239-1	26'5
[illegible]	Wheat Barley	7*50	453-0 522-7	975-7	'1,542-3	25-9
[illegible]	Wheat Gram	750	685-3* 1,040-3	1,725; 6	1,664*9	43-7
[illegible]	Wheat Peas	750	598-2 922-8	1,621-0	2,439-4	40-5
B 1	Wheat	1,171	1,043-6	1,043-6	1,611-9	31-9
[illegible]	Wheat Barley	2,255	407^a8 582-7	990-6	1,579-7	26-0
3	Wheat Gram	1,123	817-6 905-1	1,722-7	1,853-2	45-3
4	Wheat Peas	929	640-0 732-0	1,372-0	2,771-7	40-4
[illegible]	Barley	1,1 G4	1,411-7	1,411-7	1,654-9	30-2
[illegible]	Barley Gram	1,137	868-6 790-5	1,659-1	1,647-4	36-9
7	Barley Peas	9S9	1,021-1 896-2	1,9173	2,797-8	44-4
C 1	Wheat	400	1,000-6	1,000-6	1,815-0	31-8
[illegible]	Wheat Barley	400	540-8 770-7	1,311-5	1,645-6	32-7
[illegible]	Wheat Gram	400	689 7 895*4	1,585* 1	2,081-2	43*2
	Wheat Peas	400	626-3 819-1	1,345-4	2,178-0	36-0
6	Barley	400	1,458-0	1;458'0*	1,621-4	30-9
6*	Barley Gram	400	949·a 792-tf	1,7^2-3	1,875-5	39-3
[illegible]	Barley Peas	400	[illegible]	1,681-9	2,093-3	37-1

The practice of sowing gram with wheat and barley appears desirable. The total crop gives a larger outturn for sale or food.

54. Of the oil seeds and pulses the following were tried in three series a, *b* and c.—

1 Gram.
2* Peas.
3 Chatar.
4 Masur.
5 Arhar.
6 Sarson (mustard/.
7 Labi ⎫
8 Sehuan ⎭ rape-
9 Linseed.
10 Castor.

Following tables will give their treatment and outturn per aofe :—

Treatment—

Table XIII.

	Series (a)	*Sirie** (6)	*Series* (c)
Manure	Mil	Nit	Dting, 120 maunds per acre.
Ploughing	2	5	2
Watering	Gram Nil M»<jur 1 Peas 2	Linseed 2 Others 1	1
Weeding	1	1	1
Crop	Gram, peas Chatar, iiiasur	Sarson, lahi Buhuan, husccd.	Arhar, castor.

Table XIV.

Number.	Crop.	Area in square yards.	Outturn per acre. Grain.	Outturn per acre. Straw.	Value per acre in Rupees.
1	2	3	4	5	6
			lb.	lb.	Rs.
1	Gram	800	960-7	1,185 8	23-2
2	Peas	800	1,905-2	2,371*6	30-0
3	Masur	800	654 6	955*9	17-7
4	Chatar	800	1,652-9	1,089-0	28-y
5	Arhar	800	521-9	988*7	17-8
6	Sarson	568	5309	2,243*0	21-2
7	Lahi	596	6659	1,9734	22-2
8	Sehua	598	8174	1,893-9	23-3
9	Alsi	595	341-6	1,171-3	13-G
10	Castor	400	1,113*2	740-5	34-1

55.- C. Acclimatized and imported seeds.—The follwing were tried during the season:—

1 Cape oats.
2 Barley, golden.
3 „ peerless.
4 „ beardless.
5 „ Kotgarh.
6 „ chevalier.
7 Wheat, Australian.
8 German rapeseed.
9 Italian turnips.
10 Carrots.
11 Mangold.

From Nos. 1 to 5 are the grains sown from seed grown on the farm for some years past.

No. 6 was received from the Commissioner of Settlement and Agriculture, Panjab.

No. 7 from the Superintendent of Botanical Gardens, Saharanpur.

No. 8 from Bombay Chamber of Commerce. This seed was received through the Local Government in 1884,-but the time for its sowing being then expired it was reserved for the present year.

No. 9 was received from Government of India with the object to try it on dry land chiefly, being said that it requires little or no irrigation.

Nos. 10 and 11 were procured from Messrs. Sutton and Sons of Reading (England).

From Table XV their treatment and outturn will appear.

Table XV.

No.	Crop.	Area in quart yards.	Outturn per acre. Grain.	Outturn per acre. Straw.	Manure.	[illegible]	[illegible]	[illegible]	Value of crop per acre.
			lb.	lb.					Rs.
A 1	Cape oats	2,167	2,423*3	3,419-6	Poudrette, 400 mds. per acre.	3	1	8	58-0
2	Ditto	891	2,620*6	4,8292	Poudrette, 400 mds. per acre	4	1	4	70*0
3	Ditto	2,304	?,2698	3,793'9	Poudrette, 400 [illegible]	2	1	?	567
4	Ditto	1,333	2,425*4	4,462-4	Ditto	2	1	3	62^
5	Ditto	2,070	79(V3	1 022*7	Nil			2	84'**
	Barley, golden	440	1,074 7	2,860 0	Hemp & Poudrette, 100 mds. per acre.	4	!	4	-
B	Ditto peerless	413	609-4	3,293-1'	Ditto	4	1	4	fi.
	Ditto beardless	891	466 6	3,168*8	Ditto	4	1	4	
	Ditto Kotgarh	3W	786*9	2,006 8	Ditto	4	1	4	23-8
	Ditto country	462	1,613*3	1,843*8	Ditto	4	1	4	34-*
C	Ditto chevalier	596	1,676-4	3,8U65	Ditto 200 mds. per acre.	5	1	4	43*3
	Ditto country	627	2,716-4	2,4856	Ditto	5	1	4	5&'t
	Wheat, Australian	240	452*6	4,7219	Poudrette, 200 mds, per acre.	4		4	30*3
	Ditto Muzaffarnagar	141	1,808*9	2.668*9	Ditto	4	1	4	549
	Rape, German	399	433-1	*••	Nil.	5	1	1	15'5
	Ditto country	591	580-9		Ditto	6	1	1	1-2

Table XV— (continued).

No.	Crop.	Area in square yards.	Outturn per acre. Grain.	Straw.	Manure.	[illegible]	[illegible]	[illegible]	Value of crop per acre.
			Mds.						Rs.
1	Carrot, Belgium, on ridges ...	260	153-5	...	Poudrettc, 260 mds. per acre.				38*4
	Ditto in lines ...	£55	1138	...	Ditto ...		6	7	28*5
	Carrot, country, on ridges ...	252	355*3	...	Ditto ...				88*8
	Ditto in lines ...	250	315-5	...	Ditto ...				78-9
2	Carrot, Belgium, on ridgei	485	2275	...	Ditto ...				31-9
	Carrot, country „ ...	473	235-6		Ditto ...	5	3	6	58-9
3	MaDgold in lines ...	546	73 8	...	Ditto ...				36-9
	Ditto on ridges ...	551	85-2	...	Ditto ...	[illegible]	4	7	42*6
4	Ditto „ ...	862	120-7	...	Ditto ...	5	3	8	60-3
5	Italian turnip in lines, watered,	4*	52-2	...	Poudrette, 200 mds. per acre.				26-1
	Ditto not watered ...	44	*Nil.*	...	Ditto ...	4	3	6	*Nil.*
	Italian turnip on ridges watered,	44*	63-2	...	Ditto ...				31*6
	Ditto not watered ...	44	*Nil.*	...	Ditto ...				*Nil.*

Although perhaps owing to the unfavourable character of the season generally the yield of the above crops compared to the last year was low, still they indicate the facts (1) the acclimatized seed produces more than the newly imported one; (2) the native barley has again enlarged its produce among its foreign species, and so the Muzaffar-fcagar wheat gave much larger yield than the Australian one.

Of the German and country rape seeds lOtb seed of each was pressed for determination of *the* quantity of oil they produce.

Country oil press (the kolhoo) was employed in crushing the seed. The result is as follows:—

Description of seed.	*Quantity of seed pressed.*	*Oil expressed.*	*Percentage of oil on seed.*
Country rape	... lOtbs	3-28	32·8
German rape	... 10 „	2-37	23-7

Not only in the quantity of produce but in quality too (fatty matters) the country seed camd out best. Among the root crops the foreigu seods do not seem to have any great advantage over the country ones, as far as the quantity of the produce is concerned. The yield from indigenous seeds was ddubble and threefold.

Mangold ‹rivo vorv noor crou :.its fair average is from 25 to 30 tons per acre.

Money \aiuo oi a crop oi country carrot per acre, as roughly estimated, is Bs. 84*8, much too higTi indeed than any cereal. To the cultivators near large town-carrot is a very good speculation.

56. *Ensilage.*—During the season before last thorough attention has been paid to the experiment of keeping fodder in sites, and estimating its nutritive value by feeding some working cattle of the farm on the stuff.

During the season under review, the fodder was ensilaged in much larger quantities. The following statement gives the detail of the number and dimensions of the pits, of their cost, and of the quantity of fodder ensilaged.

Table XVI.

No. of silo.	Date on which closed.	Date on which opened.	Form of silo.	Cost of digging.	Cost of roofing or raising mound of earth for shelter.	Pillars.	Cost of chopping.	Cost of filling, treading and weighting.	Total cost.	Fodder filled in.	
1	2	3	4	5	6	7	8	9	10	11	
				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		Mds.
1	12th December, 1884,	8th June, 1885 ...	Circular 6' diameter, 10' deep ...	0 8 0	0 6 0	...	2 2 3	0 15 6	3 15 9	Jwar ...	71
2	14th ditto, „	18th ditto ...	Ditto ditto ...	0 8 0	0 5 0	...	1 12 6	0 10 6	3 4 0	Jwar ...	74
3	18th ditto, „	Not opened ...	Ditto ditto ...	0 8 0	0 5 0	...	2 9 3	0 13 0	4 3 3	Jwar ...	62
										Surgho ...	23
4	3rd November, „	Ditto ...	Ditto ditto ...	0 8 0	0 11 6	...	1 6 6	0 8 0	3 2 0	Jwar ...	61
5	7th ditto, „	10th April, 1885 ...	Ditto ditto, 20' deep ...	2 0 0	0 13 6	...	4 13 0	1 10 3	9 4 9	Jwar ...	180
6	11th ditto, „	Not opened ...	10' diameter, 6' ditto ...	0 12 0	2 8 0	...	6 3 6	1 8 0	9 15 6	Jwar ...	171
7	6th October, „	10th May, 1885 ...	Longest diameter 18' ... *Shortest diameter* 10', *depth* 11'	3 12 0	21 4 0	6 6 0	Not chopped.	3 8 9	34 14 9	Common grass,	725
8	1st November, „	Not opened ...	Ditto ditto ...	3 11 0	20 7 0	6 6 0	13 13 0	2 8 0	46 13 0	Jwar ...	490
9	22nd December, „	Ditto ...	Ditto longest diameter 25' ... *Shortest diameter* 10', *depth* 12'	6 8 3	22 7 0	7 6 0	20 1 6	4 11 0	61 1 9	Jwar ...	756
10	30th ditto, „	12th June, 1885 ...	Ditto longest diameter 30' ... *Shortest diameter* 18', *depth* 13'	13 9 0	39 10 6	15 13 0	43 13 3	7 14 3	120 12 0	Jwar ...	1,417
										Guinea grass...	416
11	4th September, „	19th February, 1885...	Square 10' by 10', depth 6' ...	...	Masonry pits.	...	Not chopped.	1 11 0	1 11 0	Common grass,	159
12	Ditto ditto,	17th March, 1885....	Ditto ditto ...	...	...	...	Ditto,	2 4 0	2 4 0	Ditto,	212
13	21st ditto, „	11th February, 1885,	Ditto ditto ...	...	...	...	Ditto,	2 1 0	2 1 0	Guinea grass...	191
			Total ...	32 4 3	108 13 6	35 15 0	95 10 9	30 11 3	303 6 9		6,007

Three of the 'above thirteen pits were masonry, which were formerly connected with subsoil drainage, and since 1883 are used as silos, the remaining 10 pits were simply excavations on a piece of high ground, seven of these were covered with chhappers, and three were 'protected from the rains simply after the native fashion of pre-c"~ving their dung cake heaps, *viz.,* a cone shape earth-hill was raised over them.

The fodder ensilaged consisted of j war and sorghum, guinea and common grasses. Some jwar was cut when in flower, but most of it filled in at the time the seed bunches were maturing. The grasses cut when they were in flower. Sorghum and jwar were chopped up into bits of about an inch .in length, but the common and half of the guinea grass were packed in uncut. •All the siles were stuffed gradually after what is called SIQW process, by layers varying from two to four feet in thickness according to the size -of the silo. The interval between the two successive fillings was about two "days. .After thei pits were filled they; were, covered with a laryer of earth two to three feet thick.

The masonry pits were opened while I was in Lalitpur, but I# saw samples of the ensilage and found it exceedingly good. .One of the pits (No. 2-) was opened, when Mr. Allen, S. C, M. R. A. 0., the .Assistant Director of the Department of Agriculture of Bengal, happened to be .here 'at the farm. It is very satisfactory that he considered the ensilage to be first rate. Except in some pits, about six inches of the fodder at the top and around the sides had turned mouldy, and \his is not an unudual rate of the waste. Besides this, the whole of the 'fodder was'iu an excellent state of preservation. The temperature at the depth of about two feet stood between 110 and 120. It was freely, rather eagerly, eaten not only by farm bullocks, which have learned the taste of it, but by the bullocks which neyer had it before.

As far as the matter of preservation of fodder is concerned, I am pretty certain we were quite' successful, but whether the thing in itself is a' good food for animals is of course an open question and requires long consideration and trial. Also it is to be ascertained yet which is the best process for preserving the fodder, that the albumenoids may be less converted into amoids and acetic acids.. In the next ^experiments these points "will be aimed at and necessary reforms will be adopted. There is no space here to describe how this should be done.

IMPLEMENTS.

57. *Supply of.*—The implements -turned out in the farm workshop and stippliod are—

1. Ploughs (Kaisar and Duplex;*
2. • Waterlifts or chainpumps of 5, 10, 15 and 2Q feet in length.
3. Sugar evaporators.

Watts? plough and chaff-cutte'r are imported And supplied.

The following table shows their distribution during two years—

Implements.	1883-84. Sold.	1883-84. Seat for trial.	1884-86. Sold.	1884-86. Sentfor trial.
Ploughs-				
Watts'	25	3	23	*Nil.*
Kaisar	183	3	•60	*NU*
Duplex	67	28	81	*7
Pumps	26	*Nil.*	44	*Nil.*
Eraporators	5	*Nit.*	14	*mi.*

58. The Kaisar'is getting out of,fashion lately or since the improved duplex was invented and pushed on. As the latter does both works; cultivating and sowing, it is really of greater use to farmers ahd is more admired too than the old Kaisar.

Watts'is unquestionably the best for first ploughing on stubble and is valued bj those who become aware of its quality. Arrangements have been made for diffusing broadcast the advantages of the modified and improved plough, tha Duplex, during the next rabi season. Apprentices with ploughs*and ploughmen have been sent out to several districts with instructions to tour through the districts and plough for all who will consent. The Collectors have interested themselves for the experiment.

59. *American plough.*—This plough was seut from America by Mr. Wilson, the late Engineer connected with this department, and was tried in last May. The Superintendent's report on the same is as follows : —•

1. " It turns over the soil very welf, but not better than Watts'."
2. " It requires a powerful team of cattle to draw it. We had yoked one of our strongest pairs, and even then it could be driven with difficulty."
3. •" It can be used both as a "short and long be^m plough, and this is the only point of novelty about it, otherwise it does not differ much from the Kaisarr"
4. " To ,sui£ it for different heights of cattle it has got a hoop of iron with a number of holes. After placing the, beam at the required inclination, a bolt is passed through the holes of the hoop and the beam rests there. This is, howevdr, ftot soisimple as the wedges which we use in the Kai^ar and Duplex.

60. *Pump.*—The Pump is getting more and more popular. The one of five feet is most economical and useful for the irrigation done by the side of the canal distributaries in the. fields which a*e higher than the water-lenel.

61. *Sugar evaporator'.*—Like sugar millet most probably it seems to push on itself very rapidly. The only complaiut heard of it is that it is made of thin sheets of iron by which, of course, it is liable to break and *go* out of use soen.

By jisiijg durable materials it will become more costly. However, it is to be searched out to make it cheap and good.

62. *Seed separator.*—A new seed separator has been received during the year under report. Th6 Superintendent's note on its trial is quoted below.

" Seed separator was tried in June for separating the big grains of wheat for seed. It servfes very well for separating the bigger grains from the smaller ones, but it fails to remove the larger impurities which remain with the big grains."

63. *Show of implements.*—A collection of various kinds of ploughs and useful machinery is kept in the farm premises for show, and new things added at opportune times.

In the district fairs the Duplex, pumps- and evaporators' had been exhibited widely and generally approved of by the committee.

64. *Seed distribution.*—The following Hs* shows the amount of seed distributed during the year under review. As far as the results have been ascertained, they agree with the results obtained on the farm.:—

	ft.
Nankin cotton seed	2,808
^ew Orleans '	365
Sorghum	-1,986
Maize	978-
Wheat, Mnzaffarnagor*	12,123
Ifcitto, Mundia	786
Cape oats	4,011
Barley, acclimatized	20a

65. TJie Superintenttent, Babu Lachraan Pershad Burmah, has shown his usual activity and has taken a hearty interest in conducting tho works on the farm.

SAYYID MUHAMMAD HUSSAIN, M.B.A.C,
In charge of Experimental Farm, Cawnporc

APPENDIX.

Notes on Usar and Reh soils, by DR. R. ROMANIS, D, SO., *Chemical Examiner, British Burmah.*

THE specimens examined were—

1st—Specimen of surface soil, usar plain, near Cawnpore.
2nd—Samo place, 4-10 inches below surface*
3rd—Well water, same place.
4th—Reh taken from wheat field, Bulandshabr.
5th—Reh from a field at Nethra-Hasanapura, about three miles from Bulandshalr.
6th—Reh, same place, 1-4 inches below surface.
7th—Reh, 6-10 inches below surface.
8th—Soil from surface, same place.
9th—Soil, 6-10 inches below surface.

There was no reh on the surface of the lisar plain at Juhi near Cawnpore.

It seems to me tljat its barrenness is caused by the natural poverty of the soil and its physical nature.

A specimen of the salt bush planted there looked unhealthy: not because the reh does not agree with it, but because there is no food for it. This soil contains a fine clay that remains suspended in water for days, and no doubt it chokes the roots of plants.

A sample from the surface of the soil contained no phosphoric acid : the other essential constituents in sufficient quantity.

The subsoil contains a moderate amount of phosphoric acid : the other constituents in larger quantity than the surface.

The subsoil water contains a notable amount of alkali, *and a trace is found in the soil. So far as I sec, it is the physical more than the chemical nature of the soil at Juhi that is at fault. It'is possible that the presence of alkali causes that peculiar state of semi-solution of the alumina in which it passes through filters, and remains suspended in water for many days, for ^vhen acid is added tho solution clears quickly ; also if a salt of iron is added.

* [illegible] rains per ga[illegible].

At Nethra-Hasanapura there was a barren plain covered with alkaline reh. Some of this scarped off the surface had the following composition :—

Carbonate of sodium. ... ... < ...	72-57
Sulphate	20-41
Chloride	6.43
	99-41

The layer, about £ inch deep, contained 14 per cent, of reh and 86 of sand ; therefore about 11 per cent, of sodium carbonate. There was no borax, which I hopeclto find.

Tho quantity decreased rapidly downwards.

From one inch to four inches there was 0*7 per cent, alkali, and from six inches to 10 inches 0*6 per cent.

At Bulandshahr a sample was taken near tho municipal boundary pillar on the road to tho Railway. It was taken from the middle of a wheat field. The composition was—

Carbonate of sodium	[illegible]
Sulphate „	[illegible]
Chloride „	[illegible]
Organic matter and un It tPriiiiiwrl	[illegible]
	100'00

Tho reh contained 80 por cent, of sand anil 20 per cc:.......>alts ; therefore tlir surface layer containod OR of alkali. Tho wheat looked well enough, except wlimv "to aalt had effloresced on tho surface.

It is well known that an alkaline substance like sodium carbonate is far more injurious to plants than neutral salts like the sulphate and chloride ; but we have no experiments to show what is the minimum of any of these, salts* that will prove injurious.

The alkali can be neutralised by sulphate of lime (gypsum), which produces carbonate of lime and sulphate of sodium ; sulphate of magnesium, which produces sulphate of sodium ; and basic carbonate of magnesium, or sulphate of iron, which will produce sulphate of-sodium, oxide of iron, and carbonic acid.

I should like to s6e the latter especially tried, as I fancy it would improve the physical condition of the soil.

But these substances could only be profitably applied where the alkali is in comparatively small proportion, as at Bulandshahr or the sub-soil at Nethra-Hasnapura.

Where there is a large quantity, it must be removed mechanically. Whether this can be done profitably^ depends on various circumstances^

(1) If where the crust of reh is removed from the surface, the sub-soil reh is not in sufficient quantity to prevent vegetation (Ex. at Nethra-Hasnapura it is 0*7 per cent.):

(2) If, since the source of the reh is the subsoil water, the land being once cleared, it takes a sufficiently long period before the alkali accumulates at the surface by capillary attraction and evaporation to make the process of clearing again necessary :

(3) If the improved value of the s*pil and the value of the reh repay the cost of collecting.

These, then-, are the points which require to be settled. The only point on which I can give any data is the last. Litres 61 cubic inches of reh from Nethra-Hasnapura gave 72'6 grains of alkali, which is at the mte of lib per 380 cubic inches. Supposing the layer scraped off was £ inch, wo have lib. per 1,520 square inches of surface, or nearly 2 tons per acre of dry carbonate (37cwt.), or 98cwt. of soda crystals, the price of which at Liverpool is about £4 to £5 per ton. If the Nethra-Hasanpura reh is of uniform quality, it should yield about £20 of carbonate per acre.

What we have now to ascertain is the area and composition of the alkaline reh (jn addition to the points mentioned above;. There is, I understand, a survey of the reh country in progress. If not already done, it would be easy to determine this by means of standard acid, and a burette, the simplest of all analytical operations. We should then know the value of the material, and could calculate the profit of removing it.

The soils vary greatly in composition. The following is the composition of the part soluble in hydrochloric acid :—

	tJsar, Cawnpore.		*IVethra-Hainopura.*	
	Surface \ in.	Subsoil 4 to 10 inches.	Surface.*	Subsoil 6-10 inches.
Potash	0-294	0808	O-26O	0*608
8°°*	... -O-174	0271	O*09	O675
Lime	... O-coo	I^IO	not determined	1*450
Magnesia	... o*220	O-35O	...	o•2O
Alumina, not weighed	...	8 900	...	7•,6
Phosphoric acid trace	...	0-055	0*064	0*11

This shows the subsoil to be twice as good as the surface, and richer imi'i »u best Burmese soils I have examined. In the case of the Cawnpore soil it is evidently the physical nature of the soil that is at fault. At Nethra-Hasnapura it is the reh.

The water of a well in the liaar plain at Cawnpore contained 36 grains per gallon of residue, of which 22 grains were carbonate of soda and 14 grains carbonate of lime. The soil also contains minute traces of alkali.

R. R0MANIS, D. Sc,
Chemical Examiner, British Btirmah.

• This surface soil was the residue from the reh.

REPORT

ON THE

CAWNPORE EXPERIMENTAL STATION

FOR THE KHARIF SEASON, 1885.

ALLAHABAD:
NORTH WESTERN PROVINCES AND OTJDII GOVERNMENT PRESS.
1880.

No. 683A OF 1886.

DEPARTMENT OF AGRICULTURE AND COMMERCE, N.-W. P. AMD OUDH.

DATED CAWNPORE, THE 26TH MAY, 1886.

FROM

LIEUT.-COLONEL D. G. PITCHER,

OFFG. DIE., DEPT. OF AGRI. AND COMMERCE,

N.-W. PROVINCES AND OUDU,

To

THE CHIEF SECRETARY TO GOVERNMENT,

N.-W. PROVINCES AND OUDH.

SIB,

I HAVE the honor to submit for the information of His Honor the Lieutenant-Governor and Chief Commissioner the report for the kharif season of 1885 of the Cawnpore Experimental Station, now in the charge of Mir Muhammad Husain, M.R.A C, Officiating Assistant 'Directory by whom the report has been compiled.

2. The report was due officially in December last ; but owing to the lateness of tlie cotton crop, particularly in regard to exotic varieties, it has never been found practicable to render the report within the time fixed, and this year experiments with certaiu kharif mixed crops has delayed the report still further.

3. *Character of the season.*—The season was marked by early and heavy rain with early cessation. Sorgho and maiz& suffered, but cotton appears to have done fairly well.

4. *Experiments with manures.*—Notwithstanding the eccentricities of the seaspn, the established precedence of the various manures was fairly maintained ; but the yield of both grain and straw was remarkably low all through and would appear to indicate that ordinary cultivators must have suffered considerably. That they did so was very practically established later on by the scarcity amounting to very grave inconvenience throughout the country of that winter fodder which in ordinary years is derived from the stalks and straw of kharif crops.

5. *Comparative experiments: Saltpetre against certain organic manures.*—In these saltpetre maintained the lead. The most interesting fact in the table is the high value now obtained from woollen refuse, a waste product of the Cawnpore Mills which the latter at one time found the greatest difficulty .in getting rid of on any terms The figures for pigs' droppings and for poudrette embody facts interesting to students of rural sanitation.

6. *Experiments in sowing maize after the American method.*—The sowings were personally conducted by the American gentleman at whose suggestions the experiment was carried out, but the results were not satisfactory ; and as the season was so unfavourable, it is hoped that next year may show better.

7. *Experiments with cotton.*—Used as the test crop in trial of deep *versus* shallow ploughing, the deep-ploughed plot as usual gave the best results. Tested for various methods of sowing, that of broadcast sowing proved most suitable for the slender plants of country cotton, while for the more bushy occidental varieties sowing in lines is better adapted. Cow-dung manure nearly doubled the produce as compared with that on unmanured plots. Eight different varieties were grown for comparison, with the result that Sahāranpur seed gave the best results, ordinary country cotton and New Orleans following with about equal success.

8. *Oilseeds.*—Some very useful experiments were instituted this year under this heading in view of ascertaining the comparative outturn and value in the system of growing oilseeds alone and mixed. A connected series will in due time furnish figures now greatly needed for the annual harvest forecasts for the provinces.

Another useful series termed in the report " miscellaneous " was inaugurated to test the value of the method largely followed of sowing mixed crops in the kharif, one of which is reaped with the rabi harvest and the other with the kharif harvest, instead of sowing a full kharif crop one year and a full rabi the next. The series will be continued until sufficient figures have been collected to admit of true deductions being drawn.

9. A small experiment was tried [in growing sugarcane according to the Mauritius method as compared to that in vogue in the district. So far as the experiments went, the Mauritius method proved no more superior to the local methods than did the Demarara plan tried on the farm about two years ago.

10. *Ensilage.*—This system can no longer be considered in the light of an experiment, as it has been successful on the Station for some three years past and silos form a regular part of the establishment. The inopportune rains and consequent failure of kharif fodder proved this y^ar the opportunity of ensilage. In the previous year a great deal more fodder had been ensilaged than could at the time be got rid of, and it was reserved as an experiment against time. When opened after 18 months it was found so good that the farm cattle were fed almost exclusively on the ensilaged ju&r for about two months, keeping excellent condition. The result was a large saving in money which would otherwise have had to be expended in buying fodder at the very high rates ruling.

Grass was not so successful as jiuir. It is to be noted that the offensive smell so often complained of in regard to silos is not a concomitant of those at Cawnpore.

11. *Implements.*—Of these mention has already been made in the annual list of implements, &c., tried, which has been submitted to Government. The centrifugal sugar separator introduced by the makers of the Behea mill promises to be a most useful addition to implements suited to the country. In regard to Rogers' sugar mill, it is true that the weight renders it less portable than mills with wooden stands; but, on the other hand, weight lends stability, an object most desirable to attain in working any mill.

Bull's improved dredger has proved a decided success. Four are now in use and orders have been received for six more, which are now on their way from Bombay. It greatly cheapens and expedites well-sinking when sand is met with.

12. Mir Muhammad Husain was in entire charge of the farm for the period under report and had much difficulty to contend with in the character of the season.

I have the honor to be,

SIR,

Your niost obedient servant,

D. G. PITCHER, LIEUT.^COL.,

Offg. Director.

REPORT

ON THE

CAWNPORE EXPERIMENTAL STATION

FOB THE KHARIF SEASON 1885.

1. *Cause of delay in submission.—As* kharif report includes cotton and ensilage experiments, and in the season under report it included arhar and sugarcane, therefore the submission of this report ha3 necessarily been delayed. The picking of Nankin cotton kept on as late as the last week of January, and of other varieties a little earlier than that; arhar was harvested only a day or two before the writing of this report was commenced; milling sugarcane was not over till the end of •January, and the silos were opened on the 16th of April last.

2. *Rainfall.*—As a rule, the rainfall is sever or very seldom up to the satisfaction of agriculturists: there always remain more or less complaints of its being inopportune and unfairly distributed.

Last year the complaint was greater at the beginning : just at the very ploughing and sowing time it had been excessively heavy, while at the end it ceased altogether. It affected every crop, especially sorgho and maize. Nankin cotton stood more vigorously against the unfavourable circumstances than other varieties* On the whole, cotton did not suffer much on the farm.

3. The following table will show the rainfall of last two years : —

Month.	Rainfall in inches. At the Station. In 1884.	At the Station. In 1885.	At the City. In 1885.	At the City. Mean of 15 years
June	2'57	68	6-69	2*61
July	S'11	160	14*62	9*6>
August ... — ...	2447	18*8	15-06	7*89
September	9'32	2*2	1-57	5'3 S
October	6-17	...	0'29	I'06
November	...	...		...
December	...	"o«9	"i-56	26*56

4, *Major heads of experiments.*—In the season under review the following operations comprised experiments :—

I.—MAIZE.

(a) Treatment of standard and duplicate plots as usual.
(6) Effect of certain animal manures,
(c) Effect of special manures.
{d) American way of sowing *versus* country fashion.

II.—COTTON.

(a) Effect of deep and shallow ploughing from improved and country ploughs.
(6) The produce from different varieties of seed,
(c) Effect of different kinds of sowings on country seed.
\d) Effect of different kinds of sowings on Nankin seed.

III.—OILSEED.

(a) Black til.
(i) White til: (1) early variety; (2) late variety.
(o) Mixed crop (til, maize, cotton, pulses, &c.)

IV.—SUGARCANE.

(a) Sugarcane *versus* sorgho.

(6) Effect of different kinds of sowings.

V.—MISCELLANEOUS.

(a) Money value of mixed kharif crop against a crop of wheat.
(b) Outturn of pulses and millets.

VI.—ENSILAGE.

(a) Silo opened after 18 months.

(b) Silo opened within 9 months.

5. A copy of the programme which was drawn up for the works of this season is appended at the end of this report. It will show the detail of the operation of the kharif sowing.

6. *Maize.*—(a) *Experiment in a series of* 26 *plots termed standard and duplicate, each division having* 13 *plots.*—Twenty out of the plots (26) have been under the same experiments for the last six years. Three new plots have been added in each division from 1884 for sheep-dung, ashes of cowdung top dressed with saltpetre, and poudrette Respectively. Each plot is 400 square yards.

The manure applied and the crops sown for the last five years are shown in the following return :—

Table I

Number of plot.		1880-81. Manure.	1880-81. Crop.	1881-82. Manure.	1881-82. Crop.	1882-83. Manure.	1882-83. Crop.	1883-84. Manure.	1883-84. Crop.	1884-85. Manure.	1884-85. Crop.	1885-86. Manure.	1885-86. Crop.
I	Standard,	Dung ...	Maize & wheat,	Dung ...	Maize	Dung ...	Maize ...	Dung ...	Maize	Dung ...	Maize,	Dung ...	Maize.
	Duplicate,	Nil	Maize	Ditto	Maize & wheat,	Ditto	Ditto	Ditto	Wheat	Ditto	Ditto,	Ditto	Wheat.
II	Standard,	Dung and bone-dust,	Maize & wheat,	Dung and bone-dust,	Maize	Dung and bone-dust,	Ditto ...	Dung and bone dust,	Maize ...	Dung and bone-dust,	Ditto,	Dung and bone-dust,	Maize.
	Duplicate,	Nil	Maize	Ditto	Maize & wheat,	Ditto	Ditto	Ditto	Wheat	Ditto	Ditto,	Ditto	Wheat.
III	Standard,	Dung and calcic sulphate.	Maize & wheat,	Dung and calcic sulphate.	Maize ...	Dung and calcic sulphate.	Ditto ...	Dung and calcic sulphate.	Maize	Dung and calcic sulphate.	Ditto,	Dung and calcic sulphate.	Maize.
	Duplicate,	Nil	Maize	Ditto	Maize & wheat,	Ditto	Ditto ...	Ditto	Wheat	Ditto	Ditto,	Ditto	Wheat.
IV	Standard,	Ashes of dung ...	Maize & wheat,	Ashes of dung ...	Maize	Ashes of dung	Ditto ...	Ashes of dung ...	Maize	Ashes of dung	Ditto,	Ashes of dung ...	Maize.
	Duplicate,	Nil	Maize	Ditto	Maize & wheat,	Ditto	Ditto ...	Ditto	Wheat	Ditto	Ditto,	Ditto	Wheat.
V	Standard,	Poudrette	Maize & wheat,	Poudrette ...	Maize	Potassic nitrate	Ditto ...	Potassic nitrate ...	Maize	Potassic nitrate ...	Ditto,	Potassic nitrate ...	Maize.
	Duplicate,	Nil	Maize	Potassic nitrate ...	Maize & wheat,	Ditto	Ditto ...	Ditto	Wheat	Ditto	Ditto,	Ditto	Wheat.
VI	Standard,	No manure	Fallow	No manure	Fallow	No manure ...	Fallow.	Potassic nitrate and bone-dust.	Maize ...	Potassic nitrate and bone dust.	Ditto,	Potassic nitrate and bone-dust,	Maize.
	Duplicate,	Nil	Maize	Potassic nitrate and bone-dust.	Maize & wheat,	Potassic nitrate and bone dust.	Maize ...	Ditto	Wheat	Ditto	Ditto,	Ditto	Wheat.
VII	Standard,	Bone superphosphate.	Maize & wheat,	Bone superphosphate.	Maize	Bone superphosphate.	Ditto ...	Potassic nitrate and bone-dust superphosphate.	Maize ...	Potassic nitrate and bone superphosphate.	Ditto,	Potassic nitrate and bone superphosphate.	Maize.
	Duplicate,	Nil	Maize ...	Ditto	Maize & wheat	Ditto	Ditto ...	Ditto	Wheat	Ditto	Ditto,	Ditto	Wheat.
VIII	Standard,	Bone-dust	Maize & wheat,	Bone-dust	Maize ...	Bone-dust	Ditto ...	Sheep-dung and bone-dust.	Maize	Sheep-dung and bone-dust.	Ditto,	Sheep-dung and bone-dust.	Maize.
	Duplicate,	Nil	Maize	Ditto	Maize & wheat,	Ditto	Ditto ...	Ditto	Wheat ...	Ditto	Ditto,	Ditto	Wheat.
IX	Standard,	Calcic sulphate ...	Maize & wheat,	Calcic sulphate ...	Maize ...	Calcic sulphate	Ditto ...	Sheep dung and calcic sulphate.	Maize	Sheep-dung and calcic sulphate.	Ditto,	Sheep-dung and calcic sulphate.	Maize.
	Duplicate,	Nil	Maize	Ditto	Maize & wheat,	Ditto	Ditto ...	Ditto	Wheat	Ditto	Ditto,	Ditto	Wheat.
X	Standard,	No manure ...	Maize & wheat,	No manure	Maize	No manure	Ditto ...	No manure	Maize	No manure	Ditto,	No manure ...	Maize.
	Duplicate,	Nil	Maize	Ditto	Maize & Wheat,	Ditto	Ditto ...	Ditto	Wheat	Ditto	Ditto,	Ditto	Wheat.
XI	Standard,	„	Pulses	Dung ...	Cereals	Green soiled with hemp.	Barley..	Ditto	Sorgho ...	Ashes of dung and saltpetre.	Ditto,	Ashes of dung and saltpetre.	Maize.
	Duplicate,	„	Maize	No manure	Cotton ...	No manure	Juār and gram	Ashes of dung and saltpetre.	Sorgho and wheat.	Ditto ...	Ditto,	Ditto	Wheat.
XII	Standard,	„	Pulses	Dung ...	Cereals	Green soiled with hemp.	Barley...	No manure	Sorgho	Sheep-dung ...	Ditto,	Sheep dung	Maize.
	Duplicate,	„	Maize	No manure	Cotton ...	No manure	Juār and gram.	Sheep-dung ...	Sorgho and wheat.	Ditto	Ditto,	Ditto	Wheat.
XIII	Standard,	„	Pulses ...	Dung	Cereals	Green soiled with hemp.	Barley...	No manure ...	Sorgho	Poudrette	Ditto.	Poudrette	Maize.
	Duplicate,	„	Maize	No manure	Cotton ...	No manure ...	Juār and gram.	Poudrette ...	Sorgho and wheat.	Ditto	Ditto,	Ditto	Wheat.

Other treatment of the plots in question was as follows :—

Ploughing	
Weeding	
Irrigation	Nil
Seed maize	12 lb. per acre.

The following table shows the outturn obtained from each plot during the year under report and the year before it:—

Table II.

No.	Manure and rate per acre.	Year.	OUTTURN PER ACRE. Grain. Standard.	Grain. Duplicate.	Stalk and leaf. Standard.	Stalk and leaf. Duplicate.
			lb.		Mds.	Mds.
1	Cowdung, 180 maunds ...	1885 ...	266*2	6O5-O	30-3	43-2
		1884 ...	1860-0	1680-4	89-6	75-2
2	Cowdung, 180 maunds; bone-dust, 360 lb. ...	1885 ...	471-9	629-2	61-6	44-7
		1884 ...	1632*0	1568*4	76-8	85-6
3	Cowdung, 180 maunds; calcic sulphate, 240 lb.	1885 ...	435-6	641-3	40-5	37-1
		1884 ...	1914-0	1524-O	96-0	80-8
4	Ashes of 180 maunds dung ...	1885 ...	326-7	314-G	37-9	27-7
		1884 ...	12300	806-4	69-6	48"8
5	Potassic nitrate, 240 lb. ...	1885 ...	871-2	484-0	60-05	34*5
		1884 ...	1608 0	876-O	77-6	58-4
6	Ditto bone-dust, 360 lb. ...	1885 ...	435-6	629-2	45-1	43-3
		1884 ...	1644-0	12O0-O	73-6	56-8
7	Ditto bone superphosphate, 240 lb. ...	1885 ...	520-3	762-3	36-8	40-4
		1884 ...	1260 0	852-0	76-0	65-2
8	Sheep-dung, 180 maunds ; bone-dust, 360 lb.	1885 ...	508-2	5O8-9	46-1	41-0
		1884 ...	15180	1062-0	80-8	53-6
9	Sheep-dung, 180 maunds; calcic sulphate, 240 lb.	1886 ...	329-7	520-3	23-9	38*3
		1884 ...	1359-6	1O74-O	70-4	68'4
10	No manure ...	1885 ...	338-8	193-6	38-3	36-0
		1884 ..	1044-O	564-0	70-4	43-2
11	AnUrat e!s 480 ft m8aildB dUDg «* *Ot"sic	1885 ...	726-0	SUS'4	79-3	71*5
		1884 ...	1514-4	1134-0	73-6	68-8
12	Sheep-dung, 180 maunds ...	1885 ...	290-4	847-0	24-O5	60*4
		1884 ...	1316-4	1167-6	73*6	69-6
13	Poudrette, 180 maunds ...	1885 ...	460-7	869-1	38-7	43-2
		1884 ...	1932-0	1728-0	96-8	86-4

From the figures tabulated in the foregoing statement the effect of bad season is clearly visible. It is said that throughout the province maize and early-sown cotton crops have suffered a great deal. The plots, being situated on somewhat low-lying ground, never got free of water when the plants were growing. Although due attention had been paid to drain off the water by surface drainage, yet, owing to the continuous rain of day and night, the incoming quantity of it always exceeded the amount discharged out.

Although the season had been very unfavourable and the outturn extremely poor, still in most cases the fertilizers experimented upon have proved true in their effects,—the farmyard manure stimulated with some artificial fertilizer has given better result than the former applied singly ; for instance, cow-dung and calcic sulphate, sheep-dung and bone-dust, &c

Potassic nitrate too did not fail to produce its recognised effect, but gave a comparatively better crop. Poudrette has proved to be a better manure than cattle-dung.

The excess of rain has not only injured the grain but produced the same effect over the stalks of the crop.

Duplicate plots in which maize and wheat arc sown alternately have nearly in all cases given a better crop this time than the standard plots in which maize is sown year after year. But this is contrary to the previous results. This exception may be attributed to the excess of rain, which, perhaps, decomposed organio matters deposited by the roots e£ the previous wheat crop quickly and made it available for maize in the time of need. The other fertilizers applied to the plots no doubt were washed away to a great extent by surface drainage, while the organic matter left by the previous crop, the wheat, was being decomposed and got ready just in time for being used by the plant.

7. (6) *Experiments to determine the comparative value of certain animal manures and saltpetre.*—The following table Shows the crops produced during the current and the last five seasons in the eight plots under this experiment: —

Table HI.

No. of plots.	1880. Manure.	1880. Crop.	1881. Manure.	1881. Crop.	1882. Manure.	1882. Crop.	1883. Manure.	1883. Crop.	1884. Manure.	1884. Crop.	1865. Manure.	1865. Crop.
I	Sheep dung.	Wheat	Nil.	Cotton	Nil	Wheat	Woollen refuse.	Maize & barley.	Woollen refuse.	Maize.	Woollen refuse & lime.	Maize.
II	Do.	Do.	Do.	Do.	Do.	Do.	Do.	Do.	Sheep-dnng.	Do.	Sheep-dung.	Do.
III	Do.	Do.	Do.	Do.	Do.	Do.	Brickiln refuse.	Do.	Cow-dung.	Do.	Cow-dung.	Do.
IV	Do.	Do.	Do.	Do.	Do.	Do.	Poudrette.	Do.	Poudrette.	Do.	Poudrette.	Do.
V	Do.	Do.	Do.	Do.	Do.	Do..	Nil.	Do.	Horse-dung.	Do.	Horse* dung.	Do.
VI	Do.	Do.	Do.	Do.	Do.	Do.	Do.	Do.	Pigs' droppings.	Do.	Pigs' droppings.	Do.
VII	Do.	Do.	Do	Do.	Do.	Do.	Do.	Do.	Saltpetre.	Do.	Saltpetre.	Do.
VIII	Do.	Do.	Do.	Do.	Do.	Do.	Do.	Do.	Nil.	Do.	Nil.	Do .

Qjther treatment of the plots during the year was as follows :—

Floughinga	... ...	2
Weeding	... ...	1
Irrigation	... ...	*Nil.*
Seed and rate per acre	... ...	Maize. 12 lb.

The outturn of each plot is shown in the following table :—

Table IV.

No. of plots.	Manure and rate per acre.	Outturn per acre. Grain.	Outturn per acre. Stalks and leaves.
		lb.	Mds.
1	Woollen refuse, 120 mds.	1,185-8	80-7
2	Sheep-dung, 120 „	780-4	72-7
8	Cow-dung, 120 „	780-4	54*4
4	Poudrette, 12O „	847*0	75-1
6	Horse-dung, ISO „	[illegible]	73-3
6	]'igs' droppings, 12o „	1,016-4	80-1
7	Potassic iiitrate-<saltpetre), 3 mds.	1,806-8	76-1
8	No manure	660*8	41-5

The produce from these plots is much greater than that from the duplicate and standard plots treated before. It should not be considered that the different kinds of* fertilizers used in this case have to account for it, the true cause being that these plots, being on a slope, did not allow water to lodge in them.

After saltpetre, ^j|ollon refuse has given the best results and has again proved to be better than poudretto for maize. By the results of the past two years tho conclusion can safely bo drawn now that it is a good manure. If tho blanket-manufacturing class in the country, who as a rule are cultivators too, may become aware of the fact and learn it that they can utilize the waste of their manufactory in fertilizing their fields, they can derive immense good by it. They already know the effect of their sheep excrement, but do not know the value of the woollen refuse, which is simply wasted. Cow and sheep-dungs have given just equal results. Poudrette exceeds them here again. Horse-dung and pigs' droppings are still better, but this is an exception in the present case : generally they have not proved to be so* Saltpetre tops the list.

8. *(c) Brick-kiln refuse and ashes of weeds.*—These series consist of four plots. Past and present treatment stands as below :—

Table V.

No. of plot.	*Past treatment.* Year.	Manure.	Crop.	*Present treatment.* Manure.	Ploughing.	Weeding.	Irrigation.	Crop.
I ...	1881-82 ...	Dung ..	Wheat and barley.	AB io table VI.	9	a	2	Maize.
II ...	1882-83 ...	Green soiled with hemp, *JSil.*	Oats ...					
III M·	1883-84 ...							
IV ...	1884-85 ...	1. Brick-kiln refuse. 2. Ashes of weeds. 3. Ditto *nd po t assic nitrate. 4. *ML*	Sorgho. Maize.					

The outturn is given in the following table:—

Table VI.

No. of plot.	Manure and rate per acre.	*Outturn per acre.* Grain.	Stalk and leaf.
		℔.	Mds.
1	Brick-kiln refuse, 120 maunds	387-9	64-3
2	Ashes ot 1*0 maunds cow-dung	726 0	46-4
3	Ditto and potassic nitrate, 3 maunds	762 3	[illegible]
4	No manure	302*5	[illegible]

Brick-kiln refuse in this instance too has proved to have manurial value in it. Its quality, of course, would depend on the nature of fuel burnt in it.

Ashes of cow-dung have also always proved to act as fertilizer, but of course they are not so good as the unburnt dung.

Saltpetre in every case has shown its good effect.

9. (d) *Experiment of sowing maize after American fashion, what is called'on hi\ls, against country way of soioing.~?he* idea of this method of sowing has been taken from American papers, which have highly advocated in its favour, and a trial for the iirst time was given to it in this season.

The plots were prepared and sown under the direction and supervision of an American gentleman named Dr. L. Hauser.

Four plots of equal size being measured off, treated as follows:—

Manure, cowdung, 200 mannds per acre-
Ploughing, three times.
Weeding, twice.

In one plot seed had been sown after plough according to fee native fashion, and in three plots it was sown in lines 2, 3, and 4 feet apart. The blanks between the two lines were grubbed, and earth hills or mounds raised up around the roots of the pla*ts which had been sown in tuft.

The following table shows the result:—

Table VII.

		Outturn per acre.	
		Grain.	Stalk and leaf.
		lb.	Mds.
1	Maize country sown 2 feet apart ...	[illegible]	[illegible]
2	Ditto 3 „ ...	[illegible]	[illegible]
3	Ditto 4 „ ...	[illegible]	[illegible]
4	Maize country sown behind plough	[illegible]	[illegible]

Owing to the excessive and untimely rain the seed did not germinate well : thus the loss in thinly sown plots was greater. The blanks were filled up by plants transplanted, but they did not bear good cobs. Under the above circumstances, no conclusion can be drawn safely by this first trial. In next season this would be experimented again.

10. *II.—Experiments on cotton.*—In tl^ season cotton has given much better crop than last time. Kulpahar cotton sown broadcast heads the list.

(a) *Effect of deep and shallow ploughing.*—This experiment is tried in two series, A. and B., of 4 and 3 plots respectively.

There is no difference of any treatment between the two, but the area of B. series is larger than A.

In other words in (5) series the same experiment is confirmed in a larger scale. No manure is applied.

The other treatment is as follows :—

Irrigation	... ...	*NIL*
Weeding	— ... ... —	3
Grubbing	... ...	*Nil.*

Process of sowing.—The result obtained during the last two years is shown in the»following statement:—

Table VIII.

No. of plot in the series.	Detail of ploughing.	*Outturn per acre in* 1885.		*Outturn per acre in* 1884.		*Increae'e per cent. over country ploughing in* 1865.		*Increase per cent. over country ploughing in* 1884.	
		Cotton.	Seed.	Cotton.	Seed.	Cotton.	Seed.	Cotton	Seed.
Series A.		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Plot I. ...	Twice with country plough, 1 foot.	185-5	338*8	36-8	78-4	...	...	...	...
» II. ...	Once with earth-turning plough, 5 inches.	225*8	407*3	48-0	9G-0	15-4	26-7	22	12
» III. ...	Ditto ditto, 9 inches,	209*7	387·2	60-8	124-8	7-2	16-5	55	45
» IV. ...	Twice with country plough.	20ft-7	371*06	41-6	92-8	...	...	...	...
Series B.									
Plot I. ...	Twice with countjy plough.	218-5	438*5	31-2	60·6	...	...	...	...
» II. ...	Once to 5 inches with earth-turning plough.	223-4	549-0	34-8	70-2	2-2	50*5	11	15
» III. ...	Once to 9 inches with earth-turning plough.	223-7	486-9	37·2	76·8	2'3	22-1	19	26

It has been confirmed again that deep ploughing with a mould board plough has great advantage over the country plough for cotton crop.

11 *(b) Outturn from different varieties of country and foreign seeds compared separately.*—In eight plots of the same size eight different kinds of seeds were sown all in lines, but country seed 2 feet and foreign 3 feet apart.

Other treatments were :—

Manure (poudrette)	... ...	200 maunds.
Irrigation	... ...	*Nil.*
Weedings	... ...	2

The result is tabulated as below :—

Table IX.

No. of plots in the seties.				I	Variety of cotton.			Outturn per acre. Cotton.	Seed.
								lb.	lb.
Country seed.									
Series A.	I	...	...	2	Nankin	cotton	...	79·7	160·2
Ditto	2	...	—	2	Country	ditto	...	91·1	963·1
Ditto	3	...	...	2	Sahāranpur	ditto	...	143·8	[illegible]
Ditto	4	—	...	2	Nagpur	ditto	...	91·8	178·5
Foreign seed.									
Series B.	I	...	...	[illegible]	New Orleans	ditto	...	97·7	236-1
Ditto	2	...	...	[illegible]	V pland Georgian	dit to	...	78·6	186-1
Ditto	3	—	...	[illegible]	LO usiana		...	98·3	1932
Ditto	4	...	...	[illegible]	De la Lousiana		...	99·6	2 IS* 2

Of the native varieties Sah&ranpur heads the list and among foreign seed De la Lousiana and New Orleans gave a larger yield.

Owing to the peculiarity of the seafbn no stress can be laid upon the present result.

12. (c) and (d) *Effect of different kinds of sowing.*—Under this operation two varieties of cotton were experimented : (1) Kulpahar; *(2)* Nankin. No manure was applied, but other treatments were just the same as in the foregoing experiments.

The operation was to sow the seed—•

(1) on top of ridges ;
(2) on slopes of ditto ;
(3) in lines ;
(4) broadcast.

To compare the unmanured crop with a manured one, a plot of an eqnal size was manured with 200 maunds of cow-dung.

Broadcast sown plot yielded a larger crop and the manured one largest. In lines Nankin cotton thrived better. As the plants of Nankin cotton get more bushy they require more room: hence sowing in line is advantageous; but the country variety grows thinner, so thick sowing does not prove detrimental. The results are given in the following table:—

Table X.

Mo. of plot in the series.						[illegible]	Manure*		Weeding.	Seed.		Detail of sowing.	Outturn per acre in 1880. Cotton.	Seed.
													lb.	lb.
Series	-£.	No.	1	...		2	Nil	...	2	Kulpahar cotton,		On top of ridges,	132·0	273'6
»	»	»	2	...		2	Do.	...	2	Ditto	...	On slopes of ridges.	194*3	241·8
»	»	»	3	...		2	Do.	—	2	Ditto	...	In lines ...	75-0	150*0
»	»	»	4	...		2	Do.	—	2	Ditto	...	Broadcast ...	219-0	462-6
"	B.	"	1	...		2	Do.	...	3	Nankin cotton,		On top of ridges,	127·8	298-3
»	»	»	2	...		2	Do.	...	3	Ditto	...	On slopes of ridges.	134*9	300*7
»	»	»	3	...		2	Do.	...	3	Ditto	...	In lines ...	116*0	246^9
»	»	»	4	...		2	Do.	...	3	Ditto	...	Broadcast ...	116-0	243·8
»	C.	»	I	...		2	Cow-dung, 200 maunds to the acre.		3	Ditto	...	In lines ...	229-6	600'ff

13. *III.— Oilseeds.*—In connection with the forecast of oileeds, plots were made to determine the outturn of *til** sown separately and with other crops. Three varieties of *til* had been experimented upon: (1) black ; (2) white early, and (3) white late varieties.

The trial was undertaken in four series, each censisting of five plots and each plot measuring 400 square yards.

•Xil = [illegible] oricntalis.

The result is shown in the following table :—

Table XI.

No. of plot.	Crop.	Area in square yards.	OUTTURN PER ACRE. Grain. Outturn of each crop.	Grain. Total outturn.	Straw (Total).
			lb	lb	Mds.
A. Series 1	Til (black) ...	400	142·17	142 17	30 25
2	Til (ditto) ...	400	81-67	107-32	55-41
	Juâr (a) ...		25*65		
3	Jii&r ...	400	121-0	121-0	20-3
4	Til (black) ...	40○	/Til*	Nil	Nit.
	Bajra (6) ...		114-95	114-95	15*97
5	Bajra ...	400	169*4	109-4	V5-04
B- ,, 1	Tili (katkahi) (c) ...	400	Nil.	Nil.	Nil.
2	Tili (ditto)	400	Nil.	226-87	37-51
	Jliar ...		22687		
3	Juâr ...	400	276-3	278-3	49-61
4	Tili (katkahi) ...	%.oo	Nil.	QOR>7 2UO f	lb
	Country cotton ...		205 7		393-2
5	Country cotton ...	400	193-6	193*6	Mdf. 474-9
C ,, 1	Tili (Bhadeli) (rf) ...	400	217-8	217*8	53-2
2	Tili (ditto) ...	400	157-3	210-0	13·15
	Country cotton ...		152-7		lb 326-7
3	Ditto ...	400	204-1	204-1	421-9
4	Tili (Bhadeli) ...	400	93-05	492-35	Mds.
	Country maize ...		35*9-3		25-65
5	Ditto ...	400	435*6	435·6	19-36
D. ,, 1	Country cotton ...	400	178 4	I78[a]4	363-O
2	Ditto ...	400	134-6	134-6	279*8
	Castor ...		Ai/.		
3	Castor ...	400	Nil.	Nil.	Nil.

The til, especially the " white early," was considerably damaged by the excess of rain. The results as they stand are summarized below :—

(a) Black til sown by itself gave larger yield than the crops of tiPandjn&r put together, which were grown in one field: so the juâr sown separately has thrived better. This result Jpads to the idea that the native fashion of sowing til with other crops is no good.

But this may not be considered a criterion as being the first trial.

Til with bsijra did not grow at all. This is due to bad season of course, but bâjra sown separately has done better than sown with til, though the til did not yield anything.

(6) The early variety of white til totally failed to give any crop,

(c) Late variety of white til gave better crop than black til and has also thrived with maize well.

Castor failed to give any result.

14. *IV.—Sugarcane.*—(a) *Sugarcane* versus *sorgho.*—It has been said before that the bad season had effected sorgho considerably. The crop was so far injured that it was hardly fit to feed cattle upon it: the stalks turned quite red and worthless : so it was not competed with sugarcane.

(6) *Ejffect of different kinds of sowing.*—In two plots of the same size and under equal treatment sugarcane *{barohha)* was sown in two ways : (1) as in vogue in this country, «?., in furrows behind ploughs ; (2) on top of ridges 4 feet apart. The latter method of sowing has been brought by Messrs. Thomson and Mylne of Behea *rom sugarcane-growing American or French settlements and introduced into this country.

The cane were sown in rows, leaving a wide-space between the two lines. The blanks wore kept on grubbing and the canes earthed up each time the digging was done.

KOTE—(ei) JuâreSorwhum vulgarc. | (c) Katkahi—late variety.
(6; liairtt^rcniuiliailtt bpicuta. | Id) UUadcli-early variety.

The following statement shows treatment and outturn :—

Table XII.

So. of plot.	Ploughing.	Manure.	Weeding.	Grabbing.	[illegible]	Seed.	Detail of sowing.	*Outturn per acre in 1885.* Cane.	Juice.
								Mds.	Mds.
1	11	Poudrette, 200 maunds per acre.	1	5	7	Barokha.	4 feet apart ...	196-2	80*1
2	11	Ditto ...	1	5	7		Behind plough,	203*1	84-5

None of the plots shovred any marked superiority over the other in respect of the appearance of the cane or the quantity and quality of its juice. A little *rdb* was made from the juice of each: without any difference,

15. *V.—Miscellaneous.*—It being quite customary in the province that the cultivators in kharif prefer sowing a mixed crop of the grains specified in the following table, which mature in succession, beginning from August and lasting as late as the end of April, therefore it was resolved to determine the money value of the said outturn with a crop of wheat which is aown only once in a year.

For this a plot 2,422 yards in area of a pretty fair soil and strength was taken and sown after the country fashion :—

Treatment.

Manure ...	*Nii.*
Ploughing ...	2
Weeding ...	[illegible]

The following seeds were sown : —

t1) Black til *(Sessamum orientale).*
(2) Urd or mash *{Phaseolus radiatus).*
(3) Juár *(Sorghum vulgare).*
(4) Patsan (hemp).
(5) Arhar *(Cajanus indicus).*

First of all til was harvested, then other crops came in succession thus :—hemp, nrd, juár, and arhar.

The result is shown in the following tablo. Though growing wheat looks more profitable than the mixed crop, but if *the* cost of irrigation be added to it the real profit will decrease considerably : *—

Table XIII.

Name of grain.	Quantity of seed sown.	Outturn harvested.	Outturn per acre in tt>.	Money value.	A rerage outturn of wheat per acre.	Money value.
	Mds. s. c.	Mds. s.		Bs. a. P.		Bs. a. P-
Til, black ...	0 0 2	35 O	69 9	3 16 0		
Urd ...	0 0 8	131 0	361 8	4 9 0		
Patsan ...	0 O C	5 0	10 0	0 10 0	984	24 0 O
Juár ...	0 ' 1 0	79 6	158 6	2 5 0		
Arhar ...	0 1 0	216 O	431 6	7 11 O		
				19 2 0		

16. To ascertain the outturn of certain indigenous crops they were sown again this year. Their outturn and treatment are shown below :—

Table XIV.

No.	Crop.	Manure and rate per acre.	Ploughing.	Weeding.	Outturn per acre. Grain. 1884.	Grain. 1885.	Straw. 1884.	Straw. 1885.
					lb.	lb.	Mds.	Mds.
1	Kakun (*Setaria italica*) ...	nil	2	2	644-4	290-4	43-0	10-5
2	Sawan (*Panicum frumentaceum*) ...	"	2	2	192-0	508-2	19-3	151-34
3	Mama (*Eleusine coracana*) ...	"	2	2	578-1	459-8	36-1	32-67
4	Kodon (*Paspalum scrobiculatum*) ...	"	2	2	708-0	[illegible]	16-3	12-7
5	Urd (*Phaseolus radiatus*) ...	"	2	2	366-0	121-0	25-5	12-1
6	Mung (*Phaseolus mungo*) ...	"	2	2	180-0	375-1	57-0	24-41
7	Moth (*Phaseolus aconitifolius*) ...	"	2	2	204-0	217-8	47-8	16-4
8	Lobia (*Vigna catiang*) ...	"	2	2	630-0	381-15	44-5	25-41
9	Bhutwas ...	"	2	2	...	865-15	...	25-65
10	Sanai (*Crotalaria juncea*) ...	"	2	Nil	...	917-8	...	...
11	Do. (Katkahi) (Ditto) ...	"	2	Nil	...	193-6	...	...

Owing to the difference of season the result has come out quite different from that of the last year.

Some crops suffered by the excess of rain and gave very poor outturn, while others profited by it and yielded more.

This clearly proves the effect of the season on agricultural success.

All plots had been sown unmanured, and the result of the unmanured plots of the last year is compared with them. The weeding was done twice this year, while only once last year. Other treatments in both years were the same.

17. *VI.—Ensilage.*—To confirm the previous experiments five silos had been filled with the following stuff:—

(1) With common succulent grasses of early rainy season filled in clear weather: rapid-filling process.

(2) With common succulent grasses of late season stored in rainy days: slow-filling process.

(3) Guinea-grass.

(4) Guinea-grass, juár cut as chari, *viz.,* before bearing cobs.

(5) Guinea-grass, juár cut as chari, *viz.,* after bearing cobs.

The following table gives details of cost:—

Table XV.

No. of silo.	Form of silo.	Date of filling.	Date of opening.	Cost of digging.	Cost of chappar.	Cutting and carrying.	Cost of filling and treading.	Fodder filled in.	M.	s.	c.
				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.				
1	Circular, 6 feet diameter, 10 feet deep.	17th	16th	1 8 0	6 8 6	4 5 0	1 2 0	Common grass in clear weather,	59	25	8
2	Ditto ...	16th	Do.	1 10 0	6 10 6	4 3 0	0 14 6	Ditto in rainy weather ...	60	22	0
3	Ditto ...	21st-23rd	Do.	1 12 0	7 8 0	3 4 9	2 13 6	Guinea-grass ...	76	36	1
4	Ditto ...	Sept. 25th-26th	Do.	0 10 0	...	2 8 0	1 7 9	Juár cut as chari, *viz.,* before bearing cobs ...	52	0	0
5	Ditto ...	...	Do.	0 10 0	...	2 6 6	0 3 0	Do. after cobs ...	60	32	0

18. The chappar which was put to cover the pit to prevent water going in was by itself an object of experiment.

It was made of the water-proof Willesden paper, which is so highly spoken of throughout the world. A wooden frame being made was covered with this paper, aud it served the purpose of a moveable chappar, the cost of the frame only has been shown in the statement.

The frames were from 6 to 8 feet by 4 feet, the cost of paper is Re, 1 per square yard. The result of this will be mentioned under the head of experimental machinery and appliances.

19. All the silos were opened one day, *i.e.,* on the 16th of April last, when there was a meeting of the Agricultural Association. Every stuff came out as good and with as little of its characteristic smell as could be and was decidedly of the best quality,

20. This year, at the desire of the Government, measures were taken to get the experiment confirmed by and hare the idea spread through the co-operation of a few private persons in different districts. The instructions appended at the end of this report were issued and the assistance of the Committee of Meerut Demonstration Station ; of Pandit Ajudhia Prashad, the Honorary Assistant Director ; of Kuar Lutf Ali Khan of Chhatari and of Muhammad Ali Kban of Aligarh, was requested. The result of this is a matter of a separate report, which will be submitted so soon as the reports have been received from the above-named gentlemen.

21. There is one thing quite novel and worth noting here for drawing attention of the public to it, *i. e.,* some of the silos filled in the year 1884, not being used, were kept clpsed till 18 months after they were stuffed. They were of juār chari and one of grass. In the middle of February last a grass and a juār pit was opened. The grass seemed to have been spoilt, but the ensilage of juār was as good as of a fresh silo a month old. The cattle greedily ate it.

The stock of fodder for farm cattle had exhausted, and it was intended to purchase a quantity of *bhūsa* enough to last till the following rabi harvest, as the new silos, which had been filled in about that time, were not ready to be opened. But when it was found that the cattle had eaten the old stuff heartily, the idea of purchasing fodder was given up, the beasts for last two months had entirely been fed on the ensilage 18 months old. This stuff made the staple food of theni throughout the autumn season, only now and then some green weeds from rabi fields or sliced turnips and carrots which were grown on farm were mixed with it.

The cattle undoubtedly looked very much improved in condition and seemed to have gained flesh ; of course they had no hard work in those days.

There is no arrangement on farm for weighment of the cattle and no laboratory to find out the feeding value of the two stuffs; however, arrangement is being made to feed in stall two lots of young bullocks, six in each lot, and four cows on the two kinds of ensilage (new and old). The stuff will be given alone as well as mixed with other food and the result of the experiment will be recorded as far as perceptible.

The following figures will show the physical differences which have been noted between the two ensilaged stuffs :—

Table XVI.

Description of silo.	Temperature under 14 inches, the nit an at the time being 84° in shade.	Weight per bushel of fresh stulf.		Weight per bushel of the sun-dried stulf.		Weight of ashes.		Remarks.
		lb.	oz.	lb.	oz.	lb.	oz	
Opened after 18 months,	100°	12	1J	[illegible]	4	[illegible]	12	Fresh stuff taken out of silos and given to cattle ; who did not cure much tor the old one in preference to the new ensilage.
Ditto 9 ditto,	[illegible]	18	14	[illegible]	12	1	2	

22. *VII.—Implements and appliances.—This* subject is treated in a separate report submitted to Government annually, but briefly it is noted hero also as usual.

in vogue in the province, and this is a thing which makes the people to criticise on it. It has been shown in several local shows, and the above remark was invariably made by the public everywhere. However, the people seem ready and willing to have it, and I am sure when they will use it they will admire it better.

24. (6) Tbe *centrifugal sugar-making machine.*—This portable machine, which does not require any skill or scientifical aid in working it, seems to be very well suited to the want of sugar-making districts. I went to see it first in Behea and saw it being used by a private zemindar who has been working it for the last two seasons and seemed highly satisfied with it. He said its cost was Ks. 460, which is nothing in comparison with the work it does. It of course requires a very best kind of *rdb* of very large grain for its feed, which I had not seen in these Provinces. I brought a machine with me together with two men expert in rát-making, and the first trial of it was made in Meerut Show. The men unfortunately did not succeed in making so good a *rdb* there as was required. This was of course on account of the *rdb* being wanted every day for show, and hence enough time could not be allowed to let it granulate.

However, from the *rdb* raw sugar was made, but of course neither so good nor as quickly as I had seen in Shahabad district (Bengal).

As the finer crystalline particles of the sugar came out of the mesh in the machine by centrifugal force, therefore the quantity of treacle obtained was disproportionately large, also more time was taken to purify it. As a rule 30 seers of *rdb9* after putting it into the tub and setting it to revolve, ought to be converted into raw sugar from 5 to 7 minutes; but here even half and one-fourth of the quantity took as much time as more than half an hour, and the yield of sugar was proportionately much less.

Sháhjah&npur and Cawnpore *rdbs* were obtained, but were no better.

It remains to be seen next year whether such a good *rdb* as of Shahabad can be made here; and if it can, no doubt the machine is most valuable, otherwise some modification in the machine will bo necessary. As it was late in season when the machine was got in, hence good *rdb* could not be obtained; therefore it was not competed with the indigenous way of sugar-making and no result of its produce arrived at.

25, *(c) Behea shallow pan {sugarcane juice-boiler).*—Two of these pans were received from *Behea,** one round aud the other of oblong shape. \

In Rae Bareli show they were competed with pans termed M, three in number.

The shallow pans made *rdb* and *gur* in half the time, but one-third of the quantity that was made by *bil* syatem, though full dose of juice, was not given to the latter. The produce from shallow pan was of course far better than that from the other.

The pan in question needs farther trial and competition with common deep pan and with American evaporator, which, owing to their coming late in season, could not be done. The pans were shown in the Meerut Show and Cawnpore Meeting of Agricultural Association.

26. (d) *BvXVs new patent dredger.*—This was tried by the Court of Wards Engineer, Mr. Copeland, whose report is apppended. It was shown in Meerut Fair, Cawnpore Meeting, and Moradabad Shoiy, and lias greatly attracted the attention of the public. One order for it was received in Meerut and one at Moradabad. In MoraSabad district, near Kanth in Newada village, two wells have been lately made iB which the dredger was used. It did its work throughout most satisfactorily.

27. *(e) Barakar new plough.*—This plough has lately been invented by the Director of the Agricultural Department, Bengal. It is of cast-iron, every joint of the iron part being cast in one mass. It Was exhibited in the Barapore Show, district Shahabad (Bengal).

In the improved pattern a movable share, but which is also of cast-iron, is added.

The plough seems well built, strong, and cheap enough in price. It is supposed to be well suited to Bengal soil, which perhaps never in any time of the year gets as hard as up-country land, that requires a very strong, sharp, and malleable share. It was tried in the Meerut Show and was very much liked by the visitors where they first saw it; but owing to the defect in its share, which is too thick and blunt, it could not tear up the land so well as Watts or the Duplex did, and for the same reason required a harder pull too.

In other respects it was said to be very good and strong next to Watts'.

Of course this is also not free from that common deficiency which all the improved ploughs have but the Duplex, *viz.*, it can only plough up the soil, but cannot be used for sowing.

The trial in the show can by no means be taken as a decisive one, so the implement is given to a practical k&shtk&r, who takes interest in these matters, to work it for one or two seasons and then to report upon it.

28. *(f) Willesden paper.*—This paper, as mentioned before, was used in making sheds for silos, in order to see how far it is useful for agricultural needs in this country.

It is of different thickness, but in this case what is termed two ply was used. It is quite waterproof and stood the whole rainy season very Well, but the defects are :—

(1) By the heat of summer it gets so brittle that even the small gravels in dust-storm are enough to split it up ; hence it is no good for. out-door use in this country.

(2) Its price is very heavy—Re. 1 per square yard ; perhaps corrugated iron sheet can be had cheaper than that.

Lately, another shed has been made of it ; in this little thicker paper than the above-noted one was used, but this is also torn into pieces,

S. MUHAMMAD HUSAIN, M.R.A.O.,
Assistant Director.

APPENDIX I.

Programme for Kharif 1885.

I.—Manures to be tried, as in the last year, on the plots called kharif and alternate, *vide* paragraphs 2 and 3 of last report.

2. Brick-kiln refuse and ashes of weeds as in the last year in F. 28, Tatfe VI., page 5.

3. Different kinds of dung, woollen refuse and saltpetre in A plots, *vide* page 4 of the last report.

II.—Deep and shallow ploughing experiments to be continued in tiie A. U plots, *vide* paragraph 5 of last report, Table VII.

HI.__Sowing of cotton in line, 4c, and broadcast in Fo 15.

IV.—Maize in the American fashion in F. 14.

V.—Sorghum, half of F. 28,

Ditto F. 14 ;

Whole F. 26.

VL—*China grass.—In* F. 90 a little under shade and F. 89 and 73.

YII.x— *Cottons.*—American and Indian in 8 plots, F. 16 and 17.

V1IL__*Til*—In the various ways sown by natives to determine their yield.

IX.—*Castor.*— Ditto ditto ditto.

X.—*Millets and kharif pulses* —To determine their yield in plots made for them last year, *vide* page 7 of last year's report.

XL—*J'udr for enplane.*—In Collector's Bagh and the ground between the office and the garden.

XII.— *Sugarcane.*—Balf of F. 20. *

XIII.—*Sanaifor manure for wheat.*— In F. 21, 22, and A. *(a)* plots.

XIV.—In a field of about one or half an acre a mixed crop of juar, urd, til, *san* and ferhar be sown after native fashion, to be followed by sawan or maize in the hot months, when all these crops are off the ground, and in the rains next by kakun and ma£Jfo after a strong dose of some strong manuring, and in (lie rabbi by p^as^nd so on, to keep the land always under one cw>p or th$ other, lts'income during a year to be compared with the income frojp wheat which is £own after a year's fallow.

•XV.—In two big fields the several varieties of American tobacco, seed of which has been received this year, should be planted along with two good country varieties to compare thoir outturn ; the produce of each plot to be cured after the American fashion.

*XJ'I—In one plot *san* to be sown very early, to be followed by barley and subsequently by rye grass, which is to be sown as a catch crop, and the income from the three to be compared with that from a single crop after a bare fallow.

JvVIT.—A small heap of compost manure to be made for trial during the next rabi—*Composition* : —

11) Weed from kharif fields.
(2) Unslaked lime.
(3.) Stable refuse.
(4:.)' Road-sweeping (if available).

"*I* VTTT.—On a very small plot of known dimension maize plants to be transplanted when about C inches high, to see whether they bear transplanting. A little farmyard manure to be applied to each plant at the time it is transplanted.

* Thia will go in the rabi icport.

APPENDIX II.

Note on Bull's Improved Dredger hy MR. COPELAND.

This dredger was tried on a well in Bawatpur, in the district of Cawnpore, which had silted up and was 55 feet deep.

The dredger worked particularly well, coming up on each occasion quite filled with silt, except when a piece of Kankar got jammed between the scoops, when it came up empty.

The dredger was emptied eight times in 20 minutes and came np twice empty. It would work much faster when the workmen have got used to the machine. The only fault that can bo found with the machine as a whole is with the frame-work, which is very weak, ill-fitted, and shaky.

The dredgor, therefore, is a very good one and will do at least four times the quantity of work with fewer men, but the frame is decidedly weak and badly fitted.

Instructions for ensilaging the luxuriant vegetation of the rains.

1. JVa^Mr«o//>i<5.—Experiments to be tried in earthen pits Creoles dug down into the ground.

2. *Site for the pits.—"She* ground selected for making these pits should be a little higher than the general level of the surrounding ground, and should possess an ea9y drainage, so that in the event of any heavy rains inter may not lodge over the pit^

3. *Number* o/pito.-r-Four pits to be made in alll One in August, one in September, one in October, and one in November.

4. *Shed.*—Over the pits made in August and September a cheap *ehappar* should be thrown like the temporary sheds made by cultivatoB^ftji their fields to shelter them against the rains, when they watch their crops durin£the period of their ripening. No shed to be made over the pits dug in October and November.

5. *FormoftRe pits.*—The pits should all bo cylindrical and their sides should be a little sloping.

6. *Size of the pits.*—Each pit should be 10 feet deep, unless the distance of water in the neighbouring wells ifamld bo less than 15 feet from the surface of the ground, in which case the depth of the pit should not exc eed 6 feet. The diameter of the pit at its mouth should measure 7 feet and at its bottom 5 feet.

7. *Crop to be ensilaged.—Tfyif* grasses which spring up spontaneously during; the rains should be. ensilaged, care being taken that only those grasses are put ia which are eaten by bullocks or horses.

8. *Cutting.*—The grass should bo cut with a *hansia* (sickle) leaving an inch or two from the ground, so that the stuff ensilaged should not get muddy.

9. *Chopping.*—The grasses should bo packed entire without any chopping.

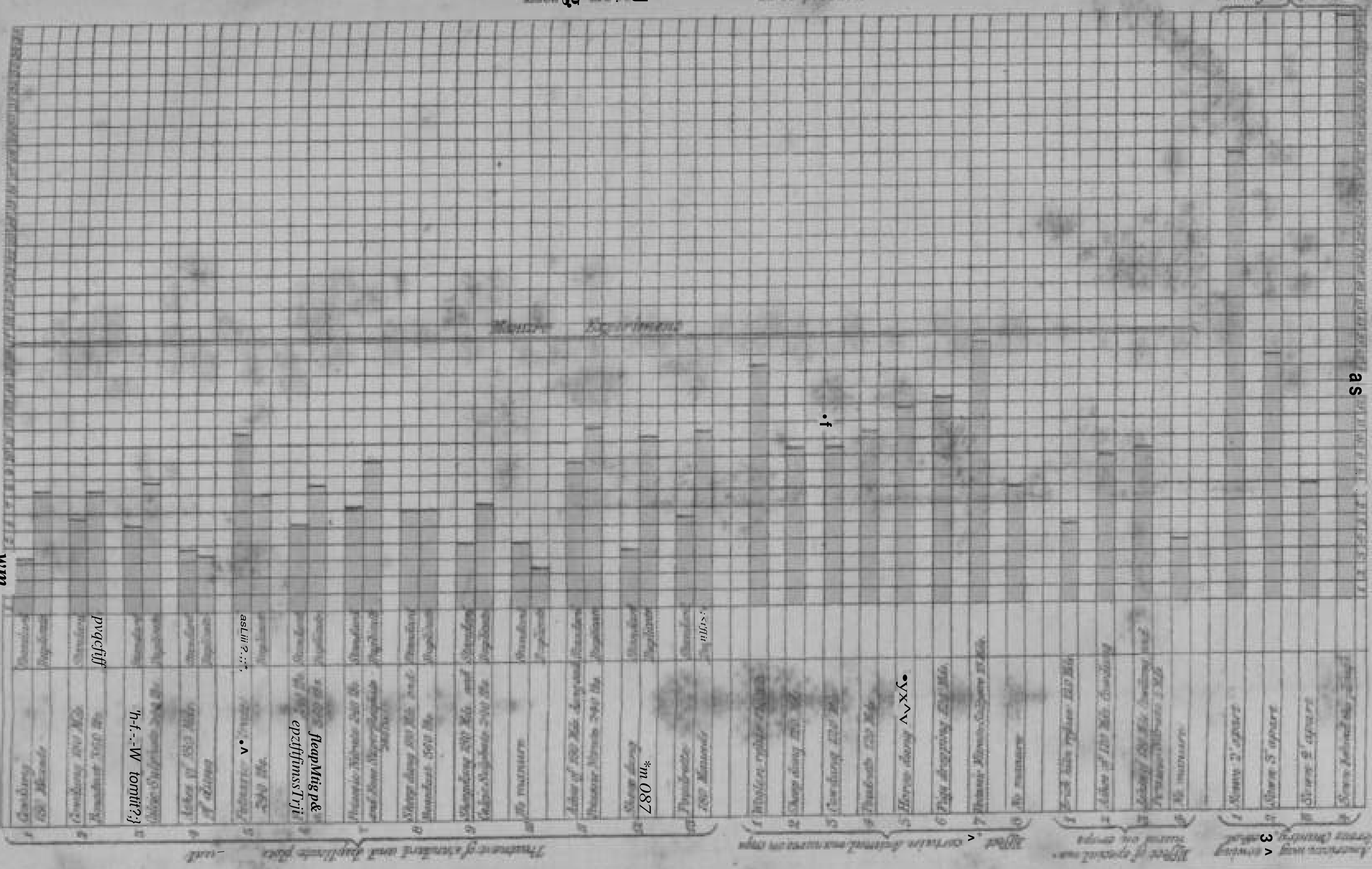
10. *Weighing, filling, treading, and clocing.*—As soon as the grasses are cut, they should be carefully weighed and then thrown into the pit, four or five men being at the same time directed to get down into the pit and to level and tread down the grass as each' load is thrown into the pit. Thirty or forty maunds should thus be ensilaged on the first day. This weight should fill nearly half of the pit. After the mass has been trodden dovva. for about an hour, a layer of earth two feet thick should be placed over it, and the pit should thus remain closed for 48 hoars. It should then he opened and the mass trodden down to press out the air and tho gaseous compound which may have formed during this interval. The top layer with which earth may have mixed up should bo carefully removed and its weight deducted. A second filling should then be made exactly like the one made on tlie first day till the pit is completely filled, when-all the earth dug out of the pit should be piled over it in the form of a sloping mound. As the fodder settles the pile of earth will sick down, and openings and oracks will be noticed, especially around the edges. Care should be taken to close these cracks as soon as noticed.

H# *Time of opening.*—No pit should be opened before four months from the date of its closing.

12. *Weight of fodder preserved in good condition**—The weight of the portion which should be found to have become mouldy should be carefully determined separately from tho weight of the portion found in gofed condition, and a cubic foot of the fodder from each silo should bo sent to this Department for inspection as soon as any silo is opened. •' .

[redacted] IF, 85.

[redacted]—The chart shows the yield of grain on ... Ch... ing the result of manure and sowing experiments.
In[redacted] case yield per acre has been g[redacted] C... EXPERIMENTED UPON—MAIZE.
Each ... are ... [redacted] ... of produce.



REPORT ON THE

CAWNPORE EXPERIMENTAL STATION

FOR THE RABI SEASON OF 1885-86.

ALLAHABAD:

NORTH-WESTERN rnovracss AND ODDH (SOVERNMEKT PRESS.

1886.

No. ygg OF 1886.

DEPARTMENT OF AGRICULTURE AND COMMERCE, N.-W. P. AND OUDH.

DATED CAWNPOBE, THE 9TH DECEMBER, 1886.

FROM

DONALD SMEATON, ESQ., M.A., C.S.,
DIR., DEPT. OF AORI. AND COMMERCE,
N.-W. PROVINCES AND OUDH,

To

THE CHIEF SECRETARY TO GOVERNMENT,
N.-W. PROVINCES AND OUDH.

SIR,

I HAVE the honor to submit, for His Honor's orders, the report of operations in the Cawnpore experimental station during the rabi season of 1885-86.

The report has been written by Mir Muhammad Husain, Assistant Director, himself, as Superintendent of the operations. It is too long and detailed, and hence, in great measure, the delay in its submission. I have asked Mir Muhammad Husain to bring these reports in future into a much smaller compass, and, as far as possible, deal in detail only with Operations and results that are new, referring very briefly to such confirmations of previous results as are likely to be useful. The tables of treatment and outturn will be curtailed and placed in an appendix. Henceforward I would recommend that this, the rabi season narrative, be incorporated in the annual report and not issued separately at all. The kharif season narrative must, I imagine, continue to be separately issued, but its dimensions will also be considerably curtailed.

2. To glance at some of the principal results.

Among the permanent experiments, we find that after all ordinary farmyard manure is the cheapest and most efficient that the cultivators of the country can have. It never fails to ensure a good return : and it is always available. Saltpetre is shown to be an excellent fertilizer. Were there no salt excise, I verily believe that saltpetre would come to be extensively used, and with great advantage, by the people. The dread of the *"permit"* authorities is deep-seated, and it will be hard to rid the people of it. If by any means the simple manufacture of crude saltpetre could be allowed to spread, the way would be opened for introduction of this fertilizer. But there are, I admit, serious difficulties while the salt excise remaining an important source of public revenue.

The new experiment of manuring with the dung of cake-fed cattle has been a success. The cultivator would have better and stronger cattle by feeding them with cake, and would at the same time have better crops by using the manure than he now has. Bat the invariable question of cost intervenes and renders it very doubtful if the cultivator can ever really put in practice what the experiment teaches.

Another result, not a new one, is that the rotation of wheat with maize is, for both crops, probably the best. But the cultivator knows this as well as we do.

The results of green-soiling are only conformatory of previous experience. The Superintendent's conclusion in regard to deep and shallow ploughing in the absence of manure is deserving of attention.

The outcome of the watering experiment is conformatory of previous experience.

The Jethro Trill system of sowing is apparently good, but is scarcely likely to appear so to the cultivators, who will be prone to aver that it is a waste of good land. I do not think this experiment need be continued.

3. Looking now to what are called the temporary experiments, we find that lucerne, like clover in Europe, is a good preparation for cereals.

Linseed was a failure owing to destruction of the crop by an insect pest. Attention will be paid to developing the white variety which is so highly spoken of by experts in England.

The tobacco experiment was new. It is doubtful whether this experiment can serve any useful end. The people themselves do not care for a highly cured article : and it is pretty certain that no export trade in tobacco grown in North-Western India can ever spring up.

Ensilage shows really good and useful results. *Cham·<Ir* thickly-sown, early cuty^ar, proves to be an excellent fodder for storage in the T £ *n* f *W* t the ago o I ^ months ifc WaS aS frGSh and aS palatable -> new. The only thing is that, unluckily, the cultivator cannot generally afford to grow more *chart* than is necessary for one season : so that he never can have much to store.

The L I ^ w * and Duplex ploughs appear to be ^king some head. maLTn i ... Gr 18 againSt lfc But * haS been foun* possible to price and *I* *T* ^ P 1 ^ ** little mo~ than half the American price, and it is hoped that this may be useful.

cheapt/ I ^ *T*^' ^ P 0 ^ * *han the ori^nal and much cheaper, is also being made and samples are being circulated.

the ^\ nea7r T ?n approach the appearance and weight and cost of ... more likely we are to induce cultivators *o *M*o". our teaching.

belief T^e*stribution of seed has been on an extensive scale : and I the quality ... raised by the people ... improvement of ... The fine white wheat

zeal and ... devote ... himsel ...

, <%, xurenegence to the experimental operations.

Ali Husain, the Overseer, has also been most industrious and useful.

I have the honor to be,

SIR,

Your most obedient servant,

DONALD SMEATON,

Director.

REPORT

OK THE

CAWNPORE EXPERIMENTAL STATION

FOR THE RABI SEASON OF 1885-86.

Character of tlie season.—Tho rainfall recorded during the season under review is shown in the following table :—

Month.	RAINFALL IN IITCHBS.			
	At the Station.		*In the City.*	
	ID 1884-85.	In'1885-36.	In 1884-85.	IQ 1885-86.
September ... ••• ••• •-	93C	220	8 70	1-57
October ... . ••• ••• •••	6 10	•••	650	•29
November ,M — •*• •••	•••	•••	•«	•••
December ... '•« •••	•10	0*90	•10	2-56
January ••• ••• •« •••		0'19	•11	•19
February ... ••• ••• •••	•••	•••	•••	...
March ... «• ••• •••	•••	0-34		•34
Aptil ••• ••• ••• •••		•••	•••	•••
Total	*15-50*	3*63	15-41	4-95

It ceased all of a sudden and very early this time. This as well as the dry westerly winds, which blew in those days, caused a rapid loss of the moisturo from the soil, and necessitated the finishing and sowing of the fields within a very limited time.

Tho crops, up to the ripening time, looked most promising, but unfortunately strong, dry winds began to blow, just when the grain was in the dough state, which increased evaporation and deprived the grain of its nourishment at the very time when it needed mo*t. The grain shrivelled and the yield generally was poor. The wheat commonly suffered throughout the provinces a great deal.

2. *Diseases.*—With the exception of some slight appearance of mildew, no disease or insect pest disturbed any of the rabi crops. Of the varieties of wheat tried at tho station, the *kathya* and beardless proved to be more susceptible to mildew than the Muzaffarnagar white variety. The Muzaffarnagar wheat, grown with different kinds of fertilizers, remained very healthy, excepting ona or two plots of the green-soiling, series where the plants were slightly attacked by the yellow fungus called *girwi.*

3. *Average yield per acre.*—There were about 25 acres under wheat of different descriptions. Of these 13*69 acres were under various experiments and 7*4 acres under ordinary cultivation, sown simply for seed.

Ten plots of 400 square yards each, under tho influence of tho best fertilizers, produced at an average as much as 33*6 bushels,* or 26 maunds* and 10 seers per acre—tho average of 30 bushels per acre is considered a good yield in England —

•Standard bushel of wheat * e * Ib.

82 Jb. *m* 1 maund.

While 10 plots which have received no manure for years, and are kept as standards to compare the result of good farming or of simple ploughing, watering, &c, gave an outturn of only 5*31 bushels.

The yield of the plots kept unmanured is getting lower and lower every year.

EXPERIMENTS.

4. The experiments may be classed—

L— Permanent.

II. —Temporary.

These experiments are to determine—

(1) Whether wheat can be grown year after year by the aid of artificial manures.

(2) Whether to obtain a good crop rotation proves indispensable.

(3) For how long and to what amount without artificial means a soil remains capable of nourishing the plant-life and its growth.

(4) Which constituent in soil or in a manure is more essential for wheat, and needs to be provided artificially in the case of its absence.

(5) For how long the residue of a manure remains available for a cereal, especially wheat.

(6) Whether simply deep-ploughing and watering ia enough for obtaining a good crop or an application of manure still required, and what the real effect of the different kinds of ploughing and of watering in the absence of a fertilizer is.

In order to confirm previous results most of the experiments are kept unchanged, and some of them are tried in duplicate and triplicate plots ; not only side by side, but at some distance, and in somewhat different soils.

5. The following are the permanent experiments, the area which they cover and the year when they were first started are noted below—

Experiment on the effect of—			*Area under experiment.*	*Year when started.*
A —Different manures	...	...	494	1880.
B.—Green soiling	...	...	4 45	"
C.—Poughing	...	...	1-80	"
D.—Watering	...	...	•90	"
E —Sowing	...	...	1-60	"
	Acres	...	13-69	

6. The following is a brief summary of the experiments conducted during the season under report :—

A. Experiments on Manures—These may be classed into—

I.—Farmyard aqd artificial manure.

11.—Oil-cake used as manure.

111.—Miscellaneous.

L—Experiment ttith fdrmyard and artificial manure.* These are carried on in two series :—

(1) The standard series.

(2) The duplicate series.

These series consist of 26 plots—13 in each. In the standard series wheat is grown year after year. In the other series plots are cropped with wheat and maize alternately. All the treatments in every plot remainth© same, *vU.* ;—

Ploughing with Watt's—twice.

Ditto country—ditto.

Watering—three times.

Weeding—if necessary.

Manure as in the following table.

The result of the experiment i* tabulated below :—

Table II.—J2,u/* of Standard Series.*

1	✝	9	4	5	6	7	8	9	10	11		12			13	14	15
	Comparison 0/outturn with the unmanured plot in the serif.*									*Comparison of cost and income with the ordinary kind of cultivation in vogue in the country.*							
3 £ 1! Vi 1*	Detail of Bpecial treatment with the rate of its cost.	...eshed f V	Weight of grain.	CO 1	Weight per bushel	Percentage of ...	... n	Increase or decrease over standard plot in the series.	ir	*Actual outturn per acre.* 1	St[TM]	*Value of outturn.* h Grain at ... per ...	h i	Total.	loas per ... cost ... of ordinary ..., ionassumed Rs. 30. S|8|J fails	... oss per acre ... alue of out- ... gainst ordi- ... ind of culti. ... assumied to ... 18.	Net profit or loss against the assumed income ... ordi- ...
	Quantity of manure opplitdptr acre.	*Tb.*	Ib.	lb.	Ib.	▲	».	ib.	Ib.	Ib.	lb.	Rs as.	EB. as.	Rs. as.	Rs. a.	Rs. a.	Rs. a.
*	Cowdunjr, 180 maands per acre, at Rs. 3-0 per 100 mannds.	-644	127	264	67*	48	208	+514	+ 624	1,537	3,194	37 8	8 0	45 8	— 2 6	+ 78	+ 52
-	Cowdung, 180 maunds per acre, st Rs. & per 100 maunds, and bone dust, 3C0 It, at 11 annas per 8*2 tb.	669	156	200	66|	78	128	+ 801	+ 975	1,888	2,420	46 0	6 1	52 1	— 5 6	+ 14 1	+ 8 11
8	Cowdunjr, 180 trannds per acre, nt Rs. 3 per 100 maunds, and gypsum, 240 tb per acre, at He. 1-12-0 per 82 tb.	583	153*	219	67	70	143	+ 78	+ 914	1,857	2,650	45 5	6 10	51 15	— 7 8	+ 13 15	+ 67
7	Ashes of ISO maunds cowdung per acre at Rs 3 per 100 mnunAs.	544	791	178	68i	46	224	+ 4	+ 49	962	2,154	23 7	6 6	28 13	— 2 6	— 9 3	—11 9
11	Ashes of 180 maunds cowdung at Ks. 3 per 100 roannds, and saltpetre, 240 lb per acre, at Ks. 3-3-0 per 82 Ib.	60S	80	200	67*	40	250.	+ 44	+ 55	96S	2,420	23 10	6 1	£9 11	-12 10	— 8 5	—20 15
0	Sheep dun*', lbO m*unds per acre, at Rs. 3 per 100 m.mnds	576	125|	198	67 7c	63	153	+ 50	+ 605	1,518	2,396	37 0	6 0	43 0	— 2 6	+ 50	+ 2 10
9	Sheep dung, 180 maund*, at Rs. 3 per 100 m«unds, and bone dust, 360 Ib per acre, at 11 annas per 82 lb.	594	117	170	67|	69	145	+ 41*	+ 503	1,416	2,057	34 9	5 2	39 11	— 5 «	+ 1 11	— 3 11
10	Shrep dung, 130 maun Is, at Rs. 3 per 100 mHnnda, and gyj sum, 240 lb per acre, at Re. 1-12-0 per 82 Ib	629	933	160	68	59	170	+ 18*	+ 221	1,131	1,936	27 10	4 13	32 7	- 7 8	+ 69	— 1 15
12	*Poudrette,* ISO maunds per acre, at Rs. 4 per 100 maunds.	598	1014	162	68	63	158	+ 26	+ 315	1,228	1,960	29 15	4 14	34 13	- 7 3	— 3 3	—10 6
1	Saltpetre, 240 tb per acre, at Rs 3-8-0 per 82lb.	639	141*	250	C6r	67	177	+ 66	+ 79©	1,712	3,025	41 12	7 9	49 5	- 7 4	+ 11 5	+ 4 1
2	Saltpetre, 240 Hi per aero, at Us. 3-3-0 per 82 K) nd bone dust, 240 ft per acte, at 11 unnas per 82 Ib.	653	16G	253	66	62	161	4-844	+ 1,023	1,936	3,122	47 4	7 13	55 1	— 10 4	+ 17 1	+ 6 13
9	Saltpetre, 240 Ib per acrr, at Its. 3-8-0 per 82 ft and superphosphate, 240 Ib per acre, at Rs. 4-8 per 112 tb.	646	90*	162	68}	56	179	+ 15J	+ 185	1,098	1,960	26 12	4 14	31 10	—19 4	—6 6	-25 10
11	No manure .., ... M·	613	75;	110	63|	69	146	...	-	913	1,331	22 4	3 5	25 9	+ 30	—12 7	— 9 7

Not!.—(1) Column 1 contains not serial numbers, but farm map numbers.
(2) The total of columns 4 und 5 would not agree with the eutry of colamn t, because though the sheaves were weighed after a fixed time, yet they were not equally dry a*t the time of weighmeot.
(3) Plus (+) indicates gain ami minus (-) loss.
• <4) The entries of column 9 is the difference of the outturn of unmanured plct and other plots in the series respectively.
(5) Extra cost of siug.e »r compound manure ovsr Rs 3 cost of 100 maunds farmyard manure, (included in the cost of standard plot) is shown in col a HlM 13.
(6) In the cnlr ilations the fractioiiR after seers, ounces, and annas have been left out ; and in the case of its being more than half is taken as a whole number*
(7) Bntriea oi colimm 14 are the d.fcreuce of the total in column 12, and of Us. 38, (the ftflaumed income from an acre of wheat, raised by ordinary kind of cultivation,) *1,312 Ib at 41 Ib per rupee *m* Bs. 32 ; and 2,400 Ib straw at 400 tb per rupee=IU. 26.

Table III.—Result of [illegible] Series.

Number of plots as per map of the farm.	Details of manure applied with the rate of its cost.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Grain.	Straw.	Grain at Re. 1 per 41 lb.	Straw at Re. 1 per 400 lb.	Total.	Gain or Loss per acre in the cost against the cost of ordinary cultivation, assumed to be Rs. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation, assumed to be Rs. 38.	Net profit or loss against the assumed income of Rs. 38.
	applied per acre.	lb.	lb.	lb.	lb.	P.	P.	lb.	lb.	lb.	lb.	Rs. a. p.	Rs. a.	Rs. a.	Rs. as.	Rs. a.	Rs. a.
1	18 maunds p[illegible]	580	167	[illegible]	[illegible]	[illegible]	186	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+20 12	[illegible]
[illegible]	[illegible] and bone	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] indfl, and	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] per 100	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] and salt-	570	190	[illegible]	[illegible]	[illegible]	186	[illegible]	454	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	645	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3,690	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Sheep dung, 18[illegible] 360 lb per acre [illegible]	579	[illegible]	250	[illegible]	[illegible]	154	[illegible]	[illegible]	[illegible]	3,025	[illegible]	[illegible]	[illegible]	[illegible]	+17 11	[illegible]
[illegible]	Sheep dung, 18 maunds, 240 lb per acre, at Rs. [illegible]	576	19[illegible]	252	[illegible]	[illegible]	[illegible]	[illegible]	454	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] maunds per acre, [illegible]	584	149	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3,073	[illegible]	[illegible]	[illegible]	[illegible]	+18 [illegible]	[illegible]
[illegible]	[illegible]te, 2[illegible] per acre [illegible] per 82 lb.	520	116	[illegible]	[illegible]	[illegible]	154	[illegible]	[illegible]	1,404	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Saltpetre, 240 lb per acre [illegible]	635	[illegible]	[illegible]	[illegible]	[illegible]	188	[illegible]	974	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+22 15	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2,057	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

In the majority of cases the plots alternated with wheat and maize have given a better yield than the plots in which wheat was sown successively.

By the light of the theory which on the farm has now proved true beyond doubt, we can safely affirm that, for good cropping, rotation is as necessary as the manure is.

9. The effect of each manure in question may briefly be described thus:—

Cowdung alone and combined with other substances.—By comparing the results it will be seen that cowdung is the most handy and cheap manure for a common kâshtkâr. It has *always* proved to be so.

By the application of dung alone the percentage of grain over straw was not very good, but the weight per bushel very fair. Against unmanured plots in the series it has given nearly double yield.

Dung applied with bone dust gave still better yield, and it has shown the same result during the last three seasons. So the dung with gypsum in many instances (though not steadily) has proved to be better than dung alone. In both cases the percentage of grain over straw has been very good, being 78 and 70 respectively.

The ashes of dung have never proved to be a good fertilizer—at all events never so much as the unburnt dung. The percentage of grain over straw in this case is worst of all ; from the weight per bushel it seems that there was no defect in the quality of the grain.

Even with saltpetre the ashes do not seem to have ever shown any remarkable effect. The last experiment has existed for the last two seasons only.

Sheep dung.—The sheep dung singly and with other fertilizers has again proved not so good as the cowdung. There can be no other reasons for this but those stated in the last report, para. 21, *viz.* ;—

(1) The sheep on the farm are kept entirely on grass, while the cattle in some months are fed on grain.

(2) Folding sheep on a field provides better manure for it than putting their rotten excrement.

As promised in para. 22 of last year's report, the experiment of folding sheep was tried. The plot on which sheep were folded yielded 19·7 maunds per acre against 18·5 maunds as produced in the plot of this series which was manured at the rate 180 maunds of rotten sheep dung per acre. The result, however, cannot at present be pronounced to be decisive.

Poudrette.—To the great astonishment this manure has remained behind the cattle dung : no cause for this can at present be assigned. From an economcial point of view, this manure gave the worst result. But it must be noted here that, under circumstances, on the farm we have to pay a very high price for it, while to the owners of fields near the village site it does not cost even as much as the farmyard manure.

Saltpetre alone and with other fertilizers.—This over-successful fertilizer alone and with bone dust has always left some margin of net profit after recovering its own cost, but the question is whether the use of the same can possibly be made by the cultivator in this country. Under the present circumstances, being a purchased manure, it does not prove very tempting to a common kâshtkâr.

The yield with saltpetre combined with superphosphate has been very poor. The reason for this too, like *poudrette*, is not apparent. Economically, it has shown the greatest loss, i.e., of Rs. 25-10-0 per acre; more than 2½ times against the unmanured plot.

10. *Percentage of grain over straw.*—It is worth noticing that the ashes of dung in both, and tbe saltpetre in two out of three farms being applied to, gave a less percentage of grain over straw.

This point, that the saltpetre made the stock grow more luxuriantly, and produced proportionately less grain, had been noticed in last year's report *{vide* para. 30) But whether this is a fact is yet to be confirmed.

With simple cowdung also the percentage of straw was much too large, but with sheep dung it was very fair, being 48 and 63 respectively.

The plots with bone dust and gypsum combined with cowdung, sheep dung and saltpetre have produced grain in larger proportion.

11. *Eetracost of manure.*—From column 13 of Table I. it is seen that the most expensive manures are those applied to plots Nos. 4, 5, 13, 8, 10^ 12, 1, 2 and 9. Of these Nos. 4, 5, 1 and 2 recovered their expenses and left some net profit. The largest profit was left by the cowduag and bone dust.

12. *Duplicate series.*—The plots of this series, as a rule, have comparatively given much larger yields than the plots of the standard series. The greatest profit seems with simple oowdung and sheep dung.

Poudrette—In this case has given a fair result, and so the saltpetre and bone dust.

The greatest loss in this instance also is in the case of saltpetre and superphosphate applied combined.

18. *II.*—The following is one of the two new manure experiments started from this season : —

Determination of the effect of different oil-cakes, and of the cake-fed dung.

In a concentrated form this experiment, too, will be kept permanent.

For this seven series each of seven plots and each plot of 400 square yards were made.

The kinds of cakes experimented upon were : —•

(A.) Mustard cake.
(B.) Cotton seed cake.
(C.) Linseed do.
(D.) Til do.
(E.) Saffiowe* do*
(F.) Poppy do.
(Q.) Castor do.

Of the seven plots in each series, one was kept unraannrdd, and ia three th9 cike >vas applied at the rate of 5, 10 and *20* maund3 per acre respectively, and in the remaining three plots the dunsj of the cattle fed upDn the sancn cake was put at the rate of 50, 100 and 200 maunds per acre.

The other treatment was—

(1) Ploughing with Watt's twice.
Ditto country do.
(2) Watering three times.

The result is shown łu the following table : —

Table No. V.

1	2	3	4	5	6	7	8	9	10	11		12			13	14	15
	Comparison of outturn with the unmanured plot in the series.									*Comparison of cost and income with the ordinary kind of cultivation in vogue in the country.*							
Number of plots of the Farm.	Detail of special treatment with the rate of its cost.	Weight of unthreshed sheaves.	[illegible] grain	[illegible]	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	*Actual outturn per acre.* Grain.	Straw.	*Value of outturn.* Grain at Rs. 1 per [illegible] lb.	Straw at Rs. 1 per 400 lb.	Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation [illegible]	Gain or loss per acre in the value of outturn against ordinary kind of cultivation, assumed to be Rs. 38.	Net [illegible]
	Quantity of manure applied per acre.	ft.	ft.	ft.	lb.	ft.	ft	lb.	ft.	ft.	ft.	Rs. as	Rs. as	Rs. as.	Rs. as.	Rs. as	Rs. as.
A 1	Mustard cake, 5 maunds per acre, at Re. 1 per 30 seers.	598	147	297	67|	49	202	24	291	1,779	3,598	43 6	9 0	52 6	−3 11	+ 14 6	+ 10 11
2	Ditto 10 „ ditto ditto.	410	115	194	67|	69	169	8	97	1,391	2,347	33 15	5 14	39 13	•10 5	+ 1 13	− 8 8
[illegible]	Ditto 20 „ ditto ditto.	492	153	246	67f	62	161	30	368	1,851	2,977	45 2	7 7	52 9	−23 11	+14 9	− 9 2
[illegible]	Drag from mustard cake, 50 maunds per acre, at Its. 4 per hundred.	4S4	86	195	671	44	227	37	447	1,041	1,359	25 6	3 6	28 12	+ 1 0	− 9 4	− 8 4
[illegible]	Ditto ditto 100 „ ditto.	656	164	307	[illegible]	[illegible]	187	41	496	1,984	3,715	48 6	9 5	57 11	−1 0	+ 19 11	+18 11
[illegible]	Ditto ditto 200 I, ditto.	574	153	297	67}	52	194	30	363	1,851	3,595	45 2	9 0	54 2	5 0	+16 2	+ 11 2
[illegible]	No manure. .	416	123	246	67}	50	200	[illegible]	[illegible]	1,488	2,977	36 5	7 7	43 12	4-3 0	+5 12	+8 12
fil	Cotton seed perished, 5 mtunds per acre, at Be. 1 per 29 [illegible]	430	122	184	67|	66	151	13	157	1,476	[illegible]	36 0	5 9	41 9	−3 14	+ 3 9	−0 5
	Ditto 10 „ ditto ditto,	799	225	348	67»	65	155	90	1,089	2,722	4,211	66 6	10 8	76 14	−10 13	+ 38 14	+28 1
a	Ditto 20 „ ditto ditto.	518	164	328	671	50	200	29	351	1984	3,964	48 6	9 15	C8 5,	−24 9	+20 5	−4 4
[illegible]	Dung from cotton seed, 50 mannds per acre, at lie. 4 per hundred.	332	95	153	67J	62	161	40	484	1,14*	1,851	28 0	4 10	32 10	+1 0	− 5 6	−4 6
[illegible]	Ditto 100 „ ditto,	410	92	190	67|	48	207	43	520	1,113	2,299	27 2	5 12	32 14	−1 0	− 5 2	−6 2
[illegible]	Ditto 200 „ ditto.	492	170	246	67J	69	145	35	424	2,057	2,977	50 3	7 7	57 10	−6 0	+ 19 10	+ 14 10
[illegible]	No manure.	492	135	246	67|	65	182	[illegible]	[illegible]	1,633	2,977	39 13	7 7	47 4	+ 3 0	+9 4	+12 4
[illegible]	Linseed cake, 6 maunds per acre, at Re. 1 per 21 seers.	443	1103*2	188	67|	65	182	6*14	82	1,247	2,275	30 7	5 11	36 2	−6 8	−1 14	− 8 6
[illegible]	Ditto 10 „ ditto ditto.	612	»148-14	225	67*	66	151	52·10	636	1,801	2,722	43 15	6 13	50 12	−16 1	+12 12	− 3 5
[illegible]	Ditto 20 „ ditto ditto.	434	125J	235	671	53	1-88	29 0	351	1,516	2,843	37 0	7 2	44 2	−35 2	+ 6 2	•29 .0
[illegible]	Dung from linseed cake, 50 maunds per acre, at Rs. 4 per hundred.	27G	1 80 1	125	67i	65	155	15*6	187	978	1,512	23 14	3 12	27 10	+1 0	−10 6	− 9 6
[illegible]	Ditto ditto 100 „ ditto.	49:1	142	[illegible]	[illegible]	63	158	46 0	556	1,721	2,722	42 0	6 13	48 13	−1 0	+10 18	+9 18
[illegible]	Ditto &tV> VW »» ditto.	689	164 0	276	[illegible]	59	168	67 12	819	1,984	3,340	48 4	8 6	56 10	−5 0	+18 10	+13 10
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,165	2,347	28 7	5 14	84 5	+ 3 0	−3 U	i − 0 11

These plots were made on a land which is naturally rich and had enjoyed dead fallow of one year. The previous crops on it were wheat and oats mostly.

Being a new experiment, it cannot be said how far the natural richness of the soil is to account for the good produce obtained this year. Many of the unmanured plots have given a very good crop indeed. The more the land will get exhausted of its natural fertility, the more correct the result of the experiment will be obtained.

However, from the table it is seen that in the majority of cases five maunds of cake and 100 maunds of cake-fed dung have given the best economical results. In many instances the increase in the quantity of cake and the dung has increased the yield but the simultaneous increase in the cost of manure has absorbed the profit; although it may be said that the increased cost cannot be considered to have gone into dead loss since its effect will, no doubt, extend to future years.

14. The theory of the English practical farmers, that the best and most economical manure for a farmer is the cake-fed dung, has proved to be true in the instance under review too.

The cost of the dung to a farmer is nothing. He feeds his cattle on cake to eive them good nourishment, and he gets good manure by this in the bargain. In every case, instead of using cake as a manure, it will be wise to convert it into dun" The undernoted figures prove the fact. They are the averages of the cost and of "the net profit per acre, as shown in foregoing table :—

				Net profit or loss.
ont0f			^ a. p.	He. a. p.
Cake, per acre	...	...	+ 39 12 3	– 9 2 0
Cake fed dung, per acre	...	.«	+ 4 8 0	+13 8 0
No manure, per acre	...	...	– 3 0 0	+ 6 0 0

75. (///.) *Miscellaneous manure experiment*—(a) Of the two new experiments, the second one is to determine for how many years a manure leavos its residue available for succeeding crops.

For this a field was divided into 10 plots aad in the year under report they were manured as follows :—

No. of plot.	Area.	Manure applied.	Quantity per acre.
	Square yards.		Maunds.
1	40(5	Cowdutig	300
2	463	*Poudreitd*	200
3	£02	Cake	300
4	463	Woollen refuse	120
5	496	Cowdung and boae dust	200 and 3 cwts,
6	ir,7	Cx>copost	300
7	450	Green manure	...
8	400	Saltpetre	240tb.
0	445	Ammonic chloride	240H>.
10	532	No manure	...

No mwrnre will be applied f«r the fi™ .-.cewdiog year3, and every year a year after .0 oro ear

The following table shows results of the present season. T, draw any conclusion we must, however, wait for futuro years' results :—

lableSo. VI.

1	2	3	4	5	6	7	8	9	10	11		12		
		Comparison of outturn with the unmanured plot in the series.								*Outturn per acre and iU value.*				
										Actual outturn per acre.		*Value of outturn.*		
Number of plots as per map of the farm.	Detail of special treatment with the laie of its cost.	Weight ot uuthreshed sheaves.	Weight of grain.	Weight of straw.	&b '8 •s-g	it	si	Iiicrtase or decrease over standard plot in theseiies.	Increase or decrease g. acre.	S	Straw.	Grain @ Us. 2 per 82 lb.	C3o	Total.
	Quantity of manure applied per acre.	lb.	ft.	lb.	lb			Rs.	Rs.	lb.	ft.	Ks. a.	Us. a	Rs. a.
1	CowduDg at Us. 3 per 100 maunds—per acie, 300 mds.	278	92	170	63}	54	185	—39	—243	949	1,754	23 2	4 6	27 8
2	*Poudrette* at Rs. 4 per 100 mau rids—per acre, 2u0 niaunds.	385	115	172	65*	67	149	—16	+ 10	1,202	1,798	29 5	4 8	33 13
3	Cake at Re. 1 i»er 30 'seers —per acre, 300 maunds.	455	84	186	65|	45	221	—47	—382	810	1,793	19 12	4' 8	24 5
4	Woollen refuse at Rs. 2-8 per 100 maunds—per acre, 120 niHunds.	397	881	178	65|	50	201	—424	—267	925	1,861	22 9	4 10	27 3
5	Cowdung and bone dust—per acre, 2<Kl'«naunds.	387	108	190	65|	57	176	—23	--138	11054	1,854	25 11	4 10	30 4
6	Compost per acre, 300 mauDtls—at Rs. 8 per 1C0 maunds.	326	92	170	65|	54	185	-39	—218	974	1,800	23 12	4 8	23 4
7	Green m.A.mired with mustard (will be sown with wheat next season).	...	...	...	...	...	...	...	...	...	...	...	...	...
8	Salpetre, per acre 240 15 at Ks 3-8.	351	96	196	65|	50	200	—33	—224	968	1,936	23 10	4 13	28 7
9	Ammonic chloride, 240 ft. per acre, at Rs. 15 per 100 lb.	373	83	184	65f	45	222	—48	—289	905	2,001	22 0	5 0	27 0
10	No manure ...	391	131	183	65|	72	140	...	...	1,192	1,665	29 1	4 3	33 4

From the foregoing table it will be seen that the result has come out quite extraordinary. Excepting one, no manured plot has given better results than the unmanured. This can only bo ascribed to a difference in the conditions of the soil, arising probably from their previous treatments and cropping being somewhat different.

16. *Miscellaneous (b)—Experiment on determination of what constituents of plant-food get exhausted by sowing wheat year after year on the same land.*—It is operated with a series of six plots, thus : —

In one of the plots four manures, in each of which a known substance of plant-food makes an essential part, is applied, and the manures are withheld one by oue in the other four plots, while the last is kept unmanured.

The treatment of the plots was as follow : —

(1) Manure, as in the following table.

(2) Ploughinge, four.

(3) Waterings, three.

Table No. VII.—Showing manures and outturn.

Comparison of outturn with the standard plot in the series.										*Outturn and it* value.*				
1	2	3	4	5	6	7	8	9	10	11		12		
										Outturn per acre.		*Value of outturn.*		
Number of plot.	Detail of special treatment with the rate of its costs.	Weight of outturn.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase over standard plot in the series.	Increase or decrease per acre.	Grain.	Straw.	Grain at Rs. 2 per 82 lb.	Straw at Rs. 1 per 400 lb.	Total.
	Quantity of manure applied per acre.	lb.	lb	lb.	lb.	lb	lb.	lb	Rs.	lb.	lb.	Rs. as.	Rs. as.	Rs. as.
1	(1) Calcic superphospate, 180 lb. (2) Ammonio chloride, 1381b. (3) Potassic sulphate, 901b. (4) Calcic sulphate, 961b per acre.	221	584	135	67}	43	231	341	829	1,416	3,267	34 9	8 3	42 12
2	AH but caloio superphosphate.	213	554	131	67*	42	236	31J	756	1,343	3,170	32 12	7 15	40 11
3	All but ammonic chloride	192	39	141	66»	28	362	14JI	357	944	3,412	23 0	8 8	31 8
4	All but potassio sulphate,	17€	42*	147	66i	[illegible]	346	[illegible]	[illegible]	1,023	'3,555	25 1	8 14	33 15
5	All but calcic sulphate...	[illegible]	32	137	66	23	428	[illegible]	[illegible]	774	3,315	18 14	8 5	27 3
6	No manure.	1634	24*	[illegible]	62)	21	473	[illegible]	187 ...	587	2,«07	14 5	7 0	21 5

The present results confirm what were obtained in previous years, *vis.*, " the chief want of the (farm) soil for cereals lies in nitrogen."

The following figures are quoted for comparison from previous years' reports : —

	Outturn of grain per acre.			
	1885-86.	1884-85.	1883-84.	1882-83.
	lbs.	lbs.	lbs.	lbs.
Obtained by application of all manures ...	1,416	1,459	1,777	1,726
Obtained by applying all except ammoiiic chloride,	944	808	1,002	1,192
Obtained by applying no manure —	587	757	762	1,045

The importance of nitrogenous manures for wheat has unquestionably been settled now.

17, *Miscellaneous* (c).—This series consists of eight plots of 400 square yards eacfc.

Their treatments and result are shown below :—

(1) Manure, as in the following table.

(2) Ploughing—four times.

(3) Watering—three times.

Table No. [illegible]

1	2	3	4	5	6	7	8	9	10	11		12			13	14	15
Number of plots as per map of the farm	Detail of special treatment with rate of its cost	Weight of un threshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Actual Outturn per acre. Grain.	Actual Outturn per acre. Straw.	Value of outturn. Grain at Rs. 2 per 82 lb.	Value of outturn. Straw at Re. 1 per 400 lb.	Value of outturn. Total.	Increase or decrease per acre in the cost over common cultivation, assumed to be Rs. 30.	Gain or loss per acre in the value of outturn against ordinary kind of cultivation, assumed to be Rs 38.	Net profit or loss against the assumed income of Rs. 38.
	[illegible] applied per acre.	lb.	lb.	lb.	lb.			lb.	lb.	[illegible]	[illegible]	Rs. a.	Rs. a.	Rs. a.	Rs. as.	Rs. as.	Rs. as.
1	Brick kiln refuse, 120 maunds, at [illegible] per 100 maunds, per acre.	291	87	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	215	[illegible]	[illegible]	25 11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Silt 300 maunds, [illegible]	283	[illegible]	[illegible]	[illegible]	[illegible]	211	[illegible]	227	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Compost 300 [illegible] per acre.	270	[illegible]	[illegible]	[illegible]	[illegible]	205	[illegible]	130	[illegible]	[illegible]	23 10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Road scrapings, [illegible] per 100 [illegible] acre.	311	[illegible]	[illegible]	[illegible]	[illegible]	207	[illegible]	130	[illegible]	[illegible]	[illegible] 10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Ashes of [illegible] per 100 maunds, per acre.	272	[illegible]	[illegible]	[illegible]	[illegible]	192	[illegible]	163	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Ashes and [illegible] 3-8 per [illegible] lb., per acre [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	400	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Ammonic chloride, [illegible] 15 per [illegible] acre	305	[illegible]	[illegible]	[illegible]	[illegible]	191	[illegible]	381	1,219	[illegible]	29 12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	No manure	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	218	[illegible]	[illegible]	838	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

From the above figures it is seen that anything given in the shape of manure, if it is not very expensive, is better than producing a crop without any manure.

B.

18.—The next class under the permanent experiments, is that of green or vegetable manure (4*45 acres). It consists of five series.

The 1st series, consisting of thirteen plots, is the main one, and the other four are its duplicate. The latter are kept up simply to confirm the results obtained from plots in the main series.

The treatment and the results were as follows:—

Treatment

(1) Manure, as in table IX.

(2) Ploughing—four times.

(3) Watering—three times.

T«//, So. IX.

1	2	3	4	5	6	7	8	9	10	11		12			13	14	15
	CcmparisonTof outturn with the standard plot in the series.									*Comparison Of cost and income with the ordinary kind of cultivation in vogue in the country.*							
Number of ... map of ...	Detail of special treatment with the^rate of its cost.	Weight of sheaves.	Weight of [illegible]	Weight of [illegible]	Weight of bus-hel.	Percentage grain stiaw.	Percentage o gram.	[illegible]	Increase or ... aero.	*Actual outturn per acre.* Grain.	Straw.	*Value of outturn.* [illegible]	[illegible]	[illegible]	Gain or loss ...	Gain or los the valu against 0 of cultiva to be Rs. ...	Net profit on the assum of Rs. 38.
	Quantity of manure applied per acre.	lb.	lb.	lb.	lb.	lb	lb.	lfc.	lb	lb.	lb.	Rs. as.	Rs. as	Rs. as.	Rs. as.	Rs. as.	Rs. as.
T.																	
1	Old indigo refuse 120 maunds, at Re. 1 per 100 maunds, per acre,	518	108£	200	'63	54	184	— 4}	— 54	1,313	2,420	32 0	6 1	38 1	+ 1 13	+ 0 1	+ 1 14
2	Fresh ditto 120 maunds, at Be. 1 per 100 maunds, per acre,	532	114	223	671	51	185	+ 1	+ 12	1,379	2,698	33 10	6 12	40 6	+ 1 13	+ 2 6	+ 4 3
3	Indigo water 3,600 cubic feet per acre, at Re. 1 per l,200 cubic feet	779	92	188	66|	49	204	-21	+ 254	1,113	2,275	27 [illegible]	5 11	32 13	[illegible]	- 5 3	— 5 3
4	Hemp water ditto ditto at Re. 1 per 1,200 cubic feet	439	106	202	67J	53	190	— .7	— 84	1,283	2,444	31 5	6 2	37 7	[illegible]	— 0 9	— 0 9
5	No manure	492	113	211	68}	53	187	.	...	1,367	2,553	33. 5	6 11	40 0	+ 3 0	+ 2 0	+ 5 0
6	ferei-n-inamrred with indigo, at Rs. 8 per acre	4<J7	1-284	244	63	50	Ifc8	+'104	+ 127	1,494	2,952	36 7	7 6	43 13	— 5 0	+ 5 13	+ 0 13
7	Alter indigo crop	512	143	264	67|	56	178	+ 35	+ 424	1,791	3,194	43 11	8 0	51 11	+ 3 0	+ 13 M	+ 16 31
8	Gret n ind go ploughed in as manured with six maunds of gypsum «t Re 1-12 per 82 Hi, per acre	5i3	152}	283	68	53	186	+ 3H	+ 478	1,845	3,424	45 0	8 9	53 9	-15 8	+15 9	+ 1 6
9	Green hemp ploughed in as manured with six maunds of gypsum at Re. 1-12 per 82 lb,].ei acre	573	89}	769|	67}	53	189	—234	—284	1,(83	2,051	26 7	5 2	31 9	— 5 0	— 6 7	—11 7
10	No manure	4S7	1084	198	674	55	1(3	...	...	1,313	2,396	32 14	6 0	38 ?4	+ 3 0	— 0 14	+ 2 2
11	Alternate, with lucerne ...	f76	123	219	67||	56	178	+ 144	+ 175	1,488	2,650	36 5	6 10	42 15	3 0	+ 4 15	+ 7 15
12	After hemp crop ...	490	84	186	67||	45	221	...	.	1,116	2,250	27 4	5 10	b2 14	+ 3 0	— 5 2	— 2 2
13	Green manured with heDip, at Rs. 3-8 per acre ...	479	[illegible]	190	634	50	202	+ioi	+ 122	1,138	2,299	27 12	5 12	33 8	+ 0 8	— 4 8	— 4 0
II. 1	Freah indigo refuse 12 maunds and lime six maunds per acre, at Ke. 1 per 100 maunda and Rs. 20 per 100 mauuda.	608	170J	337	67}	50	197	—10	-56*6	968	1,910	23 10	4 12	28 6	+ 0 10	— 9 10	— 9 0
2	Ditto ditto ditto only	520	175}	.3*3	•684	53	190	- 5]	-29-7	9S5	1,887	24 4	4 11	28 15	+ 1 13	— 9 1	- 7 4
3	Old indigo refuse 120 maunds, and lime six maundf, per acre	.712	194	344	68}	56	177	+ 13*	+ 75-1	1,099	1,950	26 13	4 14	31 11	+10 0	— 6 5	— 5 11
4	Ditto ditto ditto only	706	181|	313	684	17	175	+ 1	+ 5-7	1,030	1,802	25 2	4 8	29 10	+ 1 13	- 8 6	— 6 9
5	No manure ...	676	ISt?	352	68	53	189	...	...	1,054	1,995	25 11	5 0	bo 11	+ 3 0	— 7 5	— 4 5
6	Ditto	678	175J	327	68|	54	Ib6	...	...	995	:,853	24 4	4 10	28 14	+ 3 0	— 9 2	— 6 2
III. 1	Green-manured with hemp	1,756	609|	919	68}	66	151	+	...	836	1,259	23 2	3 2	*26 4	+ 0 8	-11 12	—11 4
2	No manure	9.63	296|	631	68£	56	179	+	...	986	1,765	24 1	4 7	28 8	+ 3 0	— 9 8	— 6 8
IV. 1	Green-manured wilh hemp...	1,067	252	496	66]	5J	197	+ 26}	+ 51	484	952	11 13	2 6	14 3	+ 0 8	—23 13	—23 5
2	No manure ...	1,041	2254	505	66$	45	224	+	+	433	969	10 9	2 7	13 0	+ 3 0	—25 0	—22 0
V. 1	Ditto	262	80	117	66|	68	146	1 +	[	968	1,416	23 10	3 9	27 3	+ 3 0	-10 13	+ 7 13
2	Ditto	387	75	157	66|	48	209	i	+)	907	1,900	22 2	4 12	26 14	+ 3 0	-11 2	— 8 2
3	Alternate with lucerne	584	145}	291	68}	50	200	+ 68	+ 826	1,761	3,521	42 15	8 13	51 12	+ 3 0	+ 13 12	+ 16 1

As noticed before, plots in series Nos. Ill and IV were injured by mildew *(girui) ;* hence it would not be fair to include them for comparison.

From the total in column 7 of the above statement it is seen that in most cases the yield has been good, and by no' means inferior to other kinds of fertilizers, *i.e.,* farmyard and artificial manures; but the margin of profit was only in the case of six plots, the other eleven having resulted in loss.

In two cases it is due to the high price of manures applied. But if the price of the crops of indigo and hemp taken from some of the plots and sold be included, the amount of loss will be much diminished.

On the whole, it can fairly be said that indigo and hemp havo proved again to be good and economical fertilizers. Sowing wheat after lucerne is just as good as cropping it after indigo.

This year, wheat alternated with lucerne heads the list when net profit is taken into account. In one plot it has given a profit of Rs. 13-8-0 and in the other of lis. 16-11-0 per acre.

By putting lucerne seed on oats or barley if onQ can afford giving two or three waterings from April till June, a very good catch-crop of fodder can be obtained, and the field will be left prepared for sowing wheat.

C.

19.—*Determination of the effects of deep an& shallow ploughing.*—This experiment is under operation for more than six years, and the plots set aside for this have never received any kind of manure since then.

The natural fertility of the land is getting more and more exhausted every year.

It is obvious that deep ploughing without manure is detrimental to tlu crop. The exhausted sub-soil coming up on the surface contains nothing to nourish the plant that grows upon it. The following table gives tho figures. It shows that the outturn per acre is very poor indeed.

In next season'the farmyard manure will be given to each of the plots, and then the result of the deep and shallow ploughing irill fairly be compared.

Table No. X

1	2	3	4	5	6	7	8	9	10	11		12			13	14	15
Comparison of outturn with the standard plot in the series,										*Comparison of cost and income with the ordinary kind of cultivation in vogue in the country.*							
No. of plots as per plan of the farm. 5 §8	Detail of special treatment with the rate of its cost.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard in the series.	[illegible]	*Actual outturn per acre.* Grain.	Straw.	*Value of outturn.* Grain at Re. 1 per 41 lb.	Straw at Re. 1 per 400 lb.	Total.	[illegible]	an* f -Us it*	[illegible]
	Ploughing,	ft.	ft.	ft.	ft.	ft.	ft	ft.	ft.	ft.	lb.	Es. a.	Ra. a.	Ra, a.	Bs. a.	KB. a.	Rs, a.
1	Ploughed 5" deep (twice) at annaa 12 per each ploughing	80	13	65	60i	[illegible]	500	121	206	210	1,049	5 2	2 10	7 12	+7 8	-30 4	-22 12
2	Ploughed four times with country plough at annas 12 per each ploughing.	92	17	69	60	[illegible]	406	+	+	274	1,113	6 11	2 13	9 8	+ 6 0	-28 8	-22 8
3	Ploughed four times with country plough at annas 12 per each ploughing.	162	344	106	CO*	32	312	+	+	557	1,710	13 9	4 4	17 13	+6 0	-20 3	-14
4	Ploughed 9" deep (twice) at annas 12 per each ploughing!	156	16	73	60*	23	456	[illegible]	157	258	1,178	6 5	2 15	9 4	+ 7 8	-28 12	-21 4
5	Ploughed 9" deep (twice) at annas 12 per each ploughing.	734	2061	40i	62J	51	196	26)	53	413	808	10 1	2 0	12 1	+ 7 8	-25 15	-18 7
6	Ploughed 9" deep (twice) at annas 12 per each ploughing.	744	217	387	62J	56	178	37	71	415	741	10 2	1 14	12 0	+ 7 8	-26 0	-18 8
7	Ploughed four times with country plough at annas 12 per each ploughing.	760	180	402	62J	45	223	+	+	335	748	8 3	1 14	10 1	+ 6 0	-27 15	-21 15

The difference.*)! the value of manure, Rg. I per acre, and of ploughing for eight times, at annas 12 each time=Bs 6, is ehown in column 1$.

The present experiment shows that simple ploughing, whether deep or shallow, is no good. Good farming needs good ploughing, good manuring, good watering and good seed.

D-

20.—Watering.—As usual, two series of experiments were tried tinder this head:—

(j).—To ascertain the increase in produce by the increase in the nnmber of waterings.

(2).—To estimate the value of well against canal water.

There have been some winter rains in odd times during the season under report, which has spoilt the purity of the experiment.

However, it seems that the increase of water has somewhat increased the produce too.

But, on the whole, the outturn is much below the plots with manure and only three waterings.

Well water this year has proved in one case better than the canal; but in other cases canal water has given a slight increase.

As stated before, on account of the rain no fair conclusion can be made this year by the experiments.

The following table gives the detail:—

Table No. [illegible]

1	2	3	4	5	6	7	8	9	10	11		12			13	14	15
		Comparison of outturn with the standard plot in the series								Comparison of the cost and income with the ordinary kind of cultivation in vogue in the country.							
										Actual outturn per acre.		[illegible] of outturn.					
Number of plots as per map of the farm.	Detail of special [illegible] [illegible]	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per Here.	Grain.	Straw.	Grain at Kg. 2 per 82 lt).	Straw at Be. 1 per 400 tt>.	Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation, assumed to be Bs. 80.	Gain or l»4M per uci e in the value of outturn against ordinary kind of cultivation, assumed to be Bs. 38.	Net profit or loss against the assumed income Bs. 38.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.
1	[illegible] each water	431	[illegible]	148	67	58	173	91	260	[illegible]	1,730	21 5	5	28 10	[illegible]	[illegible]	[illegible]
2	[illegible] each water	431	[illegible]	86	66	100	100	24	29-	[illegible]	1,041	25 4	10	27 14	[illegible]	[illegible]	[illegible]
3	[illegible]	246	61	82	67	74	[illegible]	[illegible]	[illegible]	[illegible]	902	18 0	6	20 6	[illegible]	[illegible]	[illegible]
1	from well at Rs. 1-15 [illegible] time	147	[illegible]	85	66½	51	107	—8	—57	[illegible]	788	[illegible]	1 15	11 11	[illegible]	5	—24 0
2	from canal at Rs. 1-4 [illegible] on water	158	[illegible]	59	66½	61	263	[illegible]	[illegible]	[illegible]	714	[illegible]	1 15	12 7	[illegible]	9	—29 8
1	[illegible] times at Rs. 1-4-0 per each from canal.	[illegible]	80	[illegible]	67	42	[illegible]	37	[illegible]	808	[illegible]	23 10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible] times at Rs. 1-4-0 per each	[illegible]	71	[illegible]	67	38	[illegible]	28	[illegible]	880	[illegible]	21 2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible] times at Rs. 1-4-0 per each	[illegible]	60	[illegible]	66	33	[illegible]	16	[illegible]	841	[illegible]	20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	2 times at Rs. 1-4-0 per each	[illegible]	69	[illegible]	66	34	[illegible]	16	[illegible]	816	[illegible]	20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	1 time at Rs. 1-4-0 per each	[illegible]	68	[illegible]	66	28	[illegible]	10	[illegible]	742	[illegible]	18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]	68	[illegible]	66	32	[illegible]	[illegible]	[illegible]	641	286	15 1	[illegible]	[illegible]	[illegible]	[illegible]	11

The difference of the value of manure, Rs. 3 per acre, and of the labour of three waterings, Rs. 3-12-0, is shown in column 13.
* 2.—In well watering extra cost of labour against canal water (as. 11) is included.

E.

21. — *Sowing.*_The experiment of sowing by the Jethro Tull or Lois Weedon system was again tried this year in two places.

The following table shows the result: —

Table No. XII.

I* s s á a s *	;tfanner of sowing.	Area in square yards.		Actual out-turn.		Outturn per acre calculated on the total area of the plot.		Outturn per acre calculated on the cropped area alone.	
				Grain.	Straw.	Grain.	Straw.	Grain.	Straw.
I	2	3		4	5	6	7	8	9
				Ib.	m.		Ib.	B5.	ft.
26a	Tull's ...	Under wheat ••	— 828	265	448	672	1,136	1,549	.2,619
		Fallow ...	... 1,080						
		Total	... 1.WW						
266	Or dinar j ...		1,980	249	438	609	1,070	...	...
		Duplicate.							
34a	Tail's •••	Under wheat \M	«• 903	201	287	556	793	1,077	1,538
		Fallow ...	... 348						
		Total	... V5[1]						
[illegible]	Ordinary...		1,66[illegible]	328	674	951	1,665	...	...

The above table shows that ia one case Tull's system of sowing has given good yield, but in the other case not so good. However, in both oases it shows some advantage over the ordinary kind of sowing. So where manure cannot reach, this system of sowing may advantageously be followed.

SECOND CLASS OF EXPERIMENTS.

Temporary or Variable.

22._During the last season 8*86 acres of land were under these experiments, and the following crops were grown :—

1. Wheat of sorts.
2. Barley.
3. Oats.
4. Leguminous crops.
   (a) Gram.
   (6) Peas.
5. Linseed.
6. Imported seeds.

Wheat.—Four different kinds of wheat were tried: the following table show* their result :—*

Table No. XIII.

1	2	3	4	5	6	7	8	9		10			11	12	13	14
No. of plots as per map of the farm.	Detail of [illegible]	Weight of UDthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Actual outturn per acre. Grain.	Straw.	Value of outturn. Grain at Be. 1 per 41 lb.	Straw at Re. 1 per 400 lb.	Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation, assumed to be Rs. 30.	Gain or loss per acre in the value of outturn against ordinary kind of cultivation, assumed to be KB. 38.	Net profit or loss against the assumed income Rs. 38.	Remarks.
	Quantity of manure applied per acre.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	
	No. 1.—Ghajaria [illegible]															
42	[illegible]ing, 300 maunds, at Rs. 3 per 100 maunds.	2170	470	916	66	91	110	1422	1367	35 11	3 14	38 9	— 6 0	+ 0 9	— 5 7	
	No. 2.—Muzaffarnagar soft white wheat.															
10	[illegible] 200 [illegible]	3190	648	381	[illegible]	45	222	1617	4041	44 8	10 2	54 7	— 7 12	+16 7	+ 8 11	Seed was [illegible] and sown broadcast.
11	Poudrette, 200 maunds, at Rs. 4 per 100 maunds.	2600	[illegible]	[illegible]	[illegible]	[illegible]	269	1374	3869	33 8	8 15	42 7	— 5 0	+ 4 7	— 0 0	[illegible]
	No. [illegible]															
39	Sheep folded a week at Rs. 8	885	1133	107	[illegible]	110	91	1616	3463	39 7	8 10	48 1	+ 1 8	+ 5 1	+ 6 9	
	No. 4 [illegible]															
9	[illegible] maunds, [illegible]	418	67	209	57	33	312	378	1105	0 3	2 15	12 2	— 5 6	—25 14	—30 14	

No. 1.—Gujaria. This variety was sown under Government Order No. 12, dated 22nd September, 1885, and the quantity cropped has already been despatched to the India Office. Only 1 maund and 15 seers of S3ed was received from the* Superintendent, Botanical Garden, Saharanpur. It came rather late in the season, but with due care a fair crop was obtained. It gave a very good yield of grain, the percentage over straw being 91.

No, 2.—Muzaffarnagar white wheat. The sowing of this Variety was connected with an experiment tried for the first time at the station. The seed before sowing was pickled in a solution of copper sulphate. This process of pickling is almost universal in England, but in this country it is quite unknown. One of the two fields in which this experiment was conducted was also top-dressed with saltpetre, after the English fashion of sowing wheat. The result seems to be very successful. The top-dressed plot produced a crop worth Rs. 54-7-0 per acre, while the other which was not top-dressed with saltpetre yielded a crop worth Rs. 42-7-0 only. In the first case there was a clear profit of Rs. 16-11-0 over and in excess of what is obtained from the ordinary method followed by the caltivators.

No. 3.—Beardless. It was sown after the fashion in vogue in the country, to serve as a standard for comparison of the results of all experiments in money value. Though the field was to some extent affeoted by smut, yet the outturn was, on the whole, very good.

No. 4.—Kathya. This variety is a especial produce of the *mar* land of Bundelkhand. The result shows no success, and it may be assumed that no other SQU but *mar* is suited to it.

Barley.

23. The following varieties were tried, their roaulta a*e shown in the table .below : —

1. Rasuli (unhusked).
2. Chocolate.
3. Ordinary country variety of the Doab.

Table No. XIV—Barley.

1	2	3	4	5	6	7	8	9	10	11		12			13	14	15
		Outturn.								*Comparison of cost and income with the ordinary kind of cultivation in vogue in the country.*							
[illegible]	Detail of special treatment with the rate *of* its cost.	Weight of unthreshed sheaves.	Weight [illegible]	[illegible] of straw.	[illegible]	Percentage of grain to straw.	[illegible] of straw [illegible]	Increase or decrease over [illegible] 8-9	Increase or decrease per acre.	*Actual outturn per acre.* Grain.	Straw.	*Value of outturn.* [illegible]	[illegible] at Re 1 [illegible]	Total.	[illegible]	[illegible]	[illegible]
	Quantity of manure applied per acre.	lb.	25.		lb.			lb.	lb.	lb.	lb.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.
							No. 1~Chocolate colour variety.*										
306	Ho manure, 2 waterings at Rs. 2-12 each,	202	47	94	64	50	200	...	...	1109	2209	18 2	4 8	22 10	+ 5 12	—15 6	—9 10
							No.2>—Unhuaked or naked variety.										
—	Ditto ditto ...	157	12	78	64	15	650	...	...	538 1	3496	8 13	7 2	15 15	+ 5 12	-22 1	-16 5
							No. 3—Country barley.										
15	No manure, 2 waterings at *Us.* 2-12 each,	1398	526	768	53	*69*	*U6*	...	...	1697	2478	27 13	5 1	32 14	+ 5 12	-5 2	+0 10
16A	Lucerne ploughed in at Rs. 8-4 per aere and 2 waterings at Us. 2-12 each.	296	106	84	53	126	79	...	...	2094	1659	34 5	3 6	37 11	—2 12	—0 5	-2 7
							Ko. I—Country barley.										
F.	Poudrette, 120 maunds per acre, at Rs 4 per 100 rauun,J*, and 2 waterings at KB. 2-12 each.	1430	678	567	53 3	119	83	...	103	1172	980	19 3	1 15	21 2	+0 15	-16 14	—15 15
...	No manure, 2 waterings at Rs. 2-12 each,	3924	1561	882	53*8	177	[illegible]	...	...	1349	762	22 2	1 9	23 11	+5 12	-14 5	—8 9

NoTB—Th«, assumed figures are—

(1) Value of outturn of an acre of barley—

		Rs.
(a) Grain, 16 maunds @ Re. 1-8 per maund	=	24
(p) Straw, 24 ditto @ 6 maunds per Re.	=	4
Total ...		28

(2) Assumed coBt of cultivation per acre is Rs. 20.

(3) 'lhe difference of the actual cost of the different experiments on barley and of the assumed cost *f wheat (Rs. 38) is entered in column 1&

(4) The figures iu column 15 show the Ions or gaiu against or above the income from an acre of wheat (Us. 36).

Nos. 1 and 2 were under Government orders procured from Sahāranpur. The seed received was, however, very small in quantity and so the crop raised was not much. Their produce is carefully preserved for next season.

Country barley.—The field in which it was sown after lucerne gave very good yield. This again con firms that, like clover in England, lucerne in India prepares the land for cereals. *Poudrette* here too, as in the case of wheat, produced no effect, but this looks extraordinary.

24.—Oate.—The cultivation of Cape oats was repeated. The following table shows its results :—

Table No. XV (Cape oats).

Outturn.								Comparison of cost [illegible] of the ordinary [illegible]							
1	2	3	4	5	6	7	8	9		10			11	12	13
Number of plot as per map of the Farm.	Manure.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Actual outturn per acre. Grain.	Actual outturn per acre. Straw.	Value of outturn. Grain at Re. 1-8 per 82 lb.	Value of outturn. Straw at Re. 1 per 492 lb.	Value of outturn. Total.	Increase or decrease per acre in cost against the cost of ordinary cultivation of wheat.	Gain or loss per acre in the value of outturn against wheat cultivated in the ordinary way.	Net profit or loss compared with the profit from wheat cultivated in the ordinary way.
		[illegible]	lb.	lb.	[illegible]			lb.	lb.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.
25b	Quantity of manure [illegible] 100 maunds [illegible] 100 maunds, 76 [illegible] per 100 maunds, Rs. 30 per 100 [illegible]	1 [illegible]	394	900	[illegible]	40	252	2,224	5,561	[illegible]	17 [illegible]	44 6	+7 8	+22 6	+14 [illegible]
20	Cowdung, 200 maunds at Rs. 8 per 100 maunds.	1033	384	782	40½	50	201	1,834	—	28 8	[illegible]	4[illegible] 13	+8 0	+ [illegible]	+8 8
[illegible]	[illegible] ploughed [illegible] Rs. 8-4-0 per [illegible]	398	113	149	41	79	127	1,808	—	28 [illegible]	[illegible]	18 15	+ [illegible] 4	—9	—14 [illegible]
9	[illegible] 300 maunds at Rs. 3 p[illegible]	784	205	489	40½	89	212	1,012	[illegible]	18 8	[illegible]	26 [illegible]	+8 0	— [illegible]	— [illegible]
	Total	4,086	1,107	2,572	162½	[illegible]	[illegible]	8,460	14,350	113 7	48 14	162 4	+1 [illegible]	+10 4	[illegible] 3
	Average	1,016	277	643	41	50	[illegible]	1,610	[illegible]	8 10	10 15	40 9	+ [illegible]	+ [illegible]	— [illegible]

The above figures prove that growing oats is very profitable. With woollen refuse it gave an outturn worth Rs. 60 per acre, far in excess of any crop, even wheat. In one of the two fields to which it was applied, cowdung too gave good results.

Lucerne ploughed in as a green manure has not shown any excess here.

LEGUMINOUS CHOPS.

26.—As a rule, gram in this oountry is grown without any manure or watering, and even with no good tilth. The cost of sowing gram is the least of all grains, being only about Rs. 15, and its outturn is usually worth about Rs. 20. The figures in the following table show that by good culturer and good treatment the outturn, and thereby the net profit, can be considerably increased. Similar remarks are applicable in the case of peas also. The following table gives the result:~~

Table No. XVI.

1	2	3	4	5	6	7	8	9		10			11	12	13
		Outturn.						*Comparison of cost and income with the ordinary kind of cultivation in vogue in the country.*							
								Actual outturn per acre.		*Value of outturn.*					
Number of plots as per map of the farm.	Detail of special treatment with the rate of the cost.	Weight of unthreshed sheares.	Weight of grain.	Weight of straw.	Weight of grain per busheL	Percentage of grain on straw.	Percentage of straw on grain.	Grain.	Straw.	Grain at Re. 1-8 per 82 lb.	Straw At Re. 1 per 492 lb.	Total.	Inerease or decrease per acre in cost against the cost of ordinary cultivation.	Gain or loss per acre in the value of out tarn against ordinary cultivation of wheat.	Net profit or loss against the assumed income, by cultivation of wheat Us. 38.
	Quantity of manure applied per acre.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.
							Gram.								
26	Sheep dung 200 maunds at Rs. 3 per 100 maunds and one watering at Rs. 2-12-0 = 8-12-0.	1,246	678	516	62	131	71	2,081	1,588	36 9	6 2	42 4	+2 8	+4 4	+8 12
2	Saltpetre 1 cwt. at Rs 5-8-0 per 82 lb and one watering at Rs. 2-12-0 = 8-8-0.	518	205	312	62	65	153	1,287	1,966	22 9	7 11	30 4	+3 12	—7 12	—4 0
1	No manure, one watering at Rs. 2-12-0	145	39	86	62	35	287	640	1,547	8 7	6 1	*15 8	+8 2	—22 6	—14 0
9	Lona 4 cwt. at Re. 1-8-0 per 82 lb = 3-2-0 and one watering at Rs. 2-12-0 = 5-8-0.	124	92	140	62	67	174	721	1,253	12 10	4 14	17 8	+5 15	—20 8	—14 12
	Total ...	2,243	1,045	1,075	248	298	690	4,609	6,333	80 12	24 12	105 8	+20 8	—46 6	—26 0
	Average ...	561	261	268	62	74	172	1,152	1,583	20 3	6 8	26 6	+5 2	—11 10	—6 8
							Pros								
29a	Mixture of cowdung, sheep dung, poudrette 200 maunds, at a total cost of Rs. 10 and one watering at Rs 2-12-0.	1,723	578	1,016	62	56	176	2,311	4,074	36 15	15 14	52 13	—1 8	—14 18	+13 5
24	Poudrette 200 maunds at Rs. 4-0-0 per 100 maunds and one watering at Rs. 2-12-0.	1,525	395	623	62	63	158	740	1,172	11 14	4 9	16 7	+0 8	—21 9	—21 1
	Total ...	3,252	968	1,638	124	119	334	3,054	5,246	48 13	20 7	69 4	—1 0	—6 12	—7 12
	Average ...	1,641	484	819	62	59	167	1,527	2,623	24 6	30 3	34 10	—0 8	—3 6	—3 14

* Suffered from waterlogging in the fields.

27.—*Linseed.*—Two varieties of linsped, (1) Riga, (2) country, were sown ; both destroyed by insect pest *{aphis)* called *mahun.*

Experiment on foreign seeds.

28.—During the season under report the following seeds were obtained from the English seedsmen, and tried on the farm : —

(1) Field bean, two varieties—
 (a) Dwarf.
 (b) Creeping.
(2) Green peas.
(3) Egyptian lentil.
(4) Canary seed.
} Received from Messrs. Praschkauer and Co., England.

(5) Mangold (golden tankard.)
(6) Belgium carrot.
} Messrs. Sutton and Sons, England.

Tho first three, notwithstanding every possible care and exertion, either did not germinate or the plants perished soon after germination.

They were sown in three different places and some of them two or three times. A few plants of the bean which germinated and grew a foot high were attacked and destroyed by *aphis.*

Canary seed succeeded very well. It was sown in two places and both plots gave good yield.

Mangold and Belgium carrot.—A large supply of these seeds was obtained fresh from England and distributed in the country. At the station mangold was grown in two plots. The plot, which received saltpetre and superphosphate as manure, yielded 22,854 tb per acre, which at the rate of only four annas per maund is worth about Us. 70. Though the expenses of cultivation exceeded by Rs. 8-2, yet the net profit was not small, being Ra. 24-15 against Rs- 8 yielded by a crop of wheat. In tho second plot a mixture of very good farmyard manure with gypsum was applied, yet without saltpetre and superphosphate it gave a very poor outturn. However profitable the growing of mangold may be, but commonly Ihere being no use of it in tho country, there can be no hope that the people would take it up.

Carrot seed also gave a very good crop, but the produce of several fields was fed off to farm bullocks in odd times.

Tobacco Experiment.—During the season two varieties of American tobacco and one of native was sown and cured after the Burmese and native fashions, and the samples sent to Pusa tobacco factory for opinion. The results did not turn up as satisfactory as were expected.

Ensilage.—As promised in the last kharif report, para. 21, page 12, the experiment of feeding cattlo on two kinds of ensilage was tried.

Two batches of cattle, sis in each, were fed on tho two kinds of ensilage. In each batch the beasts were selected of nearly equal age and condition. To determine the effect of the fodder on milk, four cows were also fed and the result recorded Tho experiment kept on for four weeks, beginning from tho 22nd of May when there was no grass and other kind of fodder to be had. The beasts were kept in stall, only being turned out in fresh air for an hour or two.

The result is recorded as per following table :—

I.—Experiment with regard to gain in flesh.

No.	Age: Years.	Age: Months.	Kind of fodder given, with quantity.	Quantity of fodder left unconsumed.	Weight on the 1st day of experiment. M. s. c.	Weight at the end of 1st week. M. s. c.	Weight at the end of 2nd week. M. s. c.	Weight at the end of 3rd week. M. s. c.	Weight at the end of 4th week. M. s. c.	Difference between the first and last week: Increase in weight. M. s. c.	Decrease in weight.
1	4	...	Old ensilage alone, 10 seers ...	[illegible]	6 4 8	6 3 8	6 4 12	6 9 4	6 10 0	0 5 8	
2	3	...	Ditto ditto, 7 ,, ...		4 18 0	4 18 4	4 18 0	4 20 0	4 20 0	0 4 0	
3	3	6	New ensilage alone, 10 ,, ...		5 1 0	4 39 0	5 0 0	5 4 0	5 5 8	0 4 8	
4	3	...	Ditto ditto, 7 ,, ...		3 23 0	3 20 0	3 21 0	3 27 0	3 30 0	0 7 0	
5	3	...	Half old and half new ensilage, 10 seers.		2 28 0	4 24 8	4 25 0	4 32 0	4 33 0	0 5 0	
6	2	6	Ditto ditto, 8 seers ...		4 28 4	4 26 4	[illegible] 28 0	4 33 0	4 35 4	0 7 0	Nil.
7	2	6	Half new ensilage and half bhusa, 12 seers.		4 24 12	4 28 0	4 24 0	4 27 0	4 29 0	0 4 [illegible]	
8	2	...	Ditto ditto, 8 seers ...		4 16 8	4 14 8	4 15 4	4 18 8	4 20 0	0 3 [illegible]	
9	2	3	Bhusa alone, 12 seers ...		[illegible]	[illegible]	[illegible] 13 0	4 15 4	[illegible]	[illegible]	
10	2	...	Ditto, 8 ,, ...		3 18 12	3 20 4	3 22 0	3 25 0	3 25 12	0 7 0	
11	2	...	Half mangold and half bhusa, 10 seers.		4 36 0	4 35 0	4 35 8	5 0 0	5 2 0	0 6 [illegible]	
12	2	...	Ditto, ditto ...		4 [illegible] 0	4 13 0	4 14 8	4 16 4	4 18 0	0 5 0	
			Total ...	...	57 [illegible] 0	54 14 8	54 21 8	55 27 4	56 6 0	1 20 [illegible]	

II.—Experiment on the effect of fodder on milk.

No.	Fodder.	Quantity of milk given at 1st week.	Quantity of milk given at the end of 4th week.
1	Sani a mixture of bhusa cake and water as much as they can eat.	0 1 8	0 1 11
2	Usual sani with sliced mangold as much as they can eat.	0 2 0	0 2 6
3	18 months old ensilage and cabbage ... ... } 9 months old ensilage and cabbage. ... ... }	0 2 0	0 2 7

The above figures show that by the change of food the animals lost some weight in the first week, but gradually increased after it. The total increase at the end of the 4th week was 1 maund and 20 seers, proving that both the old and the new ensilage had feeding value by no means inferior to bhusa, which in the country is considered first-rate fodder for cattle. The eighteen-months old ensilage by no means seems to contain less nutritive ingredients than any of the fodders compared with. On milk too it has shown no bad effect.

Determination of the nutritive value of inga dulcis *and of babul* (acacia arabica) *pods.*—Ten sheep of pretty equal age and condition were fed on each kind. They were turned out in fresh air for only two or three hours every day to graze. Five seers of pod of each kind was the ration per head.

The result stands thus :—

Description.	By feeding *inga dulcis.* M. s. c.	By feeding babul pods. M. s. c.
Total weight of ration given to ten sheep for 27 days at 5 seers per head.	3 15 0	3 15 0
Total weight of fresh excrement	3 35 0	4 14 0
Total weight of ten sheep on the 6th May, 1886	5 2 0	6 4 0
Total weight of ten sheep on the 1st of June, 1886... ...	5 20 0	6 15 0
Total increase in weight	0 18 0	0 11 0
Increase per cent.	8·9 0 0	[illegible] 0 0

From the above figures it will be seen that the sheep fed on *inga dulcis* gained seven seers more weight than those fed on babul. Moreover, the excess in the weight of solid fresh excrement of the sheep fed on babul beans leads to two points, *(a)* either the stuff is not so well assimilatad as the *inga dulcis, (b)* or it made the sheep drink water in excess. The former fact, however* seems more reasonable, because it is confirmed by the sheep gaining more weight by eating *inga dnlcis,* being nearly 9 per cent, while in the other case the increase in weight is only 4*5 per cent.

Implements, supply of.—The following comparative statement will show the progress in the sale of the improved implements, made in the workshop aud imported from other countries :—

	Ploughs.				*Pumps.*			*Sugar pan.*			*Grain kibbling mill.*			*Chpff-cutter*			*Drtd-yer.*		
	Sold.	Sent for trial.	Sent to district.	Total.	Sold.	Sent for trial.	Total.	Sold.	Sent for trial.	Total.	Sold.	Sent for trial.	Total.	Sold.	Sent for trial.	Total.	Sold.	Sent for trial.	Total.
From 1st January to 15th August, 1885.	82	3	...	85	8	—	8	4	4	8	5	...	5	6	...	6	1	..	1
From 1st January to 15th August, 1886.	106	27	107	240	31	11	42	4	...	4	10	...	10	7	...	7	4	1	5

The ploughs are coming more and more into use now. It can be positively said that almost iu all districts a few at least are being* used by *bond fide* kāshtkūrs, and those who can afford buying it and have learnt using it properly, do really like them. The plough which decidedly is considered to be the best of all is Watt's For foul land the people uuobjectionably prefer using it, but there are two great draw-backs in the way of its success, (1) the high price, as it cannot be imported for less than eleven or twelve rupees, *(2)* its breast and mould board, rather the whole body being broader and larger, requires drafUcattle stronger than the bullocks commonly used for ploughing.

Since last rabi season in some selected districts in the united provinces tho ploughs are sent with traiued *men* to be worked in ploughing seasons, in order to let the people have an opportunity of judging the result of its work at their very doors. At present in nine districts the ploughing campaign is going on : about 80 ploughs are at work. It is hoped that after seeing the advantages of the improved imple-ment, the people will have more reason to appreciate it.

Pump.—The demand for pump is on an increase. It is owing only to its high price that it is not used more freely by common people. Attempts are being- made to make it cheaper. It has unquestionably been admitted by practical farmers now that fur the places where canal water requires lifting, it is an unequal appliance. Eleven pumps are sent to canal officers for trial and to make the people acquainted with its advantages. Thirty-one were soM daring the period nnder report against eight during the corresponding period last year.

Sugar ecap >vator.—Whether this pan is good for the large manufactory of " gur" i* a question yet to be decided. Those who have purchased it doubt of its being of much use to them.

Grain kibbling mill and chaff-cutter.—These two machines are growing more and niore popular. Their price is Rs. 35 a piece. They are imported from England. The purchasers seem highly satisfied with them.

REPORT ON THE

CAWNPORE EXPERIMENTAL STATION

FOR THE KHARIF SEASON OF 1886.

ALLAHABAD:

HOBTH-WESTUBN PROVINCES AND OUDD GOVERNMENT PRESS.

1887.

DEPARTMENT OF AGRICULTURE AND COMMERCE, N.-W. P. AND OUDH.

DATED CAWSPORE, THE :>2SD JANUARY. 1887.

FROM

DONALD **SMEATON,** ESQ., **M.A., C.S.,**

Din., DEFT, OF AGHI. AND **COMMERCE,**

IS^T.-W. PaoyiFOES AND OUDII,

To

THE CHIEF **SECRETARY TO** GOVERNMENT,

N -W. rnovisfCEs AND OIDII.

SIR.

] HAVE the honor to submit, for the consideration of his honor the Ueutcnnnt-Gnvernor, **the report** written by Mir Mahomed Iloscln, **Assistant** Director **of Klmrif** Operations on the Cawnpore Experimental Station.

2. The heavy **hailstorm** in the end of October destroyed most ati<i **damaged** the **remainder** of the crops on the station.

Mir Mahomed **Horaehi** accordingly has only noticed the continued experiments **in** cotton and maize culture.

3, The most important of the **cotton experiments was that which** luis confirmed tlic belief that—

(I) Deep **ploughing** is **better than** shallow **ploughing** for cotton ;

(II) And that **the efect** of deep ploughing is greatly enhanced by **manuring.**

4 As regards maize, **the experiment** has shown that although the weight of the **yield obtained by** cultivating on the American fashion is **less,** the cobs are larger and plumper.

Further experiment may show that the American method, called the " hill " method, will yield a larger gross yield, the theory **of** the American* **beiDg that** the more sunlight the plants get **the Wore** and the larger cobs **they** will yield.

5. The rest of the experiments do not call for **special mention.**

I have the honor to be.

Sis,

Your most **obedient** servant.

DONALD **SMEATON,**

Director.

REPORT

ON'THB

CAWNPORE EXPERIMENTAL STATION

For the Kharif Season of 1886.

*Character of tl*e season.—Tha* season had beea quite an extraordinary and unfortunate one in many ways for the crops. The experimental station was an especial victim of it Tho rain eommeaeed very early and the season seemed to be very promisinw, but a long break of the rain in August just at the time it was greatly needed caused snort deul iunnge to mafee crops. It ceased for about 20 days altogether, and we were obliged to protect some of the fields by irrigation. After that, till about the end, the monsoon had been very reguhir and favourable, but at the time the poises and millet crops were ready for being liar vested, and only four or five times cotton pioking was done, a most severe hailstorm killed the former crops all of a sudden and damaged tho latter (cotton) considerably. In some fields Hie hailstones accumulated as thick as three inches, and did not melt altogether for 3G hoars. The fearful storm did not only spoil the kharif harvest entirely, but has done great harm to the present *rabi crops* too. *Jho enrly sown cereals were- beaten down flat and plucked off to some extent, and tho seed which was not come out yet, owing to fife tilth of the fields being silted up did »ot germinate welt. The great damage which it has done is spoiling the culture of the rabi fields, which more or less will affect the crops on the whole.

Under the circumstance the results of experiments in review are-not worth laying 'iny stress upon. However, the result of the cotton and maize crops have been recorded, and of the pulses- and millet which did not give any produce are left off.

The cottou and maizes experiments are very old on the farm, and by continuous Operations ibeir' results have beea fairly confirmed. It ia therefore intended that from the next season for three succeeding years indigo and sugarcane culture which has got a very High place in Indian farming, *iU bo added id tlie list of experiments.

For the sake of teaching the Bgnooltoriab "tat bow and ia what way *their* business can be more paying) the experimonta mostly will be tried not from the scientific "•" from Ihe economical point of view. The tables herewith appended will *tr'wv* the ^fctiiil of the special treatments, and the'results of the experiments.

Under the head of cotton the experiments were—

(a) *Keeping nankin* or *khaki cottoa-plots-for* 2 *or 3-year.i in a fidd half ratt*ooned *»nd half unratooned* to see:—

0) The comparative produce of the ratooned against the unratooned portion of the' field.

(2) Tho comparative yield of them against the field sown annually.

IS} The effect of" the long standing over the color of the cotton.

(4) The effect and economy of purchased fertilizer against the common farm-yard manure.

Both er the [dots {ratooned and unratoonod) were grubbed twice and weeded once. Saltpetre and jmperpho,sph:itc ;;it the rate of 2 cwt per acre applied, There was no other cost abova that,

From table No. I *h* will be aeen-

(1) That unratooned portion gavo more cotton and less seed than the ratooned one.

(S) Comparing with the result of the same kind of cottoa fresh sown, the result "f which is tabulated in statement No. 2, it will be seen .thnt this has given much larger yield.

This may be attributed partly to the effect of the artificial manureapplied to.

(3^ There was no difrerence of color between the two crops in this (first) year.

The economical result of applying costly manure is no good, but itmaybeowing to the bad season.

(b) The tame cotton town in tuo plot, side-by side, in one before and in the other after rain :•—*

Each plot was of 1286 square yards; the one sown before rain was irrigated once, ! Farm }'ard manure at 200 maunds per acre was given to both.

All other-treatments for both were the same.

The Statement Mo, II will show that the cotton sown after rain gave comparatively better yield. This ia however extraordinary. Early sowing'for cotton, as a rule, is always better.

The economical result of either is not good.

{c) Country cotton sown UUre and after rain with four different kinds of manure. To determine—*

(1) The result of early and late sowing.

(2) The effect of the manures applied.

From statement No. **Ill,** it will'be seen that the cotton sown before rain has an average shown better result than that E°wn after n\nf being 84 against 59 ft>s. per acre.

(3) The effeot of the manures on the two kinds of sowing appeared to be changeble. This may be due to the unfavorable season.

(d) lo determine the tfect of- deep and shallow plovphlng, with the improved and country ploughs alone, and with and without manure:—

(1) Four plots of 300 square yards each were treated as follows. They did not receive any manure :—

One **with** "Watt's plough, 9 inches deep.

One .,, Duplex ,, 5 ;, ,,

Two ,, Country ,, 3 » ,,

(2) Six other plots were divided into two portions *A* and /?, each being of 800 square yards. They wore operated as under—No. 5 *a* and *b* ploughed 9 inches with the "Watt's plough—No. 6 *a* and *h* ploughed 5 inches deep, No. 7 a and *l>* **ploughed** 3 inches deep. Ta all *A* plots 100 maunds per acre farm yard manure was applied. AII the *B* plots were left unmanurod.

The appended statement No. IV confirms the result that the deep ploughing lias; advantages over the shallow one and the deep plongbing with manure is still more advantageous.

The experiments on maize were conducted as follows:—

(a) Sowing maize after American fashion Us determine (1) its advantages again.*:, the country way ci' sowing, (2) to find out the difference between the cost of the two processes.

A field was divided into 4 plots of | of f^n acre each. One of them was sown after country fashion, i.e., seed thrown in the furrows behind a plough, and in three plots the need was sown in lines 2, 3, »nd & feet apart. The plants in all plots were earthed up.

The statement No. V. will show that—

(1) The country way of sowing has produced more.

(2) That the ihinner tho sowing the less the yield was.

Plot No. 1 produced 1,323 tt»s, of grain against 241 Its, obtained from No. 4 plot sown 4 feet apart.

(3) That in the cost of the two Itinds of sowing there is no marked difference.

There is however one fact to be noted, that the cobs of the plants 6O#n in lines were larger and more plump than those of the other plots.

{b) Determination of the effect of different fertilizers on maize grown year after year in 13 *pints termed Standard, and to compare their results with other* 13 *ploU named Duplicate, which are treated just in the same toay as above ones, but they are kept under rotation vf wheat and maite •alternately:—*

This is the oldest experiment on the farm. Ita obi eots are more scientific than economical. They may be noted thus:—

(1) To find out that by sowing one kind ,of grain and by **applying** one kind of manure for what time the strength of a soil can be kept on ?

(2) Does the rotation change the condition of the fertility ?

' Statements Nos. VI and VII will show the results. From the table number 6 it will be seen that even in the bad season the cowdung and saltpetre, singly and combined with other fertilizers, did not fail to give their usual results, and proved to be trne in their good effect, in all cases and in every circumstanoe.

The figures in the table No. 7 show a result contrary to that, which in the major- **ity** of cases has been heretofore recorded, *viz.,* the plots alternated with wheat and maize yielded much less than their counterparts. Perhapa **this** also may be due *to* the bad season.

(c) To compare the* mammal value of certain animal matter with the ordinary kind of fertilizers eight plots are kept under this experiment. The site of these plots .beincr most suitable for a wet crop, they are less affected by the unfavourableuess of tbe season. They are on high ground inclined to-one direction, so the rain water can never injuriously lodge in them, and there being irater-courses on both sides of them, they derive great benefit from the same. Wheu there is excess of rain the trenchment of the'water-courses help the plots in sabsoil draiuage, and otherwise the canal water running in them supply enough moisture to the subsoil.

They are the only plots which have produced a fair crop during tho season. Table NO. VIII will show the result. Woollen refuse, poudrette, find sheep dung have left a good margin of profit against their cost-

They have generally proved to do the same.

Unfortunately other experiments have been totally spoilt by the hailstorm, and their final results could not be noted, so they are left out here.

MIR MAHOMED HOSEIN, M.R.A.C.,

Asst. Director and Supdt. of Experimental Station,

CULTIVATION IN [illegible]

	1	2	3	4	5	6	7			8	9	10	11
	Number of plants per [illegible] of Farm	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Value [illegible]			[illegible]	[illegible]	[illegible]	[illegible]
Rs. a.	[illegible]	Rs.	Rs.	Rs.	[illegible]	Rs.	Rs. a.	[illegible]	Rs. a.	[illegible]	[illegible]	[illegible]	
13 9	[illegible]	23	6	35	[illegible]	40	11 8	[illegible]	14 11	[illegible]	5	[illegible]	
18 9	[illegible]	26	7	37	[illegible]	54	15 8	[illegible]	17 1	[illegible]	15	10	

COTTON No. III.—Experiment of early and late sowing.

Quantity of manure applied.	Value of manure.	No. of plot in Map of Farm.	Weight of uncleaned cotton.	Weight of cleaned cotton.	Weight of seed.	Percentage of cotton on seed.	Difference.	Difference per acre.	Outturn per acre: Cotton.	Outturn per acre: Seed.	Value of outturn: Cotton at ..., 1 per 6 lbs.	Value of outturn: Seed, ... 1 per 61 lbs.	Value of outturn: Total.	Gain or loss per acre in the cost of manure over ordinary cultivation assumed to be Rs. 31-1-0.	Gain or loss per acre in the value of Outturn against ordinary cultivation assumed to be Rs. 45.	Net profit or loss over or against the assumed income Rs. ...	Remarks.
	1													10	11	12	13
Wood ash ... mds., at ...	Rs. 6 a. 4	Sown before rain and after water given	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Rs. −1 a. 12	Rs. −0 a. 13	[illegible]	
... mds., at ...	7 4		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Poudrette ... per ... mds.	9 4		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Cow-dung ... per 100 mds.	7 [illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Wood ash ... mds., at ...	5 0	Sown after rain and ... seed.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Sheep-dung ... mds., Rs. ... per ...	[illegible] 0		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Poudrette ... per 100 ...	8 0		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Cow-dung ... per 100 ...	6 0		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

REPORT

ON'THE

CA.WNP0RE EXPERIMENTAL STATION

For the Eharif Season of 1886.

*Character oj tl*e season.—The* season had been quite an extraordinary and unfortunate one in many ways for the crops. The experimental station was an especial victim of it. The rain commenced very early and the season seemed to be very promising, but a long break of the rain in August just at the time it was greatly needed caused good deal damage to maize crops. It ceased for about 20 days altogether, and We were obliged to protect some of the fields by irrigation. After that, tiH about the end, the monsoon had been very regular and favourable, but at the time the pulses and millet crops were ready for being harvested, ami only four or five times cotton picking was done, a most severe hailstorm killed the former crpps all of a sudden and damaged the latter (cotton) considerably. In some fields the hailstones accumulated as thick as three inches, and did not melt altogether for 36 hours. The fearful storm did not only spoil the kharif harvest entirely, but has done great harm to the present *rabi crops* too. The early sown cereals were beaten down flat and plucked off to some extent, and the seed which was not come out yet, owing to fine tilth of the fields being silted np, did wot germinate well. The great damage which it has done is spoiling the culture of the rabi fields, which more or less will affect the crops on the whole.

Under the circumstance the results of experiments in review are not worth laying any stress upon. However, the result of the cotton and maize crops have been recorded, and of the pulse* and millet which did not give any produce are left off.

The cotton and maizes experiments are very old on the farm, ^nd by continuous operations their results have been fairly confirmed. It is therefore intended that from the next season for three succeeding years indigo and sugarcane culture, which has got a very high place ift Indian farming, will bo added in the list of experiments.

For the sake of teaching the agriculturists that how and in what way their business can be more paying, the experiments mostly will be tried not from the scientific but from the economical point of view. The tables herewith appended will give the detail of the special treatments, and the results of the experiments.

Under the head of cotton the experiments were—

(a) *Keeping nankin or kliaki cotton plots for 2 or & years in a field half ratooned* «nd *half unratooned* to see:—

0) The comparative produce of the ratooned against the unratooned portion of the field.

(2) The comparative yield of them against the field sown annually.

13) The effect of the long standing over the color of the cotton.

(4) The effect and economy of purchased fertilizer against the common farm-yard manure.

Both of the plots (ratooned and unratooned) were grubbed twice and weeded once. Saltpetre and ^superphosphate at the rate of 2 cwt. per acre applied. There was no other cost above that.

From table No. I it will be seen—

(1) That unratooned portion gave more cotton and less seed than the ratooned one.

(2) Comparing with the result of the same kind of cotton fresh sown, the result of which is tabulated in statement No. 2, it wi'l be seen that this has given much larger yield.

[illegible] No. II.—*Experiment of early and late sowing, outturn and* [illegible]

Quantity [illegible] applied.	Value of manure and one watering.	1. Number of plot as per map of Farm.	2. Weight of uncleaned cotton.	3. Weight of cleaned cotton.	4. Weight of seed.	5. Percentage of cotton on seed.	6. Percentage of seed on cotton.	7. Increase or decrease.	8. Increase or decrease per acre.	9. Actual outturn per acre. Cotton.	9. Actual outturn per acre. Seed.	10. Value of outturn. Cotton @ Re. 1 per 4 lb.	10. Value of outturn. Seed @ Re. 1 per 41 lb.	10. Value of outturn. Total.	11. Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 31-4-0.	12. Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 45.	13. Net profit or loss over or against the assumed income Rs. 45.	14. Remarks.
	Rs. a.		lb.	lb.	lb.	lb.	lb.	[illegible]	lb.	[illegible]	lb.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	
[illegible] watering...	7 4	P. 24 [illegible] rain.	22	8	17	20	283	[illegible]	[illegible]	[illegible]	85	6 8	1 [illegible]	[illegible]	* 2 12	37 15	40 11	
[illegible]	6 0	After rain ...	29	7	23	32	314	[illegible]	...	[illegible]	[illegible]	8 8	2 0	[illegible]	3 8	36 0	[illegible] 0	

* In first case column 11 includes the cost of [illegible] as well as of manure [illegible] case only of manure.

COTTON No. IV.—(*Kharif*) Ploughing experiment.

Kind of cultivation in	Value of ploughing and manure.	No. of plots as per map of Farm.*	Weight of uncleaned cotton.	Weight of cleaned cotton.	Weight of seed.	Percentage of cotton on seed.	Percentage of seed on cotton.	Difference.	Difference per acre.	Actual outturn per acre. Cotton.	Actual outturn per acre. Seed.	Value of outturn. Cotton at Re. 1 per 6 lbs.	Value of outturn. Seed at Re. 1 per 61 lbs.	Value of outturn. Total.	Gain or loss per acre in the cost of cultivation against the cost of ordinary cultivation assumed to be Rs. 31-4-0.†	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 45.	Net profit or loss over or against the assumed income Rs. 45.
		1	2	3	4	5	6	7	8	9	9	10	10	10	11	12	13
	Rs. a.		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.
Twice ploughing with country plough.	[illegible] 9	1	7	3 6	4 10	61	186	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Once ditto 6" deep with improved plough.	0 13	2	10	3 7	6 9	59	161	+1 4	20	[illegible]	5	[illegible]	[illegible] 11	[illegible]	[illegible]	[illegible]	[illegible]
Ditto ditto 9" ditto with improved plough.	1 9	3	14	4 11	9 5	50	198	+2 8	40	74	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Twice ploughing with country plough.	1 9	4	8	2 1	3 15	54	181	[illegible]	[illegible]	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Once ditto 9" deep and manured with 100 maunds dung (a).	4 8	6a	25	6 6	18 11	36	299	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	1 9	6b	8	2 13	6 3	[illegible]	220	+	33	[illegible]	0	[illegible]	[illegible] 10	[illegible]	[illegible]	[illegible]	[illegible]
Once ditto 9" deep and manuring	3 13	6a	17	5 13	11 3	52	199	[illegible]	[illegible]	17	87	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ditto ditto	0 15	6b	13	4 5	8 11	49	201	+4	0	[illegible]	67	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Twice ploughing with country plough and manured with dung 100 maunds per acre in (a).	4 [illegible]	7a	10	6 [illegible]	10 5	62	191	+9	6	[illegible]	89	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	1 9	7b	13	4 7	8 9	51	198	[illegible]	[illegible]	97	[illegible]	[illegible]	0 13	5 6	[illegible]	[illegible]	[illegible]

* NOTE.—From No. 1 to 4 each plot is 500 square yards, show the result of only ploughing and no manure. 6 to 7 each portion (a, and b) * [illegible] result of manured against unmanured plots, all the (a) portions were manured and (b) were [illegible] [illegible] the [illegible] [illegible] ploughing as well as the

† The figures of column 11 are made up from the savings of the cost of manure and of the number of ploughing [illegible] in [illegible] of cultivation of [illegible]

Value of manure.	[illegible]	[illegible]	[illegible]	[illegible]
Treatment.	Seed sown at a distance of			
	ditto	ditto	ditto	200
Weight of cobs.	996	835	842	[illegible]
Weight of grain.	336	200	[illegible]	[illegible]
Weight of stalks.	576	635	[illegible]	[illegible]
Weight of grain per bushel.	[illegible]	[illegible]	[illegible]	[illegible]
Percentage of grain on stalks.	[illegible]	[illegible]	[illegible]	[illegible]
Percentage of stalks on grain.	[illegible]	[illegible]	[illegible]	[illegible]
Increase or decrease over the lost plot.	[illegible]	[illegible]	186	275
Increase or decrease per acre.	[illegible]	538	[illegible]	1,087
Value of produce per acre. Grain.	[illegible]	790	597	[illegible]
Stalks.	[illegible]	[illegible]	65	[illegible]
Grain at Re. 1 per 61 lbs.	[illegible]	[illegible]	[illegible]	[illegible]
Stalks at Re. 1 per 4,812 lbs.	[illegible]	[illegible]	[illegible]	[illegible]
Total.	[illegible]	[illegible]	[illegible]	[illegible]
Gain or loss per acre in the cost against ordinary cultivation assumed to be Rs. 16&.	[illegible]	[illegible]	[illegible]	[illegible]
Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 20.	[illegible]	[illegible]	[illegible]	[illegible]
Net profit or loss over or against the assumed income Rs. 20	[illegible]	[illegible]	[illegible]	[illegible]

Remarks

COMPARISON OF COST

Maize No. [redacted] —Manurial experiment.

Column	Heading	Values
	Quantity of manure applied per acre.	[illegible]
	Value of manure.	[illegible]
1	Number of plots as per map of Farm.	[illegible]
2	Weight of unthreshed cobs.	[illegible]
3	Weight of grain.	[illegible]
4	Weight of stalks.	[illegible]
5	Weight of grain per bushel.	[illegible]
6	Percentage of grain on stalks.	[illegible]
7	Percentage of stalks on grain.	[illegible]
8	Increase or decrease against unmanured plot.	[illegible]
9	Increase or decrease per acre.	[illegible]
10	Actual outturn per acre. — Grain.	[illegible]
	Actual outturn per acre. — Stalks.	[illegible]
11	Value of outturn. — Grain at Re. 1 per 61 lbs.	[illegible]
	Value of outturn. — Stalks at Re. 1 per 4,812 lbs.	[illegible]
	Value of outturn. — Total.	[illegible]
12	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 16-8.	[illegible]
13	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 20.	[illegible]
14	Net profit or loss over or against the assumed income Rs. 20.	[illegible]
15	Remarks.	

* Dung cake powdered and burnt for ashes.

Maize No. VII.—

Value of manure.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Number of plots as per mop of Farm.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Weight of unthreshed cobs.	311	562	479	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Weight of grain.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Weight of stalks.	[illegible]	529	427	[illegible]	483	[illegible]	[illegible]	[illegible]	[illegible]
Weight of grain per bushel.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Percentage of grain on stalks.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Percentage of stalks on grain.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Increase or decrease over the unmanured plot?	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Increase or decrease per acre.	[illegible]	193	314	[illegible]	326	[illegible]	[illegible]	[illegible]	[illegible]
Actual outturn per acre. — Grain.	205	[illegible]	520	[illegible]	532	[illegible]	[illegible]	[illegible]	[illegible]
Actual outturn per acre. — Stalks.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Value of — Grain at Re. 1 per 61 lbs.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Value of — Stalk at Re. 1 per 4,812 lbs.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Value of — Total.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Gain or loss per acre in the cost against the cost of ordinary cultivation, assumed to be Rs. 16.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 20.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Net profit or loss over or against the assumed income Rs. 20.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Remarks.									

MAIZE No. VIII.—Animal excreta — as manure.

Quality of ... applied per acre.	Value of manure.	Number of plots as per map of farm. (1)	Weight of uothreshed cobs. (2)	Weight of grain. (3)	Weight of atalk. (4)	Weight of grain per bushel. (5)	Percentage of grain on stalk. (6)	Percentage of stalk on grain. (7)	'Increase or decrease against unmauured plot. (8)	**Increase or decrease per acre.** (9)	Actual outturn per acre. Grain. (10)	Actual outturn per acre. Stalk. (10)	Value of outturn. Grain at Be. 1 per 61 I&s. (11)	Value of outturn. Stalk at Re. 1 per 4,812 lbs. (11)	Value of outturn. Total. (11)	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Us. 16$. (12)	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Hs. 20. (13)	"Net profit or loss over or against the ussumed income Ks. 20. (14)	Remarks. (15)
	Rs. a.		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. p.	
[illegible]		1	510	168	368	61	45	220	65	[illegible]	2,000	[illegible]	32 15	5 7	35 6	— 0 5	+13 8	+ [illegible]	
[illegible] 1 [illegible]	[illegible]	2	[illegible]	164	[illegible]	61	48	210	65	[illegible]	1,086	[illegible]	[illegible]	5 2	37 10	— 3 9¼	+ [illegible] 10	+14 [illegible]	
[illegible] 120	8 [illegible]	3	[illegible]	164	[illegible]	61	[illegible]	[illegible]	3	88	1,256	[illegible]	[illegible]	4 13	25 7	— 3 9¼	+ [illegible] 7	+ 1 10½	
[illegible] 120	3 1[illegible]	4	[illegible]	180	[illegible]	61	46	[illegible]	65	780	[illegible]	[illegible]	32 [illegible]	5 7	33 6	[illegible] 13½	+ 8 [illegible]	+12 8¼	
[illegible] 150	8 [illegible]	5	[illegible]	110	[illegible]	61	28	[illegible]	9	160	1,331	[illegible]	21 18	4 14	26 11	[illegible] 8 9¼	+ 6 11	+ [illegible]	
[illegible] 120	8 [illegible]	6	308	165	200	61	41	[illegible]	4	48	[illegible]	[illegible]	20 18	8 8	[illegible]	— 3 9¼	+ 4 1[illegible]	+ 7 [illegible]	
[illegible] 240 lbs.	[illegible]	7	300	105	[illegible]	61	41	[illegible]	4	48	[illegible]	[illegible]	24 18	8 [illegible]	[illegible]	—10 5	+ [illegible]	— 6 [illegible]	
[illegible]	—	8	350	101	[illegible]	61	40	[illegible]	...	...	1,222	3,073	20 0	5 5	25 5	..	+ [illegible]	+ [illegible]	

roudrette here also has given tbe largest yield, leaving a net profit of Its. 15 par ~TM Last year the case was not so. Sheepdung is next ; ashes of wwdnng, with ^Itpetre, hare come out third, and cowdung with boueduat and sbeendun* with gypsum last.

In tho duplicate serio* the increase in yield of soil,0 of the plots against the unmannred ones is very great.

Cow and sheepdung, with saltpetre, saltpetre with bonedust and superphosphate, Jiave given larger percentage on straw.

(II.) *Grtm wiling.-The* statement No. Ill, herewith appended, shows the result. It indicates that in this year hemp and indigo water, as w,)l as indigo stubble, have not done any good. The reas.n may be considered that hy applying this fertUiz.r for years, which is m doubt very weak in action, tbe land has W a good deal ot its natural fertility.

Indigo crop plowed in and gypsum added have given tbe largest yidd.

Fresh indigo refuse with lime aUd hemp with gypeua feave done ^

Economically, tl* iniiigQ aud]lemp crops takell off> and t[)e 9tllbble ^hed fa ag manure, are most profitable-a net profit of Es. 22 and 3-14 are left U tbe two cases.

Last year, out of tie IS kinds of the green soiling, eight had left a profit of from 1 to 16 rupees.

(III.) *Miscellaneous* man««.-The statement No. V contains the result,

'lins is to ascertain how far some of tbe things, which are a mere waste, and ia some oases one does not know how to get rid of them, have any mammal value.

Eight plote are under this experiment which have not received VOf strong mUnure for years. In this case, of course, the vitality of the soil cannot be kept up.*

However, tbe result is that giving anything ia the shape of manure is better than no manure at all.

This year road scrapings have given a larger yield than even aromonial chloride.

Economically, the losses ure very great. Thia show*.that for good husbandry tho farmyard manure is the essential thing.

(IV.) *Watering.—The* statement No. VI contains tho result of the experiment, wtacb no doubt depends entirely on the season.

This year by five waterings tho largest outturn was obtained, and the decrease js proportionate to the number of waterings.

(V.) *Canal against well-watering.—The* statement So. VI shows, that the well has given the umalreipsh; that is, its effeotM better than canal water. Though the Wit of well-watering is Rs. 5-13-0 against Its. 2-10-0, yet the loss by the cauJ water U double> Lei"S B». 14-9-0 per acre against Us. 7-6-0.

tVl.) *Hemp and indigo asgrem manure.—*To confirm the effeotof indigo and hemp as OHarare • the experiment is tried on a large scale. In four different plots Uenjp is p oughed in, and in five indigo, some with and some without lime.

The statements Nos. VII and VIII contain the average of tiio outturn of all tbe },l<)U tlreElted similarly. They show that tbe plot manured with lump has given Bkore thnn double grain against the unmanured plot and has left a profit of Ks 4 Ioduro *lth l:,,R1 sbl)1« better result than indigo by itself.

(VIL)—*Ploughing experimenti.* — Statement No. IX will-show the result of deep andshallow ploughing. As these plots have not received mauure for jews, the outturn per aero ia verj poor. FrOm nest season manure will be applied to them.

B.—'temporary emperimetat.--Of the temporary experiments the result of the following has been recorded :—

I(a).—The effect of cake-feddtmg against the cake applied as manure;

It).—Tbe eflect of nndecorticated ooiton seed.

EEPOET OH TIE

CAWNPOKE EXPERIMENTAL STATION

FOR THE RABI SEASON OF 1886-87.

ALLAHABAD : •

NOBTH-WBSTBRN PROVINCES AND OODII GOVERNMENT PRESS.

1888.

III.—*English reheat experiment.*—The following are the results of the experimental cultivation of wheat presented by ATessra. E. G. O;ikshott and Co., Reading. The seed was sowa at three stations, *viz.*, Experimental Station, Oawnpore, Lyall Farm, Ujhaoli, Budaun, and again on Babu **Luehman** Pershai's farm adjoining tho Oaivnporo Experimental Station. At the first two places it failed entirely, the results of that sown in the vicinity of the Experimental Station are noted below.

The seed wa^sown in four highly cultivated plots especially prepared for wheat. It was seriously damaged in transit, as informed in this Office No. 6017, dated 22nd November, 1886, and was therefore sown very thick, the quantity used being more than four times of what would **bare** been required for an equal itrea had the seed been sound. The germination was very irregular. The grain did not ripen till the end of April, and two of the plots, which were at a distance from tlia **canal** distributary, and could not be watered more than three times, did not yield a single grain. The other two plots, each of which was watered six times, yielded the following quantities :—

Ho.mber of plot.	Area of pluta in squire yards.	Actual "utlnra in lbs.	Outturn per aero lbs.
1	250	60	i.iet
2	V'.'J	76	1,228

Ensi!age.r—1. A nuiny season grass silo, filled in three years ago, was opened, and the contents found unfit for use. It wus scarcely expected that the result would be otherwise with grass after such a lapse of time.

2. From the 4th to 10th September, 100 in minds of grass, taken from one of the tisar plots, was ensilaged in an ordinary pit- The cost of filling and cutting was Es. 6-4-0i On the 20th of June the pit was opened, the npper layer weighing about 10 mauads had gone bad', but the rest was very good, and was consumed by tho cattle.

Sale of Implements.—The following statement **will** show the difference in the salo of implements made in the workshop and imported from other countries :—.

Miintb and date.	*Ploughs.*				•Pump*.			*Sugar puns.*			fJra in At mitf.			*Chiff cutters.*			*Dndgtn.*		
	So TJ	§ fur	.1 S ? S co	'3 0	I	1 5	3	\ Sold.	; for s	1	Sold.	•a. fur ! Q.	a		4 1 a ai 15	3	t	rial I g 3	?;
tfrom 16th August, 1888 to 151I1 August, 183B.	W	M	1 \9	351	37	M	£1	—	1	a	12	...	12	[illegible]	—	[illegible]	..	1	[illegible]
from Itjtll Anqint, I8S6 Co 15ili Angust, 1887.	151	(i	[illegible]	m i	a	7	iO	3	1	[illegible]	23	...	[illegible]	IB	1	[illegible]	.	...	•

The great decrease in the number of ploughs is owing to extra ploughs not having been seat out to]the districts within this year (1887). During the **laat** two years in ploughing seasons, Moharirs were sent with **plongna** to **sell** them on credit. **1MB** experience of the last two years has shown that great inconvenience and some Jos results from selling ploughs **en the terms of payment By instalment**

Tbo cumber of ploughs actually sold lias also decreased by 16.

Pump or waler-UJt.— There is a slight decrease in the sale of this implement also. Seven were cot much taken **this** year.

No. 4632 OF 1887.

DEPARTMENT OF LAND RECORDS AND AGRICULTURE, N.-W. P. AND OUDH.

DATED CAWNPORE, THK 29TH NOVEMBER, 1887.

FROM

LIEUT.-COLONEL D. G. PITCHER,

OFFG. DIR., DEPT. OF LAND RECORDS AND AGRI.,

N.-W. PROVINCES AND OUDH,

To

THE CHIEF SECRETARY TO GOVERNMENT,

N.-W. PROVINCES AND OUDH.

SIR,

I HAVE the honor to submit for information the report on the Cawnpore Experimental Station for the rabi season of 1886-87, written by Mir Muhammad Husain, Assistant Director, who conducted the work of Superintendent. In paragraph 1 of the letter covering the report for last year, it was suggested that the report should no longer issue as a separate compilation, but be incorporated with the annual report of this department. It has, however, been finally decided—*vide* Government of India's Circular No. [illegible], dated 14th September, 1887, paragraph 6—that the report is to be published as heretofore, and I therefore now so submit it.

2. There is little of novelty to call for comment. Experiments with manures, organic and inorganic, with green soiling, deep ploughing, and irrigation were continued with but little variation on the old lines, the results of which aro elaborately tabulated. Varying with the season, as the latter may be wet or dry, some manures show better in one season than others. It would only be after a long and continuous series, much longer than are yet available, that authoritative deductions could be drawn as to the precise gain or loss resulting from any particular treatment. For the past season the general outturn was very disappointing at least one-third less than we had reason to expect. The adverse causes were heavy hail, at seed time, and, most severe frost, at the time of flowering. On the other hand the crops were free to an unusual extent from fungoid growths.

Experiments were made with English wheat seed sent out through the India office. The condition of the seed on arrival was bad, but still there was enough with whioh to show what we have shown before, *viz.*, that we have better varieties or rather perhaps local varieties that suit us well, and have even a European reputation. Local varieties were as usual subjected to comparative trial, and one now introduced for the first time on the station and known as Buxar appears likely to compete suc-cessfully with the best of our own Provincial varieties. Of all experimental work on the station there is none of greater TOlaetbanth8t touching the selection of seed and trial of varieties.

Ensilage continues to be managed with success. One grass Silo kept for the purpose was opened a penetratedand the contents were SelsSS> h was hardl to be that with grass the result T be otherwise ras u s the expected difficult of all to manag úsar reserves gave good silage after being stored for the ordinary time.

The sale of implements appears on the whole to have been less brisk than formerly, exceptions being small English grain-crushers and chaff-entters, for which there is increasing demand.

I have the honor to be,

SIR,

Your most obedient servant,

D. *G.* PITCHER, LT.-COLONEL,

Offg. Director.

REPORT

ON TUB

CAWNPOEE EXPERIMENTAL STATION,

FOR THE RABI SEASON OF 1886-87.

1. *Character of the season.*—As reported before at ther time of sowing, just when the seed was sown, a heavy hailstorm had done great damage, and in the month of February, just at the time when the fields were in full blossom, the abnormally bitter frost ruined- the success and the prosperity of the crops. Though it did not do much harm to the farm crops, yet the yield got reduced considerably. The field which promised to have 10 maunds hardly *g&ve* two-thirds of it.

2. Except the damage done by the hailstorm- and the frost, no diseases affected any variety of the wheat sown.

Classification of the experiments.—-The experiment? are—

(A) Permanent. (B) Temporary.

The appended statements, No*. 1 to 9, will show the results of the permanent, and the statements Nos. 10 to 12, results of temporary experiments.

Of the A series the result may be summed up thus—

(I.) *Whether wheat can he grown year after year by the aid of artificial manure.*—The plots under this experiment are termed standard and duplicate, being 26 in number ; in the 13 plots wheat is sown year* after year, and their duplicate plots are alternated with wheat and maize.

The treatment of these plots is the same as reported last year. The different fertilizers, the effect of which is being determined, are bhown in statements Nos» 1 and 2. This year saltpetre alone, and combined with other manures, has not shown any superiority over poudrette, cow and sheep dung, put in the standard plots. The largest yield is obtained from the plot manured with poudrette. The ashes of dung have again proved to be of no good. Against the unmanured plots in the series all the manured ones, except the one with the ashes of oowdung, have given greater yield. JPb udretto this time stands first. Saltpetre and bonedust second ; sheep dung and gypsum third.

Economically, there is no gain against the cost of any of the plots in the series.

This may be attributed to a certain extent to the effect of the frost, but greatly to the fact that by keeping land under one kind of crop for years without rotation, so mo ingredients in the soil, essential for plant food, are exhausted; therefore the fertility of the soil is decreased.

This fact almost in all cases has been proved by the duplicate series, which is treated in all respects just the same as the foregoiug one, except being sown alter* nately with whoat and maize.

Statement No. IE contains tho result of the duplicate series. It shows that the yield in all the plots is larger than their counterparts in the standard series, ashes of cowdung have again failed here. This proves that nitrogen is the most essential thing for wheat.

The economical result of the effect of the fertilizers in question, togelhor with the rotation, is not bad. In five out of 13 cases it has left a profit of froi" 2 to 15 rupees per acre.

Poudvette here also has given tbe largest yield, leaving a net profit of Rs. 15 per acre. Last year the case ^as not so, Sheepdung is next ; ashes of cowdung, with saltpetre, have come out third, and cowdung with bonedust and sheepdung with gypsum last.

In the duplicate series the increase in yield of some of the plots against the unmanured ones is very great.

Cow and sheepdung, with saltpetre, saltpetre with bonedust and superphosphate, Jiave given larger percentage on straw.

(II.) *Grren soiling.*—The statement No. Ill, herewith appended, shows tho result. It indicates that in this year hemp and indigo water, as well as indigo stubble, have not done any good. The reason may be considered that by applying this fertilizer for years, which is no doubt very weak in action, tho land has lost a good deal of its natural fertility.

Indigo crop ploughed in and gypsum added have given the largest yiold.

Fresh indigo refuse with lime and hemp with gypsum have done good.

Economically, the indigo and hemp crops taken off, and the stubble ploughed in as manure, are most profitable—a net profit of Rs. 22 and 3-14 are left in the two cases.

Last year, out of the 13 kinds of the green soiling, eight had left a profit of from 1 to 16 rupees.

(III.) *Miscellaneous manure.-The* statement No. V contains the result.

Ihis is to ascertain how far some of the things, which are a mere waste, and in some cases one does not know how to get rid of them, have any manurial value.

Eight plotB are under this experiment which have not received any strong manure for years. In this case, of course, the vitality of the soil cannot be kept up.

However, the result is that giving anything in the shape of manure is better than no manure at all. •

This year road scrapings have given a larger yield than even amraonial ebloride.

Economically, the losses are very great. ™* shows that for good husbandry the farmyard manure is the essential thing.

(IV.) *Watering.*—The statement No. VI contains the result of the experiment, •which no doubt depends entirely on the season-

This year by five waterings the largest outturn was obtained, and the decrease is proportionate to the number of waterings.

K V) *Canal against well-watering.-Tbo* statement No. VI shows, that the well has given the usual result; that is, its effect is better than canal water. Though tho cost of well-watering is Rs. 5-13-0 against Rs. 2-10-0, yet the loss by the canal water is double, being Rs. 14-9-0 per acre against Bs- 7-6-0.

(VI.) *Hemp and indigo as green manure.*--To confirm the effect of indigo and hemp used as manure, tbe experiment is tried on a large scale. In four different plots hemp is ploughed in, and in five indigo, some with and some without lime.

The statements Nos. VII and VIII contain the average of the outturn of all the plots treated similarly. They show that the plot manured with hemp has given more thnn double grain against the unmanured plot and has left a profit of Rs. 4. Indigo with lime shows better result than indigo by itself.

(VIL) — *Houghing experiments.*-Statement No. IX will-show the result of deep and shallow ploughing. As these plots have not received manure for years, the outturn per acre is very poor. From next season manure will be applied to them.

B.—Temporary experiments.—O£ the temporary experiments the result of the following has been recorded :—

I(a)._The effect of cake-feddung against the cake applied as manure;

U>).—The eflect of undecorticated cotton seed-

III.—English wheat experiment.—The following are the results of the experimental cultivation of wheat presented by Messrs. E. G. Oakshott and Co., Reading. The seed was sown at three stations, *viz.*, Experimental Station, Cawnpore, Lyall Farm, Ujhaoli, Budaun, and again on Babu Luchman Pershad's farm adjoining the Cawnpore Experimental Station. At the first two places it failed entirely, the results of that sown in the vicinity of the Experimental Station are noted below.

The seed was sown in four highly cultivated plots especially prepared for wheat. It was seriously damaged in transit, as informed in this Office No. 6017, dated 22nd November, 1886, and was therefore sown very thick, the quantity used being more than four times of what would have been required for au equal area had the seed been sound. The germination was very irregular. The grain did not ripen till the end of April, and two of the plots, which were at a distance from the canal distributajry, and could not be watered more than three times, did not yield a single grain. The other two plots, each of which was watered six times, yielded the following quantities :—

Number of plot.	Area of plots in square yards.	Actual outturn in ft*.	Outturn per acre lbs.
1	250	60	1.161
2	300	76	1,226

Ensilage,—I. A rainy season grass silo, filled in three years ago, was opened, and the contents found unfit for use. It was scarcely expected that the result would be otherwise with grass after such a lapse of time*

2. From the 4th to 10th September, 100 maunds of grass, taken from one of the tuar plots, wa, ensilaged in an ordinary pi*. The cost of filling and cutting was Ra. 6-4-Oi On the 20th of June the pit was opened, the upper layer weighing about 10 maunds hai gone bad", but the rest was very good, and was consumed by the eattle.

Sale of Implements.—The following statement will show the difference in the sale of implements made in the workshop and imported from other countries :-

Month and date.	*Ploughs.*				*Pumps.*			*Sugar pans.*			*Grain kibbling mills.*			*Chaff cutters.*			*Dredgers.*		
	Sold	Sent for trial.	Sent with the apprentices.	Total.	Sold.	[illegible]	Total.	Sold.	Given for trial.	Total.	Sold.	Given for trial.	Total.	Sold.	Given for trial.	Total.	Sold.	Given for trial.	Total.
From 16th August, 1885 to 15th August, 1836.	167	35	149	351	37	14	51	7	1	8	12	...	12	9	...	9	4	1	5
From 16th August. 1836 to 15th August, 1887.	151	5	36	192	33	7	40	3	1	4	23	...	23	15	1	16	2	...	2

The great decrease in the number of ploughs is owing to extra ploughs not having been sent out to the district* within this year (1887). During the last two years in ploughing seasons, Moharirs were sent with plougns to sell them on credit. The experience of the last two years has shown that great inconvenience and some loss results from selling ploughs on the terms of payment by instalment.

The number of ploughs actually sold has also decreased by 16*

Pump or water-lift.—There is a slight decrease iu the sale of this implement also. Seven were not much taken this year.

The sale of grain kibbling and chaflF-cutting machines is nearly doubled. Bull's dredgers and sugar evaporators do not yet find incteasing sale.

Seed.—Tfie following statement shows distribution : —

Month and date.	[illegible]	[illegible]	Barley.	*Sorgho.*	[illegible]	[illegible]	[illegible]	Tob[illegible].	Remarks.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
From 16th August, 1885 to 15th August, 1886.	62,630	1,205	247	517	712	39	94	2	
From 16th August, 1886 to 15th August, 1887.	37,190	3,854	[illegible]	330	1,218	12*	[illegible]	I*	

Many zamindárs, who took seed in previous years, have now a sufficient store of their own; this accounts for smaller sales during the year.

MIR MUHAMMAD HUSAIN, M.B.A.C, C,
Assistant Director, in charge of Farm.

STATEMENT No. 1.-STANDARD SERIES.

1	2	3	4	5	6	7	8	9	10	11		12			13	14	15	16
Calculation of the result and comparison of outturn with the standard phi in Hie series.										*Comparison of cott and income with the ordinary kind of cultivation in vogue in this country.*								
Number of plot.	Detail of special treatment with the rate of its cost.	Weight of unhusked grain.	[illegible]	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease in the standard plot.	Increase or decrease per acre.	*Actual outturn per acre.* Grain.	Straw.	*Value of outturn.* Grain at Re. 1 per 41lbs.	Straw at Re. 1 per 400lbs.	Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 33.	Net profit or loss per acre.	Remarks.
	Quantity of manure applied per acre.	tt)3	lbs.	lbs.	tbs.	lbs	lbs.	lbs.	lbs.	lbs.	tb*.	Ks. a.	Us. a.	Rs. n.	Rs. a.	Rs. a.	Ks. a.	
1	Saltpetre, 240lbs. per acio, at Rs. 3-8-0 per 82ll5s	319	102	217	[illegible]	47	213	16	193	1,234	2,626	30 2	6 9	36 11	- 7 5	- 1 5	- 8 10	
2	Ditto ditto and boneūust, 300lb*. per acre, at 11 annns per mnund.	315	in	204	[illegible]	54	174	25	302	1,343	2,468	32 12	- 6 3	38 15	—10 10	+ 0 15	- 9 II	
3	Cowdung, 180 maunds per acre, at Bs. 3 per 100 muunda ...	289	104	185	66	56	178	18	217	1,258	2,288	30 11	5 10	30 5	—2 6	- 1 11	- 4 1	
4	Ditto ditto and bonedust, 360lbs. at 11 Rnnas per 82llw	253	102	156	66	65	153	16	193	1,234	1,888	30 2	4 12	34 14	- 5 11	- 3 2	- 8 13	
5	Cowdimg, 180 maunds per acre, at Rs 8 per 100 maunds, and gypsum 240lbs per acre, at Rs. 1-14-0 per f121bs.	295	98	199	65	48	207	10	121	1,162	2,408	28 5	6 0	34 5	- 7 8	- 3 11	- 11 3	
6	Sheepdung, 180 raaunds per acre at Ks. 3 per 100 maunds	266	102	164	66	02	161	16	193	1,234	1,984	30 2	4 15	35 1	- 2 6	- 2 15	- 5 5	
7	Ashes of 180 maunds dung per acre, at Rs. 3 per 100 maunds.	172	69	103	64	67	149	17	206	835	1,246	20 6	3 2	23 8	•2 8	—11 8	- 17 0	
8	Shcepdunçr. 180 mannds,at Rs. 3 per 100 maunds, and bone-dust 360fl)s per acre, at 11 nnuns por 82!bs.	227	90	137	65	66	152	4	48	1,089	1,658	26 9	4 2	30 11	—5 11	~7 5	- 13 0	
0	Saltpetre, 240lb« per acre, at Rs 3-8-0 per S-Ibs, and super-phosphate 240lb? per acre, at Rs. 4 8-0 per 112lbs.	258	99	159	65	62	161	13	157	1,193	1,924	29 3	4 10	34 0	- 37 0	- 4 0	- 21 0	
10	Sheepdung, 180 maunds, at RB 3 per 100 maunds, and gypsum, 240lbs. per acre, at Re. 1 per 82lbs	386	108	278	6G	39	257	22	266	1,307	3,364	31 14	8 7	40 5	- 7 8	+2 5	- 5 3	
1]	Mo manure ... IM ... ... ,,	251	86	165	65	52	192	+	+	1,041	1,996	25 6	5 0	30 6	+3 0	- 7 10	—4 10	
12	Poudrettc, 180 mnunds pern ere, at Rs. 4 per 100 maunds ..	356	120	236	66	51	197	34	411	1,452	2,856	35 7	7 2	42 9	- 5 12	+ 4 9	—1 3	
13	Ashes of 180 maunds cowilung, at Rs. 3 per 100 maunds, and saltpetre 210ils per acre, at Rs 3-8 0 per S2tbs.	307	[illegible]	211	65	45	220	10	121	1,162	2,553	23 5	6 G	U 11	—12 13	- 3 5	- 16 2	

STATEMENT No. III.—GREEN MANURE SERIES.

1	2	3	4	5	6	7	8	9	10	11		12			13	14	15	16
	Calculation of the result and comparison of outturn with the standard plot in the series.									*Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.*								
	Detail of special treatment with the sale of its cost.	Weight of unthreshed ears.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	*Actual outturn per acre.* Grain.	Straw.	*Value of outturn.* Grain at Re. ... per ...	Straw at Re. 1 per ... lbs.	Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be ...	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. ...	Net profit or loss over or against the assumed income.	Remarks.
	Quantity of manure applied per acre.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	
1	Old indigo refuse, 120 maunds at 1 Re. per 100 maunds per acre.	297	108	139	65	77	175	+15	+400	1,297	2,387	31 14	6 11	37 9	− 1 12	− 0 7	[illegible]	
2	Fresh ditto ditto ditto ...	328	120	208	66	58	174	+60	+895	1,469	2,617	35 7	6 6	41 12	− 3 8	+ 3 12	[illegible]	
3	Indigo water, 3,600 cubic feet per acre at Re. 1 per 1,200 cubic feet.	221	61	160	63	38	262	− 9	−108	735	1,938	15 0	4 13	22 13	− [illegible] 0	−16 4	[illegible]	
4	Hemp water, 3,600 cubic feet per acre at Re. 1 per 1,200 cubic feet.	198	64	128	64	50	200	− 6	− 73	774	1,549	15 14	3 14	22 12	[illegible]	[illegible]	[illegible]	
5	No manure	227	70	157	64	45	227	+	+	847	1,810	20 10	4 13	25 6	[illegible]	[illegible]	[illegible]	
6	After hemp crop	160	53	107	65	50	202	−17	−208	641	1,286	13 10	3 4	18 14	[illegible] 0	− 1 15	[illegible]	
7	Green manured with hemp [illegible] 3-8-0 per acre ...	197	72	125	64	58	174	+ 2	+ 24	871	1,412	21 4	4 12	26 0	[illegible] 4	− 0 13	[illegible]	
8	Green manured with indigo [illegible] 8 per acre ...	250	105	145	64	43	231	+35	+423	1,270	2,904	31 0	7 7	38 7	[illegible] 1	+ 0 [illegible]	[illegible]	
9	After indigo crop...	305	145	160	65	58	178	+36	+436	1,984	3,200	31 6	6 12	37 1	[illegible]	− 0 [illegible]	[illegible]	
10	Green indigo ploughed in an acre with 6 maunds gypsum at Re. 2-13-0 per 82lbs. per	397	132	265	65	50	201	+63	760	1,587	3,200	38 15	8 0	46 15	[illegible]	+ 8 1	[illegible]	
11	Green hemp ploughed in an acre with 6 maunds gypsum at Rs. 1-12-0 per 82lbs. per	298	109	190	65	94	174	39	472	1,310	2,228	32 3	5 12	37 15	− 5 12	− 0 [illegible]	[illegible]	
12	No manure	208	97	140	65	47	170	+	+	1,174	2,018	23 10	5 2	33 12	+ 3 0	− 4 4	[illegible]	
13	Alternate with lucerne	241	3	246	+	1	7,834	...	...	36	2,330	0 14	7 3	8 1	+ 3 0	−23 15	[illegible]	

* Saving of the value of manure ... Rs. 3
Value of the crop of indigo sold ... " 20

STATEMENT No. I[illegible] LANDS.

[illegible] in the series.										Comparison of cost and income of the ordinary kind [illegible] in [illegible] country.								
1	2	3	4	5	6	7	8	9	10	11		12			13	14	15	16
										Actual outturn per acre.		Value of outturn.						
Number of plots as per map of Farm.	Detail of special treatment with the rate of its cost.	Weight of an threshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Grain.	Stra^.	Grain at Be. 1 per 4im3.	Straw at Be. 1 per 400B53.	Total.	Gain or los* per acre in the cost aeainst the cost of ordinary cultivation assumed to be Rs. 30.	Gain or loss per acre in the value of outturn ngainst ordinary cultivation assumed to be Ks. 38.	Net prof.t or loss over or against the assumed income, Bs. 3d.	Kemnrks.
	Quantity of manure [illegible] per acre.	lbs.	lbs.	[illegible]	[illegible]	[illegible]	[illegible]	lbs.	lbs.	lbs.	lbs.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	
1	Brick-kiln refuse, 150 maunds at Re. 1 per 100 maunds per acre.	195	60	[illegible]	61	65	[illegible]	28	[illegible]	780	1,[illegible]62	19 8	6 10	23 2	+1 4	—14 14	—1[illegible] 10	
[illegible]	[illegible] per 100 [illegible]	[illegible]	63	80	63	79	[illegible]	28	[illegible]	[illegible]	[illegible]88	18 9	[illegible]	[illegible] 0	+[illegible] 4	—17 0	—1[illegible] 12	
[illegible]	[illegible] per 1 [illegible]	[illegible]	64	90	64	47	61	27	[illegible]	[illegible]	1,[illegible]	18 14	2 1[illegible]	[illegible] 19	— 0	—18 [illegible]	—1[illegible] 4	
[illegible]	[illegible] at Re. [illegible] per [illegible]	[illegible]	88	158	64	56	[illegible]	49	603	1,[illegible]	[illegible]	[illegible] 6	4 [illegible]	[illegible] 1	—[illegible] 11	—7 15	—9 10	
5	[illegible] of 130 maunds [illegible] per 100 [illegible] acre.	[illegible]	[illegible]	74	+	43	[illegible]	—5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] 11	[illegible]	[illegible] 5	—[illegible]	
[illegible]	[illegible], saltpetre, [illegible] per [illegible]	[illegible]	59	150	+	40	[illegible]	18	[illegible]	[illegible]	1,[illegible]	1[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—[illegible]	
[illegible]	[illegible] chloride, [illegible] per [illegible]	[illegible]	61	110	+	61	[illegible]	24	190	[illegible]	1,[illegible]	1[illegible] 0	[illegible]	[illegible] 0	[illegible]	[illegible]	—[illegible]	
[illegible]	[illegible] manure	[illegible]	57	84	+	44	[illegible]	+	+	[illegible]	1,[illegible]	[illegible]	[illegible]	18 8	+ [illegible]	[illegible] 8	—[illegible]	

No. V.—WATER[illegible]

Number of plots as per map of farm.	Detail of treatment with the rate of its cost.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Outturn per acre: Grain.	Outturn per acre: Straw.	Value of outturn: Grain at Re. 1 per [illegible]	Value of outturn: Straw at Re. 1 per [illegible]	Value of outturn: Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 38.	Net profit or loss over or against the assumed income, Rs. 63.	Remarks.
1	2	3	4	5	6	7	8	9	10	11		12			13	14	15	16
	Watering.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	
B.D.																		
1	[illegible] at Re. 1 [illegible] per each watering from canal ...	305	[illegible]	193	[illegible]	[illegible]	170	[illegible]	[illegible]	1,387	[illegible]	[illegible]	5 15	19 2	−[illegible]	[illegible]	−[illegible]	
2	[illegible] at Re. [illegible] per each watering ditto ...	237	103	131	[illegible]	[illegible]	170	48	[illegible]	1,944	[illegible]	[illegible]	6 2	33 [illegible]	−1 13	[illegible]	−8 11	
3	[illegible] at Re. 1 [illegible] per each ditto ...	[illegible]	85	154	[illegible]	67	176	[illegible]	[illegible]	1,600	[illegible]	[illegible]	4 11	30 11	+[illegible] 0	[illegible]	[illegible]	
4	[illegible] at Rs. 1-4-0 ditto ditto ...	219	[illegible]	139	[illegible]	[illegible]	174	18	[illegible]	[illegible]	[illegible]	[illegible]	1 3	27 [illegible]	+[illegible]	[illegible]	−14 [illegible]	
5	Ditto [illegible] at Rs. 1-4-0 ditto ...	172	[illegible]	100	[illegible]	[illegible]	173	1	[illegible]	762	[illegible]	[illegible]	3 [illegible]	21 [illegible]	+[illegible]	[illegible]	[illegible]	
6	Dry ...	174	[illegible]	139	[illegible]	[illegible]	191	+	+	760	1,355	[illegible]	[illegible]	21 [illegible]	+[illegible]	[illegible]	−[illegible] 11	
B.A.																		
1	Three times watered from well at Re. 1 15-6 per each time ...	274	80	18[illegible]	45	[illegible]	[illegible]	[illegible]	251	1,041	[illegible]	[illegible]	6 11	35 1	+[illegible]	[illegible]	−[illegible] 11	
2	Ditto from canal at Re. 1-4-0 per each watering.	190	57	138	61	45	215	+	+	690	[illegible]	16 1[illegible]	4 0	20 14	+5 [illegible]	[illegible]	−14 [illegible]	

STATEMENT No. VII.—GREEN MANURED DUPLICATE PLOTS

Number of plots as per map of Farm	Detail of special tie ... rate ... cost.	Weight of unthreshed sheaves.	Vf eight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Actual outturn per acre: Grain.	Actual outturn per acre: Straw.	Value of outturn: Grain at Re. 1 per ... lbs.	Value of outturn: Straw at Re. 1 per 400 lbs.	Value of outturn: Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Ks. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 38.	Net profit or loss over or against the assumed income, Üs. 3S.	Remarks.
		8	9	10	6	7	8	9	10	11	12				13	14	15	16
	Quantity of ...	[illegible]	lbs.	lbs.	[illegible]	[illegible]	lbs.	[illegible]	[illegible]	[illegible]	lbs.	[illegible]	[illegible]	[illegible]	Rs.	[illegible]	[illegible]	
	... manured with ...	[illegible]	117	226	[illegible]	[illegible]	194	2	[illegible]	[illegible]	2,7[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+	+	
	[illegible]	[illegible]	[illegible]	[illegible]	+	[illegible]	237	+	+	[illegible]	1,[illegible]94	[illegible]	[illegible]	[illegible] 11	+	[illegible]	[illegible]	
	... manured with ... Rs. ... per acre	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,300	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+	+	910	[illegible]	[illegible]	[illegible]	[illegible]	+	[illegible]	[illegible]	
	... per acre	2,347	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+	[illegible]	[illegible]	3,093	[illegible]	[illegible]	[illegible]	[illegible]	+	+	
	[illegible]	604	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+		[illegible]	1,389	[illegible]	[illegible]	[illegible]	+	[illegible]	[illegible]	

STATEMENT No. YIII.-GBEEN MANURED DUPLICATE PLOTS BESULTS.

Calculation of the mult and comparison 0/outturn with the standard plot in the eeriee. | *Comparison of coat and income teith the ordinary kind of cultivation in vogue in thit country.*

1	2	3	4	5	6	7	8	9	10	11		12			13	14	15	16
										Actual outturn per acre.		*Value of outturn.*						
Number of plots as per map of farm.	*Detail* of special treatment with the rate of its cost.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of [illegible]	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Grain.	[illegible]	Grain at Rs. 1 per 41 lbs.	Straw at Rs. 1 per 400 lbs.	[illegible]	[illegible]	[illegible]	Net profit or loss over or against the ordinary incomes, Rs. As.	Remarks.
	Quantity of manure applied per acre.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	
1	Fresh indigo refuse, 120 rods, and lime 6 mds. per acre at Be. 1 per 100 mds. and Rs. 20 per 100 maunds.	660	196	464	65	42	237	86	521	1,186	2,807	23 15	7 0	35 15	- 3 8	- 2 1	- 5 9	
2	Fresh indigo refnse, 120 mds. at Re. 1 per 100 mds.	463	180	283	65	64	157	70	424	1,089	1,712	26 9	[illegible]	30 13	- 1 12	- 7 3	—8 15	
3	Old indigo refuse, 120 mda. and lime 6 mds. per acre at Re. 1 per 100 mds, and Rs. 20 per 100 mds.	442	148	294	65	50	199	38	230	895	1,779	21 [illegible]	4 7	[illegible]	- 3 8	—11 11	- 15 3	
4	Old indigo refuse,120 mds. at Re. 1 per 1Q0 mds.	442	166	276	65	60	166	56	[illegible]	1,004	1,670	24 8	4 3	28 11	- 1 12	• 9 5	—11 1	
5	No manure	369	110	259	65	42	235	+	+	665	1,567	16 4	3 15	20 3	+3 0	—17 13	- 14 13	

STATEMENT No. *IX.—PLOUGHING SERIES.*

1	2	3	4	5	6	7	8	9	10	11		12			13	14	15	16
Calculation of the result and comparison of outturn with the standard plot in the series.										*Comparison of cost and income wifh the ordinary kind of cultivaton in vogue in thin country.*								
Number of plots. [illegible]	Detail of special treatment with the rate of its cost.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	[illegible] of [illegible] on straw.	Percentage of straw on grain.	Increase or decrease over standard [illegible] the series.	Increase or decrease per acre.	*Actual outturn per acre.* [illegible]	[illegible]	*Value of outturn.* [illegible] at Rs. 1 per 41 lbs.	Straw at Rs. 1 per 400 lbs.	Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 30.	Gain or loss per acre [illegible]	Net profit or loss over or against the assumed income, Rs. 38.	Remarks.
	Ploughing.	fife.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Ks. a.	Ks. a.	8s. a.	Bs. a.	Bs. a.	Bs. a.	
1	Ploughed 5" deep (four times), at annas 12 per each ploughing.	72	[illegible]	43	+	67	148		[illegible]	468	694	11 7	1 12	13 3	+5 12	-24 13	-19 1	
2	Ploughed (eight times) with country plough at 12 annas per each ploughing.	61	25	36	+	69	144	+	+	403	581	9 14	1 7	11 5	+3 4	-26 11	—23 7	
3	Ploughed (eight times) with country plough at 12 annas per each ploughing.	61	[illegible]	37	+	65	154	+	+	381	597	9 7	1 8	10 15	+3 4	-27 12	—23 13	
4	Ploughed 9" deep (four times) at 12 annas per each ploughing.	90	37	53	+	70	143	12	202	597	855	14 9	2 2	16 11	+3 4	-21 5	-18 1	
5	Ploughed 9" deep (four times) at 12 annas per each ploughing.	800	285	515	[illegible]	55	181	220	434	563	1,017	13 12	2 9	16 5	+3 4	-21 11	-18 7	
6	Ploughed 5" deep (four times) at 12 annas per each ploughing.	410	[illegible]	286	63	43	231	59	116	245	565	6 0	1 7	7 7	+5 [illegible]	—30 9	—24 13	
7	Ploughed (eight times) with country plough at 12 annas per each ploughing.	265	65	200	63	[illegible]	30S	[illegible]	[illegible]	128	395	3 2	1 0	4 2	+3 4	-33 14	-30 10	

PART IX.

Number of plots as per map of Farm.	Detail of special treatment with the [illegible] [illegible]	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.*	Increase or decrease per acre.	Actual outturn per acre. Grain.	Actual outturn per acre. Straw.	Value of outturn. Grain at Re. 1 per 41lbs.	Value of outturn. Straw at Re. 1 per 400lbs.	Value of outturn. Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to [illegible]	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 38.	Net profit or loss over or against the assumed income, Rs. 38.	Remarks
1	2	3	4	5	6	7	8	9	10	11	11	12	12	12	13	14	15	16
	Quantity of manure [illegible] per acre.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	
1	Mustard cake, 5 [illegible] Rs. 1 per [illegible] 30 seers per acre ...	464	153	311	64	49	203	24	190	1,909	2,458	23 8	6 9	65 10	− 6 1	− 2 6	− 7 7	
2	[illegible] 1o man ditto [illegible] to ...	471	[illegible]	[illegible]	66	54	185	36	[illegible]	1,304	2,418	31 13	6 1	37 14	−13 1	− 0 9	−1[illegible] 9	
3	Co [illegible] 240 [illegible] 5 per 100 maunds [illegible] acre ...	[illegible]	[illegible]	420	64	59	172	57	[illegible]	1,476	2,509	36 14	6 6	42 4	− 8 0	+ 4 6	+ 1 4	
4	[illegible] cake-fed dung, 60 maunds per acre 5[illegible] per 100	[illegible]	176	272	[illegible]	65	154	47	370	1,391	2,148	30 16	5 5	39 5	+ 1 0	+ 1 6	+ 2 5	
5	Ditto ditto 1[illegible] ditto ...	464	169	276	67	68	147	[illegible]	467	1,496	2,181	36 4	5 7	41 11	− 1 6	+ 3 4	+ 1 4	
6	[illegible] dung, 200 maunds at [illegible] maunds per acre ...	506	178	328	65	[illegible]	184	[illegible]	385	1,407	2,442	34 5	6 4	40 13	− [illegible] 0	+ 8 13	− 0 3	
7	No manure	391	129	262	66	49	203	+	+	1,019	2,670	24 14	5 3	30 1	+ [illegible] 0	− [illegible]	− 6 0	

30 53 No. XI.

Number of plots as per map of Farm.	Calculation of the comparison of outturn with standard plot in the series.										Comparison of the cost of the ordinary kind of cultivation in this country.							
1	2	3	4	5	6	7	8	9	10	11		12			13	14	15	16
										Actual outturn per acre.		Value of outturn.						
	Detail of experiment with the rate of its cost.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of *grain* per bushel.	Percentage of grain on straw	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Grain.	Straw.	Grain at Rs. 1 per 40 lbs.	Straw at Rs. 1 per 400 lbs.	Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 38.	Net profit or loss over or against the assumed income, Rs. 38.	Remarks.
	Manure applied per acre	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	
1	Cotton seed, dung, 50 maunds per acre at Rs. 4 per 100 maunds.	[illegible]	133	218	65	[illegible]	160	[illegible]	146	[illegible]	1,686	23 10	[illegible] 8	29 13	[illegible]	[illegible] 8	[illegible] 8	
2	Cotton seed, dung, 100 maunds at Rs. 4 per 100 maunds.	[illegible]	139	218	65	[illegible]	170	[illegible]	115	[illegible]	[illegible]	24 14	[illegible] 6	29 8	[illegible]	[illegible]	[illegible]	
3	[illegible] costs at Rs. 3 per [illegible]	[illegible]	110	205	[illegible]	54	186	[illegible]	[illegible]	[illegible]	[illegible]	21 8	[illegible] 1	26 4	[illegible]	[illegible] 12	[illegible]	
4	[illegible] maunds at [illegible] per	328	103	228	[illegible]	44	216	[illegible]	−67	[illegible]	1,702	19 14	[illegible] 6	24 4	[illegible]	[illegible]	[illegible]	
5	Purchased cotton seed, 0 maunds Rs. 1 per [illegible] per acre.	387	150	217	68	68	156	[illegible]	234	[illegible]	1,715	23 14	[illegible] 6	33 8	[illegible]	1 14	7 16	
6	Dung, 200 maunds at Rs. 3 per 100 maunds	85	98	199	65	49	203	[illegible]	−197	[illegible]	1,573	13 14	3 15	22 16	[illegible]	[illegible] 9	[illegible] 3	
7	Manure	8	114	181	65	[illegible]	158	+	+	901	1,480	21 0	3 9	25 9	[illegible]	[illegible] 7	[illegible] 7	

STATEMKNT No. XIL

1	2	3	4	5	6	7	8	9	10	11		12			13	14	15	16
Calculation of the mult and comparison of outturn with the standard plot in the series.										*Comparison of cost and income with the ordinary hind of cultivation in vogue in this country.*								
Number of plot ... Farm.	Detail of special treatment with the rate of Its cost.	Weight of ... sheaves.	Weight of ...	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease ... plots in ...	Increase or decrease per acre.	*Actual outturn per acre.*		*Value of outturn.*			[illegible]	[illegible]	Net profit or loss ... [illegible]	Remarks.
										Grain.	[illegible]	[illegible]	[illegible]	Total.				
	Quantity of manure applied per acre.	Tba.	lbs.	lbs.	lbs.	lbs.	B5S,	lbs.	lbs.	lbs.	lbs.	Us. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a	Rs. [illegible]	
		Mundia wheat.																
88	No manure	2,591	826	1,765	66	47	214	...	617	[illegible]	[illegible]	29 8	6 7	35 15	+3 0	-2 1	+0 15	
		Muzaffarnagar wheat																
	No manure	340	107	239	65	45	223	...	...	592	1,322	14 7	3 4	17 11	+3 0	-10 5	-7 5	

REPORT

ON THE

CAWNPOEE EXPERIMENTAL STATION

FOB THE KHARIF SEASON OF 1887.

ALLAHABAD:

NORTH-WESTERN PROVINCES AND ODDH GOVERNMENT PRESS.

1888.

PART II.

Trial of machines and implements.

Sugar-mills.

(1) *The "Rája" sugar-mill.*—This is patented by Mr. J. Rogers of Cawnpore; was shown in several shows; and much admired by mill-owners. Its price is Rs. 120. On the 3rd of March it was tried on the farm in Mr. Rogers' presence with the following result:—

No. of trial.	Length of beam.	Traction in number of steers. Without cane.	Traction in number of steers. With cane.	Variety of cane crushed.	Weight of cane pressed.	Duration during which the mill worked.	Revolutions.	Weight of juice expressed.	Percentage of juice on the weight of cane crushed.	Weight of cane crushed per hour.
					Seers.	Mins.		S. c.		S. c.
1st ...	9' 3"	4	12	Dhaul.	55	65	113	23 5¼	42·4	50 12
2nd ...	9' 3"	4	12	Do.	55	57	141	26 6¼	48·0	57 14
Average,	...	...	...	...	...	61	127	24 14	45·3	54 5

N.B.—The weight of juice given above is the net amount after deducting the weight of sugar particles held in the juice.

(2) *Nahan sugar-mill.*—Three of these—(1) 6-inch two roller; (2) 8-inch three roller, double squeeze; (3) 8-inch three roller, double feed—were shown in Moradabad, and on the 3rd of March were tried at the Cawnpore experimental station in presence of Mr. Jones, the patentee. No. (2) was shown at Muttra and Meerut and drew considerable attention of the sugarcane-planters. The following figures show the results:—

Description of mill.	Price.	Length of beam.	Traction in number of steers. Without cane.	Traction in number of steers. With cane.	Variety of cane crushed.	Weight of cane pressed.	Duration during which the mill worked.	Revolutions.	Weight of juice expressed.	Percentage of juice on the weight of cane crushed.	Weight of cane crushed per hour.
	Rs.					Seers.	Mds.		Seers.		S. c.
Nahan, 8-inch double feed three-roller mill.	90	10' 0"	1	14½	Dhaul.	55	39	109	26	47·27	84 9
Nahan 6-inch two-roller mill.	60	9' 2"	2	8	Do.	55	57	157	22	40	57 14

Sugar-refiner.

(3) *Centrifugal or sugar-refining-machine,* introduced by Messrs. Thomson and Mylne, of Behees, was tried again during the year. The results are as follows:—

Number of trial.	Quantity of rab worked.		Time occupied.		Quantity of refined sugar.		Remarks.
	Mds.	s.	Hour.	mins.	S.	c.	
1 ...	0	30	0	[illegible]	4	3	Very white and fine.
2 ...	0	23	0	[illegible]	1	4	Ditto.
3 ...	0	36	0	[illegible]	11	0	Yellowish colour.
4 ...	0	32	0	[illegible]	7	4	Ditto.
5 ...	0	31½	0	[illegible]	7	6	Whitish colour.
6 ...	0	19	0	[illegible]	6	2	Very yellow.
Total ...	4	11½	1	33	37	3	

No. *II*. OF 1888.

DEPARTMENT OF LAND RECORDS AND AGRICULTURE, N.-W. P. AND OUDH.

DATED CAWNPOEB, THE 23RD JUNE, 1888.

FROM

LIEUT.-COL. D. G. PITCHER,
OFFG. DIB. OF LAND RECORDS AND AGRICULTURE,
N.-W. PROVINCES AND OUDH,

To

THE CHIEF SECRETARY TO GOVERNMENT,
N.-W. PROVINCES AND OUDH.

SIR,

I HAVE the honor to submit, for the information of His Honor the Lieutenant-Governor and Chief Commissioner, the kharff report of the Cawnpore experimental station for the year 1887-88.

2. The season was again for the third year in succession most unfavourable for ordinary farming, and as experimental farming requires that for reliable results the season shall be at least au average one, it is not surprising to find that the results at Cawnpore were, on the whole, somewhat negative. The unfavourable nature of the past season has been brought home to us all as one of the causes operating to maintain Prices at so high a rate throughout the cold season.

3. Experiments were confined to plots of maize, indigo, cotton, and sugarcane. To maize and cotton various fertilizers were applied, the best of which proved to be woollen refuse followed by sheep's dung. Other experiments in early sowing gave somewhat negative results, and the same is reported of the regular series of standard manure plots, of application of gypsum and kainite and of sowing after the American fashion as compared with other methods. In all these the bad weather levelled distinctions.

4. Gypsum was applied to iadigo with, some better results, indigo being, it may be remarked, leguminous. These experiments, which will be continued on a larger scale next year, may prove of great importance, should gypsum be found to possess any markedly good effect on the plant. Large deposits of gypsum are available at Klieora, in the Punjab, close to the North-Western Railway. Through the kindness of the Agents, East Indian Railway and North-West Railway, a considerable quantity was procured from thence, some of which has been distributed for experiment to indigo-growers. "Land plaster," as it is called m America, is there considered the most valuable application for all leguminous crops.

5. For sugarcane alone was tbe season favourable and tbe experiments there were more satisfactory. The cane grown was very fair mdeed, and the results proved so far tbat tbe metbod of cultivating ordinarily adopted here suits the conditions of climate, &c, far better than tbe West Indian plan of growing in lines. In tbe latter case tbe plan is designed for a climate where rain falls on most days of the year ; tbe canes must, therefore, be grown well apart to secure tbe full benefit of tbe falls. In India tbe water is delivered by artificial irrigation channels direct to the foot of the cane, and a close growth overhead minimises loss of moisture by evaporation in tbe intervals between irrigation. The two plans were tried some years back at tbe farm and tbe same result in favour of the native metbod obtained.

So, also, I must observe in regard to ratooning cotton tbat the me*]ts and demerits had previously been exhaustively experimented on. The most to be looked for in later experiments now is tbe improvement of seed by selection, and to tbis the Superintendent's attention will be directed.

The report closes with an account of various trials of implements tbe results of which speak for themselves.

6. I must apologise for tbe late appearance of tbe report. At is nominally due in December—an impossible date for any year in which cotton or sugarcane is grown. This year tbe operations connected with tbose two crops were not concluded until towards the end of March, when the Assistant Director bas his hands too full of agricultural show work and tbe rabi harvest to be able to expedite his report. I venture, then, to take this opportunity of suggesting that tbe Government of India be moved to consent to a separate kharif report being discontinued and to one annual report being submitted for the station by the date now fixed for tbe submission of tbe rabi report.

1 have tbe honor to be,

SIB,

Your most obedient servant,

D. G. PITCHER, LT.-COI..,

Offg Director-

IR, E :P O :R T

OF THE

CAWNPORE EXPERIMENTAL STATION,

FOE THE KHARIF SEASON OF 1887.

PART I.

Experiments on Crops.

BESIDES the experiments on the usual kharif crops, indigo and sugarcane were iucluded this season. The milling of sugarcane went on up to the 5th, and cotton-picking up to the 15th of March : hence delay in submission of this report.

•^., *Determination of the effect of various fertilizers on maize.* — From statement I >t will be seen that woollen refuse (shoddy) has this year again taken the leading place and has given 1,6701b. per acre more grain than the unmanured plot, leaving a profit of Rs. 11-2-0 over and above the usual profit per acre.

Sheep dung and pigs' dropping too hare given a profitable yield, but saltpetre has shown uncommonly bad result: it may be said that in too wet a season, as of the last kharif, it is of no avail.

21., Determination of the effect of early and late sowing on maize. — Against early sowing the plot sown in ordinary tima has produced 76tt>. per acre more grain *vide* statement No. II. ; the difference is, however, not much and not worth taking into consideration. The loss, as shown by the statement, may be attributed to the bad season which at Cawnpore had been throughout unfavourable for the crop. The other experiments on maize, such as sowing on flat and ridges after the American way, and those connected with gypsum and kainite started this year and various kinds of dungs which are tried in duplicate series every year, were so much injured by the heavy and continuous rain that they hardly gave any yield worth noting.

21L, Determination of the quality and yield of different varieties of foreign cotton from acclimatized need.—Cotton of two varieties, (1) Louisiana and (2) Egyptian, vras tried under the same treatment ; each was sown in two series, (1) before and (2) after rain. For the seed sown before rain the fields were prepared and till monsoon time protected by irrigation. Statement III shows result. The produce of <*rly-gown plots was greater than those sown late. In either case the variety called Egyptian has proved to be better for our soil and climate than the other. The pro-Portion of lint to the total weight of seed-cotton is also higher in this variety.

From a financial point of view the result was very poor, which is no doubt due tobad season : heavy rain is always injurious to a cotton crop.

IV., Determination of the effect of gypsum and kainite on cotton and comparison of the yield of American against country variety.—In two plots country cotton and in other two with the same treatment New Orleans was sown. Statement IV gives details. In both cases the yield with gypsum and kainite has been greater than otherwise- The produce of New Orleans was 1451b. clean cotton per acre and of country cotton 121R/.

The financial condition of this experiment is also not favourable.

IP., *Experiments with Haniin cotton.*—The points aimed at in those experiments were :—

(a) For how many years the plants will continue to bear.

{!») Whether the yield is equ.il to the annually-sown crop or not,

(cj Whether there is any change of colour in the produce of the annual and perennial plants.

(d) Whether ratooning makes any difference.

For last three years this experiment has been kept up.

With regard to (o), it is sufficiently proved that Nankin cotton plant is perennial and will staud and yield for several years. If kept long it thrives a good deal, becomes more busby, and bears more pods. But compared with the fresh-sown cotton, S greater number of pods do not yield fine cotton. Experiment has also shown that longer the plant is kept the smaller the seed becomes ; thus the percentage of clean cotton ou seed increases.

With regard to *(b),* owing to the unfairness of season, nothing can decidedly b« said- One of the two plots sown this year yielded per acre as much as 172ft. cleaned cottoo, and the other only 40ft., while the produce of the two plots sown three years »g" wa* 85It>. per acre in each case. Details are given in statements V and VI •pp»ded to this report.

With regard to *(e)* and (tf), there did not appear any difference between the coloar of the produce of the two kinds of plants, nor was there any difference between the results of ratooned and unratooned plants.

By summing up the result of the last three years' experiments, it mny be saiJ that there is no dfence between the quantity of the produce and quality of its colour, from ,the *Hnual a«<* Perennial pknts : so there is a deal of saving in cost by keep^S tne plants for several years h> field, if the land is not suitable to bear an extra crop-

VL, E,,rhj and late sowing i» the case of yankin w«on.—The statement N°- VI wiU show the results of the two kinds of sowing. Early sown plot has given far Urg" yield than the other, and the percentage of cotton ou seed is also better.

It is a recognised fact that early sowing of all kharif crops, especially cotton, is advantageous.

VII, Determimition of the t$eet of gypsum on ind!ao.-'£he following figures show the result:—

No. of plot and area.	Special treatment.	Cost of special treatment.	Weight of green crop sold.	Actual outturn per acre.	Value of the outturn per acre at Rs. 1 per 30 lb.	Increase of outturn: In weight.	Increase of outturn: In money after deducting the cost of manure.
			lb	lb	Rs. a. p.		Rs. a. p.
(1) 7,360 square yards.	Gypsum applied as manure, 3 cwt. per acre.	Rs. 3 per acre	21,780	14,487	47 7 0	1,827	9 4 0
(2) 6,400 square yards.	No manure ...	...	17,129	12,660	45 3 0	...	...

Gypsum was not expected to produce its full effect in the first year: still it is satisfactory to see that it has left a net profit of R9-2-4-0 per acre.

VIII. Drill versus *broadcast.*—The following fable gives the reaults of indigo sown In the two ways :—

No. and area of plots.	Special treatment.	Cost of the special treatment per acre.	[illegible]	[illegible]	[illegible]	Increase.	
						[illegible]	[illegible]
			lb.	lb.	Us.	lbs.	lbs.
(1) 522 square yards.	Seed sown with drill.	No noticeable difference of the cost between the two ways of sowing.	5,507	7,507	24 7 O	5,462	17 13 0
(2) 4,658 square yards.	Seed sown broadcast.		2,045	2,045	G 10 0	...	...

Equal quantity of seed was sown in both cases (8Jtb). There is no doubt that almost half of the seed sown broadcast, owing to its being deposited unevenly and too deep in the field is lost, and fails to germinate : still I must say the difference in the present instance is rather abnormal.

IX. Experiments with Sugarcane..—This experiment may be classed into :—

(«) Comparison of the foreign against the ordinary varieties of the district.

(6) Determination of the merits of sowing canes in lines as done in the French sugar-growing settlements, against the ordinary method followed in the country.

Statement VII shows the details.

Foreign seed was obtained from the best sugarcane-growing districts—(I) Sh6hjuhánpur, (2) Kauth (Moradabad), (3) Beheea (Shahabad).

JSach varietv was sown in two plots. AH the plots were made side by side on one Piece of land and received similar treatment in every respect.

The two plots of Sh&hjahánpur seed were attacked by parasite and one of then* was almost entirely destroyed, although every possible effort was made to save it. A mixture of kerosine-oil and sulphate of copper was applied, the attacked and injured canes were dug out with roots and thro** away, an eitra d.gging and watering were given : but all to no effect.

The other two varieties did bettei, but did not come up to the mark. This proves that either the vitality of seed was affected during the transit or that it did not adapt itself to its new home and might do better in the next year or so—a question which will be decided by future trials.

In every case sowing after country fashion gave much better results. There was no perceptible difference in the oiir made from plants raised in the two ways.

PART II-

Trial of machines and implements.

Sugar-mills.

(1) *The "Rája" sugar-mill.*—This is patented by Mr. J. Rogers of Cawnpore; was shown iu several shows; and much admired by mill-owners. Its price is Rs. 120. On the 3rd of March it was tried on the farm in Mr. Rogers' presence with the following result:—

No. of trial.	Length of beam.	Tension in number of stones. Without cane.	With cane.	Variety of cane crushed.	Weight of cane pressed.	Duration during which the mill worked.	Revolutions.	Weight of juice expressed.	Percentage of juice on the weight of cane crushed.	Weight of cane crushed per hour.
					Seers.	Ming.		S. c.		S. c.
1st ...	0'3"	4	12	Dbaul,	55	G5	113	23 5	42-4	50 12
2nd ,,	9' 3"	4	12	Do.,	55	57	141	26 6*	48 0	57 1*
Average,	...	...	...	...	...	61	127	24 14	453	54 5

N.B.—The weight of juice given above is the net amount after deducting the weight of megas particles in the juice.

(2) *Baton* «wj«w^miB.—Three of these—(1) 6-inch two roller; (2) 8-inch three roller, double squeeze; (3) 8-inch ihree Ioiler, double feed—were shown in Moradabad, and on the 3rd of March were tried at the Cawnpore experimental station m presence of Mr. Jones, the patentee. No. (2) was shown at Muttra and Meerut and drew considerable attention of the sugarcane-planters. The following fig™** sbo* the results :—

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Kahan, 8-ich double feed three-roller mill.	90	10' 0"	4	14½	Dhaul,	55	30	108	26	47·27	84 9
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Sugar-refiner.

(3) *Centrifugal or sugar-rejining-mackine,* introduced by Messrs. Thomson ^ Mylne, of Beheea, was tried again during the year. The results are as follows :—

Number of trial.	Quantity of ráb worked.		Time occupied.		Quantity of refined sugar.		Remarks-
	Mds.	s.	Hour,	inins.	S.	c.	
1 ...	0	30	0	13	4	[illegible]	Very white and fine-
2 ...	0	23	0	10	1	4	Ditto.
3 ...	0	36	0	21	11	0	Yellowish colour.
4 ...	0	32	0	13	7	4	Ditto.
5 ...	0	31*	0	17	7	6	Whitish colour.
6 ...	0	19	0	19	6	[illegible]	Very yellow.
Total ...	4	11½	1	33	37	8	

1R87 • two of the Beheea men'were sent for and made in February,18«. <-of ^ ^ ^ ^ be ^ |• ^ at
^ployed to make it. The machine at the station ^ ^ ^ ^ ^ ^, ^ WM
the various agricultural shows of the provinces, ^ did not come> we had to
ordered from Messrs. Th«m«« «ndMy being this water, ^ ^ jn ^ ^ standing loilg in
wait till May, when the ^ ^ J ^ m ,ery fine> and this accounU for the per-
the molasses, perhaps got broken or beoaro The j.
cei»t8ge ot refined sugar ou *treacle* being so ve.y low.

A 5n<r last February and March it was worked with
In many of the shows during an trial to J^ ^ ,*khuwha*^ broUght his own
great success. At Moradabad a maH, course of first-rate quality, ^ ^ ^ mBch
rab and worked it himself; the rab was ot
more sugar by this machine than by the * * * P^ess.

. ^-*nft* for capitalists, but it requires rab of an especial
The machine is . great thing j£ make yet in ^ ^ ^ ^ ^ 1,, this
kind, which though not at all difficult w , *j*
country.

i f the flour-mills was tested again this year. The — Flour-mills.
(4) *W»».'.',.-The work of U» The seers of ^ ^ ^ ^ ^ ^ giyea fa
trial was made on the 5tb of April last. *
each mill (three) under trial. The result stands thus^ ^

Name of the mill.	Quantity of grain given.	Labour applied.	Time occupied in the work.	Produce. Flour.	Bran.	Loss.
	Seers.		Hrs. mins.	S. c.	Chks.	Chks.
1. R. Hunt's "The Colonist" ...	5	6 men	0 49	4 9	6	1
2. Ditto "The Little Wonder."	5	2 women	1 8	4 7	8	1
3- Ali Husain's flour-mill ...	5	4 men	0 15	4 .9	6	1
4. Native chakki ...	5	2 women	1 15	4 8	6	2

Kos. 1 and 2 have steel grinding plates, 2- i«fp. which soon get heated to such an extent as to ^ ^ ^ ^ ^ ^ ^ ^ Te §
spoil the qoality of the flour. The grooves ^ ^^ they grind, and ^ grinding
of the plates are very fine and get choked £ ^ worked ^ good ^^ ^ ^^ ^
any more wheat: the machine thus canno-
a few minutes.

r mill but the stones are placed vertically, and are
The mill No. 3 is really a nat.v* *·*J ^ ^ ^ . ^ ^ . Dm-ed simply
fed by a hopper placed at the top of the frame. ^ ^ ^^ fa ^^ ^^
tya fiy.wheel without any complicated spring.
)vhere many offers for its purchase were made, a rafjl at Moradabad, after watchiog
its work for several days, took it for its fi*a price of Rs. ^

fIK parin 0/ *cast-iron.*—In 45 minutes a tank — Waterlift and pump.
(5) *Barrakar Waterlift,* 5 *feet long,* ^ price ^ pum? ·g Rg> g^ Jfc does
of 500 cubic feet was filled by this pump. ^ ^ to ^ ^ ^
f«ir work for the price, but being of cast iron is very heavy
Was shown in several shows, but none sold as yet.

, Tsr ;•// This is a force pump forcing water to 30 feet,
(6) 2*. « fitavfa.." ^ - * - ^ t o men. It was shown at Meerut and was
Us price i8 Bs. 98 and is worked by *v*
purchased by a zemindar.

·.—This is patented by Mr. J. L. Houert,
an Amencan gentleman, res.d.ng m B J. It resembles a *Noria*, consists of ten
Wkets fastened between two endl.s, tins which latter are worked by means of four
grooved wheels, arranged on a wooden frame ^ ^ middle of the frame Js · trough
* w * rece'.es water from the backets. The length of chain and number of buckets
are varied according to depih of water. The distance between the two buckets the

lift tried on the'farm was 6* feet, the total length of chain on one side 31* fed.tk height of stand 3 feet, and the capacity of a bucket 22 cubic feet.

In one honr and 30 minutes it filled a tank of -250 cubic feet, or lifted !««•«* cubic feet per hour; on au average it raised 13 backets in a minute, and thus there was a loss of nearly 4 per cent. in tne qu·intity of ,aterraised by u^age, fc.

The lift was set to work on the 2ht March *nd kept on working till the 4th of AH ! the results qnoted above were recorded on the last day.

©i&in separator.

(8) *Grain ,,parotor* 6y *Hmdand Lund, Pr»tn.-toh* machine was ruu by p°*er at 000 revolutions per minute. The sieves supplied with tlie machine prove to be of too large a raesh, and nearly ,he whofc of the bari,.y, as ai80 the small peas (kasab"), contamed ,n the wheat was delivered with the clean sample.

d B ^Ti," 6TM 8 of * SmaUer lne8b were then firted to the machine with the result be buik of the Wl «y a^ small peas were separated fro.n wheat,

la my opinion the machine «ill give satisfactory result if it is used to clean **the** *dm* of wheat that ordinarily c«,mes illto the market containing, say, 5 to *1 V** centof foreign grain and irapurities.

tfae. int.

(9) The following threshers were tried against thre.hing by bullocks :-

(1) May Furth'g hand thresher.

(2) Ben Heed's thresher.

(3) Shearer Brothers' hand and foot thresher.

No. (1, was worked by hand, the other two were worked conjointly by bullock power. Jl^nMtoarBn^ Mowirjg table:

Number.	Name of machine	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Total cost.	[illegible]	[illegible]
		[illegible]	M. s. ch.	[illegible]	S. ch.	H. m.	[illegible]		Ks. a. p.	A.P.	Bs. [illegible]
I	May Fnrth's hand thresher.	10	3 16 0	620 0	4 0	1 30	[illegible]	...	0 3 0	OWi	5 7 6
II	Ben Seed's and Shearer Brothen' tlueshen.	20	[illegible] 30 12	12 37 [illegible]	12 4	1 2 0	[illegible]	[illegible]	0 11 0	X n	? 0 [illegible]
III	Country way of threshing by bullock..	10	a 31J 0	5 [illegible]	[illegible] 0	19 30	[illegible]	[illegible]	1 3 6	•4 104	30 7 [illegible]

Cost in ,he above iable includes interest on capital, repairs, wear and tear, wages of **wdined ioreman, oil, *&c***

The work done by machine No. I. was no doubt the cheapest of all; but the straw on e,am«,at,on was found to contain . lar<re portion of unthreshed entire ears which had to be beaten out by sticks.

Butter-making apparatus

A set of the butter-making apparatBS has lately been received from BD«1«J-We cream separator, which was worked both at the farm and at the shows, see.ns to be very efficent m iu work. Prom pnre fresh milk it turned oot more tlian 20 per cent. of cream. The-entire apparatus w,l| however, be given a thorough trial next cold weather and its retults embodied in th;nest report.

WE MUHAMMAD HUSA1N, M.B.A.0.,

Amaant Direct-

The cost for threshing ... has been ... including that the j B 5 m...

STATEMENT No. 1.

Maize.

No. of plots as per map of farm.	Quantity of manure applied per acre.	Value of manure.	Weight of unthreshed cobs.	Weight of grain.	Weight of stalks.	Percentage of grain over stalks.	Percentage of stalks over grain.	Increase or decrease over standing plot in the series (No. 8).	Increase or decrease per acre.	Outturn per acre: Grain.	Outturn per acre: Stalk.	Value of outturn: Grain at Re. 1 per 51lb.	Value of outturn: Stalk at Re. 1 per 4812lb.	Value of outturn: Total.	Gain or loss per *acre* in the cost against the cost of ordinary cultivation assumed to be Rs. 16-8-0.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 20.	Net profit or loss over or against the assumed income Rs. 20.
		Rs. a. p.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.
1	Woollen refuse * [illegible] maunds, and lime, 12 maunds ...	[illegible]	225	[illegible]	756	30	504	+189	[illegible]	1,815	9,148	[illegible]	[illegible]	87 7	[illegible]	[illegible]	+11 2
2	Sheep dung, 100 maunds	[illegible]	[illegible]	[illegible]	609	20	508	+ 89	1,085	[illegible]	6,147	[illegible]	[illegible]	24 15	[illegible]	[illegible]	[illegible]
3	Cow dung, 120 maunds	[illegible]	[illegible]	[illegible]	190	19	[illegible]	+ 19	167	[illegible]	1,978	[illegible]	[illegible]	[illegible] 4	[illegible]	[illegible]	[illegible]
4	Poudrette, 120 maunds	[illegible]	[illegible]	[illegible]	460	23	[illegible]	[illegible]	762	[illegible]	4,656	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	Horse dung, 120 maunds	[illegible]	75	[illegible]	330	15	[illegible]	+ 38	460	405	8,145	11 14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	Pigs' dropping, 120 maunds	[illegible]	[illegible]	[illegible]	[illegible]	20	[illegible]	+ 88	1,065	1,210	6,171	23 13	[illegible]	[illegible]	[illegible]	[illegible]	+ 74
7	Saltpetre, 240lb.	[illegible]	[illegible]	[illegible]	200	19	521	+ 26	216	409	2,480	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	No manure	...	[illegible]	[illegible]	70	17	583	...	...	145	847	[illegible]	[illegible]	[illegible]	...	[illegible]	[illegible]

Area [illegible] 400 square yards.

STATEMENT No. II.

Maize,

No. of plots as per map of farm.	Quantity of manure applied per acre.	CALCULATION OF THE BESULT AND COJIPABISON OF OUTTUBN WITH THE STANDABD PLOT IN THE BEBIES (*I.E.,* CEOP SOW* AFTBB BAIN). Value of manure.	Weight of unthreshed cobs.	Weight of grain.	Weight of stalks.	Weight of grain per bushel.	Percentage of grain over stalks.	Percentage of stalks over grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	COMPABISON OF COST AND INCOME WITH THE OBDINABY KIND OF CULTIVATION IN VOGUE IN THIS COUNTBY, *Outturn per acre.* Grain.	Stalk.	*Value of outturn.* Grain at Rs. 1 per 51 lb.	Stalk at Rs. 1 per	I	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 1 2	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs.	Net profit or loss against the assumed Rs.
		B*. a.	ft.	lb.	lb.	ft.	lb.	lb.	lb.	lb.	ft..	ft.	Bs. a.	Bs. a.	Bs. a.	*Ha. A.*	Rs. a.	Bs. a.
38	Horse *dung,* 200 maunds per acre (crop sown before rain).	6 0	738	603	3,228	61	19	511	...	...	734	3,751	14 6	0 12	15 2	- 6 0	—4 14	- 10 14
41	Horse dung, 200 maunds per acre (crop sown after rain).	6 0	714	615	3,010	61	20	494	...	+ 76	810	4,004	15 14	0 13	16 11	- 6 0	- 3 6	- 9 6

AVCA { No. 38, 4,105 beware yards.
{ „ 11, 3,075 ditto.

STATEMENT No. III.

Cotton—Louisiana and Egyptian.

Quantity of manure applied per acre.	Variety of cotton.	Value of manure.	Treatment.	Weight of uncleaned cotton.	Weight of cleaned cotton.	Weight of seed.	Percentage of cotton over seed.	Percentage of seed over cotton.	Actual outturn per acre: Cotton.	Actual outturn per acre: Seed.	Value of outturn: Cotton at Re. 1 per 5 lb.	Value of outturn: Seed at Re. 1 per 60 lb.	Value of outturn: Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 31.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 45.	Net profit or loss over or against the assumed income Rs. 45.
		Rs.		lb.	lb.	lb.	lb.		lb.	lb.	Rs. a.	Rs. a.	Rs. a.	Rs.	Rs. a.	Rs. a.
A.																
Farmyard manure 200 maunds — gypsum 2 cwt.	Louisiana	4	Sown before	33	10	23	46	[illegible]	131	[illegible]	24 [illegible]	4 7	28 10	-4	-16 6	-30 [illegible]
	Ditto	4		24	8	16	50	[illegible]	97	[illegible]	19 [illegible]	3 4	23 0	-4	-22 6	[illegible]
	Egyptian	4		37	12	25	48	[illegible]	146	[illegible]	29 [illegible]	5 1	34 [illegible]	-4	-10 15	[illegible]
B.																
Farmyard manure 200 maunds and gypsum 2 cwt.	Louisiana	4	Sown after	33	[illegible]	[illegible]	46	[illegible]	121	206	24 [illegible]	4 7	28 [illegible]	-4	-16 0	[illegible]
	Ditto	4		30	[illegible]	[illegible]	43	[illegible]	73	169	14 [illegible]	2 [illegible]	17 [illegible]	-4	-27 [illegible]	-31 [illegible]
	Egyptian	4		33	[illegible]	[illegible]	46	[illegible]	121	206	24 [illegible]	4 7	28 [illegible]	-4	-16 0	-30 [illegible]

Area of each plot 400 square yards.

		Rs. a. p.
Value of cattle 60 maunds farmyard manure ...	...	1 [illegible] 0
Ditto gypsum 2 cwt.	...	[illegible]
Total	...	[illegible] 0

STATEMENT No. IV.

Cotton—Country and [illegible] Orleans.

Number of plots as per map of farm.	Quantity of manure applied per acre.	Variety of cotton.	Weight of uncleaned cotton.	Weight of cleaned cotton.	Weight of seed.	Percentage of cotton over seed.	Percentage of seed over cotton.	Outturn per acre: Cotton.	Outturn per acre: Seed.	Value of outturn: Cotton at Re. 1 per 5 lb.	Value of outturn: Seed at Re. 1 per 60 lb.	Value of outturn: Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 31.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 45.	Net profit or loss over or against the assumed income Rs. 45.
			lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a.	Rs. p.	Rs. a.	Rs. p.	Rs. a.	Rs. p.
A—1	Fish manure, 200 maunds, Rs. 4	Country cotton ...	20	6	14	43	233	73	169	[illegible] 10	[illegible] 13	17 7	[illegible] 00	−27 9	−20 [illegible]
A—2	Farm [illegible] manure, [illegible], 1 cwt. each, Rs. 0 ...	Ditto ...	32	10	[illegible]	[illegible]	220	121	[illegible]	[illegible] 3	4 7	28 10	— o	−16 6	−20 6
[illegible]	Farmyard manure, 200 maunds, Rs. 4.	New Orleans ...	21	8	10	[illegible]	[illegible]	57	191	10 6	8 4	[illegible] 10	— 00	−22 0	−23 14
[illegible]	Farmyard manure, gypsum and [illegible], 1 cwt. each, Rs. 0 ...	Ditto ...	[illegible]	12	[illegible]	53	132	142	[illegible]	[illegible] 0	4 10	[illegible]	— o	−11 0	−16 0

* Note.—[illegible] of 50 [illegible] manure and 1 cwt. [illegible]. Area of [illegible] 400 square yards.

STATEMENT No. V.

Cotton—Nankin, sown in 1885.

Quantity [illegible] applied per acre.	Value of manure.		Calculation of the result and comparison of outturn with the standard plot in the series (B).					Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.							
			Weight of uncleaned cotton.	Weight of cleaned cotton.	Weight of seed.	Percentage of cotton over seed.	Percentage of seed over cotton.	Outturn per [illegible]: Cotton.	Outturn per [illegible]: Seed.	Value of outturn: Cotton at Rs. 1 per 5 lb.	Value of outturn: Seed at Rs. 1 per 60 lb.	Value of outturn: Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 31.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 45.	Net profit or loss over or against the assumed income, Rs. 45.
			lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. p.	Rs. a.	Rs. a.	Rs. a.		Rs. a.
A.															
Manured with farmyard manure, 200 maunds, per acre.	Rs. 8 [illegible] 100 maunds,	Ratooned portion ...	62	14	8	87	9	85	220	17 0	8	20 18	+7 14	[illegible]	[illegible] 8 15
B.															
[illegible]ed with farmyard manure, 200 maunds, per acre.	Rs. 8 [illegible]	[illegible]ed portion,	51	14	38	37	271	63	220	17 0	8 13	20 18	+ [illegible]	—24 13	—16 16

Area of each plot [illegible] square yards.

		Rs. a. p.
Note.—(1) Saving by no ploughing	...	1 10 0
(2) " " seed	...	0 4 0
(3) " " weeding	...	7 8 0
Total	...	[illegible]

		Rs. a. p.
Extra charge.—Value of extra manure, [illegible] maunds	...	[illegible] 8 0
*Net gain	...	[illegible] 14 0
	...	[illegible]

STATEMENT No. VI.

Cotton— [illegible] 1887.

Quantity of manure applied per acre.	Special treatment.	Calculation of the results and comparison of outturn with the standard plot in the season (B). Weight of uncleaned cotton.	Weight of cleaned cotton.	Weight of seed.	Percentage of cotton over seed.	Percentage of seed over cotton.	Comparison of cost and [illegible] with the ordinary [illegible] of cultivation in this country. Outturn per acre. Cotton.	Seed.	Value of outturn. Cotton at Re. 1 per 5 lb.	Seed at Re. 1 per 60 lb.	Total.	Gain or loss per acre in the cost of cultivation against the cost of ordinary cultivation assumed to be Rs. 31?	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 45.	Net profit or loss over or against the assumed income Rs. 45.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.	Rs. a.
A.														
Farmyard manure, 200 maunds	Nankin cotton sown before rain.	184	49	120	35	279	172	480	34 6	8 0	[illegible] 0	[illegible]	[illegible] 5	[illegible] 8
B.														
Farmyard manure, 200 maunds	Nankin cotton sown after rain.	40	10	30	33	300	40	120	[illegible] 0	[illegible] 0	10 0	[illegible]	[illegible] 0	–36 8

*Note.—Value of [illegible] to [illegible] farmyard manure applied were. Area of [illegible] acre yards.

STA[illegible] No. VII.

[illegible]ment.

Treatment.	Area in square yards.	Weight of cane.	Weight of juice.	Weight of rab or gur.	Percentage of juice over rab.	Percentage of rab over juice.	Increase or decrease over indigenous way of sowing.	Increase or decrease per acre.	Outturn per acre: Juice.	Outturn per acre: Rab.	Value of outturn: Gur at Rs. 1 per 22 ft.	Value of outturn: Total.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 82.	Net profit or loss over or against the assumed income Rs. 82.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a.	Rs. a.	Rs. a.	Rs. a.
Shikar [illegible] seed (Ex[illegible] or [illegible]).														
(1) Sown in lines	900	976	474	110	2050	23·82	887	1,[illegible]	2,549	646	29 6	30 6	[illegible]	[illegible]
(2) After indigenous	900	1,962	906	258	350·6	27·51	814	1,[illegible]	4,875	1,[illegible]	61 0	61 8	[illegible]	[illegible]
Bahera [illegible] or Dhaul).														
(1) [illegible] lines	900	2,740	1,404	260	561·6	17·81	237	1,226	7,[illegible]	1,[illegible]	61 1	61 1	—20 15	—20 15
(2) [illegible] indigenous [illegible]	900	5,007	2,010	316	703·20	13·59	260	1,315	13,409	1,600	77 4	77 4	— 4 12	— 4 12
[illegible]														
(1) [illegible] in lines	900	3,096	1,498	204	486·0	20·63	103	1,040	7,880	1,281	71 14	71 14	—10 2	—10 2
(2) after indigenous wa[illegible] sowing	900	4,059	1,570	420	480·6	21·71	137	737	10,620	2,307	104 14	104 14	+22 14	+22 14
Indigenous seed (Ma[illegible]).														
(1) S[illegible] in lines	900	5,450	2,088	457	613·8	16·8	70	414	16,060	2,630	[illegible] 9	110 9	+37 9	+37 9
(2) I[illegible] indigenous way of so[illegible]	900	6,090	2,858	560	509·6	19·7	...	...	16,477	3,014	[illegible] 6	128 [illegible]	+46 6	+46 6

6. *Temporary experiments.*—Determination of the value of mustard and cotton-cake used as manure against dung obtained from cattle fed on the same cakes. The outturn obtained from plots manured with cake was higher than that given by plots treated with the dung of cattle fed on cake, but from point of economy the latter proved the better. As in the last year, the results from mustard cake were better than those from cotton-seed cake, *vide* statements Nos. VII and VIII.

7. *Determination of duration for which the effects of certain manures last.*—They were applied in 1885 and withheld since that year. Statement No. IX shows the results. As expected, the plot manured with saltpetre is more exhausted than the plot to which the cowdung or poudrette was applied; still the results obtained from the former are not worse than from the plot to which no manure was applied.

8. *Competitive trial of Busar and Mundia wheat.*—The seed of each variety was sown in two plots; in one sowing was done in the native way behind the plough, and in the other by a drill. Mundia, I should note, is the variety mostly grown in Cawnpore district, while the other was the produce raised last year from seed received from Bengal. Busar wheat matured early and in the plot sown after the native fashion its produce exceeded that of Mundia by 200lb, but in the plot sown by drill it fell short by 30lb. of the outturn which the plot of Mundia similarly sown gave.

9. *Smithi wheat.*—In appearance this variety resembles the trans-Jumna wheat; its grains are long and transparent with a somewhat reddish tinge, and its ears have a double row of grain like English barley. It matured over a week after the Muzaffarnagar variety and required one more watering; the outturn was just as good as that of Mundia, *vide* statement No. X.

10. *English wheat.*—A few ounces of wheat were received from Messrs. PrMCb-Kauer and Co. The seed took longer time to germinate: up till February the plants were only an inch high and looked more like a grass growing in tufts. At last stalks appeared and bore ears; the grain ripened a month after all the Indian varieties were gathered, but it ... The experiment confirmed that English wheat will not succeed in the lower Doab.

11. *Catch crop.*—In a field of oats, when ... lucerne seed was drilled in which germinated well, but its plants were, of course, kept down by oats. Its addition did not affect the yield of oats, which was rather more than the produce obtained from a neighbouring field to which lucerne was not added. The crop of lucerne was kept for seed and added Rs. 12 to the profit. ... of catch crops can be recommended in-... barley.

12. *Effect of gypsum on leguminous crops.*—Gypsum was applied to a field of peas and gram; its effect on the former was not much, but it increased the produce of the ... The following statement shows the result:—

Number of plot.	Crops.	Manure and quantity per acre.	Outturn per acre.		Increase due to gypsum.	
			Grain.	Straw.	Grain.	Straw.
			lb.		lb.	lb.
1	Peas ...	Farmyard manure 100 maunds, gypsum 3 cwt. ...	1,672	1,608	22	20
2	Ditto ...		1,610	1,698	...	...
3	Gram ...		1,611	6SC	1G3	60
4	Ditto ...	Farmyard manure 100 maunds ...	1,408	537	...	...

13. ... the following varieties of barley were sown at the station, for ascertaining their value in the English market:—

1. Green.
2. Chocolate color.
3. White huskless.

It was intended to grow a sufficiently large quantity, on which a definite opinion could be procured ; but more than a handfol of their seed could not be procured, which low produced the following quantities :—

1. Green, 210H).
2. Chocolate, *4'2tb.*
3. White huskless, 95H».

No. 3 so much resembles wheat that it would rather bo well not to encourage its cultivation, as otherwise there is a fear *of* its being added to wheat for purposes of adulteration. Chocolate barley would perhaps, from its color, find a good market in England for malting purposes.

14. *Effect of certain manure on potato*.—The following statement shows the result of this experiment: it will he seen that 10 maunds of castor cake with 3 cwts. of gypsum gave nearly as good result as 500 maunds of farmyard manure or 200 maunds of poudrette, with **54ft. of** iron sulphate. This is, however, the first year in which the experiment has been tried, and the results require to be confirmed for future trials :—

Comber of plot.	Manure nnij qusotitv per net*.	Outturn per acre.	IncrcaK over the last pint.
		lbs.	Eb
1	I'oudroLto 200 mniitids, rolpjl»t» rf irnn i *»t- -.. ...	4,373	—114
2	Woollen rofasc 200 maunds and gjpso" 3 ewta ...	3.0SO	—1,707
3	Pdndrette 300 raaunik and kaniti! 5 owta. p* «!» ...	3,«K)	— 1,3B7
4	Castor-oil cake 10 mannds and g.Vjisuu 3 tn,ta " ...	4.S40	+ 53
5	i-'urmj^rd nianuwaml poudrettc 500 irn" ...	-1.7S7	...

15. *Alanffold Wu-rzeL*—Berkshire Yellow Globe and Sutlon'a Golden Tankard were sown in a fielii **measuring** half an sere and produced u total crop of **110** maunds. The cattle at the statiou took to them kindly this year.

16. *Ensilage,*—A largo pit was filled with cAari.and the common grasses of **the** rainy season. It was opened in May ami proved sound ; the ensilagu was freely eaten by cattle,

MIR E0HAMHAD HUSAJN, M.R.A.C.,

AtsUianl Director

STATEMENT No. I.—STANDARD SERIES.

Number of plots according to the map of Farm.	Detail of manure.	CALCULATION OF THE RESULTS AND COMPARISON OF PLOTS WITH THE UNMANURED PLOT IN THE SERIES. 1. Value of manure per acre.	2. Weight of unthreshed sheaves.	3. Weight of grain.	4. Weight of straw.	5. Weight of grain per bushel.	6. Percentage of grain on straw.	7. Percentage of straw on grain.	8. Increase or decrease over unmanured plot.	9. Increase or decrease per acre.	COMPARISON OF COST AND INCOME WITH THE ORDINARY KIND OF CULTIVATION IN VOGUE IN THIS COUNTRY. 10. Actual outturn per acre. Grain.	10. Straw.	11. Value of outturn. Grain @ Re. 1 per 41lb.	11. Straw @ Re. 1 per 400lb.	11. Total.	12. Gain or loss per acre in cost against the cost of ordinary cultivation, assumed to be Rs. 20.	13. Gain or loss per acre in the value of outturn against ordinary cultivation, assumed to be Rs. 30.	14. Net profit or loss over or against the assumed income, Rs. 50.	15. Remarks.
		Rs. a. p.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
1	Saltpetre 240lb. per acre	10 5 0	344 0	96 0	248 0	66 0	38·7	258·3	+16	+193	1,161	3,001	28 5 0	7 8 0	35 13 0	−7 3 0	−2 3 0	−9 8 0	
2	Ditto bonedust 360lb. per acre	13 10 0	341 0	110 0	231 0	66 0	47·6	210·0	+30	+363	1,331	2,795	32 7 0	7 0 0	39 7 0	−10 10 0	+1 7 0	−9 3 0	
3	Cow-dung 180 maunds per acre	5 6 0	376 0	103 0	273 0	65 0	37·7	265·0	+23	+277	1,245	3,303	30 6 0	8 4 0	38 10 0	−2 6 0	+0 10 0	−1 12 0	
4	Ditto and bonedust 360lb. per acre	8 11 0	359 0	109 0	250 0	65 0	43·6	229·4	+29	+351	1,319	3,025	32 4 0	7 9 0	39 13 0	−5 11 0	+1 13 0	−3 14 0	
5	Ditto and gypsum 240lb. ditto	10 8 0	370 0	100 0	270 0	65 0	37·0	270·0	+20	+242	1,210	3,267	29 8 0	8 3 0	37 11 0	−7 8 0	−0 5 0	−7 13 0	
6	Sheep-dung 180 maunds ditto	6 6 0	330 0	119 0	210 0	66 0	56·7	176·5	+39	+472	1,440	2,541	35 12 0	6 6 0	42 2 0	−2 6 0	+4 2 0	+1 12 0	
7	Ashes of 180 maunds dung	6 8 0	257 0	67 0	190 0	[illegible]	35·3	283·6	−13	−157	811	2,299	19 12 0	5 12 0	25 8 0	−2 8 0	−12 8 0	−15 0 0	
8	Sheep-dung 180 maunds and bone-dust 300lb.	8 11 0	353 0	79 0	274 0	65 0	28·8	346·8	−1	−12	956	3,315	23 5 0	8 5 0	31 10 0	−5 11 0	−6 6 0	−12 1 0	
9	Saltpetre 240lb. and bone-super 240lb.	20 0 0	323 0	92 0	231 0	65 0	39·8	251·1	+12	+145	1,113	2,791	27 2 0	7 0 0	34 2 0	−17 0 0	−3 14 0	−20 3 0	
10	Sheep-dung 180 maunds and gypsum	10 8 0	313 0	118 0	195 0	66 0	60·5	165·2	+38	+460	1,428	2,359	34 13 0	5 14 0	40 10 0	−7 8 0	+2 10 0	−4 14 0	
11	No manure ...	...	207 0	80 0	127 0	65 0	62·9	158·7	...	...	968	1,537	23 10 0	3 15 0	27 9 0	+3 0 0	−10 9 0	−4 7 0	
12	Poudrette 180 maunds per acre	8 13 0	238 0	105 8	133 0	65 0	79·9	125·1	+25 8	+309	1,277	1,597	31 2 0	4 0 0	35 2 0	−3 12 0	−2 14 0	−6 10 0	
13	Ashes of 180 maunds dung and saltpetre.	16 13 0	371 0	158 0	213 0	65 0	74·2	134·8	+78 0	+944	1,912	2,577	46 10 0	6 7 0	53 1 0	−12 13 0	+15 0 0	+2 3 0	

Area of each plot 400 square yards.

No. 1299o OF 1888.

DEPARTMENT OF LAND RECORDS AND AGRICULTURE, N.-W. P. AND OUDH.

DATED CAWNFORE, THE 9TH OCTOBBB, 1888.

FROM

LIEUT.-COLONEL D. G. PITCHER,

OFFQ. DIR. OF LAND RECORDS AND AGRICULTURE,

N.-W. PROVINCES AND OUDH.

To

THE CHIEF SECRETARY TO GOVERNMENT,

N.-W. PROVINCES AND OUDH.

SIR,

I HAVE the honor to submit, for the information of His Honor the Lieutenant-Goyernor and Chief Commissioner, the Annual Report of Mir Muhammad Husain, Assistant Director, on the Cawnpore Experimental Farm for the rabi season of 1888.

2. The report states that while the season was favourable, the average outturn was low owing to the inclusion therein of every kind of experimental plot; as this affords no real clue to the general effect of the season, the Assistant Director will be asked to give in future a second average for plots under ordinary cultivation, from which some idea can be got as to the produce realized by cultivators generally.

3. The experiments are described in the usual detail as permanent and temporary, and disclose no results of such particular novelty as to call for comment. The good effects of deep ploughing, green soiling, of gypsum when applied to leguminous crops and of the good value to be obtained in the shape of manure for many materials now neglected of the people, have all been demonstrated before, but constant repetition is needed to keep the memory of these facts green. There are some experiments, however, of former years that have been discontinued which may, I think, be revived with advantage, such as growing for statistics of produce sample fields of all the main rabi crops, the cultivation of wheat on strips, with alternate strips of fallow, the pedigreeing of wheat, experiments with fodder grasses, *Sec.* I have given suggestions in this direction against next year's operations, the report on which will, as approved in G. O. No. -2%-, dated 20th July, 1888, combine the results of both harvests.

I have the honor to be,

SIR,

Your most obedient servant,

D. G. PITCHER, LIEUT.-COL.,

Offg. Director.

STATEMENT No. III.—GREEN MANUKE SERIES.

Number of plot according to the map of Farm.	Delail o£ fertilizer	CALCULATION OF THE BJ>SFJ,T AND COWrAIUSOX OF OUTTURN WITH US1TANU11EJ) TLOT IT TUB BEUIE3.									COMPARISON OF COST AND INCOME WITH THE ORDINARY KIND OF CULTIVATION IN VOGUE IN THIS COUNTRY.								
		1	2	3	4	5	6	7	8	9	10		11			12	13	14	15
		Value of the fertilizer in Cawnpore Farm.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Actual outturn per acre.		Valve of outturn			Gain or loss per acre in cost against the cost of ordinary cultivation, assumed to be Rs. 10.	Gain or loss per acre in the value of outturn against ordinary cultivation, assumed to be Rs. 28.	Net profit or loss over or against the assumed income, Rs. 28.	Remarks.
											Grain.	Straw.	Grain @ Re. 1 per 41lb.	Straw @ Re. 1 per 400lb.	Total.				
		Rs. a. p.	lb.	lb. oz.	lb.	lb.	lb.	lb.	lb. oz.	lb.	lb.	lb.	Rs. a. p.	Rs. a. p.	Es. s. p.	Ea. a. p.	Us. *a.* *p.*	Rs. a. p.	
1	Okl indigo refuso 120 mnunds per acre.	4 12 0	204	114 0	290	65	40·7	245·6	+49 0	+520	1,379	3,388	33 10 0	8 8 0	42 2 0	-1 12 0	+4 2 0	+2 6 0	
2	Fresh ditto 120 mtrands and lime 6 inminda.	6 8 0	300	123 0	245	60	50·2	199·1	+58 0	+702	1,459	2,064	36 5 0	7 7 0	43 12 0	-3 8 0	+5 12 0	+2 4 0	
3	Indigo water 3,000 culjic feet ...	27 0 0	216	71 6	143	66	50·0	200·0	+6 8	+79	863	1,730	21 2 0	4 5 0	25 7 0	-34 0 0	-12 9 0	-46 9 0	
4	Hemp water ditto	15 8 0	161	56 0	104	...	53·8	185·7	-9 0	-106	678	1,258	16 9 0	S 2 0	19 IX 0	-15 8 0	-18 5 0	-33 13 0	
5	No manure	...	163	65 0	116	...	56·0	178·4	...	...	780	1,379	19 8 0	3 7 O!	23 10 0	+3 0 0	-12 6 0	-12 6 0	
C	Green indigo n]owli<sl in ...	2 12 0	235	76 0	150	65	47·8	200·2	+11 0	+134	920	1,924	22 1 0	4 13 0	20 11 0	+0 4 0	-11 2 0	-10 1t 0	
7	**Wheat sown** aftur indigo ...	1 8 0	360	1H 0	232	66	45·2	281·6	+45 0	+503	1,370	3,040	33 10 0	7 10 0	41 4 0	+1 8 0	+3 ; 0	+4 12 0	
8	Indigo crop ploughed and 6 maunds gypsum.	13 7 0	183	61 0	120	...	40·5	247·1	-14 0	-169	617	1,525	15 1 0	3 13 0	18 14 0	-10 7 0	-ID 5 0	-29 9 0	
9	Hemp and gypsum as above ...	13 12 0	208	72 0	136	64	52·0	188·0	+7 0	+85	871	1,640	21 4 0	4 2 0	25 G 0	-10 IS 0	-12 10 0	-23 G 0	
10	Wlicsit niter Wcrn	...	234	82 0	152	66	53·0	185·4	+7 0	+200	902	1,800	24 3 0	4 10 0	28 13 0	+3 0 0	-9 3 0	-6 3 C	
11	Wheat loiK-n after hemp ...	...	250	86 0	173	66	49·7	201·2	+ 201 0	+25B1	1,04,1	2,080	25 6 0	5 4 0	30 10 0	+3 0 0	-7 G 0	-3 6 0	
12	Hemp plongVici -wlitn -1 £oct hi(;n ...	3 4 0	273	75 0	190	66	37·7	266·4	+10 0	+121	907	2,408	22 1 0	6 0 Oi	28 1 0.	-0 -1 C	-9 15 0	-9 5 0	

EEPOUT

ON THE

CAWNPORE EXPERIMENTAL STATION

FOR THE RABI SEASON OF 1888.

THB season has been generally very favourable, still the average outturn at tho station was very low. This is partly due to the continued cultivation of wheat in the same plots year after year without rotation or change in manure and partly to strong winds in February, just when many of the fields were watered which laid the plants.

2. The experiments conducted during the season may be classed as usual into (a) permanent, (6) temporary. The scheme of the permanent experiments have been fully described in previous reports.

The appended tubular statement Nos. I and II confirm the result heretofore generally obtained, *viz.*:—

(1)—That saltpetre applied either alone or combined with some other fertilizer benefits the straw more than it benefits the grain.

(2)—The percentage of grain on straw in unmanured plot is higher than in manured plot.

(3)—The most economical manure for wheat is farmyard manure.

(4)—By alternating wheat with maize its outturn is much increased.

3. *Green-oiling.*—The results of these plots are shown in statements III, IV, •nd V, and may be summarized as follows :—•

(IV—Following wheat after indigo is more economical than ploughing the indigo as manure.

(2)—Ploughing in a green crop of hemp is a most economical way of enriching the land, and is most to be recommended for fields where farmyard manure cannot be applied with profit either owing to long distance or scarcity of manure, *vide* statement No. IV.

(3)-Indigo refuse with lime is more effective than the refuse alone, *vide* statement No. V«

In connection with these experiments, I should note that cost of indigo refuse and indigo water, as entered in the statements, is much higher than what their cost would have been had there been an indigo factory close to the station.

4. *Miscellaneous manures.—Among* these are included a number of things which we ordinarily reckoned as mere waste, and for which people in towns and in villages have to spend money simply to get rid of them. Road scrapings have this year given better results, and so also the composts and the ashes of weeds. Statement VI shows result* and proves that an application of any of them is bettor than giving no manure.

5. *Ploughing.*—The experiment was conducted on the same plots in which it was tried in previous years : the result as last year is in favor of moderately deep ploughing. The fields ploughed 9 inches deep gave no better result than those ploughed with the country plough.

6. *Temporary experiments.*—Determination of the value of mustard and cotton cake used as manure against dung obtained from cattle fed on the same cakes, The outturn obtained from plots manured with cake was higher than that given by plots treated with the dung of cattle fed on cake, but from point of economy the latter proved the better. As in the last year, the results from mustard cake were better than those from cotton-seed cake, *vide* statements Nos. VII and VIII.

7. *Determination of duration for which the effects of certain manurt* last*— They were applied in 1886 and withheld since that year. Statement No. IX shows the results. As expected, the plot manured with saltpetre is more exhausted than the plot to which the cowdung or poudrette was applied ; still the results obtained iron* the former are not worse than from the plot to which no manure was applied.

8. *Competitive trial of Buxar and Mundia wheat.*—The seed of each variety was sown in two plots: in one sowing was done in the native way behind the plough, and in the other by a drill. Mundia, I should note, is the variety mostly grown in Ca*n-pore district, while the other was the produce raised last year from seed received from Bengal. Buxar wheat matured early and in the plot sown after the native fashion its produce exceeded that of Mundia by 200ft, but in the plot sown by drill it fell short by 350ft. of the outturn which the plot of Mundia similarly sown gave.

9. *Simlhi wheat.—In* appearance this variety resembles the trans-Jumna wheat: its grains are long and transparent with a somewhat reddish tinge, and its ears have a double row of grain like English barley. It matured over a week after the Muz*-farnagar variety and required one more watering *i* the outturn was just as good as that of Mundia, *vide* statement No-. X.

10. *English wheat.*—A few ounces of wheat were received from Messrs. Prase) kauer and Co. The seed took longer time to germinate: up till February the plants were only an inch high and looked more like a grass growing in tufts. At last sta ** appeared and bore ears ; the grain ripened a month after all the Indian varieties were gathered in, but it was very thin. The experiment confirmed that English wheat will not succeed in the lower Doab.

11. *Catch crop.—In* a field of oats, when the plants were some four inches hi*li> lucerne seed was drilled in which germinated well, but its plants were, of cour.so, kept down by oats. Its addition did not affect the yield of oats, which was rather more than the produce obtained from a neighbouring field to which lucerne was not added. The crop of lucerne was kept fo? seed and added Rs. 12 to the profit. Where water is available this system of catch-cropping can be safely recommended m fields of barley.

12. *Effect of gypsum on leguminous crops.*—Gypsum was applied to a field of peas and gram ; its effect on the former was not much, but it increased the produce of the latter by 113ft. per acre. The following statement shows the result z—

Number of plot.	Crops.	Manure and quantity pep acre.	Outturn per acre.		Increase due to gypsum.	
			Grain	Straw	Grain.	Straw.
			lb.	lb.	lb.	lb.
1	Peas ...	Farmyard manure 100 maunds, gyp" sum 3 cwts.	1,873	1,608	33	20
2	Ditto ...	Farmyard manure 100 maunds ...	1,840	1,588	...	...
3	Gram ...	Farmyard manure 50 maunds, gyp9,,111 3 cwts.	1,611	557	113	50
4	Ditto ...	Farmyard manure 100 yards ...	1,498	507	...	...

13. *Bar*%>-With a view of ascertaining their • value in the English market the following varieties of barley were sown at the station:-

1. Green.
2. Chocolate color .
3. White huskies*

It was intended to grow a sufficiently large quantity, on which a definite opinion could be procured ; but more than a handful of their seed could not be procured, which has produced the following quantities :—

1. Green, 210tt>.
2. Chocolate, 421b.
3. White huskless, 951b.

1^o. 3 so much resembles wheat that it would rather be well not to encourage its cultivation, as otherwise there is a fear of its being added to wheat for purposes of adulteration. Chocolate barley would perhaps, from its color, find a good market in Engalnd for malting purposes.

14. *Effect of certain manure on potatoes.*—*The following statement shows the result of this experiment : it will be seen that 10 maunds of castor cake with 3 cwts. of gypsum gave nearly as good result as 500 maunds of farmyard manure or 200 maunds of poudrette, with 541b. of iron sulphate. This is, however, the first year in ^hich the experiment has been tried, and the results require to be confirmed for future trials :—

dumber of plot.	Manure and quantity per ncre.	Outturn per acre.	Increase over the last plot.
		lbs.	lbs.
1	Poudrette 200 maunds, sulphate of iron * cwt	4,373	—414
2	Woollen refuse 200 maunds and gyp3um 3 cwts. ...	3,080	—1,707
3	Poudrette 200 maunds and kanite 5 cwts. per acre ...	3,400	—1,387
4	Castor-oil cake 10 maunds and gypsum 3 cwts.	4,840	+ 53
5	Farmyard manure and poudrette 500 maunds	4,787	...

15. *Mangold WurzeL*__Berkshire Yellow Globe and Sutton's Golden Tankard xvere sown in a field measuring half an acre and produced a total crop of 110 Maunds. The cattle at the station took to them kindly this year.

16. *Ensilage.*__A large pit was filled with *chari* and the common grasses of the rainy season. It was opened in May and proved sound ; the ensilage was freely «aien by cattle.

MIR MOHAMMAD HCJSAIN, M.R.A.C.,
Assistant Director.

STATEMENT No. I.—[illegible]

Number of plots according to the map of farm.	Detail of manure.	1. Value of manure per acre.	2. Weight of unthreshed sheaves.	3. Weight of grain.	4. Weight of straw.	5. Weight of grain per bushel.	6. Percentage of grain on straw.	7. Percentage of straw on grain.	8. Increase or decrease over unmanured plot.	9. Increase or decrease per acre.	10. Actual out-turn per acre. Grain.	10. Actual out-turn per acre. Straw.	11. Value of outturn. Grain @ Re. 1 per 41lb.	11. Value of outturn. Straw @ Re. 1 per 400lb.	11. Value of outturn. Total.	12. Gain or loss per acre in cost against the cost of ordinary cultivation, assumed to be Rs. 30.	13. Gain or loss per acre in the value of out-turn against ordinary cultivation, assumed to be Rs. 38.	14. Net profit or loss over or against the assumed income, Rs. 38.	15. Remarks.
		Rs. a. p.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
1	Saltpetre 240lb. per acre ...	10 [illegible] 0	244 0	[illegible]	348 0	58 0	58·7	[illegible]	+46	+183	1,101	3,001	[illegible] 1 0	[illegible]	35 [illegible]	−7 6 0	−2 8 0	−9 8 0	
2	Ditto bonedust 240lb. per acre ...	[illegible] 5 0	[illegible]	[illegible]	331 0	58 0	47·6	[illegible]	+80	+383	1,331	2,795	33 7 0	[illegible]	39 7 0	[illegible]	+1 7 0	−8 3 0	
3	Cow-dung 180 maunds per acre ...	[illegible]	376 0	[illegible]	378 0	58 0	37·7	235·0	+39	+7	1,245	3,500	30 6 0	[illegible]	38 10 0	[illegible]	[illegible]	[illegible] 12 0	
4	Ditto and bonedust 240lb. per acre	[illegible]	360 0	[illegible]	360 0	56 0	[illegible]	323·4	+28	+351	[illegible]	3,025	[illegible]	7 9 0	38 1[illegible] 0	−5 [illegible]	[illegible]	3 14 0	
5	Ditto and gypsum 240lb. ditto ...	10 [illegible] 0	[illegible]	100	370 0	56 0	[illegible]	270·0	+30	+248	[illegible]	3,307	33 6 0	6 6 0	37 11 0	−7 [illegible]	[illegible]	−7 18 0	
6	Sheep-dung 180 maunds ditto ...	5 5 0	330 0	110	310 0	58 0	[illegible]	178·5	+39	+473	1,440	2,641	35 13 0	5 6 0	43 3 0	−3 6 0	+4 [illegible]	+1 13 0	
7	Ashes of 180 maunds dung ...	6 [illegible]	357 0	67	130 0	54 0	35·3	288·6	−13	−167	871	2,299	19 12 0	6 12 0	26 [illegible]	−3 [illegible]	−12 [illegible]	[illegible]	
8	Sheep-dung 180 maunds and bonedust 240lb.	6 11 0	253 0	78	174 0	56	38·3	245·8	[illegible]	−17	956	3,015	23 5 0	8 5 0	31 10 0	[illegible]	[illegible]	[illegible]	
9	Saltpetre 240lb. and bone-super 240.	10 0 0	329 0	95	231 0	55 0	39·5	251·1	[illegible]	+145	1,118	2,791	27 3 0	7 [illegible] 0	34 [illegible] 0	[illegible]	[illegible]	−10 3 0	
10	Sheep-dung 180 maunds and gypsum.	10 6 0	313 0	116	195 0	56 0	60·5	165·9	[illegible]	+460	1,425	[illegible]	34 18 0	5 [illegible] 0	40 [illegible]	[illegible]	[illegible]	−4 14 0	
11	No manure	...	307	[illegible]	217 0	55 0	[illegible]	158·7	...	...	952	1,507	23 10 0	3 15 0	27 9 0	[illegible]	−1 [illegible]	−4 7 0	
12	Poudrette 180 maunds per acre ...	[illegible]	[illegible]	[illegible]	133 0	63 0	[illegible]	135·1	+25 8	+800	1,377	[illegible]	31 3 0	4 0 0	35 3 0	[illegible]	−3 14 0	[illegible]	
13	Ashes of 180 maunds dung and saltpetre.	[illegible]	[illegible]	[illegible]	0 218 0	58 0	74·2	134·8	+78 0	+944	1,012	[illegible]	46 [illegible]	6 7 0	[illegible] 1 0	[illegible]	+15 0 0	[illegible]	

Acre = 400 square [illegible].

STATEMENT No. III.—GREEN MANURE SERIES.

No. of plot.	Detail of fertilizer.	CALCULATION OF THE RESULT AND COMPARISON OF OUTTUBN WITH UNMANUBED PLOT IT THE 6EBIES. 1 Value of the fertilizer in Cawnpore Farm.	2 Weight of unthreshed sheaves.	3 Weight of grain.	4 Weight of straw.	5 Weight of grain per bushel.	6 Percentage of grain on straw.	7 Percentage of straw on grain.	8 Increase or decrease over standard plot in the series.	9 Increase or decrease per acre.	COMPAEISON OF COST AND INCOME WITH THE OBDINAUY KIND OF CULTIVATION IN TOGUB IN THIS COrXTUY. 10 Actual outturn per acre. Grain.	10 Actual outturn per acre. Straw.	11 Value of outturn. Grain @ Re. 1 per ... lb.	11 Value of outturn. Straw @ Re. 1 per 400 lb.	11 Value of outturn. Total.	12 Gain or loss per acre in cost against the cost of ordinary cultivation, assumed to be Rs. 3.	13 Gain or loss per acre in the value of outturn against ordinary cultivation, assumed to be Rs. 38.	14 Net profit or loss over or against the ordinary cultivation.	15 Remarks.
		Bs. a. p.	ft.	ft. 02.	ft.	lb.	lb.	lb.	lb. oz.	ft.	lb.	ft.	Bs. a. p.	Bs. a. p.	Bs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
1	Old indigo refuse 120 maunds per acre.	4 12 0	394	1 14 0	280	65	40-7	245·6	+49 0	+593	1,379	3,388	33 10 0	8 8 0	42 2 0	−1 12 0	+4 2 0	+2 6 0	
2	Fresh ditto 120 maunds and lime 6 maunds.	6 8 0	3GS	123 0	2i5	60	50-2	199·1	+58 0	+702	1,488	2,964	36 5 0	7 7 0	43 12 0	−3 8 0	+5 12 0	+2 4 0	
3	Indigo water 3,600 cuUc feet ...	37 0 0	21G	71 8	143	66	50-0	200·0	+6 8	+79	865	1,730	21 2 0	4 5 0	25 7 0	−34 0 0	−12 9 0	−46 9 0	
4	Hemp water ditto	18 8 0	161	56 0	m	...	53·8	185-7	-9 0	-108	678	1,258	16 9 0	3 2 0	19 11 0	−15 8 0	−18 5 0	−33 13 0	
5	No manure.,.	...	181	65 0	116	...	56·0	178-4	...	...	78G	1*379	19 3 0	3 7 0	22 10 0	+3 0 0	−15 6 0	−12 6 0	
6	Green indigo ploughed in ...	2 12 0	235	76 0	159	66	47·8	[illegible]	+11 0	+134	920	1,924	22 1 0	4 13 0	26 14 0	+0 4 0	−11 2 0	−10 14 0	
7	Wheat sown after indigo ...	1 8 0	366	114 0	252	[illegible]	45·2	211-6	+49 0	+593	1,379	3,049	33 10 0	7 10 0	41 4 0	+1 8 0	+3 4 0	+4 12 0	
8	Indigo crop ploughed and 6 inannds gypsum.	13 7 0	188	61 0	126	...	40-5	247T	-14 0	-169	617	1,525	15 1 0	3 13 0	18 14 0	−10 7 0	−19 2 0	−29 9 0	
9	Hemp and gypsum as above ...	13 12 0	208	72 0	136	64	62-9	188-9	+7 0	+85	871	1,640	21 4 0	4 2 0	25 6 0	-10 12 0	−12 10 0	−23 6 0	
10	Wheat after lucern	...	234	82 0	162	66	53-9	185·4	+7 0	+206	992	1,839	24 3 0	4 10 0	28 13 0	+3 0 0	−9 3 0	−6 3 0	
11	Wheat sown after hemp ...	...	259	8G 0	173	6[illegible]	49-7	201-21	+201 0	+2551	1,0411	2,093	25 6 0	5 4 0	30 10 0	+3 0 0	−7 6 0	−4 6 0	
12	Hemp ploughed when 4 feet high ...	S 4 0	275	1 75 0	199	[illegible]	37·7	265-31	+10 0	+121	9071	2,408	22 1 0	6 0 0	28 1 0	-0 4 0	−9 15 0	−10 3 0	

STATEMENT No. IV.

Number.	Detail of fertilizer.	Calculation of the result and comparison of outturn with the unmanured plot in the series.									Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.								
		1	2	3	4	5	6	7	8	9	10		11			12	13	14	15
		Cost of the fertilizer in Cawnpore Farm.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Actual outturn per acre.		Value of outturn.			Gain or loss per acre in cost against the cost of ordinary cultivation, assumed to he Rs. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation, assumed to he Rs. 38.	Net profit or loss over or against the assumed income, Rs. 38.	Remarks.
											Grain.	Straw.	Grain @ Be. 1 per 41 It-	Straw @ Be. 1 per 400ft·	Total.				
		Rs. a. p.	lb. oz.	lb. oz.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
1	Hemp ploughed	3 4 0	1,508½	313 14	1,148 0	65 8	44 ¾	183 ½	...	...	1,325½	2,202½	31 5 0	5 11 0	37 0 0	−0 4 0	−1 0 0	−1 4 0	
2	Unmanured	...	721½	220¼	403¼	60 0	50½	204	−10	...	587	1,107	14 5 0	2 14 0	17 3 0	+8 0 0	−20 13 0	−17 13 0	

Note—Average area of the plots {(1) of 2,424 square yards. (2) of 1,815 ditto.

STATEMENT No. [illegible]

Number of plots according to the map of Farm.	Detail of fertilizer.	[illegible] and comparison of outturn with the [illegible] plot in the series.									Comparison of cost and income with the ordinary kind of cultivation in this country.									
		1	2	3	4	5	6	7	8	9	10		11			12	13	14	15
											Out-turn per acre.		Value of [illegible].						
		Cost of the fertilizer in Cawnpore Farm.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Grain.	Straw.	Gain @ Re. 1 per 41lb.	Straw @ Re. 1 per 400lb.	Total.	Gain or loss per acre in cost against the cost of ordinary cultivation, assumed to be Rs. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation, assumed to be Rs. 38.	Net profit or loss over or against the assumed income, Rs. 38.	Remarks.
		R. a. p.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
1	Fresh indigo refuse 150 maunds and lime 6 maunds.	[illegible] 8 0	341·0	111	222½	56	50·2	187·9	+55½	+212	717	1,[illegible]	17 8 0	3 6 0	20 14 0	−8 8 0	−17 2 0	−20 10 0	
2	Ditto ditto alone ...	4 0 0	320·0	82·0	193·0	[illegible]	42·7	[illegible]	−1	−6	496	1,162	11 10 0	3 14 0	15 0 0	−1 12 0	−23 [illegible]	−24 13 0	
3	Old indigo refuse 120 maunds and lime 6 maunds.	8 8 0	446·0	[illegible]	280½	[illegible]	57	[illegible]	+91½	+354	1,066	1,[illegible]	25 12 0	3 15 0	29 11 0	−8 8 0	−[illegible]	−11 5 0	
4	Ditto ditto alone ...	4 13 0	345·0	112·0	233·0	56	47·5	210·7	+29	+176	[illegible]	1,423	16 9 0	3 9 0	20 2 0	−1 13 0	−17 14 0	−19 10 0	
5	No manure	...	220·0	83·0	154·0	58	60·3	196·4	...	...	502	988	12 4 0	2 7 0	14 11 0	+8 0 0	−23 5 0	−20 6 0	

[illegible]

STATEMENT No. VII.

Detail of manure.	1 Cost of manure on Cawnpore Farm.	2 Weight of unthreshed sheaves.	3 Weight of grain.	4 Weight of straw.	5 Weight of grain per bundle.	6 Percentage of grain on straw.	7 Percentage of straw on grain.	8 Increase or decrease over unmanured plot.	9 Increase or decrease per acre.	10 Actual outturn per acre. Grain.	10 Actual outturn per acre. Straw.	11 Value of outturn. Grain @ Re. 1 per 41 lb.	11 Value of outturn. Straw @ Re. 1 per 400 lb.	11 Value of outturn. Total.	12 Gain or loss per acre in cost against the cost of ordinary cultivation, assumed to be Rs. 30.	13 Gain or loss per acre in the value of outturn against ordinary cultivation, assumed to be Rs. 38.	14 Net profit or loss over ordinary assumed income, Rs. 38.	15 Remarks.
	Rs. a. p.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
Mustard cake 5 maunds per acre ...	8 1 0	437	129½	307½	04	42-1	237-6	+35½	+281	1,084	2,423	26 0 0	6 1 0	31 1 0	−6 1 0	−0 15 0	−12 0 0	
Ditto 10 maunds per aerc ...	16 0 0	470	164	300	68	54-6	183-6	+70	+564	1,297	2,480	31 10 0	0 1 0	37 11 0	−16 1 0	+0 5 0	−15 0 0	
Plain cowdung 200 maunds per acre ...	5 0 0	400	123	317	08	35-4	282-1	+29	+230	978	2,744	23 12 0	6 14 0	30 10 0	−3 0 0	−7 5 0	−10 8 0	
Cake-fed dung 50 maunds per aero ...	1 0 0	377	109	268	65	51-4	196-8	+15	+119	863	1,645	21 0 0	4 8 0	26 2 0	+1 0 0	−12 14 0	−11 14 0	
Ditto 100 maunds ...	4 0 0	354	107	257	08	37-5	360-3	+18	+108	848	2,270	20 10 0	5 11 0	25 5 0	−1 0 0	−11 11 0	−12 11 0	
No manure	...	343	94	251	68	37-4	207-0	...	...	743	1,236	18 2 0	4 15 0	23 1 0	+3 0 0	−14 15 0	−14 15 0	

Area 612 square yards,

STATEMENT No. VIII.

Detail of manure.	1. Cost of the manure in Cawnpore Farm. (Rs. a. p.)	2. Weight of unthreshed sheaves. (lb.)	3. Weight of grain. (lb.)	4. Weight of straw. (lb.)	5. Weight of grain per bushel. (lb.)	6. Percentage of grain on straw. (lb.)	7. Percentage of straw on grain. (lb.)	8. Increase or decrease over unmanured plot. (lb.)	9. Increase or decrease per acre. (lb.)	10. Actual outturn per acre. Grain. (lb.)	10. Actual outturn per acre. Straw. (lb.)	11. Value of outturn. Grain @ Re. 1 per 41 lb. (Rs. a. p.)	11. Value of outturn. Straw @ Re. 1 per 400 lb. (Rs. a. p.)	11. Value of outturn. Total. (Rs. a. p.)	12. Gain or loss per acre in cost against the cost of ordinary cultivation, assumed to be Rs. 30. (Rs. a. p.)	13. Grain or loss per acre in the value of outturn against ordinary cultivation, assumed to be Rs. 38. (Rs. a. p.)	14. Net profit or loss over or against the assumed income, Rs. 38. (Rs. a. p.)	15. Remarks.
[illegible] seed [illegible] maunds	[illegible] 0 0	200	108	[illegible]	65	71·0	[illegible]	+18	+108	[illegible]	1,202	20 15 0	3 0 0	[illegible] 13 0	0 0	−14 3 0	−13 3 [illegible]	
[illegible] seed [illegible] per acre	4 0 0	405	140	210	66	66·7	150·0	+51	+	[illegible]	1,2[illegible]	23 3 0	4 5 0	[illegible] 8 0	−1 0 0	−5 8 0	− [illegible] 0	
[illegible] cowdung 500 maunds [illegible]	5 0 0	370	118	215	[illegible]	52·0	[illegible]	+16	+	60[illegible]	1,700	21 13 0	4 4 0	25 1 0	−8 0 0	−11 18 0	−1 [illegible] 0	
[illegible] cotton seed [illegible] acre	[illegible] 15 0	305	108	203	[illegible]	50·7	197·0	+8	+84	[illegible]	1,505	19 14 0	4 0 0	23 14 0	−[illegible] 15 0	−14 2 0	−18 1 0	
Ditto [illegible] 10 [illegible]	18 1 0	340	150	[illegible]	66	61·7	103·3	+53	+485	1,[illegible]	2,200	28 15 0	5 1 0	34 11 0	−15 1 0	−[illegible] 0	−16 [illegible]	
No manure	...	251	93	[illegible]	66	61·1	[illegible]	...	...	751	1,471	18 6 0	3 11 0	22 0 0	+8 0 0	−16 0 0	−18 0 0	

[illegible] each plot 512 square yards.

TABLE No. IX.

Detail of manure.	When applied.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Weight of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over unmanured plot.	Increase or decrease per acre.	Actual outturn per acre: Grain.	Actual outturn per acre: Straw.	Value of outturn: Grain @ Re. 1 per 41 lb.	Value of outturn: Straw @ Re. 1 per 400 lb.	Value of outturn: Total.	Gain or loss per acre in cost against the cost of ordinary cultivation, assumed to be Rs. 30.	Gain or lose per acre in the value of outturn against ordinary cultivation, assumed to be Rs. 38.	Net profit or loss over or against the assumed income, Rs. 38.	Remarks.
	1	2	3	4	5	6	7	8	9	10	10	11	11	11	12	13	14	15
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
Cowdung 300 maunds per acre	These manures were applied in Rabi, 1885-86.	250	100	150	66	[illegible]	150·0	+ 52	+ 631	1,310	1,516	28 8 0	4 9 0	34 1 0	+ 8 0 0	− 5 15 0	+ 0 15 0	
Poudrette 200 maunds		190	75	115	66	[illegible]	153·3	+ 27	+ 327	1,097	1,391	22 3 0	5 8 0	28 11 0	+ 8 0 0	− 11 15 0	+ 9 15 0	
Oil cake 900 [illegible] acre		163	69	94	...	[illegible]	136·2	+ [illegible]	+ 136	714	1,137	17 7 0	2 13 0	20 4 0	+ 8 0 0	− 17 12 0	− 14 12 0	
[illegible]		166	63	102	...	[illegible]	162·0	+ [illegible]	+ 69	[illegible]	1,240	18 8 0	2 5 0	21 10 0	+ 8 0 0	− 16 6 0	− 13 6 0	
Cowdung and [illegible] 100 maunds ...		140	58	82	...	[illegible]	169·8	+ [illegible]	+ 121	[illegible]	1,118	17 2 0	2 13 0	19 15 0	+ 8 0 0	− 18 1 0	− 15 1 0	
Compost 300 [illegible] acre		170	58	112	...	[illegible]	193·1	+ [illegible]	+ 121	[illegible]	1,368	17 2 0	3 6 0	20 8 0	+ 8 0 0	− 17 8 0	− 14 8 0	
Green manure [illegible]		160	61	99	...	[illegible]	124·1	+ [illegible]	+ 86	[illegible]	[illegible]	15 1 0	3 0 0	18 1 0	+ 8 0 0	− 19 15 0	− 16 15 0	
Saltpetre 240 lbs. [illegible]		150	52	98	...	[illegible]	188·5	+ 4	+ 49	[illegible]	[illegible]	15 6 0	2 15 0	18 4 0	+ 8 0 0	− [illegible] 12 0	− 16 12 0	
[illegible] chloride		160	57	103	...	[illegible]	180·7	+ 9	+ 109	690	[illegible]	16 13 0	3 3 0	19 15 0	+ 8 0 0	[illegible]	− 15 1 0	
No manure		150	48	87	...	55·1	181·2	...	...	581	[illegible]	14 3 0	2 10 0	16 13 0	+ 8 0 0	− 21 3 0	− 18 3 0	

[illegible] plot 400 square yards.

STATEMENT X.

Varieties of wheat sown to compare their yield with country or Mundia wheat.	CALCULATION OF THE RESULT AND COMPARISON OF OUT-TURN WITH THE STANDARD PLOT IN THE SERIES.						COMPARISON OF COST AND INCOME WITH THE ORDINARY KIND OF CULTIVATION IN VOGUE IN THE COUNTRY.								
	1	2	3	4	5	6	7		8			9	10	11	12
	Weight of unthreshed above.	Weight of grain.	[illegible] straw.	[illegible] of grain per bushel.	Percentage of grain on straw.	Percentage of straw on grain.	*Actual outturn per acre**		*Value of outturn.*			Gain or loss per acre in cost against cost of ordinary cultivation, Rs. 20.	Gain or loss in the value [illegible] against [illegible] cultivation, [illegible] Rs. 35.	Net profit or loss per acre as against the ordinary income Rs. 35.	Remarks.
							Grain.	Straw.	[illegible]	[illegible] Re. 1 [illegible]	Total.				
	lb.	ft.	lb.	ft.	ft.	ft.	ft.	ft.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
Buxer wheat from acclamatized seed, (sown after country fashion)	1,029	•356	673	64	53	189	940	1,795	23 4 0	4 8 0	27 12 0	- 1 8 0	-10 4 0	-11 12 0	
Country or Mundia wheat sown as above..	2,049	554	1,490	66	37	180	739	1,987	18 0 0	4 IS 0	22 15 0	- 1 8 0	-15 1 0	-16 9 0	
Buzar wheat sown with drill,.,	1,392	440	952	64	46	216	1,173	2,539	28 10 0	6 6 0	35 0 0	- 1 8 0	-3 0 0	-4 8 0	Fell down.
Mundia wheat sown as above	22,749	1,144	1,605	...	71	140	1,525	2,140	37 3 0	5 6 0	42 9 0	- 1 8 0	+ 4 9 0	+3 1 0	
Sendhi wheat sown after country way	1,152	384	768	64	50	200	768	1,536	18 12 0	3 13 0	22 9 0	- 1 8 0	-15 7 0	-16 15 0	

• The difference in quantity is due to the difference in area of the plots in which the different wheats were sown thus—

(1) Buxar wheat plot of 1,S15 square yards,
<2) Mundia ,, ,, 3,630 ,,
(3) Sendhi ,, ,, 2,420

In class I the experiments Nos. 1, 2 and 3 of kharif and rabi are to determine—

(a) The length of time that wheat (a spring crop) and maize {a rainy season crop) can he groivn year after year on the same land without materia falling oS in yield by the aid of artificial manures,

(I) The relative effect on the plots thus continuously cultivated of different kinds! of manure.

(e) The effect of a judiciou&rotation of crops, as compared with a continued cropping of tlie land with wheat and maize alone.

Rabi experiment No. 3 is, moreover, to determine the mammal value of refuse not ordinarily used by Indian agriculturists.

Nos. 4, 5 and 6 in class I (rabi) are experiments with liemp and indigo utilized as **manures.**

Nos. 7 and 8 are experiments in ploughing and are of long standing. The effect of improved ploughs is compared with that of indigenous ones.

Class, II, temporary experiment, hha-rif season, Wo. l.—In* 1885 a gentleman from America, Mr. Housar, visited the farm and started this experiment. It will be continued for three or four years.

Not 2 and 4, early ***and late*** *sowing of maize 'and cotton.*—This is ft very important experiment and is very carefully demonstrated.

Nos. 0 ***to*** *10, sugarcane and indigo experiments.*—Were started in 1887 and will continue for 5 years,

2fo. ***11,*** *the.* ***mtetilaneout*** *gram* ***teriet experiment.—"Was*** discontinued 3 years sg°, but was re-started last year.

Class II. Jlabi—These experiments were all started in 18S6 or 1887 and will I* kept on for ō years,

Nos. 1 and 3 are to determine the vitality and productiveness of different varieties of wheat and barley.

No. 2 is to-find out the advantages of getting a catch crop from a barley or an oat field.

Nos. 4 and 5 are to demonstrate the effect of gypsum on leguminous crops.

Nos. 6 find 7 are to indicate the comparative manurial value of mustard and cotton cakes ; (1) applied directly to tlie soil, and (2) **indirectly** as farmyard manure.

Nos. 8 and 9 are to ascertain the residual value of certain fertilizers.

No. 10, an experiment with potatoes on a regular systenij was started last)*ear and will be kept on for 5 years.

No. 11, kainit, was started last year and its effect is demonstrated chiefly on wheat and potato.

No. 12, sheep folding, is a Tery common indigenous process and is the best method of farmintr kiinum \-n n>: •> •muwn m this country. It is being experimentally tneu t>" the larm.

KHARIF SEASON EXPEEIMKNTS.

The rainy season of 1883 was ^.^tionably unfavorable, particularly at 7 l d C : 1 7 e The -bSB *&£&* 5&-5S inches, the normal average being about 30 inches.

REPORT

ON THE

CAWNPOEE EXPEKIMENTAL STATION

FOB THE

KHARIF AND RABI SEASONS> 1888-89.

ALLAHABAD:

NORTH-WE&TEBN PROVINCES **AND** OUDH GOVERNMENT **PRESS.**

1889.

Kharif Statement VI.

(5) *Comparison of the yield of several varieties of cotton.*—The season was even worse for cotton than for maize, and the results were very disappointing. Each seed of 3 varieties of cotton, namely, (1) Jones' Improved, (2) S. B. Mexey, (3) Shine's Prolific, had been obtained direct from America and the acclimatized seed of other varieties was also sown. But the whole experiment was spoilt. However two points may be considered to have been demonstrated : *(a)* that acclimatized seed (as proved before) is better than fresh imported seed; *(b)* that the Garo Hills cotton resists wet seasoning. It gave a yield of 166 lbs., the largest yield of all the varieties.

The second cotton experiment, in the comparative value of early and late sowings, was a failure. The late sown plot yielded nothing, and the yield of the other plot was extremely poor.

Kharif Statement VII.

(6) *Experiments with sugarcane.*—The first of these experiments was to determine the yield of 4 varieties of sugarcane. The seed for plots numbered (1) to (3) was obtained the year before last from the best sugar-growing districts, 1 Behia (Bengal), 2 Shahjahanpur, 3 Moradabad.

The season was favorable for this crop, but the cane grew so high that it was beaten down by rain and the outturn was spoilt to some extent. The plots were manured with poudrette, 400 maunds per acre. They were sown on the 1st of March in two ways: *(a)* according to the indigenous way of sowing, *(b)* in lines as sown in West India settlements. They were hand hoed three times and watered five times. The yield of juice was very good, but the plots in which the cane had been beaten down by the rain did not produce fine *rāb* or *gur*.

Besides the determination of the comparative yield, the experiment was also meant to illustrate the comparative merits of sowing in the West India system and according to the native method. The results, as exhibited in Statement VII, show that the indigenous variety of cane as well as the indigenous method of sowing proves to be more suitable for this country. The same result was obtained last year.

Kharif Statement VIII.

(7) Another experiment with sugarcane was the determination of the relative economy of what is known as *peri*, namely, a second crop of sugarcane from the same plants. Accordingly the roots of the sugarcane crop sown the year before last were kept in the field, which was top dressed with farmyard manure at 200 maunds per acre, was hand hoed twice and watered five times.

The total cost of maintaining the field is calculated at Rs. 33 per acre, namely, rent of land Rs. 10, manure Rs. 6, hoeing and watering Rs. 10, making gur Rs. 7, total Rs. 33. The total income per acre has been Rs. 53; the net profit is Rs. 20. There would therefore not seem to be much gain to a cultivator from this special form of cultivation known as *peri*.

Kharif Statement IX.

(8) *Experiments with indigo.*—As gypsum is a special manure for leguminous crops and deposits of it have lately been discovered in several places in the province, particular attention has been directed for the last two years to ascertain its effect on indigo. [illegible] has been given gratis to several indigo planters for trial, and, so far as their opinions are known, they corroborate the result obtained on the farm.

The experimental plots sown with indigo and either manured or top dressed with gypsum were seriously affected by the heavy rains, but they gave heavier yield than the other plots to which gypsum was not applied.

Kharif Statement [illegible]

(9) Statement X shows details of an experiment in early and late sowings of indigo, as well as of the [illegible] plots were used, of which two were sown before and two after [illegible] they had set in. The late sown [illegible] utterly failed [illegible] plots was poor : but of these two, the [illegible] treated with gypsum gave the best results.

Kharif Statement XI.

(10) *Miscellaneous experiments.*—In [illegible] of 400 square yards, millet and other minor [illegible] experiment is to test the comparative value of th[illegible] in these Provinces. Owing to the season, the outturn of these plots was generally poor.

REPORT

ON THE

CAWNPORE EXPERIMENTAL STATION

FOR THE KHARIP AND RABI SEASONS, 3888-89.

INTRODUCTORY.

THIS is tlie first year that, by the consent o£ the Government, the two reports on the kharff and rabi seasons, which used to be issued separately, are combined in one volume.

It seems desirable in this first combined report to preface the details of the experiments with a short descriptive account of the Farm, specifying the areas under the different experimental crops and the character of the experiments in progrees.

The Cawnpore Farm was started in 1874 and is consequently about 15 years old. Its area, as also the character of the experiments conducted in the early days of its history, have been subject to considerable cliange. Some of the experiments at present carried on date from 1874. Others, such as the green soiling series, the rabi and kharif manuring series, the ploughing and irrigation series, date their existence in their present form from the year 1884-85 : before that the plots under treatment tad been subject to some extent to addition or alteration.

Experiments on the Cawnpore Farm are conducted in two places: (1) in a group of fields called "The Farm" (proper), consisting of 89 bighas and 9 biswas; (2) in the old public garden, called "The Company B&gh," in which about 12 acres of land has been cleared for growing cereals.

The chief points aimed at by the experiments now conducted are—

(a) To estimate the value and utility of improved methods of farming compared with indigenous methods.

(b) To form an idea, by weighment of crops, of the character of the season in point of outturn, and thereby obtain independent data for checking the agricultural forecasts of harvest yield obtained from the several districts of the province.

(c) To produce pedigree seed for distribution in the country.

A brief description of the experiments now in progress for one or other of the above objects will now be given, but first it may be said that such experiments naturally fall into two groups, according as they are "permanent" (that is, continued year after year with the same plots of land), or are temporary both in respect of term and in respect of the areas under treatment. With this explanation the subjoined list of experiments will be found sufficiently intelligible.

CLASS I.-LIST OF PERMANENT EXPERIMENTS.

Serial number.	Number according to khasra.	Number of plots in the series.	Name of experiment or of series.	Area.	Date of starting.	Bemarks.	Serial number.	Number according to khasra.	Number of plots in the series.	Name of experiment or of series*	Area.	Date of starting.	Remark*.
			KHAEJfF SEASON EXPEBIMEXTg.							BABI SEASON EXPEBUIENTS.			
			Maize.										
1	...	13	Kharif standard ...	Each plot 400 sq. yds.	1884.		1	...	13	Babi standard ...	Each plot 400 sq. yds.	1884.	
2	...	13	*Do.* duplicate ...	Do. ...	"		2	...	13	Do. duplicate ...	Do. ...	"	
S	...	[illegible]	N. plots	*Bo.* ...	"		3	...	8	Miscellaneous... ...	Do. ,,	"	
							4	...	13	Green soiling, No. I ...	Do. ...	"	
							5	31+33	13	Ditto, ,, II ...	4 big. 6 bis.	"	
							6	32	6	Ditto, ,, III ...	Each plot 400 sq. yds.	"	
							7	Ito4	4	Ploughing series ,, I ...	300 sq. yds.	"	
							8	...	[illegible]	Ditto, ,, II ...	3 bigs. ...	"	

CLASS II.—LIST OP PERIODICAL OR TEMPORARY EXPERIMENTS.

Serial number.	Number according to khasra.	Number of plots in the series.	Name of experiment or of series.	Area. B.	Area. Bis.	Date of starting.	Bemarks.	Serial number.	Number according to khasra.	Number of plots in the series.	Name of experiment or of series*	Area.	Date of starting.	Remark*.
			Maize.											
1	28	4	Sowing after American fashion.	2	0	1885	This experiment is for five years.	1	Changeable.	[illegible]	Comparison of five varieties of wheat.	Different ...	1888	
2	35	[illegible]	Sowing after American fashion, early and late sowing.	1	9	1886	Ditto.	2	Do. ...	4	Catch crops ...	Ditto ...	1887	
			Cotton.											
3	[illegible]	8	Different varieties of cotton.		[illegible]	1888	This experiment is for five yeais. As the fields are changing, the aiea and khasra numhers cannot he given.	3	Do. ...	[illegible]	Comparison of four varieties of barley.	Ditto ...	[illegible]	This experiment is for five years.

4	X	2	Early and late sowing of four varieties of cotton.	X	1886	*Ditto.*
6	X	6	Effects of certain manures on cotton.	X	1888	Ditto.
			Sugarcane.			
6	X	8	**Aftermath** *(prij* **series,..**	X	From 1887.	**This experimentis for** S years. Being changeable, thearea and khasra numbers cannot be given.
7	X	8	**Sowing series ,,,**	X	Do. ...	Ditto.
8	X	8	**Four varieties series ...**	x	**Do. ,,,**	**Ditto.**
			Indigo.			
9	X	2	Late and early sowing ,,,	X	**Do. ...**	**Ditto.**
10	X	3	Effect of gypsum on. indigo.	X	Do. ...	**Ditto.**
11	X	40	**Miscellaneous grain series,**	X	1888...	**This experiment is** again started for 5 **years from last year**

4	**Do. ...**	2	Effect of gypsum on leguminous crops (gram).	Ditto ...	1887 ...	**1**
5	**Do.** ...	...	**Ditto (peas) ...**	Ditto ...	**1887 ...**	
6	**10&11**	6	**Mustard cake used as manure,**	1J bighag...	**1886...**	**This experiment is** for 5 years, and the fields arc not changed.
7	**27**	6	**Cotton cake used as manure,**	1} ditto...	MI	**Ditto.**
8	[illegible]	6	**Residuary values of certain** manures.	Each plot 200 square yards.	**1887 ...**	**Ditto.**
9	**37**	10	**Ditto ditto ...**	**2 Wghas...**	**1886 ...**	**Ditto.**
10	28	6	Effect of certain manures on potato.	**U ditto ...**	**1888...**	**Ditto.**
11	[illegible]	2	Effect of kainit and woollen refuse on wheat.	[illegible]	**1889 ..**	Tliis experiment is for 5 years. Field is changeable.
12	35	2	Sheep folding ...	**ljbfghas...**	**1886..**	**Ditto.**
13	26	2	Jethro Tull system of sowing.	**li ditto ...**	**1889 ..**	**Be-started from 1889.**

In class I the experiments Nos. 1, 2 and 3 of kharif and rabi are to determine—

(*a*) The length of time that wheat (a spring crop) and maize (a rainy season crop) can be grown year after year on the same land without material falling off in yield by the aid of artificial manures.

(*b*) The relative effect on the plots thus continuously cultivated of different kinds of manure.

(*c*) The effect of a judicious rotation of crops, as compared with a continued cropping of the land with wheat and maize alone.

Rabi experiment No. 3 is, moreover, to determine the manurial value of refuse not ordinarily used by Indian agriculturists.

Nos. 4, 5 and 6 in class I (rabi) are experiments with hemp and indigo utilized as manures.

Nos. 7 and 8 are experiments in ploughing and are of long standing. The success of improved ploughs is compared with that of indigenous ones.

***Class II, temporary experiments, Kharif season, No. 1*.—In 1885 a** gentleman from America, Mr. Housar, visited the farm and started this experiment. It will be continued for three or four years.

***Nos 2 and 4, early and late sowing of maize and cotton.*—This is a very important** experiment and is very carefully demonstrated.

***Nos. 6 to 10, sugarcane and indigo experiments.*—Were started in 1887 and will** continue for 5 years.

***No. 11, the miscellaneous grain series experiment.*—Was discontinued 3 years ago,** but was re-started last year.

Class II. Rabi.—These experiments were all started in 1886 or 1887 and will be kept on for 5 years.

Nos. 1 and 3 are to determine the vitality and productiveness of different varieties of wheat and barley.

No. 2 is to find out the advantages of getting a catch crop from a barley or an oat field.

Nos. 4 and 5 are to demonstrate the effect of gypsum on leguminous crops.

Nos. 6 and 7 are to indicate the comparative manurial value of mustard and cotton cakes: (1) applied directly to the soil, and (2) indirectly as farmyard manure.

Nos. 8 and 9 are to ascertain the residual value of certain fertilizers.

No. 10, an experiment with potatoes on a regular system, was started last year and will be kept on for 5 years.

No. 11, kainit, was started last year, and its effect is demonstrated chiefly on wheat and potato.

No. 12, sheep folding, is a very common indigenous process and is the best method of farming known in this country. It is being experimentally tried on farm.

KHARIF SEASON EXPERIMENTS.

The rainy season of 1888 was unquestionably unfavorable, particularly at and around Cawnpore The rainfall aggregated 56'56 inches, the normal average being about 30 inches.

The following statement shows the exceptional heaviness of the rainfall:--

Rainfall at Cawnpore as given in the Government Gazette.		Inches.	Rainfall registered at the Cawnpore Farm.		Inches.
May,	1888	007	May,	1888	13
June,	,,	2 36	June,	,,	05
July,	,,	2398	Julj,	,,	26 8
August,	,,	22 37	August,	,,	201
September,	,,	4 52	September,	,,	22
January,	1889	.143	January,	1889	13
February,	,,	183	February,	,,	23
		56 56			54 5

The excessive and continuous rains of July and August ruined the kharif crops. The seed for the most part failed to germinate, though many fields were re-sown more than once, and where it geminated at all the want of sun and heat injured the vitality of the plants. The native agriculturists had resort to the device of sowing other kinds of crops when their first crop was destroyed. But on an experimental farm this device is inadmissible; hence we suffered great loss.

(1) *Experiments with maize, kharif standard and duplicate series.*—This experiment is to determine the effect of ordinary and artificial manures on maize. There are 2 series, each of 13 plots; the standard plots are kept under maize year after year while the duplicate plots are alternated with wheat. Each plot is treated with the same kind of manure year after year. During the year under review these plots were sown on the 14th of July, the treatment being the same as in previous years, *viz.,* ploughing twice, weeding twice. Kharif Statements I and II

Soon after the sowing the heavy and continuous rain of July destroyed the seed, as nearly all plots remained under water for weeks. Every effort was made to drain the soil, but with no effect. In the beginning of August seed was sown again, but it was too late for a good result.

The standard series gave no yield at all, but the duplicate was slightly better.

For the last two years these series have been complete failures.

(2) *Another series of miscellaneous manure experiments consists of 8 plots (termed the " N» e·ffty mtural manure series)*.—These were sown early in July, being flushed &ce; ploughing and weeding were done three times. These too were seriously affected by the rain, except the plot manured with woollen refuse. It is worth noticing here that woollen refuse again has proved this yeav to he the best fertilizer for maize. Tins is the only plot which has given a continuously good yield for several years past. Kharif statement III.

(3) *American method of sowing maize.*—Statement No. IV compares the result of sowing maize in the American way, *i.e.,* on ridges 1, 2 and 3 feet apart, with that obtained by the country fashion of sowing. The plots were sown on the 14th of July fcad, being on high land, escaped injury from the excessive rain. Ploughing and weeding were done twice. No manure was applied. The result this year confirms that of previous years,—that the native method of sowing gives a heavier outturn. This experiment is for 5 years only, which period will expire after next season. Kharif Statement iv.

(4) *Early and late sowing of maize.*—Two plots, each measuring nearly half an acre, were employed for this experiment. Kharif Statement v.

One of the plots was sown on the 15th of May. The field was once flushed for sowing and was twice watered. The other plot was sown on the 27th of June, after rain. This experiment has always hitherto shown that early sowing is better, and the same result has been obtained this year. The cost of watering, Rs. 5-7-0 per acre, has, however, to be taken into account. Against this may be set the higher prices which a cultivator can obtain for an early crop of maize.

Kharif Statement VI. (5) *Comparison of the yield of several varieties of cotton.*—The season was even worse for cotton than for maize, and the results were very disappointing. Fresh seed of 3 varieties of cotton, namely, (1) Jones' Improved, (2) S. B. ... of other Prolific, had been obtained direct from America and the acclimatized seed ... points varieties was also sown. But the whole experiment was spoilt. However ... may be considered to have been demonstrated : *(a)* that acclimatized seed i... before) is better than fresh imported seed; *(V* that the Garo Hills cotton res... seasoning. It gave a yield of 166fts., the largest yield of all the varieties.

The second cotton experiment, in'the comparative value of early and late so... plot was a failure. The late sown plot yielded nothing, and tJie yield of the otnei extremely poor.

Kbarif Statement VII. (6) *Experiments with sugarcane.-Uhe* first of these experiments was to de... the yield of 4 varieties of sugarcane. The seed for plots numbered (1) ... Bengal), obtained the year before last from the best sugar-growing districts, 1 Benia... 2 Shâhjahânpur, 3 Moradabad,

The season was favorable for this crop, but the cane grew so high that it ^^*iteH* down by rain and the outturn was spoilt to some extent. The plots were ... with poudrette, 400 maunds per acre. They were sown on the lst of March in ... ways: *(a)* according to the indigenous way of sowing, *(bj* in lines as sown in West India settlements. They were hand hoed three times and watered five times. The yield of juice was very good, but the plots in which the cane had oeen beaten down by the rain did not produce fine *rdh* or *gur.*

Besides the determination of the comparative yield, the experiment was a... meant to illustrate the comparative merits of sowing in the West India system and according to the native method. The results, as exhibited in Statement VII, show that the indigenous variety of cane as well as the indigenous method of sowing proves more suitable for this country. The same result was obtained last year.

Kharif Statement VIII. (7) Another experiment with sugarcane was the determination of the re... economy of what is known as *peri,* namely, a second crop of sugarcane from the ... plants. Accordingly the roots of the sugarcane crop sown the year before las... kept in the field, which was top dressed with farmyard manure at 200 maunds p... acre^ was hand hoed twice and watered five times.

The total cost of maintaining the field is calculated at Rs. 33 per acre, name... rent of land Rs. 10, manure Rs. 6, hoeing and watering Rs. 10, making gur Rs. ... total Rs 33. The total income per acre has been Rs. 53; the net profit is Rs. *M-* There would therefore not seem to be much gain to a cultivator from this special form o... cultivation known as *peri.*

Kharif Statement IX, (8) *Experiment toith indigo.—As* gypsum is a special manure for leguminous crops, and deposits of it have lately been discovered in several places in the province, particular attention has been directed for the last two years to ascertain its effect on indigo. It has been given gratis to several indigo planters for trial, and, so far as their op... are known, they corroborate the result obtained on the farm.

The experimental plots sown with indigo and either manured or top dressed with gypsum were seriously affected by the heavy rains, but they gave heavier yield than the other plots to which gypsum was not[1] applied.

Kharif Statement X. (9) Statement X gives details of an experiment in early and late sowings ... indigo, as well as of the manurial value of gypsum against farmyard manure, For... plots were used, of which two were sown before the rains and two after they had set in. The late sown crop utterly failed, and the yield from the other two plots was poor : *>u of these two, that treated with gypsum gave the best result*.

Kharif Statement XI- (10) *Miscellaneous experiments.—In* a series of 17 plots, each of 400 square yards, millet and other rain crops were sown. The object of this experiment is to test the comparative value of the ordinary rain crops cultivated in these Provinces. Owing to the season, the outturn of these plots was generally poor.

RABI SEASON EXPERIMENTS.

The rabi season experiments are chiefly restricted to wheat. Potato, barley, peas and gram have lately been added to the list. These occupy but a very limited area of wheat. The variety known in this Province as "Muzaffarnagar" (soft white) is, for the most part, sown; next to it in quantity is the beardless indigenous variety, called "Mundia," and on a much smaller scale Sindhi, Adelaide and Buxar.

In all, 21 acres were under wheat, of which area 15'5 acres were under different experiments, while 5"5 acres were sown for seed.

The average outturn per acre has been 13 maunds, ranging from 21 maunds or 29 bushels to 7*75 maunds or 10 bushels per acre. The fair average per acre in this country is 16 maunds or about 22 bushels, and in England about 22 maunds or 30 bushels. The season was very unfavorable for wheat, as the abnormal rain in February and March greatly injured what at one time promised to be a good crop. Kust was generated, and the grain proved to be small and discolored. The Muzaffarnagar variety of soft white wheat suffered least: the beardless variety called *mundia* proved to be most liable to be affected by rust.

The following is the detail of the experiments :—

Rabi Statements I andj II.

(1) *Tie standard and duplicate series.*—This experiment is to determine *(a)* the effect of certain manures on wheat, *(b)* the advantages of rotation, *(c)* how long wheat can be grown year after year on the same land, and which manure best returns to the soil what the plant withdraws.

The two series are of 13 plots each, every plot measuring 400 square yards. Each plot receives a particular kind of manure year after year, save one, which is always unxnanured. The treatment of the duplicate plots in point of manure is precisely the same as that of the corresponding plots in the standard series ; but the latter are cropped with wheat year after year, while the former are alternated with wheat and maize.

In this season, as usual, Muzaffarnagar wheat at the rate of 60 seers per acre was sown on the 13th of October. Other treatments were as follows : ploughing three times, weeding once, watering three times.

The standard plots germinated very well, but were bitten by frost to a certain extent, while the duplicate ones suffered more. This is an exceptional year, as the outturn of several of the duplicate plots was less than the standard ones. As a rule, it has been better. On the whole, the outturn of these series in this season was better than that of many other series. Poudrette in both series gave a good outturn.

Rabi Statement III.

(2) *Green manure series.*—This also consists of 13 plots, each of 400 square yards. The experiment is to determine the manurial value of vegetable substances in various forms. It shows that indigo and hemp, like clover in Europe, prepare the land for wheat. If ploughed in, they act as manure; while if removed as a crop, they still improve the ensuing crop of wheat. Our experiments have also shown that more profit is derived from cropping the indigo or hemp and th^Q sowing wheat than from ploughing the former in—without realizing the outturn.

The plots in these series were sown with Muzaffarnagar wheat at 60 seers per acre on the 25th of October, the other treatments being the same as described above.

Indigo refuse lias given better results than the indigo crop which was ploughed in. Both kinds of indigo refuse and also green soiling with hemp have given good outturn of grain. The plots manured with indigo and hemp water and the unmanured plots yielded little grain. The cost of indigo and hemp water at the farm is very high, owing to the distance of cartage. These fertilizers can only be economically used in close proximity to indigo and hemp factories.

Rabi Statement IV.

(3) Rabi Statement IV contains the results of a further experiment in green soiling. Separate fields were manured with green indigo and hemp. The indigo series consists of six plots, each of 800 square yards. Four of them are green soiled, as detailed

in the statement, and two are kept unmanured. The hemp series consists of 13 plots of different acres, all of them being of two acres. In seven of these, hemp is ploughed m and six are kept unmanured. The result shows the advantages of manuring. In spite of the cost of fertilizers, the income per acre is comparatively much larger than from the unmanured land. In this instance too it has been proved that indigo refuse mixed with lime is very effective.

Kabi Statement V.

(4) This experiment is to determine the effect of certain rubbish which ordinarily has no place in the list of manures known to the Indian agriculturists. The experiment, as usual, shows that the manured plots in many cases have given more yield than the unmanured one; that saltpetre is effective; that ammonia chloride has again failed, and that without the application of some good and rich fertilizers the plots in this series are gradually losing their fertility. The last one is the important point to be observed.

These plots were sown on the 24th October with Muzaffarnagar wheat, other treatments being exactly the same as in the other experiments.

Kabi Statement VI.

(5) This experiment is to determine the effect of shallow and deep ploughing, of rather the effect of ploughing with lie country plough and with improved pW>s- The experiment is carried on in two different places. In one place there are four plots and in the other three. They are respectively of 300 and 2,450 square yards each. Muzaffarnagar wheat was sown in them on the 24th October and 5th November, and they were subject to the same treatment as all other series. The three plots, this year, were manured with woollen refuse at 120 maunds per acre.

The result is again in favor of deep ploughing.' Ploughing nine inches deep has given more yield than five inch ploughing. It may be noted that hitherto no manure was given to these series •. consequently the produce had been reduced considerably. This year three plots were manured, and consequently the yield has greatly increased all round j yet the effect of deep ploughing is still perceptible in the comparative outturn of the several fields.

All the foregoing rabi experiments may be termed permanent or unchangeable. They have not been varied in the least for the last five years, and some date back to the opening of the Farm. No time for their duration is fixed. No other crop of any W»* is grown in the fields set apart for these series, and the treatment will remain m»U respects in future precisely as it is at present.

The next mentioned experiments are temporary or for a fixed period: most of them are for five years. In these,, sometimes necessarily, little changes occur, and the fields are also changeable.

Eabi Statement VII.

(6) *Experiment with cotton, seed and mustard cake, as mil as with the dung of cattle fed on the same* rf»/.—Thai is to ascertain (1) the comparative manurial value of («) cotton seed and mustard cake against the same stuff fed dungs, (J) of rich farm yard manure against plain dung; (2) to what extent good feeding of live stock is a S*m to a farmer ^ &,, shape of obtaining ^ and rich miLrmIei (3) whether nitrogen may be more economically added to the soil by directly manuring the fields with irogenous substances existing in cattle food or by converting them into dung. The iatments of the season were ploughing three times Muzaffarnagar wheat seed sown the plT™ *" aCle on thC 25th october, ''''^ once and waterm S' three timeS, Al acre. ThT Fevious8ly """""d with common manure, at the rate of 100 maunds per seed T7 71dd brtb ^ gKdn atld ^raw was from a plot treated with dead cotton compared U A T ^ ^ ^ manures applied * clearly 8een m the iaaiwA *** " IfTw* 1\ S* of the TM^«red plots. Yet the largest net profit was on one of thelatterplofc, This expwiment whi J fa wag commenced in 1885-86.

Babi Statement VIII.

(7) This experiment is to demonstrate for how long the residue of a fertilizer remains m«.nM. v i. i ^ T The ^tement shows the residual effect of the artificial manures which had been a™.r J , « ± icftfi u Deen apphed to the plots for four consecutive years up to 1S8&. Since then no manure of ari given. « • -D • the statement in Senes J3 in

indicates the residual result of ordinary and artificial manures of nearly all kinds that are in use on the Farm. These were applied in the year 1886-86. The result again is in favor of ordinary farmyard manure.

(8) *Hzjperiment wit A Jcahiit.*—Kainit is a potassic-manure, good for grasses and for wheat. Rabi Statement IX.

This is the first year that it has been tried on the Farm. It was applied along with green hemp to one plot, with farmyard manure to three plots, and with woollen refuse to four plots.

Muzaffarnagar wheat was sown in all of the plots on the 22nd and 23rd October. All the treatments were the same as usual. Kainit when combined with woollen refuse has given the largest yield : I may say largest of all the fields in the farm. With farmyard manure it has given very good results too, and with green manure also has not been bad. As this is the first year, nothing can be definitely decided about its value; but the experiment will continue for four years more, and it will be fully tested.

(9) This experiment \fas made to observe the effect of grazing down and nibbling wheat, in order to check too luxuriant growth of straw. Muzaffarnagar wheat was sown at 60iTjs. per acre on the 4th of November (late in season). The land had maize in kharff in it, and after taking the maize crop it was prepared for rabi and was manured by folding sheep in it. Only two waterings and one weeding were given. A very fair yield in grain and a distinctly good outturn of straw were obtained from the portions grazed down and nibbled by the sickle : on the portion left intact the yield of grain was about the same, while that of straw was considerably less. Rabi Statement X.

(10) In this experiment the Jethro Tull or Lois Weeden system of sowing on raised up strips of land was compared with the ordinary method of sowing. The Jethro Tull system of sowing is that in a field strips of land of equal width are marked out and six inches depth of earth from one strip is thrown upon the other, so that one strip is thus raised one foot higher than the other. On these raised up strips wheat is sown inline. In a piece of land of 1,936 square yards 21 strips were made,—11 raised, 10 depressed. In six of the latter strips a leguminous crop was sown. Rabi Statement XI.

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Muzaffarnagar wheat was sown on the 29th of October. The statement shows that wheat sown in the indigenous way has given a better crop than that sown on the strip*, and if the cost of making the latter be taken in calculation, the Tull system *oi* sowing is evidently useless in India.

(11) In this experiment the productive power and vitality of four varieties of wheat compared with the indigenous variety (Mundia) were tested. In five plots of 400 square yards each, the different kinds of wheats were sown side by side: 60 seers of seed per acre of each kind were sown. All had one kind of treatment throughout the season. Of course the bad season and heavy rain had different effects on them. In this series the country Mundia wheat has given the largest crop. Generally on the farm the yield of Muzaffarnagar was found best, as on other plots the country variety proved to be more susceptible to fungoid disease. Buxar wheat did worst of all. Rabi Statement XII.

(12) This experiment was with three special varieties of huskless barley and was made with a view of ascertaining their value in the English market. These varieties have been propagated on the Farm from a very small quantity of seed. However, this year we were able to send three maunds of the chocolate colored variety to Kew for opinion. None of the varieties yielded as much either in grain or straw as the common country barley, a plot of which was sown for comparison. Rabi Statement XIII.

(13) In this experiment the value of gypsum mixed with farmyard manure on leguminous crops was tried. Both with gram aid peas it gave a larger outturn than farm manure alone, but not enough to cover the extra cost. Rabi Statement XIV.

(14) The last experiment to be mentioned was one to ascertain the effect of special manures on potato. The field, after being manured and well prepared according to Rabi Statement X\.

the indigenous method, was divided into five plots of 726 square yards each. To four of these special manures were applied, as shown in the statement. These were then sown with the variety of potato locally called here white or *Madrasi.* The seed was obtained from Farukhabad and was sown on the 19th of October, at the rate of 8 maunds per acre. The plot manured with kainit from the beginning did badly. In growth the plants did not reach the usual height, and frost seemed to have affected them, as the leaves shrivelled and became yellow.

The experiment is for five years, and this is the second trial. The treatments were ploughing four times; weeding, hoeing and earthening up ridges four times.

The crop was dug and removed from the field on different dates from 16th to 27th February. Poudrette with sulphate of iron gave the largest yield, and next to it came woollen refuse with gypsum. The latter produced potatoes of the largest size and best quality: had not a part of this plot been spoilt, its yield would have been the highest. Last year castor oil cake gave the best result.

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KHARIF STATEMENT No. II.—KHARIF DUPLICATE SERIES MANURE EXPERIMENT WITH MAIZE.

Quantity of manure applied per acre.	Value of manure.	Calculation of result and comparison of outturn with the unmanured plot. Number of plot as per map of Farm.	Weight of threshed cobs.	Weight of grain.	Weight of stalks.	Percentage of grain on stalk.	Percentage of stalk on grain.	Increase or decrease against unmanured plot.	Increase or decrease per acre.	Comparison of cost with the ordinary kind of cultivation in vogue in this country. Actual outturn. Grain.	Actual outturn. Stalk.	Value of outturn. Grain @ Re. 1 per	Value of outturn. Stalk @ Re. 1 per 4101bs.	Value of outturn. Total	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 10-8-0.	Gain or loss per acre in the value of outturn against that of ordinary cultivation assumed to be Rs. 20.	Net profit or loss over or against the assumed income, Rs. 20.
	Rs. a. p		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p	Rs. a. p	Rs. a. p	Rs. a. p	Rs. a. p	Rs. a. p
1. Sheep dung 180 maunds	5 6 0	1	15	10	45	22	450	-20	-242	121	544	2 15 0	1 5 0	4 4 0	-5 6 0	-15 12 0	-21 2 0
2. Poudrette 180 „	8 12 0	2	30	20	58	31	290	-10	-121	242	702	5 14 0	1 11 0	7 9 0	-8 12 0	-12 7 0	-21 3 0
3. Ashes of 180 maunds of cow dung and saltpetre 240lbs.	15 13 0	3	35	22	51	43	232	-8	-97	266	617	6 8 0	1 8 0	8 0 0	-15 13 0	-12 0 0	-27 13 0
4. Saltpetre 240lbs	10 5 0	4	...	...	12	...	...	...	...	...	145	...	0 6 0	0 6 0	-10 5 0	-19 10 0	-29 15 0
5. Saltpetre 240lbs and bone dust 360lbs ...	13 10 0	5	...	...	20	...	...	...	...	...	242	...	0 9 0	0 9 0	-13 10 0	-19 7 0	-33 1 0
6. Cow dung 180 maunds	5 6 0	6	15	10	34	29	340	-20	-242	121	411	2 15 0	1 0 0	3 15 0	-5 6 0	-16 1 0	-21 7 0
7. Ditto and bone dust 360lbs.	8 10 0	7	45	30	47	64	157	...	...	363	568	8 14 0	1 6 0	10 4 0	-8 10 0	-9 12 0	-18 6 0
8. Ditto and gypsum 240lbs...	10 8 0	8	55	35	58	60	166	+5	+60	423	702	10 5 0	1 11 0	12 0 0	-10 8 0	-8 0 0	-18 8 0
9. Ashes of 100 maunds of dung ...	5 8 0	9	...	...	15	...	...	...	...	...	181	...	0 7 0	0 7 0	-5 8 0	-19 9 0	-25 1 0
10. Sheep dung 180 maunds and bone dust 360lbs.	8 10 0	10	...	...	22	...	...	...	...	...	266	...	0 10 0	0 10 0	-8 10 0	-19 6 0	-28 0 0
11. Saltpetre 240lbs and bone superphospate 240lbs.	20 0 0	11	...	...	17	...	...	...	...	...	206	...	0 8 0	0 8 0	-20 0 0	-19 8 0	-39 8 0
12. Sheep dung and gypsum 240lbs. ...	10 8 0	12	35	22	45	49	205	-3	97	266	544	6 8 0	1 5 0	7 13 0	-10 8 0	-12 3 0	-22 11 0
13. No manure	...	13	45	30	55	55	183	...	...	363	665	8 14 0	1 10 0	10 8 0	..	-9 8 0	-9 8 0

Area of each plot is 400 square yards.

KHARYF STATEMENT No. III.—MISCELLANEOUS MANURE EXPERIMENT WITH MAIZE ("N" SERIES).

Quantity of manure applied per acre.	Value of manure.	Calculation of the result and comparison of outturn with the unmanured plot in the series.								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.							
		1	2	3	4	5	6	7	8	9		10			11	12	13
		Number of plot as per map of Farm.	Weight of unthreshed cobs.	Weight of grain.	Weight of stalk.	Percentage of grain on stalk.	Percentage of stalk on grain.	Increase or decrease against unmanured plot.	Increase or decrease per acre.	Actual outturn per acre.		Value of outturn.			Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 15.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Bs. 20.	Net profit or loss over or against the assumed income, Bs. 20.
										Grain.	Stalk.	Grain @Be. 1 per 41tls.	Stalk @Ke. 1 pcr410lbs.	Total.			
	Bs. a. p.		lbs.	lbs.	fts.	ibs.	lbs.	ibs.	lbs.	lbs.	lbs.	Bs. a. p	Bs. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. p.
1. Woollen refuse 120 maunds and lime 12 maunds.	6 5 0	1	223	112	246	46	220	112	1,355	1,355	2,976	33 1 0	7 4 0	40 5 0	6 5 0	+ 20 5 0	+ 14 0 0
2. Sheep dung 120 maunds.	3 9 9	2	2	11	16	9	1,066	11	18	18	194	0 7 0	0 8 0	0 15 0	3 9 9	-19 1 0	-22 10 9
3. Cow dung 120 „ ..	3 9 6	3	2	11	19	8	1,266	11	18	18	230	0 7 0	0 9 0	1 0 0	3 9 6	-19 0 0	-22 9 6
4. Poudrette 120 „ ...	5 13 6	4	3	1	25	4	2,500	1	12	12	302	0 5 0	0 12 0	1 1 0	5 13 6	-18 15 0	-24 12 6
5. Horse dung 120 „ ...	3 9 6	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6. Pigs'dropping 120 „ ...	3 9 6	6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7. Saltpetre 240 lbs....	10 5 0	7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8. No manure ...		8	...	...	...	...	...	...	...	...	...	...			...	...	...

Area of each plot is 400 square yards.

KHARfF STATEMENT No. IV.-SOWING EXPERIMENT (MAIZE SOWN AFTER AMERICAN FASHION).

Detail of cxpcrjjnciit.	Calculatiou of the result and comparison of outturn with the plot sown after country way.								Comparison of cost and income with tlie ordinary kind of culthation in vogue in this country.					
	1	2	3	4	5	G	7	8	0		10			11
									Actual outturn.		Value of outturn.			
	Number of plot as J>cr *map o* Farm.	Weight of untlircshed cobb.	Weight of grain.	Weight of stalk.	Percentage of grain on btalk.	Percentagc of stalk on grain.	Increase or decrease against unmanured. plot.	Increase or decrease per acre.	Grain.	Stalk.	Grain @ lie. 1 per 41fts.	Stalk @ Kc. 1 per 410lbs.	Total.	Gain or loss per acre in the outturn against that of ordinary cultivation, issumed to be Rs. 20.
		lbs.	lbs.	lbs.	lbb.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Its. a. p.
Siaizc sown in ridges :—														
1 foot apart	1	215	150	320	4G	210	+25	+ 100	GOO	1,31G	14 10 0	3 3 0	17 13 0	-2 3 0
2 feet apart	2	143	104	107	53	180	*-21*	-84	41G	788	10 2 0	1 15 0	12 1 0	-7 15 0
3 feet apart	3	105	75	170	44	227	-50	-200	300	680	7 5 0	1 11 0	0 0 0	-11 0 0
After country fashion		220	125	200	-	230	...		500	1,196.	12 3 0	2 15 0	15 2 0	-4 11 0

Area of cadi plot is 1,210 s^xiaic yards.

KHARIF STATEMENT No. VI.-EXPERIMENT WITH DIFFERENT VARIETIES OF IMPORTED COTTON SEED.

	Actual outturn and comparison of outturn with plot No. 1 in each series.								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.					
	1	2	3	4	5	6	7	8	9		10			11
									Actual outturn per acre.		Value of outturn.			
	Number of plot as per map of Farm.	Weight of uncleaned cotton.	Weight of cleaned cotton.	Weight of seed.	Percentage of cotton on seed.	Percentage of seed on cotton.	Difference.	Difference per acre.	Cotton.	Seed.	Cotton @Be. 1 per Gibs.	Seed @ Be. 1 per Gllbs.	Total.	Gain or loss per acre in outturn against that of ordinary cultivation assumed to be Bs. 45.
		lbs.	lbs.	lbs.	lbs.	Us.	lbs.	lbs.	fts.	lbs.	Bs. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. p.
A. 1 Heengan Ghat..	1	25	8	17	47	212	...		111	235	18 8 0	3 14 0	22 6 0	-22 10 0
A. 2 Upland Georgcon,	2	34	10	24	42	240	+ 2	28	138	332	23 0 0	5 7 0	28 7 0	-16 9 0
A. 3 Tree cotton	3	27	8	19	42	237	...	...	111	263	18 8 0	4 5 0	22 13 0	-22 3 0
A. 4 Louisiana	4	26	7	19	37	271	- 1	11	97	263	16 3 0	4 5 0	20 8 0	-24 8 0
A. 5 GarroHill	5	30	12	18	67'	150	+ 4	55	166	249	27 11 0	4 1 0	31 12 0	-13 4 0
A. 6 Hybrid	6	21	6	15	40	250	- 2	28	83	207	13 13 0	3 6 0	17 3 0	-27 13 0
A. 7 Sealsland	7	24	7	17	41	243	- 1	14	97	235	16 3 0	3 11 0	20 1 0	-24 15 0
A. 8 Egyptian	8	23	7	16	44	229	- 1	14	97	221	16 3 0	3 10 0	19 13 0	-25 3 0
B. 1 Jones' Improved,	9	3	1	2	50	200	- 7	97	24	48	4 0 0	0 13 0	4 13 0	-40 3 0
B. 2 S.B.Mexey(Texas),	10	3	1	2	50	200	- 7	97	24	[illegible]	4 0 0	0 13 0	4 13 0	-40 3 0
B. 3 Shines' Prolific,	11	3	1	2	50	200	- 7	97	24	45	4 0 0	0 13 0	4 13 0	-40 3 0

Area of each plot up to plot No. 8 is 350 square yards, and after that 200 square yards.

KUARIF STATEMENT NO. W.-EXPERIMENT IN EABLF AND LATE COTTON SOWING.

•09

Detail of experiment.	Calculation of the result and comparison of outturn with the plot sown after rain.								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.					
	1	2	3	4	5	6	7	8	9		10			11
									Actual outturn per acre.		Value of outturn.			
	Number of plot as per map 0f the Farm.	Weight of unclcaned cotton.	Weight of cleaned cotton.	Weight of seed.	Percentage of cotton on seed.	Percentage of seed on cotton.	Difference.	Difference per acre.	Cotton. >	Seed.	Cotton @ Re. 1 per Gibs.	Seed @ Ee. 1 per Gllbs.	Total.	Gain or loss per aero in outturn against that of ordinary cultivation assumed to bo Its. 45.
	19	lbs.		fts.	Tbfl.	ftfl.			Us.	11)S.	Bs. a. p.	Ra. a. p.	Us. a. p.	Rs. a. p.
Sown before rain „•	1	16	5	11	45	220	• ••	...	81	177	13 8 0	2 14 0	16 6 0	-28 10 0
Sown after vain ...	o						*X* W.							

Area of each plot is 300 square yards.

KHARIF STATEMENT No. VII.—EXPERIMENT (1) IN THE YIELD OF DIFFERENT VARIETIES OF SUGARCANE, AND (2) IN NATIVE AND WEST INDIAN METHODS OF PLANTING.

Detail of experiment.	Calculation of the result and comparison of outturn with the standard plot in the series (the last plot).								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.				
	Area in square yards.	Weight of cane in lbs.	Weight of juice in lbs.	Weight of rab or gur in lbs.	Percentage of juice over rab.	Percentage of rab over juice.	Increase or decrease over indigenous way of sowing.	Increase or decrease per acre.	Outturn per acre*		Value of outturn.		Gain or loss per acre in the outturn against that of ordinary cultivation assumed to be Rs. 80.
									Juice.	Gur.	Gur @ Re. 1 per 22 lbs.	Total.	
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Sehea seed (Montju or Lhaul).													
(1) Sown in lines	605	1,680	772	152	509	20	-52	-416	6,184	1,216	55 4 0	55 4 0	-24 12 0
(2) After indigenous way of sowing ...	605	1,862	940	177	531	19	-57	-456	7,520	1,416	64 6 0	64 6 0	-15 10 0
Shahjahanpur seed (Dekchan).													
(1) Sown in lines	605	2,170	1,070	210	510	20	+6	+48	8,560	1,680	76 6 0	76 6 0	-3 10 0
(2) After indigenous way of sowing ...	605	2,360	1,144	230	502	20	-4	-32	9,232	1,840	83 10 0	83 10 0	+3 10 0
Moradabad seed (Jharankho).													
(1) Sown in lines	605	1,841	928	180	516	19	-24	-192	7,424	1,440	65 7 0	65 7 0	-14 9 0
(2) After indigenous way of sowing ...	605	2,276	1,151	225	512	20	-9	-72	9,208	1,800	81 13 0	81 13 0	+1 13 0
Country Matna.													
(1) Sown in lines	605	2,034	1,027	204	503	20	-30	-240	8,216	1,632	74 3 0	74 3 0	-5 13 0
(2) After indigenous way of sowing ...	605	2,168	1,173	234	501	20	...	...	9,384	1,872	85 1 0	85 1 0	+5 1 0

KHABIF^STATEMENT *No.* VIII.—EXPEELJVfENT *TO DETERMINE* THE ECONOMIC VALUE OP *PMRl* (SECOND YEAR CANE-STOCKS).

Detail of experiment	Calculation of the result and comparison of outturn with the standard plot in the series (the last plot).								Comparison of cost and income with the or<linary kind of cultivation in vogue in this country.						
	Area in square yards.	Weight of cane hi lbs.	"Weight of juice in fts.	Weight af rab or gurin lbs.	Per-centage of juice ovci rab.	Per-centage of rab over juice.	Increase or decrease over indigen-ous way of sowing.	Increase or decrease per acre.	Outturn per acre. Juice.	Outturn per acre. Rdb.	Value of outturn. Gur at Re. 1 per 22 lbs.	Value of outturn. Total.	Total cost per acre of maintain-ing tlie^eri (aftermath) crop.	Total cost per acre of raising a new crop.	Net gain per acre hi the cost of cultivation.
	sq. yds.	ft.	lb.	lb.	lb.	lb.	" ft.	ft.	ft.	ft.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Peri of Moradalad seed (tiarankha).															
1. Sown in lines...	900	2,591	1,209	229	528	19	+ 15	+ 81	6,502	1,232	56 0 0	56 0 0			
2. Native method of sowing	900	2,773	1,314	250	526	19	- 8	- 43	7,066	1,344	61 1 0	61 1 0			
Bekea seed (Mongu or DhaulJ.															
1. Sown in lineB...	900	1,290	640	115	557	18	- 99	- 532	3,442	618	28 1 0	28 1 0	33 0 0	56 0 0	23 0 0
2. Native method of sowing	900	1,036	829	162	512	20	- 96	- 516	4,458	871	39 9 0	39 9 0			
Indigenous seed (Matna).															
1. Sown in lines...	900	2,200	1,171	214	547	18	- 41	- 237	€,297	1,151	52 5 0	52 5 0			
2. Native method of sowing	900	2,755	1,379	258	534	19	...	...	7,416	1,387	63 1 0	63 1 0			

KIIARfF STATEMENT Xo. IX.—DETERMINATION OF THE EFFECT OF GYPSUM ON INDIGO.

Number of plot ami arta.	Special treatment.	Cost of special treatment.	Weight of green crop sold.	Actual outturn per acre.	Value of outturn per acre at Re. 1 per 3071bs.	Increase or decrease against the uninanurcd plot.	
						In weight.	In money after deducting the cost of nuiiuire.
		Ks. a. p.	lbs.	fibs.	Bs. a. p	lbs.	Bs. a. p.
1. 1,600 square yards	Gypsum applied as manure 3 cut. and ploughed in as manure. *	3 0 0	2,542	7,G90	25 0 0	+ 1,737	+ 3 0 0
2. 3.000	Top dressed with gypsum 'when plant G inches high,.,	3 0 0	2,214	*6,607*	22 0 0	+ 741	
3. 1,000 "	\o manure	...		5,053	10 0 0	...	...

KHAHIF STATEMENT No. X.—EXPERIMENT (1) IN EAltLY AND LATE INDIGO SOWING, (2) WITH GYPSUM AS A MANURE.

yuniher of plot and area.	When sown.	Cost of the special treatment ; or acre.	Weight of green crop sold.	Outturn per acre.	Value per aciv at 307Its. per rupee.
		Rs. ti. p.	lbs.	lbs.	Its. a. p
(1) 1,815 square yards	Before rain	*J 2 0	67G	1,803	5 11 0
(2) 1,813	After rain	...	...%	...	...
(1)1,815 "	Before rain	t3 10 0	022	2,450	8 0 0
(2) 1,815 "	After rain	...	...	...	...

* Cost of "watering and. o£ fnmynrd manure @ 200 mawnds per acre.

\ Ditto and of gypsviva 1 cwt. \K:X SWMC.

KHARIF STATEMENT Xo. XL—EXPERIMENT IN OUTTURN OF MISCELLANEOUS KHAEfF CEOPS.

Detail of experiment.	1	2	3	4	5	6	7		8			9
	Area of each 1>K	Weight of imthre&hed crop.	Weight of grain.	Weight of stalk.	I?croentagu of grain on btalk.	Percentage of btalk on grain.	Actual outturn per acre.		Value of outturil.			Gain or loss per acre in outturn against that of ordinary cultivation assumed to he Bs. 20.
							Grain.	Stalk.	Grain @ Be. 1 per 411lbs.	Stalk @ Be. 1 per 410lbs.	Total.	
		lbs.	lbs.	lbs.	lbs.	»>s.	lbs.	lbs.	Bs. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. p.
1. *Cotton* and arhar	...	...	...	...	...	...	...	...	...	...	...	...
2. Jowar for chari	400 fcq. ydri	512	...	512	...	...	...	6,195	...	15 2 0	15 2 0	- 4 14 0
3. Urd	»	41	6	35	17	583	73	423	1 12 0	1 1 0	2 13 0	- 17 3 0
4. Moong	"	50	10	40	25	400	121	484	2 15 0	1 3 0	4 2 0	- 15 It 0
B. Moih	»	146	66	80	82	121	799	968	19 8 0	2 6 0	21 11 0	+ 1 14 0
6. Lotto	»	125	?0	99	26	381	315	1,198	7 11 0	2 15 0	10 10 0	- 0 o 0
7. Ba*jra and arhar	"	22(3	8	218	1	2,725	97	2,638	2 6 0	6 7 0	8 13 0	- 1 ! 3 0
8. Bajra Blone	»	331	10	324	3	3,240	121	3,920	2 15 0	9 9 0	12 8 0	- 7 S 0
9. Jowar alone	"	523	35	488	7	1,394	423	5,905	10 5 0	14 0 0	24 11 0	+ ' 11 0
10. Jowfa and arhar	"	447	30	417	7<	1,390	363	5,046	8 14 0	12 5 0	21 3 0	+ 1 3 0
11. Til	"	57	7	50	14	711	85	605	2 1 0	1 8 0	3 9 0	- 10 7 0
12. Arhar	"	126	3G	90	40	250	436	1,089	10 10 0	2 10 0	13 4 0	- 6 12 0
13. Homp	u	136	21	112	21	467	290	1,355	7 1 0	3 5 0	10 6 0	- 9 10 0
14. Kodon	>;	77	17	60	28	353	206	7?6	5 0 0	1 12 0	6 12 0	- 13 4 0
15. Mirwa	u	...	...	...	...	...	...	...	...	...	...	...
16. Kurthi *	..	• 30j	112	102	88	I11	1,718	1,960	11 14 0	4 12 0	4fi 10 0	+ *26* 10 0
17. distorted		...	...	...	...	...	...	...	...	...	...	...

BAB1 STATEMENT No. I.—STANDARD SERIES, MANURE EXPERIMENT WITH WHEAT.

Calculation of the result and comparison of outturn with standard plot (No. 11) in the series.								Couiparisou of cost and income with the ordinary kind of cultivation irL vogue in this country.							
I	2	3	4	5	6	7	8	9		10			11	12	13
Detail of special treatment with the rate of its cost.	Weight of un-thrcshed sheaves.	Weight of grain.	Weight of straw.	Percentage of grain on straw.	Percentage of straw on grain.	increase or decrease over standard plot in the strict.	Increase or decrease per acre.	Actual outturn per acre. Grain.	Straw.	Value of outturn. Grain at He. 1 per 41fts.	Straw at Ke. 1 per 4001b*.	Total.	Gain or loss per acre in the cost against the jost of ordinary cultivation assumed to be Bs. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Bs. 38.	Net profit or loss over or against the assumed income, Bs. 38
	lbs.	lbs.	lbs.	fibs.	lbs.	lbs.	Is.	lbs.	fts.	Rs. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. P.
1 Saltpetre 240fts. per acre at Us. 3-8-0 pr 82fts.,	286	94	192	49	204	+ 21	+ 252	1,137	2,323	35 8 0	11 10 0	47 2 0	- 7 6 0	+ 9 2 0	+ 1 13 0
2 Saltpetre 2401bs. per acre and bone dust 3G0lbs. per acre at 11 annas per 82fl>s.	323	100	223	45	223	+ 27	H-127	1,210	2,698	39 11 (	13 8 0	53 3 0	-10 10 0	+ 15 3 0	+ 4 9 0
3 Cow dung 180 mar.nds per acre at Es. 3 per 100 maunds.	275	81	194	42	239	+ 8	+ 97	980	2,347	[illegible]0 10 0	[illegible]1 12 0	[illegible]12 6 0	- 2 6 0	+ 4 6 0	+ 2 0 0
4 Cow dung 180 maunds per acre and bane dust 360&S. per aero at 11 annas per 821ba.	310	102	208	49	201.	+ 29	+ 351	1,234	2,517	[illegible]9 9 0	[illegible]2 9 0	[illegible]L 2 C	- 5 11 0	+ 13 2 2	+ 7 7 0
5 Cow dung 180 maunds per acre and gypsum 2!Ofts. per aero at Be. 1-12-0 per 822)3.	304	97	207	47	213	+ 24	+ 290	1,174	2,505	[illegible]6 11 C	[illegible]2 8 0	[illegible]9 3 0	- 7 8 P	+ 11 3 0	+ 3 11 0
6 Ashes of 180 maunds of cow dung at Bs. 3 per 100 maunds.	209	69	140	49	203	- 4	- 48	835	1,694	[illegible]6 1 C	8 8 0	[illegible]4 9 0	- 2 6 0	- 3 7 0	- 5 13 0
7 Sheep dung 180 maunds per acre at Bs. 3 per 100 maunds and bone-dust 360fl>s. per acre at 11 annas per S2fbs.	278	80	198	40	247	+ 7	+ 85	968	2,396	[illegible]0 4 0	[illegible]2 0 0	[illegible]2 4 (	- 2 8 0	+ 4 4 0	+ 1 12 0
8 Saltpetre 2401bs. per acre at Ra. 3-8-0 per 82fts. and bone superphosphate 240fts. per acre at Ks> 4ro-u per nzius.	193	61	132	46	216	- 12	- 145	738	1,597	[illegible]3 1 0	8 0 0	[illegible]1 1 0	- 5 11 0	- 6 15 0	- 12 10 0
9 Sheep dung 180 maunds at Bs. 3 per 100 maunds and gypsum 2401bs. per acre at Be. 1-12-0 per 82tbs.	315	104	211	49	23	+ 31	+ 375	1,258	2,553	[illegible]9 5 0	[illegible]2 12 0	[illegible]2 1 ('	—17 0 0	+ 14 1 O	- 2 15 0
10 Sheep dung 180 mauntU at Bs. 3 per 100 mauuds.	237	84	153	55	182	+ 11	+ 133	1,016	1,851	31 12 0	9 4 0	[illegible]L 0 C	- 7 8 0	+ 3 0 0	- 4 8 0
11 No manure	267	73	191	37	266	...	...	883	2,347	27 9 0	[illegible]1 12 C	[illegible]9 5 0	+ 3 0 0	+ 1 5 0	+ 4 5 0
12 Poudrette 180 maunds per acre at Bs. 4 per 100 maunds.	322	102	220	4C	216	+ 29	+ 351	1,234	2,662	38 9 0	13 6 0	[illegible]1 14 C	- 5 12 0	+ 13 14 O	+ 8 2 0
13 Ashes of 180 miuinds of cow dxmg at B*. 3 per 100 mauuda ard saltpetre 2401bs per acre at Bs. 3-S-O pet S*Hbs.	203	70	133	53	190	- 3	- 36	847	1,609	26 7 0	8 1 G	[illegible]4 8 (	- 12 13 0	- 3 8 0	- 16 5 0

[illegible] each plot 400 square yard*.

RABI STATEMENT No. II.—DUPLICATE SERIES; MANURE EXPERIMENT WITH WHEAT.

1	2	3	4	5	6	7	8	9	10		11			12	13	14
Calculation of the result and comparison of outturn with standard plot (No. 11) in the series.									Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.							
Serial number.	Detail of special treatment with the rate of its cost.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Percentage of grain to straw.	Percentage of straw to grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Actual outturn per acre. Grain.	Straw.	Value of outturn. Grain at Be. 1 per 41lbs.	Straw at Be. 1 per 400tbs.	Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Bs. 30.	Gain or loss peMcre in the value of outturn against ordinary cultivation assumed to be Bs. 38.	Net profit or loss over or against the assumed income, Bs. 38.
		fbs.	lbs.	fbs.	ft.	lbs.	lbs.	lbs.	fts.	lbs.	Us. a. p.	Ba. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. p.
1	Saltpetre 240fbs. per acre at Bs. 3-8-0 per 82fts. ...	248	71	177	40	249	+ 20	+ 242	859	2,142	26 13 0	10 11 0	38 8 0	- 7 5 0	+ 0 8 0	- 6 13 0
2	Ditto ditto and bone dust 360fts. per acre at 11 annas per 82fos.	212	70	142	49	203	+ 19	+ 230	847	1,718	25 13 0	8 9 0	34 6 0	- 10 10 0	- 3 10 0	- 14 4 0
3	Cow dung 180 maunds per acre at Bs. 3 per 100 maunds...	253	82	171	48	209	+ 31	+ 375	992	2,069	31 0 0	10 6 0	41 6 0	- 2 6 0	+ 3 6 0	+ 1 0 0
4	Ditto ditto and bone dust 360&s. per acre at 11 annas per 82S)s.	230	72	158	46	219	+ 21	+ 254	871	1,912	27 0 0	9 9 0	36 9 0	- 5 11 0	- 1 7 0	- 7 2 0
5	Cow dung 180 maunds per acre and gypsum 240fts. per acre at Be. 1-12-0 per 82fos.	267	78	189	41	242	+ 28	+ 330	944	[illegible]	29 8 0	11 6 0	40 14 0	- 7 8 0	+ 2 14 0	- 4 10 0
6	Ashes of 180 maunds of cow dung at Bs. 3 per 100 maunds,	218	67	151	44	225	+ 16	+ 194	611	1,827	25 5 0	9 2 0	34 7 0	- 2 8 0	- 3 9 0	- 0 1 0
7	Sheep dung 180 maunds per acre at Bs. 3 per 100 maunds and bone dust 360fes. per acre at 11 annas per 82fts.	273	83	190	44	229	+ 32	+ 387	1,004	2,299	31 6 0	11 8 0	42 14 0	- 5 11 0	+ 4 14 0	- 0 13 0
8	Saltpetre 240fts. per acre at Bs. 3-8-0 per 82ibs. and bone superphosphate 240fba. per acre at Bs. 4-8-0 per 112fcs.	212	66	i46	45	221	+ 15	+ 181	799	1,767	24 15 0	8 13 0	33 12 0	- 17 0 0	- 4 4 0	- 21 4 0
9	Sheep dung 180 maunds at Bs. 3 per 100 maunds and gypsum 240fos. per acre at Be. 1-12-0 per 82ft>s.	391	131	260	50	198	+ 81	+ 980	1,585	3,146	49 8 0	15 12 0	65 4 0	- 7 8 0	+ 3 0 0	- 4 8 0
10	Sheep dung 180 maunds at Bs. 3 per 100 maunds ..	283	[illegible]	190	79	204	+ 42	+ 508	1,125	[illegible]	25 2 0	11 8 0	36 10 0	+ 2 6 0	- 1 6 0	+ 1 0 0
11	No manure	154	61	103	50	202	...	...	617	1,210	19 4 0	6 4 0	25 8 0	+ 3 0 0	[illegible]	- 9 8 0
12	Poutette 180 maunds per acre at Bs. 4 per 100 maunds ...	414	136	278	49	204	+ 85	+ 1,028	1,646	3,30-1	51 7 0	16 13 0	68 4 0	- 5 12 0	+ 30 4 0	+ 24 8 0
13	AsheTOE 180 maunds of cow dung at Bs. 3 per 100 maunds and saltpetre 240fbs. per acre at Bs. 3-8-0 per 82lbs	229	72	157	46	218	+ 21	+ 254	871	1,900	27 3 0	9 8 0	36 11 0	- 12 13 0		- 14 2 0

Area of each plot 400 square yards.

RABI STATEMENT No. III.-GREEN MANURES (WHEAT) SERIES.

	Calculation of the result unfl comparison of outturn with the standard plot (No. 12) in the dories.							Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.							
	[	2	3	4	5	6	7	8		9			10	11	12
	Weight of un-[illegible] -heaves.	Weight of grain.	Weight of straw.	Percent-age of grain on straw.	Percent-age of [illegible] on grain.	Increase of decrease over stan-dard plot in the series.	Increase or decrease per acre.	Actual outturn per aciv.		Value of [illegible]			Gain or loss per acre in the cost against the cost of ordina-ry cultivation assumed to be Bs. 30.	Gain or loss per acre in the value of out-turn against ordinary cul-tivation assumed to be Bs. 38.	Net profit or loss over or against the assumed income, Bs. 38.
								Grain,	Straw.	drain at I.V. 1 per ;:21bs.	Straw at Be. 1 per 2ooibs.	Total.			
	lbs.	lbs.	lbs.	Us.	Us.	[illegible]	lbs.		Us	[illegible] a. p.	Bs. a. p.	[illegible] a. p.	Bs. a. p.	Bs. a. p.	Us. a. p.
1. Old indigo refuse 120 maunds at lie. 1 per 100 maunds per acre.	320	107	213	50	199	+ 53	+ 641	1,205	2,57;	iJ 7 0	12 11 0	[illegible]	- 1 12 0	+ 15 5 0	+ 14 9 0
2. Fresh indigo refuse 120 maunds at lie. 1 per 100 maundy and lime 6 maunds,	322	•118	204	58	173	+ 64	+ 774	1,128	2,468	U 10 0	12 5 0	[illegible] 15 0	- 3 8 0	+ 18 15 0	+ 15 7 0
3. Indigo water 3,600 cubic feet per acre at Be. 1 per 1,200 cubic feet.	107	60	137	44	228	+ 6	+ 73	726	1,658	22 11 0	8 5 0	31 0 0	-34 0 0	- 7 0 0	-41 0 0
4. Hemp water 3,600 cubic feet per acre at Be. 1 per 1,200 cubic feet.	100	Cl	120	47	212	+ 7	+ 85	738	1,561	23 1 0	7 13 0	30 14 0	-15 8 0	- 8 0 0	-23 8 0
5. No manure	167	51	113	43	200	...	...	653	1,307	20 6 0	6 13 0	27 3 0	+ 3 0 0	-10 13 0	- 7 13 0
6. After hemp crop	223	73	150	40	205	+ 26	+ 315	883	1,815	27 9 0	9 1 0	33 10 0	+ 3 0 0	- 2 6 0	- 5 6 0
7. Green manure with hemp at Bs. 3-8-0 per acre.	248	85	163	52	102	+ 38	+ 460	1,028	1,552	32 2 0	7 12 0	39 14 0	+ 0 4 0	+ 1 14 0	+ 1 10 0
8. Green manure with indigo at Bs. 8 per acre.	206	59	147	40	240	+ 12	+ U5	714	1,779	22 6 4	8 14 0	31 4 0	- 0 4 0	[illegible] 12 0	- 8 0 0
9. After indigo crop	232	60	163	42	236	4 22	+ 266	835	1,972	26 1 0	9 14 0	35 15 0	+ 1 8 0	- 2 1 0	- 3 9 0
10. Green indigo ploughed as manure at Re. M2-C per 82lbs. per acre with 6 maunds gypsum.	203	63	140	45	222	+ 16	+ 194	762	1,694	23 13 0	8 8 0	32 5 0	-10 7 0	- 5 11 0	-10 2 0
11. Green hemp ploughed as manure at Re. 1-12-0 per 82fts. per acre with 6 maunds gypsuin.	214	69	145	49	210	+ 22	+ 266	835	1,754	26 1 0	8 12 0	34 13 0	-10 12 0	- 3 3 0	-13 15 0
12. 15o manure	I59	47	112	42	238	...	...	569	1,355	17 12 0	6 12 0	21 8 0	+ 3 0 0	-13 8 0	-16 8 0
13. Alternate witti lucerne	227	75	152	49	[illegible]	+ 28	+ 339	907	629	28 5 0	[illegible] 2 0	31 7 0	+ 3 0 0	- 6 9 0	- 9 9 0

Area of each plot is 400 senate yards.

RATH-STATEMENT No. IV.—GREEN MANURE EXPERIMENT WITH WHEAT.

	Calculation of the result and comparison of outturn with the standard plot Nos. 5 and 2 respectively in A and B in the series.								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.							
	1	2	3	4	5	6	7	8	9		10			11	12	13
	Number of plots as per map of Farm.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series (Nos. 5 and 2.)	Increase or decrease per acre.	Actual outturn per acre. Grain.	Actual outturn per acre. Straw.	Value of outturn. Grain at Re. 1 per 32 fts.	Value of outturn. Straw at Re. 1 per 200 lbs.	Value of outturn. Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 38.	Net profit or loss over or against the assumed income, Rs. 38.
		fts.	fts.	lbs.	fts.	fts.	fts.	fts.	fts.	fts.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
A. Fresh indigo refuse 120 maunds and lime 6 maunds per acre at Re. 1 per 100 maunds and Rs. 20 per 100 maunds, respectively.	* 1	600	181	479	38	265	+ 96	+ 581	1,095	2,898	34 3 0	14 8 0	48 11 0	- 3 8 0	+ 10 11 0	+ 7 3 0
Fresh indigo refuse 120 maunds at Re. 1 per 100 maunds.	2	444	117	327	30	279	+ 32	+ 194	708	1,978	22 2 0	9 14 0	32 0 0	- 1 12 0	- 6 0 0	- 7 12 0
Old indigo refuse 120 maunds and lime 6 maunds per acre at Re. 1 per 100 maunds and Rs. 20 per 100 maunds, respectively.	3	543	154	389	40	253	+ 69	+ 417	931	2,353	29 1 0	11 12 0	40 13 0	- 3 8 0	+ 2 13 0	- 0 11 0
Old indigo refuse 120 maunds at Re. 1 per 100 maunds.	4	462	135	327	[illegible]	242	+ 50	+ 302	817	1,978	25 9 0	9 14 0	35 7 0	- 1 12 0	- 2 9 0	- 4 5 0
No manure (average of 2 plots) ...	5	305	85	220	39	259	...	...	514	1,331	16 1 0	6 10 0	22 11 0	+ 3 0 0	- 15 5 0	- 18 5 0
B. Hemp ploughed in (average of 7† plots)	[illegible]	475	128	347	37	271	+ 61	+ 338	814	2,207	25 7 0	11 1 0	36 8 0	- 0 4 0	- 1 8 0	- 1 12 0
No manure (average 6 plots) ...	[illegible]	239	67	172	39	257	...	...	447	1,010	13 15 0	5 1 0	19 0 0	+ 3 0 0	- 19 0 0	- 16 0 0

* Area of each plot 800 square yards.

† The area of the plots is different, but the average of a manured plot is 761 square yards and of an unmanured one is 726 square yards.

WHEAT.

EABI STATEMENT NO. V.-MISCELLANEOUS MANURES SERIES.

	Calculation of the resalt and comparison of outturn with the standard plot Ko. 8 in the series.								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.							
	1	2	3	4	5	6	7	8	9		10			11	12	13
	Number of plots as per map of Farm.	Weight of un-thrcslttd sheaves.	Weight of grain.	Weight of straw.	Percen'-ago of grain on straw.	Percent-age of straw on grain.	Increase or decrease over stan-dard plot (No. 8) in the series.	Increase or deCHAAC per acre.	Actual outturn per acre. Grain	Actual outturn per acre. Straw	Value of outturn. Grain at Be. 1 per 32lbs.	Value of outturn. Straw at Be. 1 per 200lb.	Value of outturn. Total.	Gain or loss per acre in the cost against the cost of ordinary cul-tivation as-sumed to be Bs. 30.	Gain or loss per acre in the value of out-turn against ordinary cul-tivation as-sumed to be Bs. 38.	Net profit or loss over or against the assumed in-come, Bs. 38.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	By. a. p.	Bs. a. p.	Rs, a. p.	Bs. a. p.	Bs. a. p.	Bs. a. p.
Brick kiln refuse 120 maunda at Be. 1-12-0 per acre.	1	170	53	117	45	221	+ 4	+ 43	641	1,416	20 0 0	7 1 0	[illegible]7 1 0	+ 1 4 0	- 10 15 0	- 12 3 0
Silt 300 maunds at annas 4 per 100 maunds per acre.	2	18G	57	129	44	226	+ 8	+97	690	1,661	21 8 0	7 9 0	[illegible]9 1 0	+ 2 4 0	- 8 15 0	- 11 3 0
Compost 200 maunds at Bs. 3 per-100 maunda per acre.	3	221	69	152	45	220	+ 20	+ 242	835	1,839	26 1 0	9 2 0	[illegible]5 3 0	- 3 0 0	- 2 13 0	- 5 13 0
Boad scrapings 300 maunds=Bi. 4-11-0 per acre.	4	201	61	140	44	230	+ 12	+ 145	738	1,094	23 1 0	8 8 0	[illegible]1 9 0	- 1 11 0	- 6 7 0	- 8 2 0
Ashes of 120 maunds weeds=Bs. 4 per acre.	5	151	4C	105	44	228	- 3	-36	557	1,270	17 6 0	6 6 0	[illegible]3 12 0	- 1 0 0	- 14 4 0	- 15 4 0
Ashes of saltpetre 240fbi.=Es. 3-8-0 per acre.	*6*	281	85	196	43	231	+ 36	+ 436	1,028	2,372	32 2 0	11 14 0	14 0 O	- 11 3 0	+ 6 0 0	- 5 3 0
Ammonia chloride 24Ofts.=Bs. 15 per acre.	[illegible]	163	46	n,	[illegible]	*m*	- 3	-36	557	1,416	17 6 0	7 1 0	» . .	- 41 0 0	- 13 9 0	- 54 9 0
No manure ...	8	175	40	126	[illegible]	257	...	...	593	1,561	18 8 0	7 9 0	26 1 0	+ 3 0 0	- 11 15 0	- 14 16 0

Area of each plot 400 pquftre yard*.

RABI STATEMENT No. VI—PLOUGHING EXPERIMENT WITH WHEAT.

Ploughing series.	1	2	3	4	5	6	7	8	9		10			11	12	13
	Calculation of the result and comparison of the outturn with standard plot Nos. 4 and 7 in the series A and B.								Comparison of cost and income with ordinary kind of cultivation in vogue in this country.							
	Number of plots as per map of Farm.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over the standard plot in the series.	Increase or decrease per acre.	Actual outturn per acre. Grain.	Actual outturn per acre. Straw.	Value of outturn. Grain at Re. 1 per 32 lbs.	Value of outturn. Straw at Re. 1 per 400 lbs.	Value of outturn. Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Rs. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 38.	Net profit or loss over or against the assumed income, Rs. 38.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
A. Ploughed 5" deep (four times) at annas 12 per ploughing.	1	153	51	102	50	200	+ 7	+ 113	823	1,646	25 11 0	8 4 0	33 15 0	+ 1 8 0	- 4 1 0	- 2 9 0
A. Ploughed 3" deep (six times) with country plough at 12 annas per ploughing.	2	132	44	88	50	200	...	...	710	1,420	22 3 0	7 2 0	29 5 0	...	- 8 11 0	- 8 11 0
A. Ploughed 9" deep (four times) at 12 annas per ploughing.	3	179	61	118	52	193	- 15	+ 242	984	1,904	30 12 0	9 8 0	40 4 0	+ 3 0 0	+ 2 4 0	+ 5 4 0
A. Ploughed 3" deep (eight times) with country plough at 12 annas per ploughing.	4	139	46	93	49	215	...	...	742	1,500	23 3 0	7 8 0	30 11 0	...	- 7 5 0	- 7 5 0
B. Ploughed 9" deep (four times) at 12 annas per ploughing.	5	1,505	367	1,138	32	310	- 3	- 6	725	2,248	22 10 0	11 4 0	33 14 0	+ 3 0 0	- 4 2 0	- 1 2 0
B. Ploughed 6" deep (four times) at 12 annas per ploughing.	6	1,501	426	1,075	40	252	- 56	- 111	842	2,124	26 5 0	10 10 0	36 15 0	+ 3 0 0	- 1 1 0	+ 1 15 0
B. Ploughed 3" deep (eight times) with country plough at 12 annas per ploughing.	7	1,500	370	1,130	33	305	...	...	731	2,237	22 13 0	11 3 0	34 0 0	...	- 4 0 0	- 4 0 0

The difference of the cost of ploughing for eight times at annas 12 each time = Rs. 6, is shown in column 12.

Area of each plot (Nos. 1 to 4) 300 square yards.

„ „ (Nos. 5 to 7) 2,450 „ „

EABI STATEMENT No. VII.—MANURE EXPERIMENT WITH COTTON SEED CAKE AND COW DUNG (WHEAT SOWN).

Series	Detail of special manures applied.	Calculation of the result and comparison of outturn with the standard plot Nos. 6 and 6 in the series A and B.								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.							
		1	2	3	4	5	6	7	8	9		10			11	12	13
		Number of plots as per map of Farm.	Weight of un-threshed sheaves.	Weight of grain.	Weight of straw.	Percent-age of grain on straw.	Percent-age of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Actual out-turn per acre. Grain.	Actual out-turn per acre. Straw.	Value of outturn. Grain at Be. 1 per 32 lbs.	Value of outturn. Straw at Bic. 1 per 200 lbs.	Value of outturn. Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to bells. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to he Bs. 38.	Net profit or loss over or against the assumed income, Bs. 38.
			ILs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Bs. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. p.	Bd. a. p.	Bs. a. p.
A.	Cotton seed fed dung, *50* maiuids per acre at Its. 4 per 100 maunds.	1	422	124	298	42	240	- 14	- I11	981	2,367	30 10 0	11 13 0	42 7 0	+ 1 0 0	+ 4 7 0	+ 5 7 0
	Ditto ditto 100 maunds per acre at Bs. 4 per 100 maunds.	2	417	132	285	4G	216	- G	- 47	1,044	2,254	32 10 0	11 4 0	44 5 0	- 1 0 0	+ 6 5 0	+ 5 5 0
	Cow dung 200 inauuds at Us. 3 per 100 maunds per acre.	3	530	148	391	38	2C4	+ 10	+ 79	1,170	3,109	36 9 0	15 9 0	5? 2 0	- 3 0 0	+ 14 2 0	+ 11 2 0
	Perished cotton seed 5 maunds at lie. 1 per 30 seers per acre.-	4	498	140	358	39	256	+ 2	+ 16	1,107	2,831	34 9 0	14 9 0	49 2 0	- 3 15, 0	+ 11 2 0	+ 7 3 0
	Ditto ditto 10 maunds at Re. 1 per 30 seers per acre.	5	56G	1G2	404	40	249	+ 24	+ 190	1,281	3,260	40 0 0	16 5 0	56 5 0	- 10 14 0	+ 18 5 0	+ 7 7 0
	No special manure ...	6	530	138	392	[illegible]	284	...	...	1,091	3,103	34 1 0	15 8 0	49 9 0	+ 3 0 0	+ 11 9 0	+ 14 9 0
B.	Mustard cake 5 maunds per acre at Be. 1 per 30 seers.	1	501.	154	350	44	227	+ 33	+ 220	1,027	2,333	32 1 0	11 11 0	43 12 0	- 5 1 0	+ 5 12 0	+ 0 11 0
	Ditto 10 maunds per acre at Be. 1 per 30 seers.	2	G33	189	444	43	235	+ 68	+ 453	1,260	2,960	39 6 0	14 13 0	54 3 0	- 13 1 0	+ 1G 3 0	+ 3 2 0
	Plain cow dung 200 maunds per acre at Bs. 3 per 100 maunds.	3	G01	183	418	44	229	+ 62	+ 413	1,220	2,787	38 2 0	13 15 0	52 1 0	- 3 0 0	+ 14 1 0	+ 11 1 0
	Cake fed dung 50 maunds per acre at Bs. 4 per 100 maunds.	4	523	134	3S9	34	290	+ 13	+ 87	893	2,593	27 14 0	12 15 0	40 13 0	+ 1 0 0	+ 2 13 0	+ 3 13 0
	Ditto 100 maunds per acre at Bs. 4 per 100 maunds.	5	461	122	342	36	280	+ 1	+ 7	813	2,280	25 6 0	11 3 C	36 9 0	- 1 0 0	- 1 7 0	- 0 7 0
	No special manure ...	6	4G7	121	346	35	[illegible]	...	...	807	2,307	25 3 0	li 9 0	36 12 0	+ 3 0 0	- 1 4 0	+ 1 12 0

A.* Area of each plot 612 square yards.
B. Ditto 72ti ditto.

RABI STATEMENT No. VIII.—EXPERIMENT AS TO THE RESIDVAL VALVE OF VARIOVS MANVRES (WHEAT SOWN).

	Calculation of the result and comparison of outturn with the standard plot No. 6 and 10 in the series A and B.								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.				
	1	2	3	4	5	6	7	8	9		10		
									Actual outturn per acre.		Value of outturn.		
	Number of plots as per map of Farm.	Weight of unthrebhed sheaves.	Weight of grain.	Weight of btraw.	Percentage of grain on btraw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Grain.	Straw.	Grain at Re. 1 per 32 lbs.	Straw at Re. 1 per 200 lbs.	Total.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.
A. Calcic superphosphate 180 lbs, ammonic chloride 131 lbs., potassic sulphate 90 lbs., calcic sulphate 96 lbs. per acre.	1	89	27	62	44	229	+ 2	+ 48	653	1,500	20 6 0	7 8 0	27 14 0
Ditto except calcic superphosphate ...	2	79	24	55	44	229	- 1	- 21	581	1,331	18 2 0	6 10 0	24 12 t)
Ditto except ammonic chloride ...	3	84	26	58	45	223	+ 1	- 24	629	1,40-1	19 10 0	7 2 0	26 12 0
Ditto except potassic bulphatc ...	4	84	28	56	50	200	+ 3	+ 73	678	1,355	21 3 0	6 12 0	27 15 0
Ditto except calcic sulphate ...	5	G5	21	44	48	210	- 4	-97	508	1,065	15 14 0	5 5 0	21 3 0
No manure	G	82	25	57	44	228	...	...	605	1,379	18 14 0	6 14 0	25 12 0
B. Cowdung	1	321	85	236	36	278	+ 13	+157	1,028	2,856	32 2 0	14 4 0	46 6 0
Poudrette	2	235	70	165	42	236	- 2	- 21	817	1,996	2G 7 0	10 0 0	36 7 0
Mustard cake	3	212	64	148	43	231	- 8	- 97	774	1,791	21 3 0	8 15 0	33 2 0
Woollen refuse	4	21G	66	160	35	286	- 16	- 194	678	1,936	21 3 0	9 11 0	33 14 0
Cow dung and hone dust	5	215	59	156	38	264	- 13	- 157	714	1,8S8	22 5 0	9 7 0	31 12 0
Compost	6	209	57	152	38	2G7	- 15	- 181	600	1,839	21 9 0	9 3 0	30 12 0
Indigo ploughed	7	179	55	124	44	225	- 17	- 20(5	665	1,500	20 12 0	7 8 0	28 4 0
Salt pure	8	20G	59	147	40	249	- 13	- 157	714	1,779	22* 5 0	8 14 0	31 3 0
Ammonic	9	210	58	152	38	262	- 14	- 169	702	1,839	21 12 0	9 3 0	30 15 0
No manure	10	239	72	167	43	232	...	...	871	2,021	27 3 0	10 2 0	37 5 0

A. Each plot is of 200 square yards.
B. Ditto G05 ditto.

BABI STATEMENT No. IX.—EXPERIMENT WITH KAINIT ON WHEAT.

	Calculation of the result and comparison of outturn with the standard plot No. 5 in the series.								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.							
	1	2	3	4	5	6	7	8	9		10			11	12	13
	Number of plots as per map of Farm.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Actual outturn per acre. Grain.	Actual outturn per acre. Straw.	Value of outturn. Grain @ Be. 1 per 32lbs.	Value of outturn. Straw @ Ee. 1 per 200 lbs.	Value of outturn. Total.	Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to be Bs. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Bs. 38.	Net profit or loss over or against the assumed income, Bs. 38.
		lbs.	tls.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Bs. a. p.	Rs. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. p.	Bs. a. p.
Kainit 3 cwt. per acre and green hemp ploughed.	1	281	88	193	46	219	+ 26	+ 315	1,065	2,335	33 4 0	11 11 0	44 15 0	-8 8 0	+ 6 15 [illegible]	- 1 [illegible]
JJeup ploughed ...	2	242	80	K.2	49	202	+ 18	+ 218	968	1,960	30 4 0	9 13 0	40 1 0	-0 4 0	+ 2 1 0	+ 1 13 0
Farmyard manure *200 mds.* and kainit 3 cwt. per acre.	3	683	231	452	51	196	+ 169	+ *1,230*	1,681	3,290	52 9 0	16 7 0	69 0 0	-11 4 0	+ 31 0 0	+ 19 12 0
Woollen refuse *200 mds.* and Jciinit 3 cwt. per acre.	4	779	*219*	530	47	213	+ 187	+ 1,361	1,812	3,857	56 10 0	19 5 0	75 15 0	-11 4 0	+ 37 15 0	+ *26* 11 0
No manure ...	5	240	62	178	35	287	...	...	750	2,154	23 7 0	10 12 0	34 3 0	+ 3 0 0	- 3 13 0	- 0 13 0

1—400 square yards. 2—400 square yards. 3—665 square yards. 4—665 square yards. 5—400 square yards.

RABI STATEMENT No. X.

	Calculation of the result and comparison of outturn with the standard plot in the series.								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.				
	1	2	3	4	5	6	7	8	9		10		
	Number of plots as per map of Farm.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Actual outturn per acre. Grain.	Actual outturn per acre. Straw.	Value of outturn. Grain at Be. 1 per 32lbs.	Value of outturn. Straw at Be. 1 per 200lbs.	Value of outturn. Total.
		fts.	lbs.	lbs.	lbs.	lbs.	fcs.	fts.	as.	lbs.	Bs. a. p.	Bs. a. p.	Bs. a. p.
Grazed by sheep when one foot high ...	1	180	42	138	30	329	—1	- 24	1,016	3,340	31 12 0	16 11 0	48 7 0
KibWcd by sickle ditto ...	2	186	45	141	32	313	+ 2	+ 48	1,089	3,412	34 0 0	17 1 0	51 1 0
Left as it was ,, ...	3	155	43	112	38	260	...	...	1,041	2,710	32 8 0	13 9 0	46 1 0

Each plot 200 square yatda.

RABI STATEMENT No. XL—EXPERIMENT IN METHODS OP SOWING (WHEAT).

	Calculation *of the* result and comparison of outturn with the standard plot *No. 2 in. the series.*								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.							
	1	2	3	4	5	6	7	8	9		10			11	12	13
	Number of plotas per map of Farm.	Weight of un-threshed sheaves.	Weight of grain.	Weight of straw.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Actual outturn per acre.		Value of outturn.			Gain or loss per acre in the cost against the cost of ordinary cultivation assumed to he Rs. 30.	Gain or loss per acre in the value of outturn against ordinary cultivation assumed to be Rs. 38.	Net profit or loss over or against the assumed income, Rs. 38.
									Grain.	Straw.	Grain at Be. 1 per 41Bs.	Straw at Ee. 1 per 40011s.	Total.			
		fts.	lbs.	lbs.	lbs.	lbs.	fts.	lbs.	fts.	fts.	Rs. a. p.	Rs. a. p.	Es. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Elf* '") Sown after Jethro)	1	570 65 40	215 40 ...	355 25 ...	61	165	—206	-515	537	887	16 12 0 1 0 0 ...	4 7 0 0 4 0 1 0 0	21 3 0 1 4 0 1 0 0	* -45 2 0	-16 3 0	-61 5 0
												Total ..	23 7 0			
Sown after country fashion ...	2	1,439	421	1,018	41	2421	...	...	1,052	2,545	33 14 0	12 12 0	45 10 0	...	+ 7 10 0	...

* Cost of making strips per acre. (1) Making strips 43,560 cubic feet at Re. 1 per 1,000 cubic feet Rs. 43-8-0. (2) Labor of making lines and sowing Re. 1-10-0.

EABI STATEMENT No. XII.—EXPERIMENT WITH DIFFERENT VARIETIES OF WHEAT.

	Calculation of the result and comparison of outturn with the standard plot No. 5 in the series.								Comparison of cost and income with the ordinary kind of cultivation in vogue in this country.				
	1	2	3	4	5	6	7	8	9		10		
	Number of plot as per map of Farm.	Weight of unthreshed sheaves.	Weight of grain.	Weight of straw.	Percentage of grain on straw.	Percentage of straw on grain.	Increase or decrease over standard plot in the series.	Increase or decrease per acre.	Actual outturn per ««		Value of outturn.		
									Grain.	Straw.	Grain @ Re. 1 per 41flbs.	Straw @ Re. 1 per 400lbs.	Total.
		tts.	lbs.	lbs.	lbs.	lbs.	9)s.	fts.	fts.	lbs.	Rs- a. p.	Rs. a. p.	Rs. a. p.
Adelaide	1	305	72	[illegible]	31	324	+ 7	+ 85	871	2,819	27 3 0	14 2 0	41 5 0
•Muzaffarnagar	2	254	89	165	54	185	- 10	-121	1,070	1,996	33 7 0	10 0 0	43 7 0
Sindhi	3	328	70	258	27	369	+ 9	+ 109	847	3,122	26 7 0	15 10 0	42 1 0
liuxar	4	215	58	157	37	271	+ 21	+ 254	702	1,900	21 15 0	9 8 0	31 7 0
Mundia	5	348	79	2G9	29	341	...	...	956	3,255	29 14 0	16 4 0	46 2 0

RABI STATEMENT No. XIII.-EXPERIMENT WITH BARLEY.

Number of plot.	Crojfe.	Weight of unthrcshed sheaves.	Weight of grain.	Weight of straw.	Percentage of grain on straw.	Percentage of straw on grain.	Outturn per acre.	
							Grain.	Straw.
		lbs.	lb*.	lbs.	lbs.	lbs.	lbs.	lbs.
1	*Chocolate* colored barley	1,060	343	712	49	205	1,547	3,164
2	White huskless barley	476	178	298	60	167	1,780	2,980
3	Green ditto	523	164	359	46	219	1,312	2,872
4	Country barljy	1,205	395	810	49	205	1,974	4,050

RABI STATEMENT No. X1V.-EXPEUIMENT WITH GYPSUM APPLIED TO PEAS AND GRAM.

Number of plot.	Crop*.	Manure and quantity per aero.	Outturn per acre.		Increase due to gypsum.	
			Grain.	Straw.	Grain.	Straw.
			lbs.	lbs.	lbs.	Ibtf
1	Peas	Farmyard manure 100 maunds, gypsum 3 cwt. P. A.	1,703	1,542		484
2	Do.	Ditto 100 maunds per acre	1,673	1,058		
3	Gram	Ditto 50 maunds, gypsum 3 cwt. P. A.	1,680	745		89
4	Do.	Ditto 100 maunds per acre	1,508	G56		

The objects of this experiment have heen already stated. Each of the plots, save the unmanured one, receives a special kind of manure year after year. At the time of sowing they were ploughed twice with the **improved** plough five inches deep, and twice with the country plough. Maize seed, six seers per acre, was sown hehind the country plough. They were weeded twice and ridged up once. Sowing took place on the 13th of June,

The plants in **NOB.** 2, 4, 8 and 10 of the standard series were somewhat injured by rain. In Nos. 7 and 9 the plants were very vigorous and the cohs were plump a»d full of seed.

The subjoined statements Nos. I and II contain the result and show the difference of the produce of the several plots, which is chiefly due to the effect of different fertilizers.

Of the standard series plots *{viz.,* in which maize is sown **without** any alternation) poudrette, sheepdung, sheepdung mixed with honedust and with gypsum, and pla"> cowdung have given good results. Asa good crop of **maize (say 1,600** lbs. to the acre) is worth Us. 40 exclusive of the value of the stalks, it **repays a** liberal **expenditure** on manure.

Of the duplicate series plots (statementNo.il) ashes of cowdung **with saltpett?** have been hest of all. The yield of many plots in this **series** lias teen less **than** that of the corresponding plots in the standard series. This is due to their **enjoying** n° rest> as the maize is sown two months after **the** wheat crop has been taken.

KHAafF STATEMENT No. *I.-Standord serie*-Man«re experiment* ***mti*** *maize.*

Ifum-bac or pioi per fsiriu map.	Hanaro applied per acre.	Vftlun of manure.	Produce per acre.				Increase or decrease over unmanned plot.:			
			Grain.		Stalks.		In grain,		In stalks-	
			Average for previous 4 yoaw.	This year.	Average for previous 4 years.	This year.	Average for previous 4 jsaa.	This year.	Average ror previous 4 years.	J.1119 year.
		Ba. a. p.	fts.	as.	lbs.	lbs.	lbs.	il l.	B)9.	lbs.
K-10	Sheepdang ISO mannas ...	S 6 0	[illegible]	U98	4,459	9,8G2	+ 163	+ 920	-427	[illegible]
K- 0	Poudrette 180 mannda ...	7 3 0	1,036	1,912	3,943	8,204	+ 430	+ 1,(534	-913	+ 3,937
K-8	Ashes of 180 maunds of cowdung and saltpetre 3 maunds.	14 6 0	1,222	1,102	6,019	9,535	+ GIC	+ 834	+ 1,733	+ 5,28»
K-5	Saltpetre 3 mauuds	O 0 0	852	**1,041**	4,745	5,870	[illegible]	+ 7C3	-141	+ 1.G33
K-11	Ditto ditto and bonedust 41 maanils.	19 11 0	936	1,271	5.G90	10,570	+ **829**	t + 993	+ 810	+ a3?s
K-3	Cowdung 180 tnsunda	5 G 0	1,031	1,500	3,537	7,917	+ 425	+ 1.L'^J	[illegible]	+ 3,870
K-1	Ditto ditto and bonedust 4V maunds.	IS 1 0	1,082	UIO	4,447	8,470	+ 476	+ P32	-439	+ 4.S39
K-a	Ditto ditto and gypsum 3 lAaunds.	10 10 C	1,170	1,150	4.419	7,187	+ 564	+ 873	-407	+ 2,9W
K- 4	Ashes of 180 maunds of cowdung ,,,	s e t	E+O	895	8,708	7,817	-CG	+ C17	-1,178	+ 3,537
K-7	Sheepdung 180 maunds and bonedust 4^ maund&.	16 1 (	933	1,827	6,500	8,180	+ ^7	+1,549	+ GS3	+ 3,93*
K-G	Saltpotre 3 maunds and bone-superphosphate 3 mauuds.	30 O (	875	1.24G	4,069	1,403	+ 2G9	+ OCS	-81''	[illegible]
K-12	Sheepdung 180 mannda and gypsum 3 maunda-	10 10	846	1,700	4,702	6,304	+ 240	+1,428	-181	+ 2,057
K-13	Ko manure ,,. ••• ***	...	6oa	278	4,830	4,247	...	...	...	...

REPORT

ON THE

CAWNPORE EXPERIMENTAL STATION

FOB TUB

XHARIF AND BABI SEASONS, 1889-90.

ALLAHABAD:

WRTU-WESTERN PKOVINCJ3S AND OUDH GOVEENMBNT FRESfl.

1890.

KHARIF EXPERIMENT III.—This experiment is termed "miscellaneous," and has been carried on from 1881, in a series of eight plots each measuring 400 square yards.

These plots were sown with the usual quantity of seed, 6 seers per acre, on the 12th of June. Ploughing and weeding was done as in No. I experiment.

The plants in Nos. 1, 2, 3 and 5 of this series grew too luxuriantly and were afterwards beaten down by heavy rain. Some damage was also done by wild pigs. No. 1, as usual, gave the best results. The tendency of saltpetre to increase stalk rather than seed is noticeable.

KHARIF STATEMENT NO. III.—*Miscellaneous manure experiment with maize.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre. Grain. Average for previous 5 years.	Grain. This year.	Stalks. Average for previous 5 years.	Stalks. This year.	Increase or decrease over unmanured plot. In grain. Average for previous 5 years.	In grain. This year.	In stalks. Average for previous five years.	In stalks. This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
N-1	Woollen refuse 120 maunds ...	6 0 0	1,594	2,226	6,706	8,966	+936	+1,258	+3,596	+2,129
N-2	Sheepdung 120 " ...	3 10 0	983	1,573	4,594	7,901	+325	+605	+1,484	+1,064
N-3	Cowdung 120 " ...	3 10 0	697	1,488	3,433	9,704	+39	+520	+323	+2,867
N-4	Poudrette 120 " ...	4 13 0	1,067	1,694	4,744	9,022	+409	+726	+1,634	+3,085
N-5	Horsedung 120 " ...	3 10 0	1,002	1,331	4,957	9,741	+344	+363	+1,847	+2,904
N-6	Pigdung 120 " ...	3 10 0	1,103	1,150	5,579	9,051	+445	+182	+2,469	+2,114
N-7	Saltpetre, 3 " ...	9 0 0	954	1,355	4,405	9,898	+296	+387	+1,295	+3,061
N-8	No manure	...	658	968	3,110	6,837	...	...	...	...

KHARIF STATEMENT IV.—This experiment is for five years, which term has expired this year. Its object is to determine the comparative result of sowing maize on ridges after the American fashion at the distance of one, two and three feet.

All the plots of this series were kept under the same treatment throughout the season, i.e., were all ploughed, sown, and weeded on the same days. They were sown on the 10th of June. The number of ploughing and weeding was the same as in the foregoing cases.

The cobs in plots Nos. 1, 2 and 3 were very stout and good.

This year the plots sown on ridges have produced more than the plot sown by ordinary method, but this is contrary to the results generally obtained in previous years. The plots Nos. 1 and 4 were beaten down by the rain and suffered to a certain extent.

KHARIF STATEMENT NO. IV.—*Maize sown after American fashion.*

Number of plot per farm map.	Mode of sowing.	Produce per acre. Grain. Average for previous 4 years.	Grain. This year.	Stalks. Average for previous 4 years.	Stalks. This year.	Increase or decrease over ordinary cultivated crop. In grain. Average for previous 4 years.	In grain. This year.	In stalk. Average for previous 4 years.	In stalk. This year.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
[illegible]	One foot apart	1,000	2,300	3,800	10,400	−540	+660	−471	−752
[illegible]	Two feet apart	740	2,108	2,305	8,664	−818	+468	−1,006	−2,488
[illegible]	Three ditto	554	1,876	1,010	5,784	−1,004	+236	−2,361	−5,368
[illegible]	After country fashion	1,558	1,640	4,271	11,152	...	...	...	...

No. 1432F.

DEPT. OF LAND RECORDS AND AGRI. N.-W. P. AND OUDH.

Dated Cawnpore, the 15th November **1890.**

FROM

T. *W.* HOLDERNESS, ESQ., C.S.,

DIR., DEPT. OF LAND RECORDS AND AGRI., N.-W. P. AND OUDH,

To

THE CHIEF SECRETARY TO GOVERNMENT,

N.-W. PROVINCES AND OUDH.

SIR,

I HAVE the honour to submit the Report on the Government Experimental Farm at Cawnpore for the year ending the 30th June last. The report has been drawn up under my supervision by the Assistant Director, who has been in charge of the farm throughout the year.

2. The statements exhibiting the results of the several experiments have been recast, with the object both of simplifying them and of comparing for each field the averages of past years with the outturn for the year under report. This has considerably delayed the present report, as the averages had to be carefully worked out and checked.

3. Dr. Voelcker visited the farm on several occasions, and expressed his approval of the method of management and the mode of recording results. It is essential on an experimental station that there should be no doubt as to the exact yield of each field year by year, or as to its method of treatment. I am therefore pleased to know that in Dr. Voelcker's opinion the method of obtaining results and of recording them followed on the Cawnpore Farm meets the requirements of scientific accuracy. It is of the highest importance to obtain an exact register of what land in India will produce on the average of a number of years under unchanged conditions. This information is being gradually collected on the Cawnpore Farm, and it will become more valuable as the observations increase in number.

			lbs.	
Page 11,	average for six years,	...	950	
" 12,	ditto	...	133	
" 13,	ditto	...	956	
" 13,	ditto	...	[illegible]	
" 14,	ditto	...	630	(average of 2 plots).
" 11,	ditto	...	596	(ditto 6 do.)
" 14,	ditto	...	614	
" 15,	ditto	...	586	(ditto 4 do.)

4. The yield of unmanured land in a series of years is one of the most interesting points on which information is being collected. There are a good many such plots on the farm. I give in the margin the average outturn of wheat per acre of all plots which have been without manure and under wheat for the past six years. In some of these plots the yield is possibly still affected by manure applied before the land was placed under the present series of experiments, and may be expected to decrease in future years. Taking a bushel of wheat at 60 lbs., the general yield of unmanured land of the kind found on the Cawnpore Farm—a loam of average fertility cropped year after year and carefully watered and tilled—may be put at 10 to 13 bushels an acre. The American average for all the States of the Union is about 12 bushels. The English average

is 30 bushels. The Cawnpore experiments conclusively show that 5 to 10 bushels can be easily added to the average yield by the application of Rs. 5 worth of farmyard manure or even by green-soiling with hemp at the cost of Rs. 3-8-0 per acre. This is putting the increase at a minimum. The six years' average yield of the plot manured with farmyard manure only in the "Rabi duplicate series" is 27 bushels, and of the plot manured with *poudrette* 28 bushels. Thus we get the American average on our unmanured land and approximate to the English average on our manured. I am afraid that the American average is not unfrequent in many districts of these Provinces, especially in those where canals enable the cultivator to subject the soil to a systematic process of exhaustion.

5. As regards the comparative value of manures, the experience of the Cawnpore Farm is not favourable to artificial or extraordinary fertilizers. Bones, bone-superphosphate, gypsum, kainit, &c., are considerably more costly in this country than the common kinds of manure, and so far as they have been tried they have not given commensurate results. Green-soiling with indigo or hemp might, however, be more commonly adopted by the Indian agriculturist than at present. The cost of sowing hemp and ploughing it in when green is put at Rs. 3-8-0 an acre. But this is chiefly made up of hire of labour and bullocks, and the cultivator can find both without actual expenditure of money. In districts where indigo is not a staple crop, the fields destined for wheat (unmixed) are almost invariably left fallow in the preceding kharīf. To sow these with hemp instead of fallowing them would, according to the Cawnpore Farm Experiments, make the wheat crop heavier.

6. Most of the produce of the farm is sold to the public for seed, the seed-grain being carefully cleaned and selected. Dr. Voelcker was of opinion that this branch should be developed, and some of the minor experiments abandoned. I am considering how effect can best be given to this suggestion. The demand for good wheat, cotton, barley, and maize seed is increasing, and in endeavouring to meet it the farm can be of practical utility,

I have the honour to be,

Sir,

Your most obedient servant,

T. W. HOLDERNESS,

Director.

REPORT

ON THE

CAWNPORE AGRICULTURAL STATION,

FOR THE KHiRIF AND RABI SEASONS OF 1889-90.

THE tabular statements showing the results of the several experiments have been altered this year at the suggestion of Dr. Voelcker. They were unnecessarily elaborate and cumbersome. In the present series averages of past years have been given where possible.

Alteration in the form of the tabular statements.

The year under review lias been very favorable in this district (Cawnpore) for both kharif and rabi crops. The rains were all that could be wished, and the supply of canal water for irrigation has also been regular throughout the year.

Character of the year.

All the experiments during the year under report were virtually the same as in the last years. There is hardly room for new ones. The existing experiments are considered by Dr. Voelcker fully sufficient, if not too numerous.

The chief and important experiments are—

In kharif with maize.

In rabi with wheat, indigo, sugarcane. Potatoes have lately been added.

The experiments may be thus classed :—

Summary of experiments.

(a) "Permanent" (i.e., carried on year after year on the same plot of land and with the same kind of treatment) a detailed account of which will follow.

(5) " Temporary " in respect of duration and of land used.

The " permanent" experiments are carried on with the view to determine—

(1) Whether wheat and maize can be grown year after year on the same land by the aid of manure, deep ploughing, &c.

(2) Whether to obtain a good crop rotation is really indispensable.

(3) For how long and to what extent, without the application of manure, the soil remains capable of nourishing plant life.

(4) What constituent in soil or in a manure is more essential for the above crops, (maize and wheat) and needs to be provided artificially in case of its absence or scarcity.

(5) Whether deep ploughing and watering are enough for obtaining a good crop, or whether manure is indispensable.

The "temporary" experiments are conducted with the view to ascertain (1) the value of certain fertilizers j (2) of imported and acclimatized seeds; (3) of deep and shallow ploughing, methods of sowing, &c, &c.

Both the " permanent" and " temporary" experiments further enable us—

(a) to ascertain the value and utility of improved methods compared with the country way of farming ;

(i) to form an idea of the character of the season from the result obtained on the farm.

KHARIF SEASON EXPERIMENTS.

KHARIF STATEMENTS I AND II.—*Experiments with maize.*—This experiment is carried on in a series of 26 plots. In 13 of these plots maize is sown year after year without any change of treatment, while the other 13 plots are alternated with maize aud wheat.

on J h e ^ of tUS experiment iaTM been already stated. Each of the plots, save the tmmnured one, receives a special kind of manure year after year. At the time of Bomng they were ploughed twice with the improved plough five inches deep, and twice It--hT 7 P lou MaiZe six "« V» aVwas "«a behind the country of June. W6re weeued tWiCe Md ^^ Up once- Sowin& ^k place on the 13th

The plants in Nos. 2, 8 and 10 of ** •*•"*"* " ^ W<Jre SOmewhat ^^ * rain. In Nos. 7 and 9 th plan full of seed. * 8 ** W6re veiy vigorous ^^ tte cobs were plump and

The subjoi tements ^ and n contain the result and show the difference of the produce of the several plots, which is chiefly due to the effect of different fertilizers.

Of the standard series plots (VU,, m which maize is sown without alternation) poudrette, sheepdung, sheepdung and plain cowdung have given good results. As a good crop of maize (say 1,600 lbs. to the acre) is worth Rs. 40 excl of ^ Tahe o£ the *% tt W a literal expenditure 22 .ure.

Of the duplicate series plots (statement No. II) ashes of cowdung with saltpetre have been best of all. The yield of many plots in this series has been less than that of the corresponding plots in the standard series. This is due to their enjoying no rest, as the maize is sown two months after the wheat crop has been taken.

Kharif STATEMEaT No. I.—Standard teri., xr «"«•—.*«,•» *experiment with maize.*

Number of plot per farm map.	Manure applied per acre.	Value of manure.	Produce per acre. Grain. Average for previous 4 years.	Produce per acre. Grain. This year.	Produce per acre. Stalks. Average for previous 4 years.	Produce per acre. Stalks. This year.	Increase or decrease over unmanured plot. In grain. Average for previous 4 years.	In grain. This year.	In stalks. Average for previous 4 years.	In stalks. This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
K-10	Sheepdung 180 maunds ...	5 6 0	788	1,189	4,459	9,842	+162	+980	−437	+5,615
K-3	Poudrette 180 maunds ...	7 3 0	1,066	1,012	5,043	8,204	+430	+1,034	−948	+3,467
K-8	Ashes of 180 maunds of cowdung and saltpetre 8 maunds.	14 6 0	1,286	1,169	6,019	9,305	+610	+894	+1,733	+6,289
K-6	Saltpetre 8 maunds	0 0 0	865	1,041	4,745	5,870	+246	+763	−141	+1,613
K-11	Ditto ditto and bonedust 4½ maunds.	19 11 0	935	1,271	6,086	10,576	+339	+993	+610	+5,409
K-9	Cowdung 180 maunds	5 6 0	1,081	1,400	3,537	7,017	+485	+1,282	−1,249	+3,670
K-1	Ditto ditto and bonedust 4½ maunds.	10 1 0	1,069	1,210	4,447	8,470	+470	+932	−419	+4,299
K-2	Ditto ditto and gypsum 8 maunds.	10 10 0	1,170	1,180	4,419	7,187	+561	+872	−447	+2,940
K-4	Ashes of 180 maunds of cowdung ...	5 6 0	540	605	3,506	7,817	−66	+617	−1,170	+3,667
K-7	Sheepdung 180 maunds and bonedust 4½ maunds.	18 1 0	848	1,827	5,000	8,160	+337	+1,549	+433	+4,033
K-6	Saltpetre 8 maunds and bone-superphosphate 3 maunds.	60 0 0	875	1,348	4,000	1,408	+265	+963	−817	−2,844
K-12	Sheepdung 180 maunds and gypsum 8 maunds.	10 10 0	848	1,700	4,703	6,304	+240	+1,428	−183	+2,057
K-13	No manure	...	608	278	4,950	4,247	...	...	...	...

Kharif STATEMENT NO, *II.—ZJLartf duplicate series—Manure experiment with maize.*

Number of plot per farm map.	Manure applied pec acre.	Value of manure.	Produce per acre. Grain. Average for previous four years.	Produce per acre. Grain. This year.	Produce per acre. Stalks. Average for previous four years.	Produce per acre. Stalks. This year.	Increase or decrease ovor unmanured plot, In grain. Average for previous four years.	Increase or decrease ovor unmanured plot, In grain. This year.	Increase or decrease ovor unmanured plot, In stalks. Average for previous four years.	Increase or decrease ovor unmanured plot, In stalks. This year.	Remarks.
		Bs. a. p.	fts.	fts.	fts.	fts.	fts.	fts.	fts.	fts.	
Alb-1	Sheepdnng 180 maunds	5 6 0	715	1,270	3,648	8,325	+ 382	+ 968	+ 999	+ 3,836	The rotation on these plots is as follows. They were under maize in June-September 1887. They then lay fallow till October 1888, when they were put under wheat, which was reaped in April 1889. They were then put under maize in June 1889, of which the result is given in the accompanying report. They will now lie fallow till October 1890, when they will again be sown with wheat. Thus "maize follows wheat after an interval of only two months,- between the reaping of the maize and the next wheat sowing a fallowing of 13 months ensues.
Alb-2	Foudrette 180 maunds	7 3 0	997	1,379	3,564	7,163	+ 666	+ 1,077	+ 915	+ 2,674	
Alb-3	Ashes of cowdung 180 maunds and saltpetre 3 maunds	14 6 0	743	1,815	4,083	6,183	+ 412	+ 1,513	+ 1,434	+1,694	
Alb-4	Saltpetre 3 maunds	9 0 0	627	1,077	3,362	6,691	+ 296	+ 775	+ 703	+ 2,202	
Alb-5	Saltpetre 3 maunds and bonedust 4£ maunds,	19 11 0	791	1,040	3,268	7,554	+ 460	+ 738	+ 619	+ 3,065	
Alb. 6	Cowdung 180 maunds	5 6 0	743	1,573	4,030	6,800	+ 412	+1,271	+ 1,381	+ 2,311	
Alb-7	Cowdung 180 maunds and bonedust 4£ maunds.	16 *X* *0*	806	1,331	4,160	7,926	+475	+ 1,029	+ 1,511	+ 3,437	
Alb-8	Cowdung 180 maunds and gypsum 3 maunds,	10 10 0	780	1,355	4,053	7,623	+ 449	+ 1,053	+ 1,395	+ 3,134	Another point to be noticed is that in those years in which these plots are under wheat, they appear as the "rabi duplicate series." The 13 plots shown in the present report in the rabi duplicate series will appear in the report for next year (1890-91) as the kharff duplicate series.
Alb-9	Ashes of cowdung 180 maunds ...	5 6 0	503	920	2,983	8,688	+ 172	+ 618	+ 334	+ 4,199	
Alb-10	Sheepdung 180 maunds and bonedust *4%* maunds.	16 1 0	717	1,343	3,485	9,716	+ 386	+ 1,041	+ 836	+ 5,227	
Alb-11	Saltpetre 3 maunds and bone-superphosphate 3 maunds.	30 0 0	711	1,222	3,302	1,779	+380	+ 920	+ 653	-2,710	
Alb-12	Sheepdung 180 maunds and gypsum 3 mauads.	10 10 0	565	1,452	3,718	10,477	+234	+ 1,150	+ 1,069	+ 5,988	
Alb-13	No manure	...	331	302	2,649	4,489	...	...	...	...	

KHARIF STATEMENT III.—This experiment is termed "miscellaneous," and has been carried on from 1881, in a series of eight plots each measuring 400 square yards.

These plots were sown with the usual quantity of seed, 6 seers per acre, on the 12th of June. Ploughing and weeding was done as in No. I experiment.

The plants in Nos. 1, 2, 3 and 5 of this series grew too luxuriantly and were afterwards beaten down by heavy rain. Some damage was also done by wild pig. No. 1, as usual, gave the best results. The tendency of saltpetre to increase stalk rather than seed is noticeable.

KHARIF STATEMENT NO. III.—*Miscellaneous manure experiment with maize.*

Number of plot per farm map.	Manure applied per acre.		Value of manure per acre.	Produce per acre.				Increase or decrease over unmanured plot,			
				Grain.		Stalks.		In grain.		In stalks.	
				Average for previous 5 years.	This year.	Average for previous 5 years.	This year.	Average for previous 5 years.	This year.	Average for previous five years.	This year.
			R. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
K-1	Woollen refuse	120 maunds	6 0 0	1,594	2,226	6,706	8,966	+ 936	+ 1,258	+ 3,596	[illegible]
N-2	Sheepdung	120 "	3 10 0	983	1,573	4,594	7,901	+ 325	+ 605	+ 1,484	[illegible]
N-3	Cowdung	220 "	3 10 0	697	1,488	3,433	9,704	+ 39	+ 520	+ 323	+ 2,867
27-4	Toudrette	120 "	4 13 0	1,067	1,694	4,744	9,922	+ 409	+ 726	+ 1,634	+ 3,085
H-5	Horsedung	120 "	3 10 0	1,002	1,331	4,957	9,741	+ 344	+ 363	+ 1,847	+ 2,904
K-6	Pigdung	120 "	3 10 0	1,103	1,150	5,579	9,051	+ 445	+ 182	+ 2,469	+ 2,114
N-7	Saltpetre,	3 "	9 0 0	954	1,355	4,405	9,898	+ 296	+ 387	+ 1,295	+ 3,001
N-8	No manure	...	...	658	968	3,110	[illegible]	...	...	...	...

KHARIF STATEMENT IV.—This experiment is for five years, which term has expired this year. Its object is to determine the comparative result of sowing maize on ridges after the American fashion at the distance of one, two and three feet.

All the plots of this series were kept under the same treatment throughout the season, *viz.*, were all ploughed, sown, and weeded on the same days. They were sown on the 10th of June. The number of ploughing and weeding was the same as in the foregoing cases.

The cobs in plots Nos. 1, 2 and 3 were very stout and good.

This year the plots sown on ridges have produced more than the plot sown by ordinary method, but this is contrary to [illegible] results [illegible] previous years. The plots Nos. 1 and 4 [illegible] rain and suffered to a certain extent.

KHARIF STATEMENT NO. IV.—*Maize sown after American fashion.*

Number of plot per farm map.	Mode of sowing.	Produce per acre.				Increase or decrease over ordinary cultivated crop.			
		Grain.		Stalks.		In grain.		In stalk.	
		Average for previous 4 years.	This year.	Average for previous 4 years.	This year.	Average for previous 4 years.	This year.	Average for previous 4 years.	This year.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
[illegible]	One foot apart	1,009	2,400	3,800	10,900	− 540	+ 600	− 471	− 762
[illegible]	Two feet apart	740	[illegible]	2,357	8,654	− 818	+ 419	− 1,306	− 2,188
[illegible]	Three ditto	554	1,470	1,110	5,794	− 1,004	+ 180	− 2,301	− 5,388
[illegible]	After country fashion	1,563	[illegible]	4,571	11,773	...	...	...	...

KHAIUP STATEMENT V.—This experiment is to contiuue for five years, three of which have expired; as a rule, early sowing for all kharff crops is good. It has generally proved to be true on the farm.

Rainy season crops are often liable to damage. If cultivators can afford to maintain an early sown crop till the rain sets in, they are pretty sure to keep it free from damage. But one or two waterings are necessary.

In the season under review one plot was sown on the 18th of May and the other on the 6th of June.

Except in respect of early sowing and weeding, all the plots were subject to the same kind of treatment, being ploughed and weeded three times and sown with maize seed six seers per acre.

The early sown plot looked very healthy throughout the season. It was beaten down by rain, but, notwithstanding, its produce was best. The same result has always been obtained.

KHARLF STATEMENT NO. V.—*Experiment in early and late sowing of maize.*

Number of plot per farm map.	Mode of sowing.	Produce per acre. Grain. Average for previous 2 yenrs.	Produce per acre. Grain. This year.	Produce per acre. Stalks. Average for previous 2 years.	Produce per acre. Stalks. This year.	Increase or decrease, In grain- Average for previous 2 years.	Increase or decrease, In grain- This year.	Increase or decrease, In stalks. Average for previous 2 years.	Increase or decrease, In stalks. This year.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
35B'	Sown early	958	2,882	3,119	7,090	+ 37	+ 929	- 64	+ 1,450
35Aa-c	Sown late	921	1,953	3,183	5,640				

KHARI* STATEMENT VI.—This experiment is to determine the effect of certain manures on cotton, and is to be carried on for five years, two of which have passed. This series consists of six plots each of 400 square yards. All the plots were sown on the 14th June j the cotton picking began from the 26th of September; six seers of seed per acre were sown. Ploughing was done twice with the improved plough, and weeding three times.

'Plots Nos. 1, 3 and 4 were covered with water soon after sowing. Every possible care was taken to drain the water off, but the seed in the plots germinated very badly. At the time of flowering a heavy shower of rain came on and damaged the blossoms. Plots Nos. 3 and 4 suffered more from a fungoid disease (which has done great mjury to cotton, especially to the country variety) than the other plots in the senes.

Woollen refuse in this case also has beaten other manures. The silt from canal has come out next. All other kinds of manure have added more or less to the yield.

Kharif STATEMENT NO. *VI.-Experime»t as to the efiect of certain manures on cotton.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre. Cleaned cotton. Result of last year.	Produce per acre. Cleaned cotton. This year.	Produce per acre. Seed. Result of last year.	Produce per acre. Seed. This year.
		Ks. a. p.	lbs.	lbs.	lbs.	lbs.
Ab-1	Fresh silt from canal 500 maunds,	1 4 0	1G9	121	27S	194
Ab-2	Kainit 4 maunds and gypsum 4 maunds	12 8 0	181	97	315	169
Ab-3	Farm yard manure 180 maunds and gypsuni 1 mannd 14| seers.	7 12 0	218	73	3G3	133
Ab-4	Farm yard manure 180 maunds and kamit A maund 14£ seers.	8 3 0	230	97	375	157
Ah-5	Woollen refuse, 120 maunds	3 9 0	290	133	482	230
Ab-G	No manure		145	Gl	242	121

STATEMENT No. II.—*Duplicate series—Manure experiment with wheat.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre. Grain. Average for previous 5 years.	Produce per acre. Grain. This year.	Produce per acre. Straw. Average for previous 5 years.	Produce per acre. Straw. This year.	Increase or decrease over unmanured plot per acre. In grain. Average for previous 5 years.	In grain. This year.	In straw. Average for previous 5 years.	In straw. This year.	Remarks.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
Alu-1	Saltpetre 3 maunds	9 0 0	1,416	1,079	2,733	2,052	+451	−206	+ [illegible]	−702	The rotation is as follows:— October 1886 to March 1887 ... Wheat. June 1887 ... ... Maize. October 1887 to March 1888 ... Wheat. June 1888 ... ... Maize. October 1888 to March 1889 ... Wheat. When these fields are under maize they appear in the kharif experiments as "duplicate kharif series." The fields shown in the present report in the duplicate kharif series will be cropped in October 1889 with wheat and be shown as duplicate rabi series in next year's report.
Alu-2	Saltpetre 3 maunds and [illegible] maunds ...	19 11 0	1,726	2,239	3,011	4,162	+741	+303	+1[illegible]	+308	
Alu-3	[illegible]	2 6 0	1,304	2,850	2,452	5,764	+400	+260	+ [illegible]	+2,330	
Alu-4	[illegible]ng 100 maunds and [illegible] 4½ maunds ...	16 1 0	1,209	1,034	1,012	3,473	+354	−242	− [illegible]	−181	
Alu-5	[illegible] maunds [illegible] maunds ...	10 10 0	1,261	1,213	2,474	3,061	+306	−203	+ [illegible]	−209	
Alu-6	[illegible]	5 6 0	1,267	1,488	3,363	2,039	+222	−287	+1[illegible]	−1,016	
Alu-7	[illegible]	5 6 0	1,127	1,730	1,036	3,848	+172	−145	+ [illegible]	+194	
Alu-8	Phosphate [illegible] and bonedust 4½ maunds ...	16 1 0	1,402	1,021	2,589	3,279	+477	−254	+ [illegible]	−373	
Alu-9	Saltpetre 3 maunds and bone superphosphate 3 maunds,	20 0 0	1,180	1,367	2,501	2,955	+195	−509	+ [illegible]	−1,310	
Alu-10	Phosph[illegible] and gypsum 3 maunds ...	10 10 0	1,365	1,327	2,643	2,856	+400	−320	[illegible]	−798	
Alu-11	No manure	...	965	1,670	1,992	3,654	...	...	...	...	
Alu-12	Poudrette	7 3 0	1,022	2,043	3,044	4,130	+057	+73	+1,052	+496	
Alu-13	Ashes [illegible] of cowdung and saltpetre 3 maunds.	14 6 0	1,405	1,429	2,655	2,650	+420	−446	+663	−1,004	

Area of each plot is 400 square yards.

RABI STATEMENT III,—This experiment contuta of 13 plots nam<il "*$rte* mantrt mietf* each plot is of WO wjuarc yards. The experiment is to •:• i-rmine the manurial value of hemp and indigo, which is applied to wheat in certain farms.

In 1889 all thaw plot* were icwn with Mnaaffamagar wheat nn the 15th of October, Umg ploughed tuiee witli the improved and twice with the country plough. TVy were weeded once and waterwl three time*.

The plot* No». 3, 4, 8 and 10 Itfing rather wet at the time of sowing, did not germinate well and w«re attacked by whiteanU ; No*. 1, 2 and 7 did well.

I mligo refu»e and indifro water are not alway* obtainable by cultivators. But gjeen hamp e costs very little to *>wand plough in during tha pnoediag rain*, and reprweata MM I luapert form of manure which the cultivator can ofattta. It has the drawback that it pnreafal the field bearing a *dofatU* crop. But where a cultivator is unalilc to give hi» land farmyard manur.'. fa* Buaot lm]«> to (TOJI it twice as a regular thing, and by grwewoiling he can both rest it and improve it.

RAHI STATEMENT R No, III — <*iren*K«a«re *tenet.*

No. ••f ..:., c MB	H u m Applied JUT •«*.	V ||B| „f • .:-:T, per acre.	ProJtwi per ftcta. Offtli. \ i. : ii-r for jvlTIJlttl •ft fan*	Tliii J«M	SLrnr. \.rr»i.v for five years.	Ttiii year.	tnr*nut* of il«n». over uuuMHUTMI plot ppr iriv, In i^mib. Average for t.r. i i-i|« five jew*	Ttil. year.	la itnir. Average for •MVIMH i n]f«ftrt.	Thti year.
		Hi. ft. p	•a,	ft*.	Ibs.	n».	W,	a*.	it.	Ibs.
Aft. 1	OU inolr> n A w IW afftomd*	1 * i	UNI	1.P1Z	MM	MM	• M	+ 448	• HI	+VSU
A» 1	Fta4t IftdtgB n f M l»0 MHMdi Md Baw *i manule.	s e a	M7e	1.743	2..'-s.'	3,7 It	. .".	+ r7a	+ 1)17	+ 9*1
Aft- «	latUav «mtat MOO raUc fa*	« 0 (i	m	1 J «	uu	4 • v	• •0	-t41	4 1B0	-m
Aft- 4	Heap nlcr S,'loo embic fwi	i i i	s;.4	i.iaj	1.079	:.]>-.	+ S9	−302	+ H	- M l
Aft- b	aWaavan	...	N'.r.	1.404	LyMi	I.TW	...	...	...	...
Aft. «	WiMat»nartftTklMBpfniplMdbfta1>sn> -	—	••t;	:.:-..	UM	a.no	-M	+ 811	+ G07	+ 800
Aft- 7	Qr«M a*** pU^hvd in „	S 8 0	1 7<	)/'7-'	MM	MM	+ 108	t SSJ	+ -CU	+ 1,724
Aft. n	Green indigo ploughed in	8 0 0	1,00B	1,070	140S	1 Mfi	+ 18H	+ J-I	• UM	+ 705
A.. 9	Wftafti w « a ftftef Iwtliro cn>]i	...	l^7t»	1,488	MM	MM	+ Ml	MM	+ 1.1W	+ 423
Aft. It	O n * tmtUF* jto^fW la «d «jpw- 0 M»«M1*.	18 8 7	tM	WIl»	MM	1 M	+ 4U	ft M1	• UM	- U
Aft. i|	OHMa*m ilnartrt 1ft»«l IJT'— *> *•"!>«*»•	11 II '	1,117	U4H	1.R73	MM	t » C	» S.J	. •>•:	+ 442
A». li	No manure	—	on	1,082	ı,.'..	MU	...	...	...	...
Aft-U	AHMTMHV wllh t H M i	—	Mi	1,174	ı...	MM	-M	+ M	+ 7M	+ 52

RABI STITIMIVT IV.—Thi» i* to oonfirm lh<- n result of some nf tie BMM in U» 'ongoing MMriBMit awl b «".-ad on in ft ,W> ,,f ^*W *^ th,n tbe plotj of tht ,•* noted MriM. Th*« ploU w«r* wwi, M Ml "A «i W* "I (k-l^W with U» ••me kind bf wheat (Muiaffamagar) at U« ~me raU A0 «o» per MM; they had t*en ploughed twkw wilh the improved awl counuy ploughs rwprctirrly. Weeding wa* done otm and watering twiee.

TIM> following tUtement *tUowt* that Uw onttnrn pw acre ii larger with indigo th*» withhemn. ««tCT«nmp«»aiil*»bl$_y$incr«««U»«.y».U. Tb* hemp pbU at the tim. «f «wing had W- mouture thM U« 'oiigo f^U, hrtc* the ami » thro, germwaUdUU.

RABI STATEMENT No. IV—*Green manure experiment with wheat.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre.				Increase or decrease per acre over unmanured plot per acre.			
			Grain.		Straw.		In grain.		In straw.	
			Average for previous 5 years.	This year.	Average for previous 5 years.	This year.	Average for previous 5 years.	This year.	Average for previous 5 years.	This year.
		Rs. a. p.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
32A & L	Fresh indigo refuse 120 maunds and lime 6 maunds.	2 6 0	1,062	1,458	2,952	2,710	+ 437	+ 647	+ 994	+ 647
32B & K	Fresh indigo refuse 120 maunds ...	1 2 0	881	1,361	1,812	2,490	+ 252	+ 551	+ 433	+ 550
32C & J	Old indigo refuse 120 maunds and lime 6 maunds.	2 6 0	939	1,186	1,813	2,414	+ 310	+ 375	+ 433	+ 375
32D & I	Old indigo refuse 120 maunds ...	1 2 0	868	1,422	877	2,414	+ 239	+ 611	+ 298	+ 611
32E & H	No manure (average of two plots).	...	629	811	1,979	1,837	...	...	...	...
31A-D & 33A-C	Hemp ploughed in (average of seven plots).	3 8 0	1,131	1,123	2,229	2,302	+ 512	+ 639	+ 990	+ 1,484
31F-I & 33D-E	No manure (average of six plots) ...	...	619	484	1,228	908	...	...	...	...

RABI STATEMENT V.—This experiment is tried in a series of eight plots and is to determine the manurial value of certain things (mostly rubbish) not in the list of manures ordinarily used.

In this season these plots were sown on the 19th of October. Plots Nos. 4, 5 and 7 did not germinate well.

The statement shows (1) that all the manured plots have produced something more than the unmanured one in the series; (2) that compost and ashes of wood with saltpetre confirms the result obtained last year; (3) that the brick-kiln refuse and silt also have acted well.

RABI STATEMENT No. V—*Miscellaneous manure series.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre.				Increase or decrease over unmanured plot per acre.			
			Grain.		Straw.		In grain.		In straw.	
			Average for previous 5 years.	This year.	Average for previous 5 years.	This year.	Average for previous 5 years.	This year.	Average for previous 5 years.	This year.
		Rs. a. p.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
M-1	Brick kiln refuse 120 maunds ...	1 12 0	828	1,113	1,634	2,069	+ 212	[illegible]	[illegible]	
M-2	Silt 300 maunds ...	0 12 0	827	1,065	1,269	1,679	+ 211	[illegible]	[illegible]	
M-3	Compost 200 maunds ...	6 0 0	874	1,210	1,677	2,166	+ 258	+ 600	[illegible]	
M-4	Road scraping 300 maunds ...	4 11 0	952	980	1,847	1,735	+ 336	[illegible]	+ 259	
M-5	Ashes of 120 maunds of weeds ...	4 0 0	741	641	1,394	1,133	+ 125	[illegible]	[illegible]	[illegible]
M-6	Ashes of 120 maunds of wood & 3 maunds saltpetre.	12 0 0	942	1,020	1,900	3,130	+ 327	[illegible]	[illegible]	+ 1,028
M-7	Ammonic chloride, 3 maunds ...	45 0 0	865	620	1,740	1,476	[illegible]	[illegible]	[illegible]	+ 336
M-8	No manure ...	...	616	605	1,414	1,102	...	...	...	...

R.tBi STATEMENT VI.—This experiment u to determine the advantages of deep ploughing with an improvvd plough againct shallow ploughing with the country one,

Tbii experiment al*> Wong* to the li*t of permanent ei|»TimpnU and ii «n-dttcfad in two loriiv, one containing four sad the other three plot*. These eerie* are shown in the ttatanent under the hewli A and]), tho plot* in A aeriea do not receive any manure, but to the B plou farmyard manure is applied at the rate of 200 maundi per acre. A ploU were town on the 19th, and B plots on the SOth of **Ootobtr.**

Ploughing wa» done four time*, nine and five inchet deep respectively, with the improved plough: and *ix time*, three inehe* deep, with country plough. Plot* A were weeded twice and B ploU only once. They were in both caaea watered three time*.

In the A plot* **ten**,** Not, 3 aad 18 did not germinate well, and in tenet B plot* 1 ami 2 similarly suffered.

The ctatament *tinawu* that in all CUPM deep ploughing lin given a better yield and that the ploU with manure have produced mure than the unmanurvd one*.

Thii retult corroborate* the facU found in previon* yean.

RAM STATKMKXT NO. VI.—*Ploughing txprnmt%t ftii trifat*

	Ink per farm map.	TrmttMM.	Cost of ploughing per acre.	Produce per acre. Grain. Average for previous 5 years.	Grain. This year.	Straw. Average fcr previous 5 years.	Straw. This year.	Increase or decrease per acre over the plots ploughed with country plough. b rff»iu Average for previous 5 years.	b rff»iu This year.	In .ir-w Average for previous 5 years.	In .ir-w This year.	Remarks.
			Ok. a. p.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
A.	Ad-1	Ploughed [illegible] deep 4 times with improved plough.	S 00	*m*	[illegible]	1,121	[illegible]	[illegible]	• 40	[illegible]	[illegible]	The A plots have not received any kind of manure since they were started. To this [illegible] the lew ovttum of past years. II plots have received manure since 1898.
	Ad-2	Ploughed [illegible] deep 6 times with country plough.	6 0 0	[illegible]	[illegible]	[illegible]	[illegible]	—	—	—	—	
	Ad-3	Ploughed [illegible] deep 8 times with country plough.	e oo	[illegible]	[illegible]	[illegible]	[illegible]	—	—	—	—	
	Ad-4	Ploughed [illegible] deep 4 times OMM ail BtMgh.	o ••	[illegible]	[illegible]	LOU	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
B.	Ad-1/2	Ploughed [illegible] deep 4 times with improved plough.	• 00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	. :n	
	U I/2	Ploughed [illegible] deep 4 times with improved plough.	• 00	[illegible]	[illegible]	[illegible]	[illegible]	+71	[illegible]	[illegible]	[illegible]	
	Ad-3/2	Ploughed [illegible] deep 8 times with country plough.	I it 0	[illegible]	.1*4	[illegible]	[illegible]	—	—	—	—	

Bill SriTUaXf VII.—Thu etparimeat wa«f»r fivf rear*, whirh expired. It u to ttewtaiii the value of mu*unl and cottoa cake OMn| aa manuiv Mtaioit the duiur obUised from cattle *ttJ* « tin- »«~» cakw.

Thta* pk>u www aown on the xtnd of Ortohw, briof pl«|rhed ft•W with Uw improved and twice with country plo«ga. Owing to dryaaat of the «aw>0 three waUr-iagt were given, wtwling was done only one* *e the field* wen not fool.

« tf HM plot Xo. 1 failed to germinal* well. '

The result ihowi that is all cam but two ibe manawd plot! bate yielded «•" than the unnunuml one* in tb* aoia* ami that *+k» IIIHIM to haw gi**n brttcr rw"[1] than the dung oUainod from cattle fad on the f"" cak*

RAM STATUUBfT So. VHV-afMf, uymvil **ai t*tm m*d,* Mi> tWimfa

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H*ai 8TATBMI3T VIII,—Thw npvnmeat ii to aaeertaia for wfcat time»r for ho« »«iy yean the w»nlw of a ffrtjli^r mruin* avmilalia for wheat. The itatMwatKtow* U* iwidoal effect of the artificial *muttxnm* which had Wn apptad to UM «.o»«uli« 7«ra up to 18W; afUr that *pmt* DO nunai. of an* 1 « an/ atnd ha* l-*» given.

Ttti. exponent !• aftnUbM iittwa «n« of 10 pUu, A *uA* B A tarWwttf-t* of 0 pWU and B of 10. It - u, Wbtia« te «,, y—Vthe p ^ tJ'^ , fourth *y****• [••owBoatbe

i« :••:»T.

Tb« pl»u Si*. », 6 and «ol the A. and N.-. i and 7 of th» B did aotffrr niaate well, la the

RABI STATBSKXT NO. VIII.—*ExjaeriMtnt a$ to tie rtiiJuul talue of tarioui«vaintrei* (*wmnj.*

Kuml-T plot jK-r form nup.	ll»nnr» i|>jil«xl per wra.	TahM cf •Bam |»r m	Frodtiee *per* acre. Grain. for ttn»	Thli yaw.	SU»w. AiMng* to		Inm !«• M >l,'. nMI MM iiurwl jJul *[at *cn.* la irnin. AllTtCC for tiir™ I«an.	Thli j»r.	In MAW. Armgc	Tliit jam
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			nil	h "1	1 KM 1 ,'*.!	1,1...	+ H		—<Jj	r Hi
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V7A	OMAMI	...			MM	um	t-M	+ m	HIM	tj*»
		...	m	M		\\jm	• »so	- K	• SIS	+ 8
we			011		LNSU	um	f1M	-80	+ 430	-at
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wy				CIS		I4M	• 101	-M	• M	-M
*7(1	lDd«« i.U^W in		PIS	*tin*	tM	1.1S4	+ I9B	-130	+ M»	
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tn	Anwflsk eklotfaU		W		1,011	UM		-a		
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n HrtTUiirr IX.—IWriainititm <»f Ui* . kmintt ..n « m »1>IJM at tlw r»t« or fitur tnaui»i> to tin' a' n [a] «n;. h*l b, (4j with fantt yan) manure, and (r) wilii woollen n i

T1* «-.•.! in all plot* of *went** A gfrtmii*t»'d ami fcP; pk4 t d*l uo(gwrtnitul* w.>]\| •ml \|>J>1 No. 1 wn injur.xl 4 little *[,y* wli

TJw iUUttk. r- the rrtull It ihowi that It* rith lxMnj* •»" (tiren tin: Ur.> UHI is ali cun ita j.rxJuw IUM 0mintnl UM uM^Kiiur- *1 I'l. A

RABI STATEMENT No. IX.—*Experiment with kainit on wheat.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre.				Increase or decrease per acre over unmanured plot.			
			Grain.		Straw.		In grain.		In straw.	
			Average for previous year.	This year.	Average for previous year.	This year.	Average for previous year.	This year.	Average for previous year.	This year.
		Rs. a. p.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
A.	[illegible] kainit 4 maunds.	11 8 0	1,065	1,839	2,885	3,267	—416	+689	—303	+1,367
B.	Only green hemp ploughed in ...	3 4 0	968	1,779	1,900	3,170	—713	+629	—1,330	+1,2[illegible]
C.	No manure	...	1,481	1,150	3,230	1,900	...	...	...	...
14a.	Farmyard manure 200 maunds and kainit 4 maunds.	14 4 0	1,612	1,402	3,467	2,501	+131	+252	+237	+541
14c	Woollen refuse 200 maunds and kainit 4 maunds.	14 4 0	750	1,227	2,154	2,002	—691	+77	—1,136	+642
14b	Farmyard manure 200 maunds alone ...	6 0 0	Nil.	1,463	Nil.	2,966	Nil.	+313	Nil.	+1,066
14d	Woollen refuse 200 maunds alone ...	6 0 0	...	1,436	...	2,019	...	+286	...	+169

RABI STATEMENT X.—This experiment [illegible] contrast the produce of a field (a) [illegible] when the plants reach the height of one foot, and (b) of a field nibbled [illegible] left untouched.

The [illegible] of wheat [illegible] all the plots. [illegible] No. X [illegible] of the field left untouched.

Rabi Statement No. X.

Number of plot per farm map.	Treatment.	Produce per acre.				Increase or decrease per acre over the plot C.			
		Grain.		Straw.		In grain.		In straw.	
		Average for previous year.	This year.	Average for previous year.	This year.	Average for previous year.	This year.	Average for previous year.	This year.
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
22Aa	Grazed by sheep when [illegible] ...	[illegible]	1,102	3,340	3,399	—22	—47	[illegible]	—299
22Ab	Nibbled by sickle ditto	1,080	1,122	3,412	3,361	—43	[illegible]	+702	[illegible]
22Ac	[illegible] untouched	1,042	[illegible]	[illegible]	3,698	...	...	...	...

[illegible] STATEMENT XI.—This is [illegible] three Tull or Lois Weedon system. In this [illegible]

In a piece of land of 1,930 square yards, 21 strips were made, 11 raised, 10 depressed. In the latter lucerne and peas were sown, which did not give any crop. The result is again in favour of the ordinary way of sowing.

This experiment will be tried no more.

Field Statement No. XI.

Number of plot per farm map.	Mode of sowing.	Produce per acre. Grain. Average for previous years.	Grain. This year.	Straw. Average for previous years.	Straw. This year.	Increase or decrease per acre over the plot cultivated after country fashion. In grain. Average for previous years.	In grain. This year.	In straw. Average for previous years.	In straw. This year.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
26A	Sown after Jethro Tull system. { Wheat—on the raised strips ... Peas—on the depressed strips ... Lucerne— ditto ditto ... }	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	−575	−1,659	−1,435
26C	Sown after country fashion	[illegible]	[illegible]	2,545	[illegible]	...	—	...	...

Field Statement XII.—This experiment is to contrast the productive power and quality of five varieties of wheat compared with the indigenous variety grown in Cawnpore.

The varieties of the wheat sown were :—

(1) Muzaffarnagar.
(2) Adelaide.
(3) Buxar.
(4) Sindhi.
(5) Red nursery (English).

They were sown in six plots each of 700 square yards. All the plots received the same kind and the same amount of manure; and the same number of ploughings, weedings and waterings were given to each plot.

This year Muzaffarnagar wheat stands first in yield and Buxar comes next.

English wheat, though mixed with acclimatized seed grown on the farm for the last two years, has given the lowest crop. [illegible] was at the top of the list.

Field Statement No. XII.—*Experiment with different varieties of wheat.*

Number of plot per farm map.	Variety of wheat.	Produce per acre. Grain. Average for previous years.	Grain. This year.	Straw. Average for previous years.	Straw. This year.	Increase or decrease per acre over the indigenous variety. In grain. Average for previous years.	In grain. This year.	In straw. Average for previous years.	In straw. This year.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
30a	Muzaffarnagar wheat	1,070	2,273	1,200	2,582	+223	+1,220	−625	+71
30b	Adelaide ditto	[illegible]	[illegible]	2,520	2,568	+24	+103	+205	+59
30c	Buxar ditto	[illegible]	1,465	1,847	2,717	−22	+413	−774	+207
30d	Sindhi ditto	[illegible]	1,007	2,329	2,850	−40	−45	−292	+340
[illegible]	Mundia (country) wheat	[illegible]	[illegible]	[illegible]	2,510	...	...	...	...
[illegible]	English red wheat	—	[illegible]	—	1,[illegible]	—	−394	...	−284

Rabi Statement [illegible] the produce [illegible] four varieties of barley. The result is [illegible] country barley.

Though the country [illegible] yet the other varieties fetch a higher price. The [illegible] colored [illegible] to be popular in European markets.

Rabi Statement No. [illegible]—*Experiment with barley.*

Number of plot per farm map.	Variety of barley.	Produce per acre.			
		Grain.		Straw.	
		Average for previous 2 years.	This year.	Average for previous 2 years.	This year.
		[illegible]	[illegible]	[illegible]	lbs.
26A	Green huskless barley		1,110		1,920
[illegible]	Chocolate colored barley	1,027	[illegible]	[illegible]	[illegible]
[illegible]	White huskless barley (Basuli jau)	1,177	[illegible]	[illegible]	2,110
[illegible]	Country barley	1,374	1,540	[illegible]	1,775

[illegible] This experiment is to determine the effect of gypsum on [illegible] pease.

[illegible] a very bad year on [illegible] minous crops. The result obtained cannot be considered [illegible]ory. However, the statement shows that in both cases gypsum has done goo[illegible] to [illegible]ps.

Rabi Statement [illegible]IV.—*Experiment with gypsum applied to pease and gram.*

No. of plot per farm map.	Crop.	Manure applied per acre.	Value of manure per acre.	Produce per acre.		Increase or decrease due to gypsum.	
			[illegible]	Grain.	Straw.	Grain.	Straw.
			[illegible]				
[illegible]	[illegible] ...	Farmyard manure 100 maunds ...	[illegible]	1,060	1,234	...	...
[illegible]	Do. ...	Farmyard manure 50 maunds and [illegible]	[illegible]	[illegible]	[illegible]	+264	[illegible]
27C	[illegible] ...	[illegible] ...	[illegible]	947	817	...	...
[illegible]	[illegible] ...	Gypsum 4 maunds.	[illegible]	[illegible]	[illegible]	+63	

Rabi Statem[illegible] XV.—For the last three years potatoes [illegible] been added to the list of experiment[illegible] The experiment is to determine the effect of certain special manures for potato[illegible]

The field after being prepared according [illegible] method in vogue in this part of the country, was divided into five equal plots. [illegible] plots were manured with farmyard manure at the rate of 200 maunds per acre. In addition to this, to four out of five plots in the series, four special manures were applied. All of them were sown with a variety of potato called here "Madrasi." The seed was obtained from [illegible]. It was sown on the 7th of October.

The plots were ploughed twice with the improved plough and [illegible] with the country. They were watered [illegible] and ridged three times.

In plots Nos. 3 and 4 seed did not germinate well, the plants appeared after the first irrigation but did not thrive well. The crop in [illegible] very good both in quantity and quality.

The statement shows that woollen refuse has given the best result; last year poudrette with sulphate of iron came out first.

STATEMENT NO. XV.—*Experiment with potatoes.*

Number of plot	Manure experimented	Value of manure per acre	Produce per acre: Actual for plot	Produce per acre: Per acre	Increase or decrease per acre over the plot after country fashion: Actual for plot	Increase or decrease per acre over the plot after country fashion: Per acre
		Rs. a. p.	lb.	lb.	lb.	lb.
1	Poudrette [illegible] maunds mixed with sulphate of iron 27 lbs.	10 15 0	[illegible]	[illegible]	[illegible]	+ [illegible]
2	Woollen refuse 100 maunds [illegible]	11 0 0	[illegible]	[illegible]	[illegible]	+ [illegible]
3	Poudrette [illegible] maunds and [illegible] maunds.	[illegible] 7 0	[illegible]	[illegible]	[illegible]	+ [illegible]
4	Castor oil cake 10 maunds [illegible]	17 0 0	[illegible]	[illegible]	[illegible]	+ [illegible]
5	Sown after country fashion	—	[illegible]	[illegible]	...	—

MIR MUHAMMAD HUSAIN, M. R. A. C., C.,
Assistant Director, in charge of farms.

INDEX OF THE FARM MAP.

Number of the plot on the map.	Name of the plot.	Nature of present experiment on [illegible]	Number of the harvest of the experiment in last report.	Duration.
1 to 7	Nil ...	No experiment	...	
A (13 plots)	Cotton manure series No. 1.	Cotton manure experiment with manures...	Kharif IV ...	[illegible]
[illegible]	Nil ...	No experiment	...	
[illegible]	Nil ...	Ditto		
104 to 106, 108 to 110	Nil ...	[illegible] experiment with [illegible] and farm-yard manure.	[illegible] VI ...	[illegible]
119	Nil ...	No experiment	...	
[illegible]	Nil ...	Ditto	...	
[illegible]	Nil ...	Experiment to test the effect of certain manures on cotton.	Kharif VI,	Ditto.
[illegible]	Nil ...	No experiment	...	
[illegible]	Nil ...	Experiment with [illegible] on wheat ...	Rabi $\frac{IX}{B}$ ...	Ditto.
[illegible]	Nil ...	No experiment	...	
[illegible]	Nil ...	Miscellaneous manure series ...	Rabi V ...	Permanent.
[illegible]	Nil ...	No experiment	...	
A C (4 plots)	Nil ...	Ditto		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Nil ...	No experiment	...	
[illegible]	[illegible]	Experiment in early and late cotton sowing.	Kharif [illegible]	[illegible]
[illegible]	[illegible] ...	[illegible]	Rabi $\frac{VIII}{A}$ ...	Ditto.
[illegible]	Nil ...	No experiment	...	
[illegible]	Early sowing.	Experiment in early and late [illegible]	Kharif [illegible]	Ditto.
[illegible]	Nil ...	No experiment	...	
[illegible]	Nil ...	Ditto	...	
[illegible]	Nil ...	Ditto	...	
[illegible]	Nil ...	Ditto	...	
[illegible]	Nil ...	[illegible] different (1) in [illegible] (2) in [illegible] methods of sowing.	Kharif $\frac{IX}{I}$	Ditto.
[illegible]	Kharif alternate series.	[illegible]	Kharif II,	Permanent.
[illegible]	Rabi standard series.	[illegible] with [illegible] ...	Rabi I ...	Ditto.
A B C	Nil ...	Experiment with kainit on wheat ...	Rabi $\frac{IX}{A}$ ...	For 5 years.
[illegible]	Kharif standard series.	Manure experiment with maize ...	Kharif I ...	Permanent.
[illegible]	Rabi alternate series.	[illegible] ditto [illegible] ...	Rabi II ...	Ditto.
[illegible]	Nil ...	No experiment	...	
[illegible]	[illegible] system.	Experiment in method of sowing (wheat.)	[illegible] ...	For 5 years.

Number of the plot as on the map.	Name of the plot.	Nature of present experiment on the plot.	Number of the tabular statement in the report.	Remarks.
26B1, 26B2, 26D1 and 26D2	Nil ...	Maize sown after American fashion ...	Kharif IV.	For 5 years.
27A to 27D	Nil ...	Experiment with gypsum applied to peas and gram	Rabi XIV.	Ditto.
27e1 to 27g2	Nil ...	Manure experiment with cotton seed and farm yard manure (wheat sown).	Rabi $\frac{VII}{B}$ ...	Ditto.
27h to 27j	Nil ...	No experiment	...	
28a to 28f	Nil ...	Ditto	...	
$\frac{Ad}{2}$1 to $\frac{Ad}{2}$8	Ploughing series No. II.	Ploughing experiment with wheat ...	Rabi $\frac{VI}{B}$ ...	Permanent.
P1 to P12	New green manure series.	Determination of the effect of gypsum on indigo.	Rabi X ...	For 5 years.
P13 to P18	Nil ...	No experiment	...	
29A to 29E and 29F2	Nil ...	Ditto	...	
29F1, 29G2, 29G1, 29H2 and 29H1	Nil ...	Experiment with potatoes ...	Rabi XII...	Ditto.
29I to 29K	Nil ...	No experiment	...	
30A to 30I	Nil ...	Ditto	...	
31A to 31D and 31F to 31I and 32A to 32E	Green soiling No. II.	Green manure experiment with wheat...	Rabi $\frac{XIV}{B}$ ...	Permanent.
32E and 31J	Nil ...	No experiment	...	
33A to 33L	Green soiling, No. III.	Green manure experiment with wheat...	Rabi $\frac{IV}{A}$ ...	Ditto.
34A and 34B	Nil ...	No experiment	...	
N1 to N8	N series ...	Miscellaneous manure experiment with maize.	Kharif III.	Ditto.
35Aa to 35Ae	Nil ...	Experiment of feeding young wheat by sheep.	Rabi X ...	For 5 years.
35B	Nil ...	No experiment	...	
36a to 36h	Nil ...	Experiment to determine the manurial value of poil (2nd year crop).	Kharif $\frac{IX}{II}$.	Ditto.
37A to 37J	Nil ...	Experiment as to the residual value of various manures (wheat sown).	Rabi $\frac{VIII}{B}$.	Ditto.
38A to 38D	Nil ...	Experiment with barley	Rabi XIII.	Ditto.
38E	Nil ...	No experiment	...	
39a to 39f	Nil ...	Experiment with different varieties of wheat.	Rabi XII.	Ditto.
40A and 40B	Nil ...	No experiment	...	
41Aa to 41Al	Nil ...	Experiment with different varieties of imported cotton seed.	Kharif VII.	Ditto.
41B	Nil ...	No experiment	...	
42A to 42E	Nil ...	Ditto	...	
$\frac{Ae}{A}$5 to $\frac{Ae}{A}$7, $\frac{Ae}{A}$3 to $\frac{Ae}{A}$7, $\frac{M\ T}{1}$ to $\frac{M\ T}{17}$ and F1 to F8.	Miscellaneous kharif series.	Experiment in culture of miscellaneous kharif crop.	Kharif XI.	

No. 581A. OF 1891.

DEPT. OF LAND RECORDS AND AGRICULTURE, N.-W. P. AND OUDH.

DATED CAWNPORE, THE 12TH AUGUST 1891.

FROM

T. W. HOLDERNESS, Esq.,

DIRECTOR OF LAND RECORDS AND AGRICULTURE,

NORTH-WESTERN PROVINCES AND OUDH,

To

THE CHIEF SECRETARY TO GOVERNMENT,

NORTH-WESTERN PROVINCES AND OUDH.

Sir,

I have the honour to submit the report on the Government Experimental Farm at Cawnpore for the year ending the 30th June last. The report has been drawn up under my supervision by the Assistant Director, who has been in charge of the farm throughout the year.

2. Two appendices have been added to the report this year. Appendix A in report by Babu Lachhmi in IV§h»l lljrniih, my Personal Assistant, on a small experimental farm which he conducts at Cawnpore at his own expense. I In n jK-nmi'tiU are very carefully conducted, and the returns of outturn and cost of cultivation which he gives are particularly reliable. Appendix " ii« short account of some experiments which I started this year with the object of ascertaining the actual outturn of crops grown in the neighbourhood of the farm by ordinary cultivators.

3. The experiments on the farm varied little from those described in former years, but the interesting feature in the year is the effect which the very peculiar season of 1891 had on the different fields under wheat. The report shows that the crops on unmanured or lightly manured land were considerably above the average, while those on the best fields yielded less than usual. The abnormal rainfall and high winds of February and March were destructive to ' •»*?'> •*»a<ii«» »n«i b*»vy crop*, while Of Bffatac and ha •dm and crops were lai*i*«l bjr the rain a"1 w*'* *M° t« iwov« from the wind. Jndpntc from the outturn of the farm crops (*•'*• *<mm* fl«*r ll«t tl» ral.i uf 1891 was inferior to that of 1890 in the Cawnpore district. Thl? tf*11 wm FTM''r ln nu»|(tv * and the produce w««!(*». The average yield of wh»tthi.j-«iroathefarm w»i 1« mauM* or 21 hmktk against 23 bushels in 1890.

4. I uuiaun an.) Kntfliih wh«U h»v. been tested *• y««' « »« former years, with the indigenous varieties, and again the superiority of selected Muzaffarnagar Mai hM »-«rt«l it-rif. Tito Canadian oats and barleys were disappointing. U it wu boptd Uial lh*y w.>uld, a* in ('«*: a, quickly mature. t!,.t -i(«r raulu may ba "•"•ined next y«w fn.m jmrtUI y acclimatised seed. As a fodder crop the Canadian <wU aro likrh to prove uaM, »• Ihi «*»»* '• ver)' ›l>[>e »^ Hi h.

5. Tl»o tv«ulu wliiain^l in *" one of the ifr**!' wiil'il «nd indict rt-fu»e pl»l» (rabi •Uletnenl. No. 11J ,n | | \) were remarkably good. With wheat at 3ft *Mf» tb rupee four of the plots in statement No. IV, which were treated with indigo r.'f»»<\ Mail gave a t,rt profit of over Rs. 60 the acre, rising in one case to Rs. 87 the acre. Till* shows value of a good wheat crop at present prices. In statement No. III green indigo ploughed in gave a net profit in wheat, and straw of Rs. 38 an acre. The results obtained,

means i of the *man* exprniir« kind* of m»nun\ tnch M aaltpatn, Uine d ntt, awl bone superphosphate, were t«M «trilnng. The firrt two cannot he applied at a !«• cost than Rs. 10 the acre, and the third costs Rs. JO th* acre. To cover an outlay of Rs. . I'' an JDLTVWM of 1 mauuU of w!w*t per acre over the piwlaoe of unmam ured land is required. In Kiinn few of oor plot* we can »how ttitf or a larger inrreaaf over a term of yean ; but this i» the excvptton.

6. Tli* farm U in good or.te, aDj ba, b«m carefully matiagad darinff the year by' th.. AafctaBt Director aad tbt Parm Overawr, Ali 1lu«in. It u fr^oently visited by samiitdin and othew, and th* pkraght, ptunpt, iUK»r mill*, and *wag»r* malcii ng macbinea uMdon it an not uafnqacatly Urfowed by tb< neia^louring ctdtiraUn.

I lave the honour to I*,

Sn,

Your Boat obedient aerrant,

T. W. JIOLUtKNESS,

Director.

REPORT

ON THE

CAWXrORE EXPERIMENTAL STATION

FOR THE KHARIF AND RABI SEASONS OF 1890-91

THE KtiiKfr BKAHOX. *Ckararier of tit* MUHM.—TV rain* during the kharff season under report «epe quit* ai>nunn.i!, vst on the whole did not do any notice-able damage to any of the rrops. At the begin-tini: <'f tbe «<•»*>*n* t!)(. (,]) ^ unu.nmiiv heavy ami con tin you*, followed l>y a protracted break in Augiut anil SeptemW.

With :i .in.» exemption the kharif wperinwnU during tho aeaaon ware the name u •Otod itt tiw tart report, •' yta«) ft»! be tkt —pf»trirt nf wwng maise ftftrr American faahion hiring expired, tb« exptrimont of cawini; an ixed crop of maize •ml indigo *in»* tulwlit uted for it, tl« objact bang to dctermiii. the economy o[mixe•1 vp.|.|.tn« M comjwim] with the remit of towing the tuno cropi wparat^ly.

The important »j>mmniU of thekharif Kaaon an (1) with Ruiie^B) wil h cotton, (3) with mjimnain-, and (i) with indigo.

The abore may t» thuir obund—

[*) * P«roa>ent" (*i.e.*, carri*d on y«r after year on ttw aame plot of land and with Uw mme Lin.l of treatment),

(*) "TomporaTy" in iwpect of duration and of land uwJ.

In tii.* toDowiaf paragraph* a detailed account „f the atmre np<<Hm«niU U gim>n. In tMordaac* with the wi»h «xprrta»l in the orders of 11 >vTnm-iil. on ih<« report of 1890 that the financial mttitl of i<at h experiment should be «bo«ni, a noU> ha« baan •ddad to each statement which .11 «»lil« th« not return nf •>.ch plot to be •• n-ily >'»!-culated. It is, however, nvmaatry to remirk Utat tlw outturn *of* »]| kliuff i-Mp« rarw» largely with tW aondnnUof the wa»on, and that iM* <l<tnu>ta lacfalj frtm Itw an«tific value of kharil experime*M**, Thp ra]U»aU>r u abb to *rvplaor* »(liim*^,-,1 idasrS anp bj Ute aowittg or by »uUii(at«ng anstbar crop; Ut on an experimental farm tl.e is possible.

KHARIF STATfMrjrni No*. 1 a*» I'.— *faprrimntt wU* BMf,—Thii experiment w carried on in 2 series each of 13 plots. 1" ^'" first (or (awlanl MTIPD) mau e is sown T«ar after *jmr.* In tl> duplicate ser«• tiiwe i> a rotation of nuixe and wbmt. Tb* experiment in th« >Uixlan) imrti i* to a»f*rtaiii tlip mull of growing UM aanw crop year after year on Utr wm» land with the ««"• Lit^l of manure or, u h one inst.m«e, *ttU no manure.. at all. in the duplicate series the object of the «i|>criment u pavtf] to verify the wr.lt of the tUmlard «•"•• »"J |»rlly la IMP if rotati-m of mB'f* wiLb a wheat crop improret (lie \wU, thr manure* being theaane tu Li&d and quant.ty.

Eaah of tU 13 pM« (in both series) » V « UI« uBraanurad one* reccivw » »pwial load of ttuuture year afkr j car.

Kharíf Statement No. I.—*Standard Series.—Manure experiment with maize.*

Number of plot per farm map.	Manure applied per acre.	Value of manure.	Produce per acre in pounds. Grain. Average for previous five years.	Grain. This year.	Stalks. Average for previous five years.	Stalks. This year.	Increase or decrease per acre over unmanured plot. In grain. Average for previous five years.	In grain. This year.	In stalks. Average for previous five years.	In stalks. This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
K. 10	Sheep dung, 180 maunds	5 6 0	720	980	5,725	8,121	+279	+109	+1,327	+2,807
K. 9	Poudrette, 180 maunds	7 3 0	1,080	1,249	6,232	7,986	+679	+678	+1,854	+2,662
K. 8	Ashes of 180 maunds of cow dung and saltpetre, 3 maunds	14 6 0	1,165	1,345	7,752	8,540	+714	+474	+3,374	+3,216
K. 5	Saltpetre, 3 maunds	9 0 0	731	1,186	4,647	7,704	+280	+315	+269	+2,380
K. 11	Ditto, ditto, and bone dust, 4½ maunds	13 11 0	911	1,065	7,219	7,502	+460	+194	+2,833	+2,178
K. 3	Cow dung, 180 maunds	5 6 0	1,011	1,053	3,980	8,518	+560	+182	−398	+3,194
K. 1	Ditto, ditto, and bone dust, 4½ maunds	16 1 0	977	1,488	4,990	9,027	+526	+617	+612	+3,703
K. 2	Ditto, ditto, and gypsum, 3 maunds	10 10 0	916	1,246	455	7,671	+465	+375	−3,923	+2,347
K. 4	Ashes of 180 maunds of cow dung	5 6 0	557	1,016	4,386	8,304	+106	+145	+8	+2,980
K. 7	Sheep dung, 180 maunds, and bone dust, 4½ maunds	10 1 0	1,086	1,670	6,088	8,452	+635	+799	+1,710	+3,128
K. 6	Saltpetre, 3 maunds, and bone superphosphate, 3 maunds	30 0 0	971	1,367	3,360	8,688	+520	+496	−1,018	+3,364
K. 12	Sheep dung, 180 maunds, and gypsum, 3 maunds	10 10 0	1,061	1,113	4,680	7,817	+610	+242	+302	+2,493
K. 13	No manure	—	451	871	4,378	5,324	—	—	—	—

NOTE.—The cost of cultivation may be taken at Rs. 10-8-0 per acre, including rent, seed, [illegible] &c., but exclusive of manure. The value of the produce at a reasonable estimate may be put at Re. 1 p[illegible] for fodder. According to this estimate the outturn of the unmanured plot this year [illegible] The average net profit, however, on this plot for the previous five years was [illegible] of Rs. 28-12-0, Rs. 33-2-0, and Rs. 8-0-0, and for the previous five years [illegible] respectively.

Area of each plot, 400 square yards.

Kharíf Statement No. II.—*Kharíf duplicate [illegible] maize.*

Number of plot per farm map.	Manure applied per acre.	Value of manure.	Produce per acre. Grain. Average for previous five years.	Grain. This year.	Stalks. Average for previous five years.	Stalks. This year.	Increase or decrease per acre over unmanured plot. In grain. Average for previous five years.	In grain. This year.	In stalks. Average for previous five years.	In stalks. This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Alb. 1	Sheep dung, 180 maunds	5 6 0	741	1,661	4,763	8,273	+475	+750	+1,417	+3,103
Alb. 2	Poudrette, 180 maunds	7 3 0	910	1,996	3,537	9,244	+644	+1,135	+711	+2,088
Alb. 3	Ashes of 180 maunds, saltpetre, 3 maunds	14 6 0	813	398	4,259	7,272	+547	+127	+1,333	+2,946
Alb. 4	Saltpetre, 3 maunds	9 0 0	520	620	3,830	3,560	+254	−182	+353	+268
Alb. 5	Saltpetre, 3 maunds, and bone dust, 4½ maunds	13 11 0	553	774	3,002	9,403	+287	−37	+1,106	+4,802
Alb. 6	Cow dung, 180 maunds	5 6 0	741	653	4,189	6,340	+475	−158	+4,303	+1,006
Alb. 7	Cow dung, 180 maunds, and bone dust, 4½ maunds	16 1 0	747	1,113	4,303	7,208	+481	+202	+1,407	+3,734
Alb. 8	Cow dung, 180 maunds, and gypsum, 3 maunds	10 10 0	738	1,053	4,303	8,155	+472	+242	+1,417	+2,802
Alb. 9	Ashes of 180 maunds of cow dung	5 6 0	406	303	4,135	3,143	+140	−308	+1,239	−124
Alb. 10	Sheep dung, 180 maunds, and bone dust, 4½ maunds	16 1 0	608	1,334	4,513	8,573	+342	+423	+1,617	[illegible]
Alb. 11	Saltpetre, 3 maunds, bone superphosphate, 3 maunds	30 0 0	530	1,367	2,616	8,143	—	+252	−277	+2,879
Alb. 12	Sheep dung, 180 maunds, and gypsum, 3 maunds	10 10 0	633	1,488	5,140	8,730	[illegible]	+577	+2,274	+2,472
Alb. 13	No manure	—	266	911	2,896	3,334	—	—	—	—

NOTE.—The cost of cultivation may be taken at Rs. 10-8-0 per acre, including rent, seed, labour, [illegible] exclusive of manure. The value of the produce at a reasonable estimate may be put at Re. 1 per 40lbs. of grain and Re. [illegible] lbs. of stalks for fodder. According to this estimate, the outturn of the unmanured plot this year was worth Rs. 22-12-0 an acre, giving a net profit of Rs. 12-4-0. The average net profit, however, on this plot for the previous five years was nothing, rather a loss of Rs. 2. The net profit this year of Nos. 7 and 1 was Rs. 23 and Rs. 30-4-0, and for the previous 5 years Rs. 7-0-0 and [illegible] respectively.

Area of each plot, 400 square yards.

In the standard series seed at the rate of sixteen seers per acre was sown on the 15th of June and in the duplicate series on the 18th of the same month. In both cases it was sown behind the country plough, the plots being ploughed twice with the improved plough 6 inches deep and twice with the country plough. The plots were weeded once and the plants earthed up once. The seed in the plots of the duplicate series did not germinate well and twenty, a heavy rain came on in the evening of sowing. This caused the plots to remain under water for several days, and prevented the sowing of the entire standard series on one day. In the badly germinated plots of the duplicate series the seed was again dibbled. Thus the growth of the plants and therefore their yield was unequal.

In the season under report sheep dung and horse dung, poudrette, saltpetre, and bone [illegible] have given the best yield. The result is, on the whole, confirmed by the duplicate series and is also in accord with the results of past years.

Kharif Statement No. III.—The experiment is named "miscellaneous" and dates back from 188[illegible]. The series consists of 9 plots each of the size of 400 square yards.

These plots were sown on the [illegible] with six seers of maize seed per acre. The number of ploughings and weedings was the same as in the foregoing instance. The seed in plot No. 3 did not germinate evenly, and unfortunately the same plot was injured to a certain extent by wild pigs. The [illegible] again proved [illegible] results as it has given the largest yield. In every year and in all kinds of seasons too wet or too dry it has up to this time, has proved to be good for the crop to which it has been applied. On maize especially it has a wonderful effect. Next to this come poudrette and sheep dung.

Kharif Statement No. III.—Miscellaneous manure experiment with maize.

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre. Grain. Average for previous five years.	Produce per acre. Grain. This year.	Produce per acre. Stalks. Average for previous five years.	Produce per acre. Stalks. This year.	Increase or decrease per acre over unmanured plot. In grain. Average for previous five years.	In grain. This year.	In stalks. Average for previous five years.	In stalks. This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
N. 1	[illegible] lime, 15 maunds.	8 9 0	1,719	2,305	6,427	11,604	+ 989	+ 2,306	+ 3,897	+ 9,072
N. 2	Sheep-dung, 120 mds.	3 10 0	1,812	1,619	4,873	8,857	+ 594	+ 1,300	+ 1,331	+ 4,209
N. 3	Cow-dung, 120 "	3 10 0	769	1,174	3,270	7,708	+ 40	+ 1,065	+ 430	+ 5,179
N. 4	Poudrette,	4 12 0	1,094	1,242	3,982	8,107	+ 365	+ 1,033	+ 442	+ 5,118
N. 5	Horse-dung, 120 "	3 10 0	1,059	1,367	3,720	8,022	+ 331	+ 1,258	+ 2,180	+ 5,433
N. 6	Pig-dung, 120 "	3 10 0	1,362	902	6,312	7,308	+ 633	+ 893	+ 2,602	+ 5,010
N. 7	Saltpetre, 120 "	9 0 0	1,028	605	5,420	6,277	+ 300	+ 496	+ 1,880	+ 3,798
N. 8	No manure	—	—	729	307	3,540	2,060	—	—	—

NOTE.—The cost of cultivation may be taken at Rs. 15-8-0 per acre, including rent, seed, labour, &c., but exclusive of manure. The value of the produce at a reasonable estimate may be put at Re. 1 per [illegible] lbs. of grain and Re. 1 per [illegible] lbs. of stalk for fodder. According to this estimate the outturn of the unmanured plot this year was worth Rs. 9 an acre, giving a net loss of Rs. 7-8-0. The average net profit, however, on this plot for the previous five years was Rs. 9-12-0. The net profit this year of Nos. 1 and 4 was Rs. 43-8-0 and [illegible] previous five years Rs. 26-0-0 and Rs. 15-0-0 respectively.

Area of each plot, 400 square yards.

Kharif Statement No. IV.—This experiment was for five years, which term has expired this year. It is to determine the effect of [illegible] on the sowing of a maize crop. One plot of 1,715 square yards was sown on the 22nd of May and was maintained by means of four waterings, and the other plot of the same capacity was sown after the first shower on the 3rd of July. The seed and all other treatment, ploughing, weeding, &c., were in both cases the same as in the foregoing experiments.

Both plots [illegible] from flooding, [illegible] irrigated plot received insufficient watering. [illegible] the experiment for the year was a failure. This experiment is an important one. It is therefore intended to keep it for five years more.

KHARIF STATEMENT, No. IV.—*Experiment in early and late sowing of maize.*

Number of plot per farm map.	Mode of sowing.	Produce per acre in pounds. Grain. Average for previous three years.	Grain. This year.	Stalks. Average for previous three years.	Stalks. This year.	Increase or decrease. In grain. Average for previous three years.	In grain. This year.	In stalks. Average for previous three years.	In stalks. This year.
35 B.	Sown early ...	1,050	573	5,101	7,000	+ 322	+ 121	+ 2,428	+ 1,876
35 A. C.	Sown late ...	1,262	436	4,063	5,124	—	—	—	—

NOTE.—The cost of cultivation in the second plot may be taken at Rs. 16-8-0 per acre, including rent, seed, labour, &c. In the first plot the irrigating charges add Rs. 6 the acre. The value of the produce at a reasonable estimate may be put at Re. 1 per 41lbs. of grain and Re. 1 per 410lbs. of stalk for fodder. According to this estimate the outturn of the late sown plot this year was worth Rs. 23-8-0 an acre, giving a net profit of Rs. 7. The average net profit, however, on this plot for the previous three years was Rs. 31-8-0. The net profit this year of the early sown crop was Rs. 8-8-0 and for the previous three years Rs. 38-12-0.

KHARIF STATEMENT No. V.—*Experiment with cotton.*—This experiment is to be conducted for five years, three of which have elapsed, including the season under review, and it is to determine the effect of certain manures on cotton. This series consists of 6 plots, each of 400 square yards. The plots were sown with six seers of seed per acre on the 12th of June, being ploughed twice with the improved plough and weeded three times. The cotton picking began from the 21st of September and ended on the 15th of March.

In 1889, though the plants grew very luxuriantly, the yield was not good, as the crop was attacked by grubs. This season yield was better.

Woollen refuse in this case too, has given good results. The mixture of kainit and gypsum has come out next.

KHARIF STATEMENT No. V.—*Experiment* [illegible] *to the effect of* [illegible] *cotton.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre. Cleaned cotton. Average for previous two years.	Cleaned cotton. This year.	Seed. Average for previous two years.	Seed. This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.
Ab. 1	Fresh silt from canal, 200 maunds ...	1 4 0	142	150	236	257
Ab. 2	Kainit, 4 maunds and gypsum, 4 maunds ...	12 8 0	120	204	242	402
Ab. 3	Farmyard manure, 150 maunds, and gypsum, 1 maund 14½ seers ...	7 12 0	146	218	249	426
Ab. 4	Farmyard kainit, 1 maund 14½ seers ...	6 3 9	104	290	276	403
Ab. 5	Woollen refuse, 120 maunds ...	3 9 0	272	263	300	523
Ab. 6	No manure ...	—	102	94	242	145

NOTE.—The cost of cultivation may be taken at Rs. 20-12-0 per acre, including rent, seed, labour, &c., but exclusive of manure. The value of the produce at a reasonable estimate may be put at Re. 1 per 6lbs. of clean cotton and Re. 1 per 61lbs. of seed. According to this estimate the outturn of the unmanured plot this year was worth Rs. 18-8-0 an acre, giving a net loss of Rs. 3-4. The average net loss, however, on this plot for the previous two years was Rs. 0-12-0. The net profit this year of Nos. 5 and 4 was Rs. 22-8-0 and Rs. 19-18 and for the previous two years Rs. 10-11-0 and a loss of Rs. 3-7-0 respectively.

Area of each plot, 400 square yards.

KHARIF STATEMENT No. VI.—*Experiments* [illegible] experiment with different varieties of imported cotton seed. This is the third year out of the

§n for whioh i\m .npflriment U tn continue. The seed of varieties No», 9 to 11 have been nvenily obtained direct from Amt'riea. Seed was sown on the 18th of Jane at the rate of sis seen per acre. Picking began from the 19tU of October and ended on the 15th of March. The freshly imported varieties flowered a few day< later i luti those which luid been acclimatised in thu province some yean ago.

Cot boa thmragfarat the dirtrirt suffered greatly tlii< yew from untimely ami deary rainfall and the attacks of grub*. The farm crop similarly suffered. The yield from acclimatised varieties (Nos. 1 to 8} his been better than the yield of the newly imported sane ties.

Ku&lir STATlinurr No. VI.—*Experiment vUk different wxridit* of imported cotton *etd.*

Number of plot per farm map.	Varieties of cotton seed.	Produce per acre.			
		Cleaned cotton.		Seed.	
		Average for previous two years.	This year.	Average for previous two years.	This year.
		lbs.	lbs.	lbs.	lbs.
41Aa(1)	Upland Georgian	130	103	300	228
41Ab(2)	Tree cotton	143	115	343	251
41Ac(3)	Louisiana	153	126	300	219
41Ad(4)	Garo Hills	146	91	296	137
41Ae(5)	Hybrid	175	105	347	303
41Af(6)	Sea Island	134	91	300	251
41Ag(7)	Egyptian	140	80	335	194
41Ah(8)	Hinganghat	140	103	339	251
19e(9)	S. B., Mcney (Texas)	102	60	184	200
19f(10)	Shines' Early Prolific	82	40	164	200
19g(11)	Jones, Improved	102	60	204	120
19h(12)	Country	180	60	320	80

NOTE.—The cost of cultivation may be taken at Rs. 31-4-0 per acre, including rent, seed, labour, &c., and manure (value Rs. 4-8-0). The value of the produce at a reasonable estimate may be put at Re. 1 per 6lbs. of clean cotton and Re. 1 per 61lbs. of seed. According to this estimate the outturn of the country seed plot this year was worth Rs. 11-4-0 an acre, giving a net loss of Rs. 20. The average net profit, however, on this plot for the previous two years was Rs. 4. The loss this year of the Nos. 2 and 3 was Rs. 5 and Rs. 8-0-0, and for the previous two years a net profit of Rs. 0-2-0 and a loss of Rs. 1-10-0 respectively.

Am»dmm\jm\m square yards.

Kur .ufr STITMDTT NO. VII.—-The «tultJ of the oarly and late sowing of cotton aw ahowtt in U»ie «ut«m«nt.

^Mpma^lwMtr^wiaAauwBiwloWMdfoBrjrtiBigo. Tn 4 plou Mad uf \ Tmnctie- *ot* ootto* wai «»«™ *ª «*'• 12tl> "' ***Tf* "^ "»«»IW 4 plots eeed of :* eraa Tarieties waswwoonlhe ISth of June when the rain had eet in. *Piclaag* of all tbm plots U^»n from the SStli Decnpbtr and oontinntd till the l&th March. The late eown |'1"«« suffered *gNUij trota* heavy rain and from the attacks ot an

Th* esperimml eJcarly mUUishw that if irrigation is poanble, oottoo ihonW ho sown before the raBuamoanwDt of the rains. The plant* am rigomw. They do sufirr fwia U» *wm ot mat* tad *ifoMtllj* «oaf» Uw altacka of ias«ct*

KHARIF STATEMENT No. VII.—Experiment with [illegible] and [illegible].

Number of plot per farm map.	Variety of cotton sown.		Produce per acre.			
			Cleaned cotton.		Seed.	
			Average of previous two years.	This year.	Average of previous two years.	This year.
			lbs.	lbs.	lbs.	lbs.
12a.	Sown before rain.	S. B. Mealy (Texas) ...	170	200	310	360
12b.		Hinton's Early Prolific ...	[illegible]40	142	285	300
12c.		Jones Improved ...	155	160	245	220
12d.		Country	180	250	300	440
12e.	Sown after rain.	S. B. Mealy (Texas) ...	150	40	325	100
12f.		Hinton's Early Prolific ...	140	60	280	130
12g.		Jones, Improved ...	130	65	250	120
12h.		Country ...	130	60	220	80

KHARIF STATEMENT No. VIII.—[illegible] with experiments [illegible] statement shows [illegible] of certain varieties of sugarcane.

The object of the experiment is (1) to determine the productive capacity of 4 varieties of cane, seed of which [illegible] three years ago from Behar, Shahjahanpur, and Moradabad; (2) to ascertain [illegible] in line as done in the West Indies has any advantage over the indigenous way of sowing.

The seed was planted on the 29th March [illegible] which, as a rule, are thrown away by cultivators in [illegible]. The field was ploughed four times with the improved plough, weeded and hand-hoed four times, watered five times. The Shahjahanpur variety gave the largest produce per acre, while the method of planting cane as done in these provinces yields a far larger produce than the method practised in the West Indies.

KHARIF STATEMENT No. VIIIA.—[illegible] (1) in the yield of different varieties of sugarcane; [illegible]

Number of plot per farm map.	Detail of experiment.	Produce per acre.				Percentage of juice on cane.
		Weight of cane per acre.		Weight of juice per acre.		
		Average for previous three years.	This year.	Average for previous three years.	This year.	
	Behar seed (Mango or Bhaul).	lbs.	lbs.	lbs.	lbs.	
20R1a	Sown in line	27,832	16,262	7,023	3,111	34
20R1b	Sown in the indigenous way	20,144	21,480	10,804	11,229	53
	Shahjahanpur seed (Dhaulu).					
20R1c	Sown in line	7,032	17,228	4,123	10,148	59
20R1d	Sown in the indigenous way	15,013	20,371	9,127	12,116	41
	Moradabad seed (Baraukha).					
20R2a	Sown in line	11,920	5,003	7,372	2,323	48
20R2b	Sown in the indigenous way	20,748	9,237	10,624	4,201	46
	Country seed (Matna).					
20R2c	Sown in line	20,017	5,576	10,939	2,621	47
20R2d	Sown in the indigenous way	24,297	5,308	12,031	3,179	64

KHARIF STATEMENT No. VIIIB.—This [illegible] the result of a peri crop (ratooned cane stock kept a second year after [illegible]'s crop was taken).

This experiment is to be conducted for a period of ten years, 3 of which have now elapsed. Its object is to determine the economic value of keeping the ratooned flocks of sugarcane a second year. When the last year's crop was off, the field was watered and ploughed once and then the stumps [illegible]. On the [illegible] April it was top-dressed with [illegible] maunds of [illegible] manure and hand-hoed. It was watered five times in the hot weather.

A comparison of the yield with those given in the preceding statement shows that this year the second crop in many cases has given better results than the first year's crop.

Kharif Statement No. VIII.—*Experiments to determine the economic value of peri (second year cane stock).*

Number of plot per farm map	Details of treatment.	Weight of cane per acre.		Weight of juice per acre.	
		Average for last two years.	This year.	Average for last two years.	This year.
		lbs.	lbs.	lbs.	lbs.
	Peri of Rohea seed (Mungo or Dhaul).				
24a	Sown in line ...	1,060	14,211	5,481	7,989
24b	Sown in the [illegible] ...	10,116	20,837	6,949	
	Shahjahanpur seed (Dhaulu).				
24c	Sown in line ...	14,100	20,737	7,200	11,752
24d	Sown in the [illegible] way ...	17,760	22,034	[illegible]	12,890
	Moradabad seed (Baraukha).				
24e	Sown in line ...	14,977	14,030	[illegible]	7,888
24f	Sown in the [illegible] way ...	1,617	17,212	[illegible]	[illegible]
	Country seed (Matna).				
24g	Sown in line ...	9,816	17,021	[illegible]	8,421
24h	[illegible] ...	13,068	27,208	7,158	[illegible]

Kharif Statement No. IX.—*Experiments with indigo.*—This statement shows the results of applying gypsum to indigo. This experiment is to be carried on for [illegible] years: four years have already elapsed.

Three plots are kept under this experiment. To one of these plots no manure is applied; to the 2nd gypsum is ploughed in, while the third plot is top-dressed with the same quantity of gypsum when the plants are four inches high. The seed was sown on the 21st of April, but owing to deficiency of moisture in the soil it did not germinate evenly. The supply of canal water at this time proved [illegible] insufficient, and so the plants did not thrive as well as in previous years.

Gypsum has decidedly proved a good manure for indigo. This year again the plot in which it was ploughed in has given better results than the plot in which it was applied as a top-dresser.

Kharif Statement No. IX.—*Distribution of the effect of gypsum on indigo.*

Number of plot	Number of field per farm map	Treatment.	Average weight of green crop.		Increase or decrease over unmanured plot.	
			Average of last two years.	This year.	Average of last two years.	This year.
			lbs.	lbs.	lbs.	lbs.
P. 1	4	Gypsum applied 4 maunds per acre and ploughed in as manure, valued Rs. 3 ...	8,463	[illegible]	+ 7,022	+ 1,082
P. 2	8	Gypsum [illegible] when the plants were 4 inches high ...	7,026	8,417	+ 6,417	+ 1,186
P. 3	12	Unmanured ...	878	4,371	—	—

Note.—The [illegible] acre, including rent, [illegible] for [illegible] exclusive of manure. The value of the produce at a reasonable estimate may be put at Re. 1 per [illegible] lbs. of green crop. According to this estimate the outturn of the unmanured plot this year was worth Rs. [illegible] an acre, giving a loss of Rs. 4-12-0. The average loss, however, on this plot for the previous two years was Rs. 17. The loss this year of Nos. 1 and 2 was Rs. 2-4-0 and Rs. 3-13-0, and net profit for the previous two years Rs. 6 and Rs. 1-8-0 respectively.

Area of each plot, 1,000 square yards.

Kharif 9u-ntVEtT Xo. *X.—Ejperim*»t wit A mhttUmtm* jrai*.*—ThU iUt*-td»w»Ui«ywUoftonwkh«tf food «wpi commonly snwra. There uv 18 plot* IM ieriM, each of which meamw iOO aquar* y»r>l«. TJii* experiment ia to centum.* • five yean, three of which h»« expirwi All th«* ploti were plough*! a twice. TVy wereMWB n t h i M July. Owing to the hauy mini in July all tiopt taSend much and UM yioU wai poor.

Kharif STATturrr No. *X.—E*ptrimnt i* mdtmrm *f mitttlUmt^t kUrtfwnf*.*

Number of plot per farm map.	Crop.	Weight (Grain)	Average of last two years (Grain)	This year (Stalks)	Average of last two years (Stalks)
		lbs.	lbs.	lbs.	lbs.
[illegible]	Cotton and arhar	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Jowar for chari	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Urd	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Mung	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Moth	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Lobia	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Jowar and arhar	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Til	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

EABI SEASON EXPERIMENTS.

TIIK !Ur' Season.—*Character of the Season.*—\t the begi iininff Hie season looked vcrv promienig. Ploughing and towing on the whole *bim m* were done in good atu) 0- portune time. The seed g, T; it- 1 well in nwrSy all the Reids, and cverjtbix g looked excellen I till llic ean formedj b«t -m I the 23rd of • anuary bany rain felt t!i throughout the whole ni^l>t,-i accompanied by high winds, which beat down tbt advanced plants. In February from 5th to 7th there w ta • «-y re frost, which also did gnst harm. ItL.ill.il; he late : worn* »uJ dd ed the juice •ii<:h was wanU-.l to nourisl, and unlit the p»in, whieh Uw remain dehrivelkd anrl 1ll (omul At this time a strong west wind kept <>n blowinf fir emnl *1JV«, which added to the effec: nf fro.t, The fields with ht^h - cultivatio i eoSerad more because their crop vnu beaten down. The lastuomd pkl s this year did better th mimuJL

ID the ween under report in the farm proper the area under wheat was 34 bighas 2½ biswas (ab -lit 17 *m* res) against 35 bighas 18 biswas (about 18 acres). The t ital prodooe tibia *jma* tne 81 3 maunds 4½ seers, the average per acre being only abo I 19 m:vl;: ds or 1300lbs., ranging from 450 to 2,904ll •. TheiverAgaootturepcr acre last year IU 17} tnnuncb.

I his year the largest yield was obtained from the green soiling series (*vide* State- nwnt N l\ Oae pk4of tui« - eries, which is manured with old indigo refuse wand lime, gave an .^ttuni uf l,904lbt. wr 36 mds per acre. This ro»>> •» Uwftr ilutn Ihoaxi- muil, yield obtained last ye w.whkhwM I 858lbs. per acre (Rabi Statement No. N. plot No. 5, for 1889-90). Two more plots in the same series this year yielded 2,815 . \\». ami l,iS&Ibe. I*r arm IWp ectively. The poorest outt *'' ™ o^'' ned from Red F*n. a variety of Canadian wheat, receive: through the Government of India, being only a7lb«. per *Ktn*. The «wd, not bciiy »• acclimatized, was naturally more susceptible to in June*.

The nU (ouon UJI'•••*• •*• chiefly confined to wheat: potato, barley, peas, and gram also occupy a limited, but a comparatively small, area. As stated in previ reports tU,. experime ..U in thie *»»a tw ^ U kinds, "per uatuat" and "temporary."

Srinann Nos. I a nUlu K^eWewjii *mlk ml* *at*. Of all the per- nu, ent experime ito thk etedt Rnt: it i* conducted in two series called "standard" wd "duplicate." E it of these series consists of 13 plots. !n the "lUndmrd" * irrii-* wtiMt it sown year after „.*r witltout any rotation, while in the series called "duplicate" the plott are etopped one year with wheat utitl aoothrr yaw witli maize, Tifae^mpoDd^ Tlie corresponding I'''' ''' ' either series receive a special kind of manure year after yew, and in every I all the f plots receive the same treatment.

The object of this experiment is to observe (*a*) the effect forJinarr and artii ficial manures n w W1; W the utility of rotation; (*c*) how long wheat can 1* grown *yetf* .it.* y«r 00 • the same land without manure; and (*d*) which manure best returns to the •oil wlai tltc jiUiit (Mn»um««.

As usual, Muzaffarnagar wheat seed was sown intheM | plots, quantity being 120lbs. per acre. The standard series were sown wa on the 24th and the duplicate series on the ll th October. They were harvested on the 8th and 9th of April respectively. All the plots were ploughed twice with the improved plough and twice with the c plough. They were „. „.,,,,.! • . :. " Still watered thrice. Statements Nos. I and II show that the outturn of many of the plots in the standard series is, as usual, less than the outturn of corresponding plots in the duplicate series. This year plot No. 10 in the duplicate series has give « tin* larm^t. vieht and n>1« \ •» 5 and 9 rani next to it. Last year plot No. 3 had stood first. The advantage of rotation is obvious, and t btlaadtu that th*wJ>' of cow dung compared with the unburnt loaf «•«) very little v .1—«• manir for wheat.

RABI STATEMENT No. I.—*Standard Series.—Manure experiment with wheat.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre. Grain. Average for previous five years.	Grain. This year.	Straw. Average for previous five years.	Straw. This year.	Increase or decrease over unmanured plot per acre. In grain. Average for previous five years.	In grain. This year.	In straw. Average for previous five years.	In straw. This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
R. 1	Saltpetre, 3 maunds	9 0 0	1,376	1,440	2,028	2,455	+336	+218	+1,041	+297
R. 2	Saltpetre, 3 maunds, and bone dust, 4½ maunds	19 11 0	1,362	1,537	2,554	2,733	+345	+373	+757	+188
R. 3	Cow dung, 180 maunds	5 0 0	1,321	1,537	2,778	3,340	+279	+313	+801	+1,114
R. 4	Ditto and bone dust, 4½ maunds	16 1 0	1,098	1,742	2,652	3,541	+646	+520	+720	+1,313
R. 5	Ditto and gypsum, 3 maunds	10 10 0	1,286	1,757	2,786	3,207	+344	+543	+800	+1,041
R. 6	Sheep dung, 180 maunds	3 0 0	1,288	968	2,307	4,347	+346	−254	+490	[illegible]
R. 7	Ashes of 180 maunds of cow dung	3 8 0	972	1,367	2,043	2,521	−79	+145	+150	[illegible]
R. 8	Sheep dung, 180 maunds, and bone dust, 4½ maunds	16 1 0	1,188	1,718	[illegible]	[illegible]	+145	+436	+377	+981
R. 9	Saltpetre, 3 maunds, and bone superphosphate, 3 maunds	20 0 0	1,146	1,638	[illegible]	[illegible]	+104	+420	[illegible]	[illegible]
R. 10	Sheep dung, 180 maunds, and gypsum, 3 maunds	10 10 0	1,280	1,062	2,035	2,824	+247	+460	[illegible]	+338
R. 11	No manure	—	1,042	1,222	1,867	2,320	—	—	—	—
R. 12	Poudrette, 180 maunds	7 8 0	1,379	1,500	2,461	4,253	+337	+278	+574	+2,033
R. 13	Ashes of 180 maunds of cow dung and saltpetre, 3 maunds	14 8 0	1,246	1,404	[illegible]	2,380	+204	+182	+149	+722

NOTE.—The cost of cultivation may be taken at Rs. 27 per acre, including rent, seed, labour, &c., but exclusive of manure. The value of the produce at a reasonable estimate may be put at Re. 1 per [illegible]lbs. of grain and Re. 1 per [illegible]lbs. of straw for fodder. According to this estimate the culture of the unmanured plot this year was worth Rs. 47 an acre, giving a net profit of Rs. 20. The average net profit, however, on this plot for the previous five years was only Rs. 12. The net profits this year of Nos. 3 and 4 was Rs. [illegible] [illegible] Rs. 16-14-0 and Rs. 20-2-0 respectively.

Area of each plot, 400 square yards.

RABI STATEMENT No. II.—*Duplicate Series.—Manure experiment with wheat.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre. Grain. Average for previous five years.	Grain. This year.	Straw. Average for previous five years.	Straw. This year.	Increase or decrease over unmanured plot per acre. In grain. Average for previous five years.	In grain. This year.	In straw. Average for previous five years.	In straw. This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Alb. 1	Saltpetre, 3 maunds	9 0 0	1,401	1,019	2,548	2,229	+246	−278	+414	−220
Alb. 2	Saltpetre, 3 maunds, and bone dust, 4½ maunds	19 11 0	1,649	1,742	2,250	2,964	+604	+141	+606	+169
Alb. 3	Cow dung, 180 maunds	5 0 0	1,162	1,779	2,251	2,573	+ 7	+142	+623	+178
Alb. 4	Ditto, and bone dust, 4½ maunds	16 1 0	1,302	1,718	2,459	3,073	+207	+121	+27	+279
Alb. 5	Ditto, and gypsum, 3 maunds	19 10 0	1,384	1,700	2,503	2,479	+229	+105	+131	+478
Alb. 6	Sheep dung, 180 maunds	3 8 0	1,315	1,731	2,490	2,239	+205	+174	+48	−266
Alb. 7	Ashes of 180 maunds of cow dung	3 8 0	1,262	1,722	2,650	2,505	+130	+158	+219	−203
Alb. 8	Sheep dung, 180 maunds, and bone dust, 4½ maunds	16 1 0	1,474	2,019	2,867	2,448	+213	+473	+275	+453
Alb. 9	Saltpetre, 3 maunds, and bone superphosphate, 3 maunds	20 0 0	1,412	2,008	2,408	2,984	+237	+412	+36	+1,069
Alb. 10	Sheep dung, 180 maunds, and gypsum, 3 maunds	10 10 0	1,438	2,130	2,534	4,040	+292	+533	+402	+1,841
Alb. 11	No manure	—	1,155	1,557	2,492	2,795	—	—	—	—
Alb. 12	Poudrette, 180 maunds	7 8 0	1,152	1,673	2,328	2,118	− 3	+275	+1,050	+2,238
Alb. 13	Ashes of 180 maunds of cow dung, and saltpetre, 3 maunds	14 8 0	1,319	1,670	2,773	3,170	+158	+73	+241	+181

NOTE.—The cost of cultivation may be taken at Rs. 27 per acre, including rent, seed, labour, &c., but without manure. The value of the produce at a reasonable estimate may be put at Re. 1 per [illegible]lbs. of grain and Re. 1 per [illegible]lbs. of straw for fodder. According to this estimate the culture of the unmanured plot this year was worth Rs. 61 an acre, giving a net profit of Rs. 34. The average net profit, however, on this plot for the previous five years was only Rs. 13-12-0. The net profit this year of No. 6 was Rs. 20, and for the previous five years Rs. 23-0-0.

Area of each plot, 400 square yards.

RABI STATEMENT No. III.—This experiment is on "green manures." The series consists of 13 plots, each being 400 square yards in size. Its object is to indicate the manurial value of hemp and indigo which are applied to the plots in various forms. In this series all the plots were sown with ... wheat on the 23rd of October and were harvested on the 10th of April. The modes of ploughing, weeding, and watering were the same as used in the former experiment. The unmanured plot in this series (as well as in several others) this year has given ... yield. This is explained by the fact that ... the fields which were most advanced suffered most from wind and rain. The plots in which indigo was ploughed in green and those in which its refuse was applied have, as in previous years, given the largest yield.

RABI STATEMENT No. III.—Green Manure Series.

Number of plot.	Manure applied per acre.	Cost of manure per acre.	Outturn per acre. Grain. Average for previous five years.	Outturn per acre. Grain. This year.	Outturn per acre. Straw. Average for previous five years.	Outturn per acre. Straw. This year.	Increase or decrease over unmanured plot per acre. In grain. Average for previous five years.	In grain. This year.	In straw. Average for previous five years.	In straw. This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
[illegible]	Old indigo refuse, 120 maunds	[illegible]	[illegible]	1,747	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Fresh indigo refuse, 120 maunds, and lime, 6 maunds	[illegible]	[illegible]	1,742	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Indigo water, 2,000 cubic feet	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Hemp water, 2,000 cubic feet	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	No manure	...	[illegible]	[illegible]	[illegible]	[illegible]	...	...	...	...
[illegible]	Wheat sown after hemp crop had been taken	...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Green hemp ploughed in	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Green indigo ploughed in	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Wheat sown after indigo crop	...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Green indigo ploughed in and gypsum, 6 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Green hemp ploughed in and gypsum, 6 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	No manure	...	[illegible]	[illegible]	[illegible]	[illegible]	...	...	...	...
[illegible]	Alternate with hemp	...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NOTE.—The cost of cultivation may be taken at Rs. 27 per acre, including rent, seed, labour, &c., but exclusive of manure. The value of produce at a reasonable estimate may be put at Re. 1 per 25 lbs. of grain and Re. 1 per 240 lbs. of straw for fodder. According to this estimate the outturn of the unmanured plot this year was worth Rs. 32-4-0 an acre, giving a net profit of Rs. 5-4-0. The average net profit, however, on this plot for the previous five years was only Rs. 13-6-0. The net profit this year of Nos. 8 and 2 was Rs. 29-8-0 and Rs. 42-2-0 and for the previous five years was Rs. 13 and Rs. 29-2-0 respectively.

RABI STATEMENT No. IV.—To confirm the results of the green manure experiment, two more series of 13 plots were kept on the list of permanent experiments.

In one of these series fresh and old indigo refuse with and without lime are applied and their results contrasted with the unmanured plots. In the other series 7 plots are manured with green hemp and indigo, the results of which are compared with the 6 plots kept unmanured.

The following statement contains the results of both of these series. All the plots were sown on the 26th of October and were harvested on the 10th of April. The other treatment was the same as in other series. The plot manured with old indigo refuse and lime gave the maximum yield on the farm this year, namely 35 maunds, or 46 bushels, the acre.

RABI STATEMENT No. IV.—*Green manure experiment with wheat No. 2.*

Number of plot per farm map.		Manure applied per acre.	Value of manure per acre.	Produce per acre.				Increase or decrease per acre over unmanured plot.			
				Grain.		Straw.		In grain.		In straw.	
				Average for previous five years.	This year.	Average for previous five years.	This year.	Average for previous five years.	This year.	Average for previous five years.	This year.
			Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
A.	32A & L.	Fresh indigo refuse, 120 maunds, and lime, 6 maunds.	2 0 0	1,083	2,613	2,334	5,334	+ 392	+ 1,236	+ 900	+ 2,700
	32B & K.	Fresh indigo refuse, 120 maunds.	1 8 0	929	2,485	1,522	5,346	+ 238	+ 1,008	+ 304	+ 2,782
	32C & G.	Old indigo refuse, 120 maunds, and lime, 6 maunds.	[illegible]	[illegible]	2,504	2,014	6,424	+ 230	+ 1,517	+ 540	+ 2,860
	32D & J.	Old indigo refuse, 120 maunds ...	1 8 0	930	2,011	1,808	6,807	+ 237	+ 624	+ 300	+ 4,243
B.	32E & A.	No manure	...	720	1,387	1,408	2,564	...	...	...	...
C.	31A & D.	Hemp ploughed in	3 8 0	1,070	1,113	2,113	2,346	+ 480	+ 479	+ 545	+ 1,033
D.	31F & I.	No manure	...	596	634	1,207	1,335	...	...	...	...

Note.—The cost [illegible] without manure. The value [illegible] for fodder. According to this [illegible] plots (*i.e.*, 32E & [illegible]) [illegible] 23-12-0 and Rs. 23 an acre, [illegible] a loss of Rs. 2 respectively. The [illegible] on these plots for the previous 5 [illegible] Rs. 3-12-0 respectively. The net profit this year of the numbers 32 A & L and 32 C & G was Rs. 74 [illegible]

RABI STATEMENT No. V.—This experiment [illegible] the manurial value of certain things not commonly [illegible] by the people in this country. This series consists of eight plots. All the plots were [illegible] on the 28th of October and harvested on the [illegible] of April. Compost [illegible] strong fertilizers have [illegible] out better than the other manures [illegible] series.

RABI STATEMENT No. V.—*Miscellaneous manure series.*

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre.				Increase or decrease over unmanured plot per acre.			
			Grain.		Straw.		In grain.		In straw.	
			Average for previous five years.	This year.	Average for previous five years.	This year.	Average for previous five years.	This year.	Average for previous five years.	This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
M. 1	Brick kiln refuse, 120 maunds ...	1 12 0	815	637	1,706	1,119	+ 253	— 73	+ 205	— 242
M. 2	Silt, 200 maunds	0 12 0	1,029	986	1,523	2,000	+ 467	+ 274	+ 184	+ 624
M. 3	Compost, 200 maunds	6 0 0	800	1,434	1,750	3,135	+ 233	+ 774	+ 400	+ 770
M. 4	Road scraping, 200 maunds ...	4 11 0	833	730	1,733	1,886	+ 331	+ 67	+ 453	+ 335
M. 5	Ashes of 120 maunds of weeds ...	4 0 0	622	1,453	1,273	4,477	+ 92	+ 714	— 48	+ 3,122
M. 6	Ashes of 120 maunds of wood and 2 maunds saltpetre.	12 0 0	805	702	1,521	1,718	+ 127	+ 60	+ 233	+ 363
M. 7	Ammonic chloride, 2 maunds ...	42 0 0	701	420	1,577	1,652	+ 140	— 242	+ 250	+ 97
M. 8	No manure	...	561	703	1,341	1,256	...	...	...	...

Note.—The cost of cultivation may be taken at Rs. 27 per acre, including seed, weeding, labour, &c., but without manure. The value of the produce at a reasonable estimate may be put at Re. 1 per 32 maunds of grain and Re. 1 per [illegible] of straw for fodder. According to this estimate the outturn of the unmanured plot this year was worth Rs. 27-4-0 an acre, giving a net profit of Rs. 0-4-0. The average [illegible], however, on this plot for the previous five years was Rs. 4-4-0. The net profit this year of Nos. 3 and 5 was Rs. 25-12-0 and Rs. 21-4-0 and for the previous five years there was a profit of Re. 1 and a loss of Rs. 3-9-0 respectively. Area of each plot 400 square yards.

RABI STATEMENT No. VI.—This experiment shows the effect of deep ploughing with an improved plough against [illegible] ploughing with the country *plough*. This experiment is conducted in two *series*, one (A) containing four and the other (B) three plots. The plots in A series do not receive any manure, but the plots in B series [illegible] manure at the rate of 200 maunds per acre. All the plots were sown on the [illegible] of [illegible] and harvested on the [illegible]th of April. The manured plots suffered much from the rain on 23rd January. The deep ploughed plots, as in previous years, have given a better yield.

RABI STATEMENT No. VI.—*Ploughing experiment with* [illegible].

Number of plot per farm map.	Treatment.	Cost of cultivation per acre.	Produce per acre. Grain. Average for previous five years.	Produce per acre. Grain. This year.	Produce per acre. Straw. Average for previous five years.	Produce per acre. Straw. This year.	Increase or decrease over the plots ploughed with country plough. In grain. Average for previous five years.	In grain. This year.	In straw. Average for previous five years.	In straw. This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
A. Ad. 1	Ploughed 5" deep 4 times with improved plough.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+[illegible]	+[illegible]	+[illegible]	+[illegible]
A. Ad. 2	Ploughed [illegible] with [illegible] plough.	4 [illegible] 0	[illegible]	[illegible]	[illegible]	[illegible]	—	—	—	—
A. Ad. 3	Ploughed 3" deep 8 times with country plough.	6 [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—	—	—
A. Ad. 4	Ploughed 5" deep 4 times with improved plough.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	−110	+[illegible]	−53	[illegible]
B. Ad./3-1	Ploughed [illegible] deep 4 times with improved plough.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+[illegible]	[illegible]	[illegible]	−[illegible]
B. Ad./3-2	Ploughed [illegible] deep 4 times with improved plough.	[illegible] 0 0	[illegible]	[illegible]	[illegible]	[illegible]	+144	+[illegible]	+[illegible]	[illegible]
B. Ad./3-3	Ploughed 3" deep 8 times with country plough.	6 0 0	[illegible]	[illegible]	[illegible]	[illegible]	—	—	—	—

NOTE.—The cost of cultivation may be taken at Rs. [illegible] per acre, including rent, seed, labour &c., but without manure. The value of the produce [illegible] reasonable estimate [illegible] 1 per [illegible] lbs. of grain and Re. 1 per [illegible] lbs. of straw for fodder. According to this estimate the outturn of the plot ploughed with country plough [illegible] inches deep (*i.e.*, plot [illegible]) this year was worth Rs. [illegible] an acre, giving a net profit of Rs. [illegible]. The average net loss, however, on this plot for the previous five years was Rs. [illegible]. The net profit this year of the Nos. [illegible] and [illegible] was Rs. [illegible] and Rs. [illegible], but for the previous five years there was [illegible] Rs. [illegible] and Rs. [illegible] respectively.

Area of each plot [illegible] square yards.

[illegible]

Temporary experiments.—Temporary experiments are those which are conducted for a limited time.

RABI STATEMENT VII.—The first of these is [illegible] the [illegible] residual effect of fertilizers [illegible] for the [illegible] crop. This experiment is conducted in two series of [illegible] plots. This experiment [illegible] years, which term has expired this year. All the plots were sown on the [illegible] of October and were harvested on the [illegible]th of April.

The plot which had received cowdung has this year again given the largest yield.

RABI STATEMENT No. VII.—[illegible] wheat.

Series & No. of plot.	Manure applied.	Value of manure per acre.	Outturn per acre. Of grain. Average for previous four years.	Of grain. This year.	Of straw. Average for four years.	Of straw. This year.	Increase or decrease over unmanured plot. Of grain. Average for previous four years.	Of grain. This year.	Of straw. Average for four years.	Of straw. This year.
			lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
A. V1	Cubic superphosphate, 180 lbs., ammonic chloride, 120 lbs., potassic sulphate, 90 lbs., cubic sulphate, 90 lbs.	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	[illegible]	[illegible]
V2	All but cubic superphosphate	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
V3	Ditto ammonic chloride	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
V4	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
V5	Ditto cubic sulphate	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Unmanured	—	[illegible]	[illegible]	[illegible]	[illegible]	—	—	—	—
B. [illegible]	Cowdung	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	[illegible]	[illegible]
[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]	—	—	—	[illegible]

NOTE.—The cost of cultivation may be taken at Rs. [illegible], including seed, [illegible], labour, &c., but without manure. The value of the produce at a reasonable estimate may be put at Re. 1 per [illegible] lbs. of grain and Re. 1 per [illegible] lbs. of straw for fodder. According to this estimate the outturns of the two unmanured plots [illegible] this year was worth [illegible] an acre, giving a net profit of [illegible]. The average net profit, however, on these plots for the previous four years was only [illegible] respectively. The net profit this year of [illegible] respectively.

A.—Area of each plot of the series, 200 square yards.

B.—[illegible]

RABI STATEMENT VIII.—This experiment shows the effect of kainit on wheat. This experiment was tried in two series, in one of which kainit was applied with green hemp and in the other with farmyard manure and woollen refuse. The plots in the former series (A) were sown on the 22nd of October and harvested on the 7th of April, and those of the other series (B) sown on the 23rd of October and [illegible] of April.

This year in the first [illegible] has given the largest yield, and in the other series (B) farmyard manure [illegible] applied by themselves [illegible] kainit.

Rabi Experiment No. VIII.—Experimental [illegible] whe[at] [illegible].

Number of plot per farm map.	Manure applied per acre.	Value of manure per acre.	Produce per acre.				Increase or decrease per acre over plot C.			
			Grain.		Straw.		In grain.		In straw.	
			Average for previous two years.	This year.	Average for previous two years.	This year.	Average for previous two years.	This year.	Average for previous two years.	This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
[illegible]	Green [illegible] for manure [illegible], 1 [illegible]	[illegible] 8 0	1,4??	[illegible]	[illegible]	1,7??	+3?	[illegible]	+17?	[illegible]
[illegible]	[illegible]	3 4 0	1,0??	[illegible]	2,5??	1,6??	—373	—14?	[illegible]	—435
C.	Unmanured	...	...	[illegible]	1,042	2,025	2,105	...	...	...	...
14a.	Farmyard manure, [illegible], and [illegible]	[illegible] 4 0	1,607	1,548	2,173	2,305	...	...	...	...
14b.	Woollen refuse, [illegible], and bones, 4 maunds	[illegible]	[illegible]	[illegible]	[illegible]	2,07?	...	...	...	...
14c.	Farmyard manure, 300 maunds, alone	[illegible]	[illegible]	1,7?3	2,0??	3,105	...	...	...	...
14d.	Woollen refuse, 200 maunds ...	9 0 0	[illegible]	1,624	2,010	[illegible]	...	...	...	...

Note.—The cost of cultivation may be taken at Rs. 27 per acre, including rent, seed, labour, &c., but without manure. The value of the produce at a reasonable estimate may be put at Re. 1 per 22 lbs. of grain, and Re. 1 per [illegible] lbs. of straw for fodder. According to this estimate the outturn of the unmanured plot this year was worth Rs. [illegible], giving a net profit of Rs. 14. The average net profit, however, on this plot for the previous two years was Rs. 28. The net profit this year of Nos. 14[illegible] and [illegible] was Rs. 25-4-0 and [illegible], and for the previous two years [illegible] and Rs. 25-12 respectively.

Area of first 3 plots is 400 square [illegible].
Ditto 4 other ditto 400 ditto.

Rabi Experiment No. IX.—This experiment shows the effect on wheat (a) of grazing it by sheep, (b) of nibbling it with a sickle. The result is compared with a plot in which wheat was left to grow untouched, but which in other respects received a similar treatment. All plots were sown on the 25th October [illegible] on the 9th April. As [illegible] expected in a year in which the rains lodged, the [illegible] which were heavy with leaf, the plot in which the growth of leaf was not checked has yielded much less than the other two plots. Last year the result [illegible] in favour of the field left untouched.

Rabi Experiment No. IX.—Experiment to test the effect of (a) grazing wheat by sheep when the wheat stands at a height of one foot, and (b) of nibbling at the same stage with a sickle.

Number of plot per farm map.	Treatment.	Produce per acre.				Increase or decrease per acre over plot C.			
		Grain.		Straw.		In grain.		In straw.	
		Average for previous two years.	This year.	Average for previous two years.	This year.	Average for previous two years.	This year.	Average for previous two years.	This year.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
25Aa	Grazed by sheep when one foot high	1,070	2,148	[illegible]	3,020	—46	+1,197	+162	[illegible]
25Ab	Nibbled with a sickle ditto ...	1,102	1,023	2,346	2,942	—	+210	—58	+705
C	Untouched	1,106	951	[illegible]	3,110	—	—	—	—

Note.—The cost of cultivation may be taken at Rs. 30 per acre, including rent, seed, labour, and manure [illegible]. The value of the produce at a reasonable estimate may be put at Re. 1 per 22 lbs. of grain and Re. 1 per [illegible] lbs. straw for fodder. According to this estimate the outturn of the plot left untouched this year was worth Rs. 38-6 per acre, giving a net profit of Rs. 8-6. The average net profit, however, on this plot for the previous two years was Rs. 17-8. The net profit this year of Nos. 25Aa and 25Ab was Rs. 20-4 and Rs. 24-2, and for the previous two years Rs. 10-12 and Rs. 17-4 respectively.

Area of each plot is [illegible].

Rabi Statement No. X.—This statement compares the produce of [illegible] of wheat [illegible] which is commonly [illegible] neighbourhood of Cawnpore. Each variety was sown in a plot measuring 700 square yards. [illegible] to these plots, specially to the last one ( ), in which the water lodged for a time.

In respect of yield the Panjab red wheat has this year [illegible], and Muzaffarnagar white wheat ranked next.

Last year the latter had proved the best of the lot.

Rabi Statement No. X.—*Yield of different varieties of wheat.*

Number of plot per farm map.	Variety of wheat.	Produce per acre. Grain. Average for previous two years.	Grain. This year.	Straw. Average for previous two years.	Straw. This year.	Increase or decrease over the indigenous variety. In grain. Average for previous two years.	In grain. This year.	In straw. Average for previous two years.	In straw. This year.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
20a	Muzaffarnagar wheat	1,071	1,079	2,290	3,213	+247	+1,061	—458	+1,130
20b	Adelaide ditto	1,013	1,413	2,030	3,260	+5	+819	—150	+1,423
20c	[illegible] ditto	1,083	1,034	2,308	2,303	+75	+1,012	—374	+307
20d	[illegible] ditto	927	1,300	2,800	3,402	—77	+214	+108	+1,200
20e	Mundia ditto	1,004	839	2,902	3,126	—	—	—	—
20f	Panjab red ditto	828	1,764	1,220	3,174	+146	+1,110	—1,030	+1,058

Note.—The cost of cultivation may be taken at Rs. 30 per acre, including rent, [illegible] and manure valued at Rs. 5. The value of the produce at a reasonable estimate may be put at Re. 1 per 22 lbs. [illegible] and Re. 1 per [illegible] lbs. of straw for fodder. According to this estimate the outturn of the Mundia wheat this year was worth Rs. 27-[illegible] per acre, giving a loss of Rs. 2-14. The average net profit, however, [illegible] two years was Rs. 13. The net profit this year of Nos. 20f and 20a was Rs. 28-[illegible] [illegible] two years Rs. [illegible] and Rs. 21-[illegible] respectively.

Area of each plot is 700 square yards.

Rabi Statement No. XI.—*Experiment with barley.*—This statement shows the comparative yield of certain varieties of barley. The crop on all the plots was extremely poor.

Rabi Statement No. XI.—*Experiment with barley.*

Number of plot per farm map.	Variety of barley.	Produce per acre. Grain. Average for previous three years.	Grain. This year.	Straw. Average for previous three years.	Straw. This year.
29A	Green huskless barley	1,067	1,329	1,367	2,314
29B	Chocolate coloured barley	1,346	1,633	2,070	2,418
29C	White huskless coloured (Tonsil jau)	1,254	1,407	1,079	2,099
29D	Country ditto	1,063	1,084	2,512	2,023

Note.—The cost of cultivation may be taken at Rs. 23-13-0 per acre, including rent, seed, labour, &c., and manure, valued at Rs. 3-8-0. The value of produce at a reasonable estimate may be put at Re. 1 per 45 lbs. of grain and Re. 1 per 240 lbs. of straw for fodder. According to this estimate the outturn of the country barley this year was worth Rs. 34-[illegible] an acre, giving a net profit of Rs. 10-[illegible]. The average net profit, however, on this plot for the previous three years was Rs. [illegible]. The net profit this year of Nos. 29A and 29C was Rs. 13-13-0 and Rs. 10-[illegible], and the net profit for the previous three years was Rs. 10-13-0 and Rs. 14-7-0 respectively.

Area of each plot is 750 square yards.

Rabi Statement No. XII.—This statement shows the effect of gypsum on two principal [illegible] crops of the rabi, viz., g[illegible] [illegible] [illegible] from the statement that the effect of gypsum [illegible] [illegible] on grain.

Rabi Statement No. XII.—[illegible]

Number of plot per farm map.	Crop.	Manure applied per acre.	Value of manure applied per acre.	Produce per acre.		Increase or decrease due to gypsum.	
				Grain.	Straw.	In grain.	In straw.
			Rs. a. p.	lbs.	lbs.	lbs.	lbs.
27A	Gram ...	Farmyard manure, 100 mds.,	3 0 0	1,215	2,008	...	...
27B	Do. ...	Ditto, 50 mds., and gypsum 4 mds.	3 8 0	1,742	2,315	—127	—257
27C	Peas ...	Farmyard manure, 100 mds.,	3 0 0	233	828	...	...
27D	Do. ...	Ditto, 50 mds., and gypsum 4 mds.	3 8 0	540	1,440	—127	—[illegible]

[illegible] cultivation may be taken at Rs. 20 per acre, including rent, seed, and labour, &c., [illegible] value of produce at a reasonable estimate may be put at Re. 1 per 41 lbs. of grain and [illegible] 1 per 328 lbs. of straw for fodder. According to this estimate the outturn of the plot [illegible] and manure, i.e., No. 27A (gram) and No. 27C (peas) this year was Rs. 33-5-0 and Rs. 10-0-0, giving a net profit of Rs. 13-5-0 and a loss of Rs. 13-10-0 respectively. [illegible] this year of Nos. 27B and 27D was Rs. 20-13-0 and a loss of Rs. 11 respectively.

Area of each plot is 450 square yards.

Rabi Statement No. XIII.—*Experiment with potatoes.*—This statement shows the effect [illegible] to potatoes.

This experiment has been carried on for the last four years. A pretty big field was divided into five equal parts, each of which was treated with a particular manure. The crop suffered much from blight and no conclusion can be drawn from the results of this year.

Rabi Statement No. XIII.—*Experiment with potatoes.*

Number of plot per farm map.	Manure applied.	Value of manure per acre.	Produce per acre.		Increase or decrease per acre over the plot sown after country fashion.	
			Average for previous three years.	This year.	Average for previous three years.	This year.
		Rs. a. p.	lbs.	lbs.	lbs.	lbs.
203A	Poudrette, 200 mds., and sulphate of iron, 27 seers.	20 15 0	5,924	13,379	+2,169	+947
203B	Woollen refuse, 200 mds., and gypsum, 4 mds.	18 0 0	6,862	13,737	+1,767	—775
203C	Poudrette, 200 mds., and kainit, 1½ mds.,	21 7 0	6,436	14,863	—153	+351
203D	Castor oil cake, 10 mds., and gypsum 4 mds.	17 0 0	7,414	17,642	+889	+3,110
203E	Sown after country fashion ...	—	6,052	14,532	...	...

Note.—The cost of cultivation after the country fashion may be taken at Rs. 82 per acre, including rent, seed, labour, &c., and manure valued at Rs. 18-0-0. The value of produce at a reasonable estimate may be put at Re. 1 per 200 lbs. of potato. According to this estimate the outturn of the plot sown after country fashion this year was worth Rs. 143-2-0 an acre, giving a profit of Rs. 63-2-0. The average loss, however, on this plot for the previous three years was Rs. 12-7-0. The profit this year of Nos. 203D and 203A was Rs. 88-7-0 and Rs. 71-13-0, and loss for the [illegible] years was Rs. 4-14-0 and Rs. 0-4-0 respectively.

*'itnilannmt ap$rime*t*.*—Under thi* head nay I* nottotd th* ntttTta of certain rarietie* of wheat, barky and oat* named from Canada and of wheat from Mean, Carter aad Co.

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APPENDIX A.

Note containing results of experiments from [illegible] farm, for the year 1890-91. [illegible] conducted by and at the [illegible] of Babu [illegible] Government farm.

Rotation Experiments.—The experiment [illegible] conducted in a [illegible] divided into 18 [illegible]. The area is rented from the zam[illegible] acre. Its soil consists of poor light loam. In 1885-86 it had a crop of [illegible] and was [illegible] to it [illegible] 1882. Thus in 1887-88, when the present experiment commenced, all the plots [illegible] to have been equal as far as their natural fertility was concerned.

The object of the experiment is to ascertain the most economical way of raising [illegible] by [illegible] it with [illegible] crops [illegible] of [illegible].

For wheat all the plots were ploughed six times [illegible] with [illegible] at the rate of [illegible] per acre, and watered three times. None of the plots [illegible] manure was applied for wheat.

[illegible] following [illegible] in the past four years [illegible]. The outturn of [illegible] so greatly in different years that [illegible] the present no safe conclusion can be drawn from the figures. But it may be noticed that [illegible] the plot, or ten maunds [illegible] of poor quality.

The experiment will be repeated [illegible] rest and [illegible] plot with [illegible] at the rate of [illegible].

Number of plot.	Length of term of rotation.	Description of each plot and its outturn. First year. Crop.	First year. Outturn.	Second year. Crop.	Second year. Outturn.	Third year. Crop.	Third year. Outturn.	Fourth year. Crop.	Fourth year. Outturn.	The value of outturn of plot in four years.	Total cost of plot in four years.	Net profit.
1	2	3	3	4	6	7	8	9	10	11	12	13
			Mds. s.		Mds. s.		Mds. s.		Mds. s.	Rs. a.	Rs. a.	Rs. a.
A—1	Annual.	Wheat	0 38	Wheat	0 33	Wheat	0 30	Wheat	0 26	11 0	10 0	3 7
A—2		Urd	0 20	Urd	0 16	Urd	0 15	Urd	0 13			
		Wheat	0 27	Wheat	0 30	Wheat	0 30	Wheat	0 19	14 10	13 0	4 1
A—3		Hemp	0 26	Hemp	0 22	Hemp	0 30	Hemp	0 17			
		Wheat	0 25	Wheat	0 29	Wheat	0 23	Wheat	0 17	14 8	12 12	4 6
A—4		Indigo	12 20	Indigo	9 33	Indigo	11 0	Indigo	10 6			
B—1	Biennial.	Wheat	0 35	Wheat	0 27	Wheat	0 28	Wheat	0 20	18 9	19 10	12 5
		Cotton	0 8¼	Hemp	0 23	Cotton	0 10	Hemp	0 10			
B—2				Wheat	0 30	—		Wheat	0 33	10 12	9 4	3 13
		Do.	0 8½	Urd	0 18	Cotton	0 9½	Urd	[illegible]			
B—3				Wheat	0 23	—		Wheat	[illegible]	9 0	9 0	0 13 (loss)
		Maize*	1 5	Indigo	15 0	Maize	1 30	Indigo	13 0			
B—4		Potatoes	3 30	Wheat	1 2	Potatoes	4 10	Wheat	1 13	27 8	15 8	25 3
C—1	Triennial.	Clover	0 1¼	Do.	1 0	Clover	0 4	Do.	1 3	16 0	10 0	15 4
		Cotton	0 4	Hemp	0 27	Indigo	12 0	—	—			
C—2				Barley	1 5	Wheat	0 33	—	—	*11 4	*7 7	12 11
		Do. 8,	0 14	Sugarcane	Sold standing for Rs. 4.	Do.	1 14	—	—	*10 0	*9 5	2 11
C—3		Maize*	1 11	Sugarcane	Ditto.	Indigo	17 0	—	—			
C—4		Potatoes	2 10	—		Wheat	1 3	—	—	*17 0	*12 7	[illegible]
		[illegible]	5 20	Maize	1 3	Do.	0 38	—	—			
D—1	Quadrennial.			Pea	0 27	—		—	—	*13 15	*7 13	17 1
		Cotton	0 8½	Maize	0 24	Jowar	0 20	Hemp	0 11			
D—2				Gram	[illegible]	Peas	0 11	Wheat	0 35	10 0	9 5	2 10
		Carrots	8 10	Hemp	0 35	[illegible]	0 9	Indigo	12 0			
D—3				Barley	1 13	—		Wheat	1 5	15 4	9 15	13 4
		Maize*	0 38	Sugarcane	Sold standing for Rs. 4.	Bajra	0 34	Hemp	0 19			
D—4		Potatoes	2 15	—		Peas	0 18	Wheat	0 35	16 9	14 9	5 0
		Turnips	2 10	Barley	1 7	Clover	0 4½	Do.	1 1	14 12	9 14	[illegible]

* Figures for three years only. † Manured with cowdung at 200 maunds per acre.

The figures of outturn given against wheat, urd and other grain crops represent the weight of grain. The outturn of straw of each plot was not weighed separately. For column 11, which includes value of straw, its weight has been taken at the following proportion to the weight of grain:—

	Straw.	Grain.
Wheat	2	1
Barley	1½	1
Urd	4	1
Peas	2	1
Gram	1½	1

The produce of cotton was not cleaned. It was sold as *kapās*, and the figures given in this table represent the weight of *kapās*.

2. *Farmyard manure and ashes.*—This experiment was conducted in 12 plots, each representing one-tenth of an acre. The soil of these plots is similar to, and their previous history up to 1888-89 [illegible] that of the [illegible] in which the station experiment was conducted. In 1887-88 they had a crop of barley, and since 1888-89 they have been under the present experiment.

The object of this experiment is (1) to ascertain the loss in manurial value of farmyard manure occasioned by burning, and the extent to which it can be made up by the addition of certain nitrogenous mineral manures, such, for instance, as saltpetre; (2) to see whether a cultivator is justified in burning his manure and using the ashes, or whether it would be better to apply it unburnt and raise [illegible] or [illegible] trees on a portion of his holding for fuel.

All the plots were ploughed [illegible] times with the native plough, [illegible] at the rate of [illegible] per acre, and was watered three times; [illegible]

The following table shows the kind of manure that was applied and the average result of each plot. So far as produce is concerned, it is clear that, by burning, the manure loses [illegible] of its value for wheat. It remains to be seen how far the financial results of the field planted with [illegible] in 1888-89 (when this experiment was started) [illegible] the results of this experiment.

Number of plot.	Manure applied per acre.	Average outturn of grain in each plot during three years, 1888-89 to 1890-91.	Loss per acre on plots 5 to 8 due to burning of the manure. In weight of grain.	Loss per acre on plots 5 to 8 due to burning of the manure. In value of grain.	Loss per acre on plots 9 to 12, [illegible] addition of saltpetre. In weight of grain.	Loss per acre on plots 9 to 12, [illegible] addition of saltpetre. In value of grain after deducting cost of saltpetre.
		Mds. s.	Mds. s.	Rs. a. p.	Mds. s.	Rs. a. p.
1	[illegible]	[illegible]	—	—	—	—
2	[illegible]	[illegible]	—	—	—	—
3	[illegible]	[illegible]	—	—	—	—
4	Pig droppings [illegible]	[illegible]	—	—	—	—
5	Ashes of 100 maunds cowdung	[illegible]	[illegible]	[illegible]	—	—
6	Ditto ditto [illegible]	[illegible]	[illegible]	[illegible]	—	—
7	Ditto ditto sheepdung	[illegible]	[illegible]	[illegible]	—	—
8	Ditto ditto pig droppings	[illegible]	[illegible]	[illegible]	—	—
9	Ashes of 100 maunds cowdung + saltpetre, 100 lbs.	[illegible]	—	—	[illegible]	[illegible]
10	Ditto horsedung ditto	[illegible]	—	—	[illegible]	[illegible]
11	Ditto sheepdung ditto	[illegible]	—	—	[illegible]	[illegible]
12	Ditto pig droppings ditto	[illegible]	—	—	[illegible]	[illegible]

3. *Rotation experiment with farmyard manure.*—This experiment was tried in four plots. The soil of these plots is similar to, and their previous history up to 188[illegible] same as the rotation plots. In 1887-88 they had a crop of barley and 1888-89 cotton. The present experiment commenced from 1889-90. The object of this experiment is to ascertain how far the yield of wheat is increased by an increase in the quantity of farmyard manure. The following table shows the quantity of cowdung applied to each plot and its outturn [illegible]

Number of plot.	Weight of cowdung applied per acre.	Average outturn of grain in each plot in 1889-90 and 1890-91.	Increase per acre. In weight of grain.	Increase per acre. In value after deducting extra cost of dung.
		Mds. s.	Mds. s.	Rs. a. p.
1	100 maunds = Rs. 3	[illegible]	—	—
2	200 „ = „ 6	[illegible]	[illegible]	[illegible]
3	300 „ = „ 9	[illegible]	[illegible]	[illegible]
4	400 „ = „ 12	[illegible]	[illegible]	[illegible]

4. *I'afae of upturn to Itguminout* wo/)*.—This Mporiment wiu» triwl on iuftgo. To c-otiil: i«nt on a large *scale* and al the aune time to minimize **the** i of an uneven d \U>IIDJJ fertility in different jwrU of **tb*** Bd I, **a** tujiture **a** of land measuring 3,600 Mjnure **yardi** wai taken, and when quite ready for sowing it wu portioned out in Sfl bedi each immuring 100 «j«arv yards. In U) al these beds ffypium wu applied at the **rate** of 3, **6, and** 12 roan win to the lew; tlie other 18 bods were keft unmanured. **The beda were K** arranged that for every manured bed there ni u adj.lining unmanurwl W for comparison, (iyitsum was applied at tho time of sowing tho **iced,** iced **•ndgypnun '•** **mixed** up with the soiS **by** a hand hoe. The following Uble ihow* the produce of each bed :—

a	n wbfch frpBTO ll.rnt.BH isd tlw ontlura at Uit: nulinf aaaav norwl				Oalturn of Wd» • nk« Ml Irli, of llieir rnmwpoadii nondbnU.				hitltirtt of bid* la which RTpwi ttw ntc »t 11 Ul*UTKll per wen »t"l (1......i!:um Udr ton** xi mln:,• iii.i:,4- Mt			
	IUsand.		L'nmannml.		Hmgnil.		Innuunred.		aTiiiiiiil		I'BBUUIBIHI.	
	Vn of UJ.	(Win™.	Vn of btd.	Outturn.	N.. ,-[bed.	Outturn.	bo.	Outturn.	Z	OuUorn.	No had.	Oflttqrn.
		Hdt. *•		lid*, a.		Mia, •.		Hd*. a.		Hit. %		M.I.. •,
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**•» » oattnrnof Mferrfant ** tad (lug u H l n i w j , ,	• 44	an	...	1 0	*.*	•t M	—	4 »	—	1 M	...	a n
^ " « « S» ortt^rn do* ID fjp. ^* *• 1W tutn janU.	—	a .	—	—	—	0 B	—	...	—	0 14	...	...
		tU, p.				UL •• p.			l	B*. a. p.		
•J^<« lllff.....1 anllsni prr	—	t U 0	—	wm	—	3 1 7	—	...	—	a • »	—	...
Cost of gypsum* per acre ...	—	1 1 f.	aaa)	—	...	S 1 0	—	...	...	4 a o	...	...

* A rniii m>m rmirM ta lie* fr«a C«««FTat*r .. rlarin ,.r fom» J««, wlt'.rh «w aut d-r«.-d In ll« •U •« •Minnli jHtBr|t i* <••'• e*' •Bl* ' •d o(« m > -1-u it U in » •<•<* («* *PP>jt>« W r £-••1T2." "V* i |.,.-.

It will lliun be ma Uurt althou^ fc7P"»"n n» • brntfidaJ effect on is digo and •MN or le« benued it. prodn !um doc, IM% mow than 8 anna* • maund and be applW fl*ringly at the rnte «l o than three maunds an acre.

5. J/iWrw/M.—Tho following mixtuiw of wtton M and juár were tried during the pa«t year ;—

L—1. Cutionaw) arhar.
t. *Ho.* castor.
i. Do. tilli.
4. Do. urJ.
ft. Cotton, arhar ami tilli.
0. Do. iln, t|n. tirl.
7. Do. do. urd, Ulli, cwtor, juir and artiar.

II.—1. Juir ait I arliar.
«. U-i. artur and til.
3. Do. Jo. Jo. lobift.

Each of these was sown in a plot measuring one-fourth of an acre, and there was one plot for pure cotton and another for pure jute in each series. Each plot in its respective series received the same treatment. The land on which these plots are made is poor outlying land, rented at Rs. 3 an acre. I am not aware of any manure being applied to this land for many years past, and it grows only rain crops. The object of this experiment was to determine the utility of sowing mixed crops, and to measure the quantity by which the outturn of the principal crop is diminished. The following table shows the outturn and the financial result of each plot:—

Number of plot.	Crop.	Outturn per acre. Grain.	Outturn per acre. Stalk.	Value of outturn per acre.	Cost (including rent) per acre.	Net profit per acre.
	Cotton Series.	Mds. s.	Mds. s.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1	Cotton	4 5	—	20 10 0	13 6 0	7 4 0
2	Cotton	3 10	—	21 2 9	13 7 6	7 11 3
	and Arhar	1 18	4 24			
3	Cotton	3 24	—	17 10 6	13 7 0	4 3 6
	and Castor seed	0 24	—			
4	Cotton	3 32	—	21 10 0	13 6 6	8 3 6
	and Til	0 18	—			
5	Cotton	3 24	—	23 14 6	13 7 0	10 7 6
	and Urd	1 3	4 30			
6	Cotton	3 4	—	15 13 0	12 8 0	3 5 0
	Arhar	1 9	2 13			
	and Til	0 3	—			
7	Cotton	3 11	—	21 4 0	13 8 6	7 11 6
	Arhar	1 4	4 3			
	and Urd	0 24	2 1			
8	Cotton	3 4	—	25 3 0	13 10 6	11 8 6
	Arhar	1 12	2 27			
	Urd	0 22	1 23			
	Castor	0 16	—			
	Jute	0 20	4 5			
	and San	0 16	—			
	Jute Series.					
1	Jute	7 6	45 0	24 8 0	12 7 3	12 0 9
2	Jute	5 20	34 0	24 0 0	12 10 6	11 5 6
	and Arhar	2 0	5 28			
3	Jute	6 12	30 0	27 6 0	12 11 0	14 11 0
	Til	0 15	—			
	and Arhar	1 30	5 8			
4	Jute	5 2	30 0	26 1 9	12 11 0	13 6 9
	Arhar	1 22	6 0			
	and Lobia	0 30	8 30			

Field 4.—The following varieties of Canadian wheat were tried last year:—

1. Red Fife.
2. Red Fern.
3. White Fife.
4. Saxonka.
5. Judket.
6. Ladoga.

Only a few ounces of the seed of each variety were received. All the varieties were sown in a richly manured field in beds measuring one-ninetieth of an acre. Close to these beds of an equal size were sown three Indian varieties for comparison. In each bed the seed was dibbled by hand. The Canadian varieties matured a long time after the Indian varieties, and had to be watered from five to eight times, according to the time they took in maturing: the Indian varieties were watered only three times. All of them suffered much from the hot winds, which shrivelled up the grain when it was [illegible]rrowing. The following table shows the outturn of each variety. The produce has been carefully kept and [illegible] in [illegible] for trial in the next year.

Variety of wheat.	Outturn per acre.				Remarks.
	Grain.		Straw.		
Imported.	Mds.	s.	Mds.	s.	
Red Fife	5	30	24	0	
Red Fern	3	4	29	0	
White Fife	2	10	17	0	
Sapanka	8	28	26	20	
Judket	7	20	47	20	
Ladoga	7	12	46	20	
Indigenous.					
Muzaffarnagar	18	11	28	0	
Mundia	18	0	23	0	
Buxar	18	0	29	0	

L. P. BARMAN,

Persl. Asst. to Director, Land Records and Agriculture.

APPENDIX B.

tnlt oftfptrimeutt to atirtai tit pM ,./ trtip, in tkf* a«>J**eT*W *eftheferm.*

Thete esperimciiti tutve tins year been lUrkil to ascertain the yield of crop grown in the anghbourbood of the Government farm by ordinary cttltmttin following the ordinary OKOWKU of native buthaadry. They were carried not (>y the farm oixrxer. Syed Ali Hofaain.

1. *$*nu* [illegible] the TiHae* of Kakwleo two field* ww «U [illegible] '••*'" [illegible] WM on *)**k*»,* Uh , [illegible] ,' 11 TUakur *\'sx*i* Sinsjh. a cultivator, and «itiul«il al»ut half a furl'in [illegible] •• and paying a m» [illegible] •'" [illegible] *m:* tliu other wa* in *mjgji,* J^ | [illegible] ,l,tt# Q^to LiJb, »o»e tw<> furLogx from hi* bottw aod rented at it«. fr-9-0 tbe bf|iha.

The owner* agrml to the npnriiaent* on the cowlltMa* ttiat the wh- [illegible] ni<-!ii wm 'lone on tbe tpot and at the tann'c espetup, anJ Uiat the outturn of * * • •bouU be rnulp orer to them.

Two Nahan sugar mill* of two n l l m an I on** Beh«m erapontinff shallow p»» wen» tent to tbe village by the farm, and five Luwa* of cmne in «wh fwld wa» carefully meawnxl off and cut daily as nu.utmj [illegible] Tb* «atw in both field* **• of the " matna " variety aad was uwn in the MM montb. Too , [illegible] each field, as gathered from the «iliiv»t'»r», is (riven below. TV Cawnpore Mgb» [illegible] i 2,450 etuare yards. TIw ««.« / N the railway nuund of [illegible]

The outturn of [illegible] ._

Field.	Total weight of 5 biswas cane.		Total weight of juice extracted.		Total weight of gur made.		Produce per acre in pounds.		
	Mds.	Seers.	Mds.	Seers.	Mds.	Seers.	Cane.	Juice.	Gur.
						Srs. ch.			
Plot No. 1 [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Km i f w [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Thua the lew highly i [illegible] that |fet [illegible] -r aveng [illegible] , *n\fm.* [illegible] irrown front the stock, of tbe , [illegible] -a than th». tto uutiuru of tlu» tlt-M was aa follow*:—

Cane.	Juice.	Gur.
lbs.	lbs.	lbs.
n	»*	t. MM

TfemhtaUrrfp] [illegible] hajlnpr--. [illegible] rear* *>H his mi [illegible] eo pfa«Md with tJ, [illegible] htmi a mill and an [illegible] *jot* tromtb* Cam to work efi the r. [illegible]

t. Aal* *r/#ri»e*._SotB» MJaoTr [illegible] fi——« aehieW. [illegible] bitwa of ea, I, ft-U .,. na^and and marko 1 r»ttt UaallWM J|aJ rill- [illegible] •> tbeaw were mmid to it., fa [illegible] _..,.UJ aft* [illegible]

rieM,	Crop.	Weight of un-threshed sheaves.	Outturn of each plot in pounds.		Outturn per acre in pounds.	
			Grain.	Straw.	Una.	=—
		Bm	ft*.	IW.	IW.	ft*-
IW 1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Do. 1	MM *	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Do. >	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Do. 4	[illegible]	[illegible]	[illegible]	MM	[illegible]	[illegible]
Do. 1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The produce of plot No. I was thrashed by bullocks after country fashion, while that of No. II with Mayfur thrasher. It is noticeable that in the former case the weight of grain and straw together was equal to that of the above thrashed, while in the latter case it was proved to be somewhat less. This is probably owing to the fact that in thrashing by bullocks much dirt from the ground is mixed with the grain, while in that thrashed with machine tainnte particles of straw as well as dust are blown out.

In selecting fields for this experiment endeavour was made to illustrate the following cases ;—

(1) Good soil with a good cultivator of fair means and circumstances.

(2) Good soil with an indifferent cultivator of poor means and circumstances.

(3) Common soil with a good cultivator of poor means and circumstances.

(4) Common soil with ordinary cultivators.

Plot No. I is held by a man of fair means. He has seven relatives, who assist him in the work. His field was injured to some extent by high winds and frost, but the best portion of it was selected in order to get an idea of high rarrainjr in this locality. The selected portion gave the high yield of 40 maunds the acre ; but the average for the whole field would not exceed 30 maunds. This was as good a field as could be found near the farm. The instant jkld gn Uie ftu-tn WM 45 btuhela the acre this year.

Plot No. II is of good soil, but the cultivator is a poor man and has insufficient means. The outturn was only 8 maunds to the acre.

Plot No. III is held by a very hard working woman, but she is altogether at the mercy of her mahajan and cannot get advances when she wants them. Her outturn was 13 maunds the acre.

Plots No. IV and No. V are held by average cultivators in poor circumstances. The former gave 13 maunds and the other 16½ maunds the acre.

It is a fact worth noticing that, owing to the scarcity of fodder even the well-to-do cultivators cannot keep a sufficient number of cattle for their farms. The cultivators of fair means can afford money for the purchase of manure, yet many of the cultivators are in their way. Their crops suffer very much from insufficient irrigation. If the season is favourable, they make a small profit ; otherwise they are extremely badly off.

Regarding the disposal of the crop by these cultivators the following information was collected ;—

The holder of plot No. I, who is not in his mahajan's power, has this year sold his wheat (being of better quality) to his mahajan at 11 seers per rupee and has kept gram and barley for his own use.

The holders of plots No. II and III, being in debt to their mahajan, have made over most of the produce to him, keeping only a small quantity for their own use. The mahajan gave them credit for their wheat at the rate of 17 seers the rupee, the market rate being 16 seers.

The petty cultivators who are either proprietors or tenants, mostly cultivate at an average a bigha of land for their own use and seldom sell their produce. The holders of plots IV and V are cultivators of this kind. They have kept their produce.

—

No. [illegible]

DEPT. OF LAND RECORDS AND AGRI., N.-W. P. AND OUDH.

Dated Cawnpore, the 10th September 1892.

From

J. O. MILLER, Esq.,

Director of Land Records and Agri., N.-W. P. and Oudh,

To

The Chief Secretary to Government,

N.-W. P. and Oudh.

Sir,

I have the honor to submit the Report on the Government Experimental Farm at Cawnpore for the year ending 30th June last.

2. The Farm is under the immediate supervision of the Assistant Director, and the programme of operations for the last year was drawn up by Mr. Mohammad Husain, who was in charge at the beginning of the season. On his deputation to Hyderabad the control of the Farm was in the hands of Saiyad Mahammad Hadi, who retained it till April, when ill-health obliged him to go on leave. The report has, therefore, been drawn up by Babu Lachman Prasad, the Officiating Assistant Director, who, though he was not in actual charge during any part of the year in which agricultural operations were in progress, was well acquainted with the methods followed and with the results of the experiments, and is thoroughly qualified to report on them.

3. Tables have been added to the report to show the results of experiments conducted during the last ten years, and from them a better idea can be obtained of the values of the various manures that have been tried and of different methods of treatment and varieties of seed than is possible on a consideration merely of the trials of a single season. It would appear from these that chemical manures, and the more expensive manures generally, have a less marked effect in increasing the outturn than the ordinary farmyard manures within the reach of the native agriculturist, and that when the cost is taken into consideration the profits of the former [illegible] not unfrequently reduced to a minus quantity. The refuse of the woollen mill has been found to be a very valuable fertilizer, and next to that there is nothing better for ordinary crops than mixed farmyard manure. Recently some difference of opinion has arisen amongst the best authorities on the subject as to the loss of manurial elements caused by the native practice of using cow-dung as fuel, but the experience of the Farm is in favour of the view that the ashes have little value. The Assistant Director recommends the use of [illegible] and he informs me that the value of saltpetre earths for manurial purposes is fully recognised by the native agriculturist. The sowing of wheat after indigo appears to be financially a most successful rotation of [illegible] with [illegible] has given excellent results in the past season, though it has not always proved so satisfactory.

4. That improved ploughs give better results than the native plough is now an axiom at the Farm; and the use of deep ploughs, where effective supervision is possible, as at the Stud Farm at Babugarh and the Botanical Gardens, Saharanpur, confirms the experience gained here. At the same time the use of the improved plough spreads slowly. Cultivators in the neighbourhood of the Farm are glad to hire [illegible] and landlords [illegible] buy them [illegible] though

passive resistance to their introduction is offered by the native ploughman, who does not appreciate the advantage of economising labour.

5. Experiments with imported varieties of seed have mostly been unsatisfactory, one of the few exceptions being [illegible] oats, which have given uniformly good outturns. Other oats and varieties of barley and wheat have yielded very much less than the local varieties. There is now a good demand for oats for seed, to meet which a large quantity must be grown in future.

6. An Arab stallion was sent to the Farm in May 1891, but it has not as yet proved very successful. The system followed at Babagarh of breaking the horses into agricultural work has been adopted, and the health of the animal has much improved since he has been regularly used in the plough. No particular difficulty was experienced in training the horse to plough; but the pace at which he works makes the ploughman's task much harder than in ordinary circumstances.

7. The Farm is in good order, and the whole stock of machines and implements has recently been rearranged so as to allow of more easy inspection by visitors.

I have the honour to be,

Sir,

Your most obedient Servant,

J. O. MILLER,

Director.

REPORT

OH TOE

CAWKPOiiB AGKICULTUfiAL EXPERIMENT STATION

FOR THE YEAR 1891-92.

Bainfall.—Titere «M a good abower *oa* the 25 th of May 1391, bat the regular mini did n<il commeiuv |ill the 1;iU of July. From Ui»t date *U>* the middle of Auguit the thowera were light and irregular. Sabaquotij they ware exceptionally hwvy and eontiauout till the end of September, From Oetofcer to January there wu hardly any rain. la February there were a few li^iit *Aowtn,* TIic following table ihowi Ui actual ami normal rainfall and number of rainy days in each month from May to April *i*—

Month.	Rainfall.		No. of rainy days.	
	In 1891-92.	Normal.	In 1891-92.	Normal.
May	·60	·12	1	1
June	·18	5·11	1	4
July	4·75	10·25	9	12
August	24·02	10·06	18	12
September	13·23	4·33	14	7
October	·05	1·22	1	2
November	—	—	—	—
December	—	·34	—	1
January	·22	·54	1	1
February	·90	·28	4	1
March	—	·25	—	1
April	...	·11	—	1

1 General character of the MMOIL-Tb. .bower of %Uy amatod the earl] pboglung oprratlunt, bat the delay in Uw iettiog in of the regular rain* greatly idelayed UM lowing of m»i« and outton, with which meet of the *ct* jirrimf at. in the ktmxff mton Ue cotuluvtwl. The Uyht raioi of July proved <rry betwucul for WMding acd ploughing the land for rabi crops, but t*u>* heavy nisi of Atigtut and September did considerable damage to the atftading empt. The areiag* J «H of maixe and ootton was in *come-*quence poor, on manurtd Und the outturn wai only 033 and 721U per *mart* ropeetiToly, M «9»par«d with 1,171 and 117 lU in the prrvioiu year.

The U U D W of the winter rain* wai not much felt, oil thi had bang protected *hy* inigaiton fr .m the oatwl, a tlUtribuUry of wlnrii trmv.rv.-t tlic lUtion. The tup]dy of w»Ur wai rrguUr and mffioietit. The abowew of February, in the caae of many field., €1 one watering, which wouJd othnrwiie b»« beta giren. There were com paraUrdy oloudy djtyi, and the crop* did not euffer from nut, exoept in a few fieldi is low ctott to the ditlrilmUn . Dp tu tbt «od of February til* tpring crop protmted t o U i remarkably good one, but in March high and hot winda wt in nniuunUy early •nd nlirurll.,1 UJI the grain. The rrtalt wai a ooariderabl/ talling-off buff in the fcvtrag« and in the mum. ...um outturn of the rabi c.n - p* M eompartHl with othtr years. rii« following ligutw thow tic average ami UM maximum yield of wheat, per acre, in 1 » 1 « > aw) the proeediag two year*

T«e.	Anne* j-U «f wheat per acre.	Maximum yield of wheat per acre.
	lbs.	lbs.
1891-92	1,133	2,060
1890-91	1,800	2,004
1889-90	1,420	2,846

3. **Experiments.**—The experiments conducted during 1891-92 were directed to show the effects of—

(a) Different kinds of manure.
(b) Deep and shallow ploughing.
(c) Early and late sowing.
(d) Different methods of sowing.
(e) Restricting the growth of plants when running to leaf.
(f) [illegible] in the [illegible].
(g) Varieties of imported [illegible].
(h) Culture of mixed crops.
(i) Rust, how to prevent it.

4. [illegible].—The following experiments were made with manures:—

(1) To determine the [illegible] applied singly and combined with [illegible] on [illegible].
(2) To determine the effect of green manuring.
(3) To ascertain the comparative value of certain animal manures and of saltpetre on [illegible].
(4) To determine the effect [illegible] on leguminous [illegible].
(5) To determine the effect of [illegible] miscellaneous [illegible] on [illegible], wheat and potatoes.

5. [illegible] experiment No. I.—This experiment was commenced in 1879-80; its original object [illegible] the effect of nitrogenous and non-nitrogenous manures [illegible] in four years (1879-82) [illegible] non-nitrogenous [illegible] themselves; and in 1882 [illegible] manure was added to the plots, which had hitherto been treated with non-nitrogenous manures only, and the experiment assumed its present form, which may be regarded as an attempt to determine the effect of nitrogenous manures only, as compared with the same manures reinforced with a non-nitrogenous fertilizer.

6. **Treatment.**—The experiment is conducted in four series. Each series consists of thirteen plots of 400 square yards each. For every plot in one series there is a corresponding plot treated with like manure in the other series.

[illegible] series No. I [illegible] every year with maize.
Ditto No. [illegible] ditto ditto wheat.
Ditto Nos. II and IV [illegible], cropped alternately with maize and wheat.

Thus in series I the plots bear a maize crop after a fallow of nine months; those in series No. III bear a wheat crop after a fallow of six months; while in series II and IV maize follows wheat after a fallow of three months, and wheat follows maize after a fallow of rather more than a year.

All the plot [illegible] waterings, and [illegible] tions for every [illegible] in the [illegible] time. The maize grown on these plots is of the variety [illegible] local variety, but comes to maturity [illegible] Cawnpore variety. The wheat is the soft white wheat of Muzaffarnagar. The plots in the several series received the following treatment during the year under report:—

No. of series.	Manure.	Ploughing.	Weeding.	Watering.	Seed and rate per acre.
I	[illegible]	[illegible]	[illegible]	Nil.	[illegible]
II	[illegible]	[illegible]	[illegible]	Nil.	Ditto.
III	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
IV	[illegible]	[illegible]	[illegible]	[illegible]	Ditto.

7. Outturn.—The following Ubio *thovrs* the outturn of maizo and wheat of i plot during the preaent year, and tbo avcrago outturn of each plot frflii JSS1-- 1890-01 ;—

jj I	Musun «nl nti prr im.	(iniin	OBIIurq tif u				uu•OS-			
					,i>< t-				!1|	
			hria 1.	11	I	Hcrii* 11	111.	iMt • IV.	HI.	tv
	i	S		1		f	H			tl
			1U	IW			Itx.		lb>	1U.
I	Sallpttiv 140 IU. ...	Onltt ...	K7	«S4		s' 1				
		i*m«r ...	was							
1	(Willing 132 eirU....	Oimia ...		«u						
		Stfiw ...	1.047		.V.-72					
	Siwrp.jQnj 19) «wtt.	(lr»in								
		Stnir ...	KJBM		fl.«Tt	'Sill'	MM			
t	Poodntt* IM nrU. .. ... j	()»!•	480		LXW				IMi	
		Stnw ...		MM		:.,;•;'::	MM			
	•Mtrv*.									
S	Saltprtr* MO It*. «w) boo* d«t l	<ir»ln ...	*m*		1.IH					
	aaoiu. I	«ln« ...					;,-;:«		LMB	
'1	StltfMnMOlU. nal bounprr. (	Onia ..				M				
	pt-inr-*- »W Ibt. I						1,677			
?	B>np«tn MO n>. tad Mtu* af IU i	inin ...								
	c»(- r.iailithj,)	Btnv .	MM		:.-..•;		MM	J.977		
H	Cow-dau 1«) cvU. •«(b«n* i	timiri .						1 IM		
	Jti.i % !U (	S»™# „								
•l	lung in tin. »»J ajTMun 1	»if»l» -.								
	MV 1b*. I	Mm* .	3,-.;.							
10	ShwHaag lit twt. . «nd bow (	(Inln ...								
I	rto.t*WIU	1IW« ...								
IV		linin								
	s*f.iu. [	Ihnw								
		ilrmlp								
	A.b«rf 133 t«U. townlai.	Sir»« ...								
II		MM* .	•JOOB		*.7tt			.l.i'S		

•aim.—The 1»«»VT raia* of AttffO*t and St'pU-mU-r aibctod the different p rery unequali . tot*areaituataluna alopc, tho*c at tlw head hn.I rate i an actnntage ovw thoie)jn: away. Thii «plain« why tl« pl''t« treatnl wit i UM outturn Uuut the uniuanurcd jil-it, ati duojf »DJ boM dmt |rav« » total outturn «f onljr 472 Ibc perarro, wtu'U Ut« j'l-t wutml«l with »l>r«pJu»j; alone K>*« 1,&12)b< to the «afo con cao lb«r«fore be drawn from the mai» «»!> °' 1W1.

». Wheat—In •triei III tb« | «hwp-»lun(r gi Ul y«r, while ia •trini I •*uJ *'«'' ''''wp-Juoff »*d gj rikinjr ib*»**»ir«'nf '*»'' tw0 ''*''*'' t; ••dung i HI to ba*« ''° Bff«t, in oibor word* lmthcuw-iiu< appear to *U* perf«!t in theiwelwi ao far M UW r. B d, » i dwilhth in bow dut Tn» «1 ne ttiutin rotnlinatiou wiili NM bewfit, but UM ioorewe *hkt it yicldt it almort iltogotber ab*>rbwl !

TU» •pi'- WP*um witn <*>w''duBtJ '*• ''I** p''>*«J owleia, b«t ut ooan with «b<MMluii|{ it avenu to bare a marked Phil ii av tu proiM- vuUlile com pound Oat l-lf of lim.- to t!«- tdL Th* tultiv.ton an trim !i ibc^p-duD|i •urtaiot W!K» A1W< in the *liM>j>ruU, a' i practice' r a: lew tiiirbu j« ineof aoi« to wtwni «l> * of (rreat ben .*akk* a bn i* manure U anwt tbe «*cap of tviir-ijp-n,

w-du»g wbcti radoe«t u> a»he« * » • l^ I•»• all iu maaarial «Ji»n'.i^ . car tbe plot ao maiiuA*! b- .'-.' ai:nn

«Mit»n of iiiltp*lt«,t<>* « m m . mj-pW the nitrogenoiui eUtnenU lort ia buroing, and it wooM be a good tiling Tkton *wtn ia* add to ibe HOW. baton[1] uitag them H manuro, a •mal) quantity of crude n1tj-

10. The following talile khitws the •<•»*• in the outturn of niiu *moi* wbMt obtained by an application ol UM manure*, noted in UM *titan* Ubic, during UM pMMBl and in prenout *yt*n.*

dim	Onfator	Increase per acre over the outturn of the unmanured plots: Maize (average of series I .•Mt m .) MM	ISSI :n...j, •H—U. t. f-l.1T.	Wheat (average of series III.~1 IT). 1881-82	Average of 1881-82, vide appendix I, page 18.
fiMatlii	(Inl* ,,.	-ifll		Ml	
	•taa	•i			
Cow-dung	On* I		Ml	an	»»i
-'rrf lufv	Grain		IJM	IM	TIO
	Straw	Ml		Ml	Wfl
Poudrette	Grain	UM	UM	MM	*m*
	Straw				4*1
Saltpetre and bone dust	Grain	!.:«•	|M1	*um*	M«
		IM	«u	«n	MT
MH|MN Hi MM .ii-^ko.;^,	M«a	n	MM	MS	*?il*
	Grain	*m*	Mi	M1	Mi
Saltpetre and ashes of cow-dung	^"." ..	171	IM		Mi
	Straw	«M		KM	Mt
CW-iut «4 boo. d.		MS	MM	1 "<5	MB
	am*	•M	M|	4M	»4
Cow-dung and gypsum	!•)«» ;;	1.4U	Mn	Mt	4W
	Urai* ,	TM		: r	MO
M«r*M«M4Ww4Ml	ftln.	kM	MM		St
	Grain	M4	in	M	
»>"M-i«-«p*....	Straw	MM		4H	
	fraH	*	1 kn	Ml	
Ashes of cow-dung	Grain	'/*	MM	m	Mi
	Straw	>oi	IO»	—n	i»i
I		uw	i*i»	-n	

H. VEIMOfprodu«».—TlM lauwia twaltof MHM Of matu U •••hoi blWWURt•Mi - a r* appiwJ in tb» t*>

Manure.	CM •f	AH• «tlMkM: v%. • >«n«. 1 - 4 11) la	to	•MlIU	*f win to IMO-tl.	Ii»« HIWM p»T KW: nMtcT ^^^^^^.^. la tMl M	A••«•< UMMH	wua («	MM • 1M»»V
	IU		k		k		Hv		
MtatM	no		• »	U-M	1TM		Mi		
Cow-dung	K»					- • «	««•	1*M	
...	•oa			M i	II *H*	»M	H I	1**1	
Poudrette	t u		UM	MM	1»M		MM	itw	
Saltpetre and bone dust.		•ft	Ml		>TM	—;:*		I N	i
1 " " 'MM B M superphosphate.	ITM	»a	»•«	Mi				->r«	
Saltpetre and ashes of cow-dung.	Ml	t «	U«*		» M	Mt		IMP	
Cow-dung and bone dust.			uio	» i t			Wo	• •	
Cow-dung and gypsum.	»•«	u «	H«	!»••	UM	fM	I-M	. . . .	
•Q^MCMAMM	1110	- • •	Ut»	*torn*		-ttM		*IB*	
Sheep-dung and gypsum.	»to	•71	M«	*tut*	*it a*		tM	MM	t*T
Ashes of cow-dung	IM	411	tli		•*n*		Mi		H 1

Voi««iro«,—The ntra of milu and ibnl ftaio ted of >bml ttn* m caknktail taronghoat »l the following [»*•*, which [.nnikrl in Gamim* at (hr barn*t time in 18H1 y» :—

						Per rupee.
Maize grain	...	...	...	...	...	50 lbs.
Wheat grain	...	...	...	...	...	30 lbs.
Wheat straw	...	...	...	...	...	S nk

The *tmtm utmikt* art «rtdmn wld" i w Inof M lb*j kMp (rent Uwy w fid •panna;!; to lb« milk mixed witb (T W or wbfat >ln«, bat bj far tb* krgwt porttoo U «ttW thrown into nwtian pit* or banrt In irln Any *Jw tWh amid, ibnrfar*, b* —liannl to it, m A r a Um wtj low ud weU not kppndkbly »Bi thi (TOM rala* of lacnwd mUarn i t Un *tittntott* fc(t it oat of MBDOOL

Cvrf </ MHn.-Ttn «rt irf Diinurr <ho«u In column S ,if tit* U1>la diffen unit what frnrn tba *toA* i-iiTB in forn.fr yoan, nprr>m!l)- In ttw caa of rmr-daag ubaa, Ai Uw «t]«t of tbc rip>riuirtti> condtictrd •I tl» SUtltm l< lo • pnbDo wonld ernin or kMd by wine the nMumn» uM <w tbr Stmtioo. 1 bavr 7'IH-O kg tU* ul.W. It* port at wliirh • roltlnlor aw obtain tb* Mqsind qumUtj, iiiclmliofi ibr prioi of minnrr «od of «trlaf* In • dlntene* uf two aallaa.

It. Manure experiment No. II.—Tl. Mat lm» been cnnductM! regularly rnkMritvof)) piotetin rwndta, grain manuring with bemji and indign w i«med on in two ltfld« in anotbor part of Uu Station at some dWtantv from thaw plot*. TbcRfai town i« UM Muuffaraa^u- poft whito wheat, tlus r»U' of UOlla U> tbe acre. The *]Aot** wen) ploughed five time*, weeded twiw, and watned tlirw time*.

Thp .iiiUurn of ihp prawnt year'a crop and the wngt produce of pmriotu *ytan* an •bown in the following ttiln :—

Series.	Serial number.	Mumud ntt per *ten.*	Ktltt-.tu is'i ML Rnia	-r».	tiny) 0M-B1. Grain.	Mr.*	IMNW -irr 11, >tuu dlH 1891-92. Grain.	Straw.	Average. Grain.	Straw.
			lbs.		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
I	1	(liwn iwllg* |«M(ba< is >»d r.vp- •«n l) i	[illegible]	a.U	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	2	Green indigo ploughed in	UH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	3	F f P	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	4	• Bd llM tt Mk«Mk< oid Mir* ™r»» ll» •««»*	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	5	ll ! S.O10 tabfefMt	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	6	Wheat sown after	a	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	7	ONM Woip plo«cU4 la «d r;p- fl iilini*.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	*8	b*np ptoafbad 1*	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	9	Hemp water MWafMt	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	*10	Wbail »••« (flcr bmiB ciup bad U« 11 uL'-n.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	11	No manure	[illegible]	[illegible]	UM	XI-'l	—	—	—	—
II	1	W Miff* Wfu- 1)0 MMIHb ••J tl«H * —Hill	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	2	M 1«4«* Mo- 119 maunds alone.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	3	Old indigo refuse 120 maunds and lime 6 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	4	Old indigo refuse 120 maunds alone	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	5	No manure	[illegible]	[illegible]	7M	l.**!	—	—	—	—
III	1	Green hemp ploughed in	[illegible]	•vnai	—	—	[illegible]	[illegible]	—	—
	2	Green hemp ploughed in and farmyard manure 50 maunds	[illegible]	[illegible]	—	—	[illegible]	[illegible]	—	—
	3	Farmyard manure 200 maunds	[illegible]	[illegible]	—	—	[illegible]	[illegible]	—	—
	4	No manure	[illegible]	[illegible]	—	—	—	—	—	—

13. 'Ib* plot tR»Ud wtth ttv^h iti.lyF rrd ... and lime gave the larv»t yield. Jt is followed by the plot in which green ,<lilfo m pjotiffiwj m mth (rvpvum. In DM, of twlli imlii{» arnl hemp the plots which were treated «/'•*> B3 gypsum gave » a higher yield thin UM I plots in which !ij<»''tid b«np ^> ploughed !i«l in without i;Vi»um. Tim is another nttanoa of gypsum absorbing the volatile compounds of nitrogen lad ... tben awl available for the succeeding wheat crop. The indigo and hemp water •unity NHM to PK • any *um, Tbet** '• » steeping vat close to the Station from which water could be brought i^ht (wf^r* the (f*''[1] nwnuria! p»rt> floating in it have time to settle down. For the sake of experiment it is brought in earthen jars a long

* The plot No. 8 was added in 1884-85 and No. 10 in 1885-86; in comparing their previous outturn with the outturn of the unmanured plot the average of the latter has been taken fof 1MH-H1 Md ISB4-VI respectively.

way to the Station, and in the state in which it is supplied it is little better than pure water.

[illegible] The following table shows the financial result of each plot in the period [illegible] of the two fields in which this experiment was conducted; the average result of the past years' produce is also noted for comparison.

Field.	Serial.	Manure.	Cost of manure.	Value of outturn: 1891-92.	Value of outturn: Average 1884—91.	Net increase per acre over the unmanured plot: 1891-92.	Net increase per acre over the unmanured plot: Average 1884—91.
I	1	Green indigo ploughed in and gypsum.	Rs. 9·73	Rs. 29·70	Rs. 28·57	Rs. [illegible]	Rs. 9·52
	2	Green indigo ploughed in ...		20·14	20·00	19·89	12·81
	3	Fresh indigo refuse and lime ...	[illegible]	[illegible]		[illegible]	
	4	Old indigo refuse ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	5	Indigo water ...		[illegible]	[illegible]	[illegible]	
	6	Wheat [illegible] ...		[illegible]	[illegible]	[illegible]	[illegible]
	7	Green [illegible] gypsum.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	8	Green hemp ploughed in ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	9	Hemp water ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	10	Wheat sown [illegible] been taken.	...	[illegible]	[illegible]	[illegible]	[illegible]
II	1	Fresh indigo refuse and lime ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	2	Fresh indigo refuse alone ...		[illegible]	[illegible]	[illegible]	[illegible]
	3	Old indigo refuse and lime ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	4	Old indigo refuse alone ...		[illegible]	[illegible]	[illegible]	[illegible]
III	1	Green hemp ploughed in ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	2	Green hemp ploughed in and farm-yard manure.	[illegible]	[illegible]	...	[illegible]	...
	3	Farmyard manure ...	[illegible]	[illegible]	...	[illegible]	...

Financially the plot of which the indigo crop was cut and sold for dye furnished the best result; while [illegible] in a green crop of hemp [illegible] the cheapest form in which [illegible] manured. It [illegible] for [illegible] field. In which cow-dung and other [illegible] a very good return, especially [illegible] gypsum is [illegible] ploughed in.

15. [illegible] III.—This experiment was started in 1884. There [illegible] plot is annually [illegible] noted in the following [illegible] maize. During the year under report all the plots were ploughed twice [illegible] furrows behind the [illegible].

16. The outturn of every plot during the present year [illegible] outturn during [illegible] is shown in the following table. [illegible] list, and [illegible] next [illegible] next; saltpetre in the case of maize does not give any great increase.

Serial number.	Manure.	Outturn in 1891-92: Grain.	Outturn in 1891-92: Stalk.	Average outturn from 1884 to 1891: Grain.	Average outturn from 1884 to 1891: Stalk.	Increase of grain per acre over the unmanured plot: 1891-92.	Increase of grain per acre over the unmanured plot: Average 1884 to 1891.
1	Woollen refuse 120 maunds and lime 12 maunds.	lbs. 1,404	lbs. [illegible]	lbs. [illegible]	lbs. [illegible]	lbs. [illegible]	lbs. [illegible]
2	Sheep-dung 120 maunds ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	Cow-dung 120 maunds ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	Poudrette 120 maunds ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	Horse-dung 120 maunds ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	Pigs' droppings 120 maunds ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	Saltpetre 2 maunds ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	No manure ...	[illegible]	[illegible]	[illegible]	[illegible]	...	...

* Including Rs. 20, net amount realised by sale of indigo.
† Including Rs. 15, net amount realised by sale of hemp.

17. **The** financial remit of **each** manure t* shown in Uve following table:—

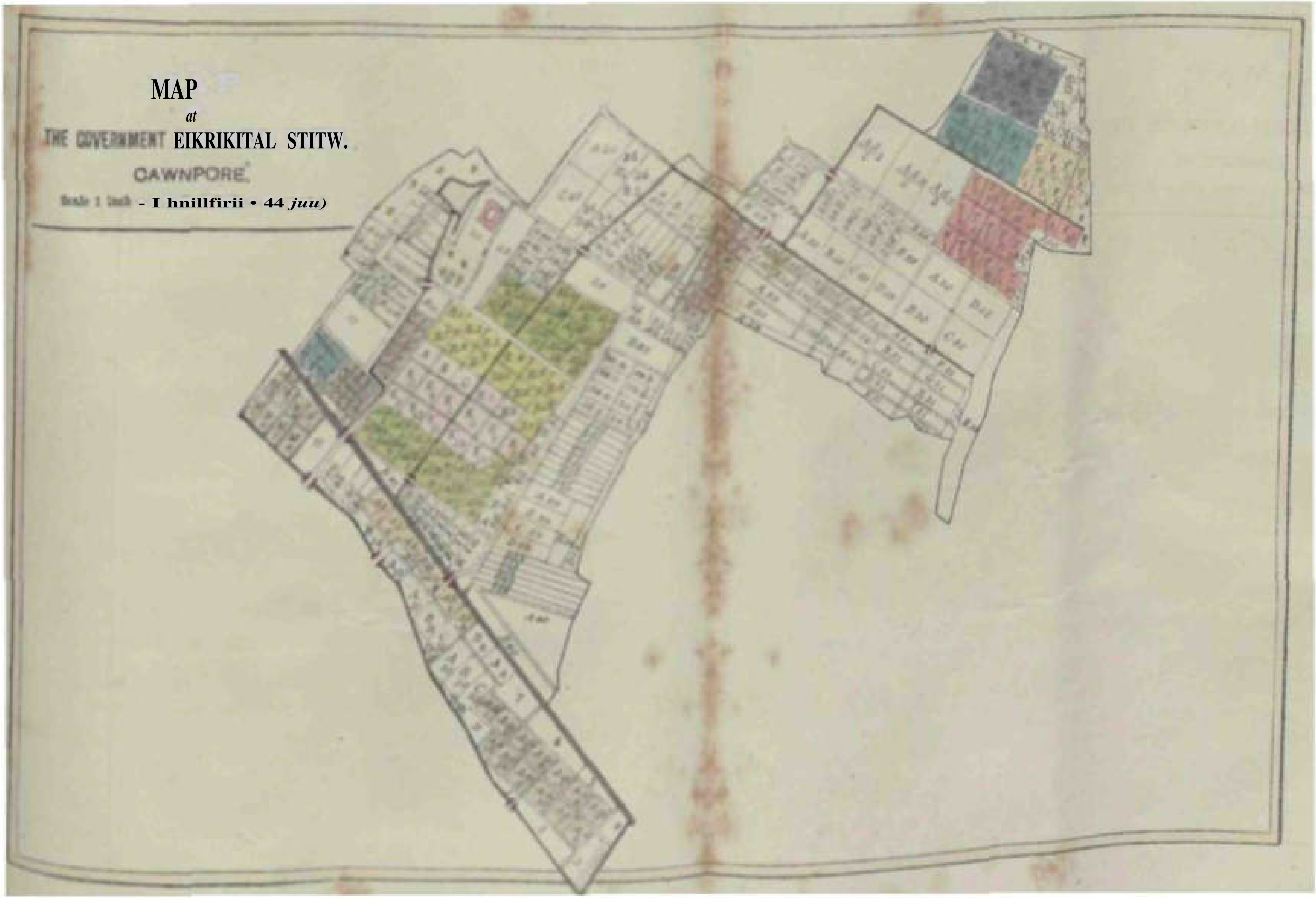
Hums.	**Co* [>»r •cue.**	**V4li» uf iacnued utiltnre.**		M inernue **|MT an*** ow 0» **utiuuiunil plot.**	
		In I[1]}	**A**rag*** last—Ul.	In 1891-92.	**Anne* U8I**
	Bd	Rs.	H*.	**k**	**Ba.**
r. **CiM and iln***		**IS SO**	»4H	814	
"ilnng ...	**13**			**ta***	
t-'flw -itunit				**• 04**	
IWrtU*			17 W	**11 IN**	**lE'U**
***Httm-4am* ...**					
1>. •to$_{tV}$ltt|»		**10 *e***			
KaUjeln-	**0V**	**4 IE**		**- in**	

18. Manure Mperimeat No. IV.—To daUraina Uu effect of **Kjptam** livmnirmu* cn>iw it was ajj|.Iiii! as » «ut# mtnure to iniligo **and** ID **eombiutioa** with farmvarj luanure to gr»m and **pau.** The following iUlcm.-nt *how« the rwult of **tlu** pn*»«t y«r'« trial:—

Crop on «h)cb	**Kuan.**	MT« is		Increase due to gypsum.	
				In weight.	**la v«Jo».**
			Cwts.	**Cwt*.**	
Indigo ...	' ^ in tW M)l at la*	PUnt.,,	Iff		**6-M**
Ditto ...	Ugk	Do. ...	138	**ft., ao**	
Ditto ...	No manure	»». ...	1O«		
Peas ...	**UOIUwl** ***ttnujii***	drain .,	1.401	No increase.	
		Straw ...			
	t'mjtti **aanBf* T) nrU.**		1,'JHC		
		Slrmi.	4.1 ui i		
•In.	***Oyrmm*** **110 Ih uj hnujnul *K** ewU.**	llf›i›› ..	« «	Ditto.	
		DIM			
	Farajrud M N n 7* nrn.	Grain ...			
		Straw ...			

19. This is the fourth y**ait** in wliii'h tl tptrriiWDt hw I In the case of indigo, gypsum this \T»r g»v* an inwws* »-»r)"ini.' rrt"» Rs. 5 to[11]». 8 per ., the plo: in wlii.li it «v apjtlnil an **a** top **diwan** **t** Largur yiuld Ouut tlw **plot** ia which it *wsw* \• *ilh tin- •••il ml tin- him- of towing. TliMtlinVn frou ill* i4)tu y n n in whicli the plni in um WM mix*) ui> with tin- Mil ffivr **M t e** refdU Uuo tbr **oti** The folluwiog an lite Ji^ur i **paat tkrae** *jmn*:—

	Outturn per acre.		
			MM
	t*u.	Cwts.	**I'wU.**
Field in which gypsum was mixed up with soil ...		**: • r.**	**•TT**
Field in which gypsum was applied as a top dressing	**4*T**	**Mt i**	**StHI**
No manure ...	**art**	**• 1**	**t i l**


MAP
at
THE GOVERNMENT EIKRIKITAL STITW.
CAWNPORE.

It M that UoUUr«l which of UMtwo formof ipplying ejpram i* UM nun ulrma-tageous. Bat the fact that an application of ffjpium ini-mun tlw w ight of indigo plants seems flu to b»v* bMn Mtffibmtljr Mabfrhfli' by experiinent* both at the Station awl elsewhere v, although the *iaertmm* which il «*_vt* in often not *wry* grmt. Tbt *mral* pl*w wh«aoe indigo plants of UMM pttmncM ami Bengal can hin a wippJy of it » Naini Tal. It *vmy* he of PDBV intern* to not« bvre the amount which a conagnrornt of[1] thii miiwrml rrohrod in 1<*W had eoat *m* to HalJavmnt, which is UM newest nil**7 kUtion to UM Nairn Tal quarry: —

	Rs.	a.	p.
Cost of quarrying 212 maunds at Rs. 4 per 100 maunds	8	7	8
Carriage to HilUnal hf 1 maunds at Rs. 0-3-6 per maund	46	11	7
Bags and string	2	9	0
	»7	II	•

TV oonugnmoit bttng panl/ for ciptiiiMt, BO royalty vw cbuwcd.

At M^Mdf the experi tittnt with gran *nd pt kit thtt *^n U> «>J » that 8 20 lbs. gypsum am rain found with t, «5 cwta of fwmyinl raanttre d.J Mot giw M gmt v«W •• 7½ I cwt> af fanujanl nunur« appliad «nVly.

20. Manure experiment No. V.-TV Mowing **naasrw wm** experimented with ondtflhu lMaJ:-

IMM	Crop on which tried.
Group A.	
1 Brick kiln refuse	Wheat.
2 Silt	Wheat.
3 Compost	Wheat.
4 Road scrapping ...	Wheat.
5 Ashes of weeds ...	Wheat.
6 Ashes of weeds and saltpetre	Wheat.
7 Ammonic chloride	Wheat.
Group B.	
1 Green hemp ploughed in and kainit	Wheat.
2 Green hemp ploughed in	Wheat.
Group C.	
1 Farmyard manure and kainit	Wheat.
2 Woollen refuse and kainit ...	Wheat.
3 Farmyard manure alone ...	Wheat.
4 Woollen refuse ...	Wheat.
Group D.	
1 Fresh silt from canal	Cotton.
2 Kainit and gypsum	Cotton.
3 Farmyard manure and gypsum	Cotton.
4 Farmyard manure and kainit	Cotton.
5 Woollen refuse ...	Cotton.
Group E.	
1 Poudrette and sulphate of iron	Potatoes.
2 Woollen refuse and gypsum	Potatoes.
3 Poudrette and kainit	Potatoes.
4 Castor oil cake and gypsum ...	Potatoes.

TW trU with commenced in 1883-84. In the first two years the plots U which BOW nti. v* •till.., and road scrapping were treated with p#n«bal indiC" and since 1885-86 no alteration has been made either in the quality or quAtitv of th» MI ""••pptwd to each plot. The experiments with B, C, D, and E were started in 1888-89, and since then tiey have been regularly mnkl o^

5. The following table shows the produce of each plot in 1891-92 and previous years:—

Number and how manured.	Crop cultivated.	Outturn per acre, 1891-92: Weight of produce.	Outturn per acre, 1891-92: Weight of seed.	Outturn per acre, average of previous years: Weight of produce.	Outturn per acre, average of previous years: Weight of seed.	Increase per acre over unmanured plot in each year, 1891-92: Weight of produce.	Increase, 1891-92: Weight of seed.	Increase, average of five years: Weight of produce.	Increase, average of five years: Weight of seed.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
A.—Brick kiln refuse, 88 cwts. ...	Wheat ...	[illegible]	1,370	[illegible]	[illegible]	—13	[illegible]	[illegible]	[illegible]
Silt ...	...	[illegible]	[illegible]	[illegible]	[illegible]	64	[illegible]	177	[illegible]
Cow-dung ...	...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	404*	[illegible]
Road scraping 219 cwts. ...	...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ashes of ...	...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ashes ... 240 lbs.	...	[illegible]	[illegible]	[illegible]	[illegible]	...	[illegible]	[illegible]	[illegible]
Ammonic chloride ...	...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
No manure ...	...	[illegible]	[illegible]	[illegible]	[illegible]	...	...	...	...
B.—... kainit 4 cwts.	...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	170	[illegible]
...	...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
No manure ...	...	[illegible]	[illegible]	[illegible]	[illegible]	...	...	...	...
C.—... kainit	...	[illegible]	[illegible]	1444	[illegible]	—104†	[illegible]	[illegible]	[illegible]
Farmyard manure ...	...	[illegible]	[illegible]	[illegible]	[illegible]	...	...	...	...
Woollen refuse 146 cwts. and ... 3 cwts.	...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Woollen refuse 144 cwts. ...	...	[illegible]	[illegible]	[illegible]	[illegible]	...	...	...	...
D.—Fresh silt ...	Cotton ...	[illegible]	[illegible]	147	[illegible]	[illegible]	[illegible]	47	[illegible]
Kainit 320 lbs. and gypsum 330 cwts.	...	141	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Farmyard manure 132 cwts. gypsum 110 lbs.	...	[illegible]	[illegible]	[illegible]	110	[illegible]	[illegible]	[illegible]	[illegible]
Farmyard manure 132 cwts. and kainit 130 lbs.	...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Woollen refuse 98 cwts.	...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	140	[illegible]
No manure ...	...	[illegible]	[illegible]	[illegible]	...	...	...	...	...
E.—Poudrette 140 cwts. and sulphate of iron ½ cwts.	Cotton ...	3,714	...	12,493	...	—1,100	...	2,330	...
Woollen refuse 146 cwts. and gypsum 3 cwts.	...	4,433	...	11,021	...	—455	...	2,018	...
Poudrette 140 cwts. and kainit 3 cwts.	...	[illegible]	...	10,137	...	—80	...	254	...
Castor-cake 300 lbs. and gypsum 3 cwts.	...	4,544	...	[illegible]	...	—390	...	1,019	...
Cow-dung 148 cwts. ...	...	[illegible]	...	[illegible]	...	...	...	...	...

Group A.—The only manures which have given an outturn over 820 lbs., which is the lowest average for irrigated land of this district, are the ammonic chloride and compost. The ... is very high ... profit; the ... gives a net profit of over Rs. 11 compared with the unmanured plot. It seems that plots Nos. 1, 2 and 6 had enough of brick kiln refuse, silt and ... during ... years; ... whether of ... or of dung have no great effect on ...

*In comparing the outturn of the plots treated with compost and road scraping with the outturn of ... the latter has been taken for the years 1889-90 to 1890-91.

†Compared with ... and with farmyard manure and woollen refuse respectively.

Groups B and C.—Kainit seems to have had little effect on wheat; the same happened last year also. Like common salt it seems to retard the growth of the wheat plant and may perhaps be applied with advantage when the crop is too forward, but not otherwise.

Group D.—All the manures in this group more or less have an increase over the unmanured plot, but in the case of kainit and gypsum it is not possible to say what portion of the increase is due to them.

Group E.—Compared with past years' outturn on potatoes, the outturn of the present year is very low. A large quantity of the potato sets planted this year failed to germinate in the field, and the crop was very thin and irregular.

23. This experiment is conducted in two series, one consisting of 4 plots and the other of 3 plots. The experiment in the former was started in 1882-83 and in the latter one year after. Up to the year 1886-87 the plots were ploughed as follows and received no manure:—

Series.	Serial number of plot.	Description of ploughing.	Number of ploughings.
I	1	Ploughed with Collin's plough, which in one ploughing turns up the soil to a depth of 9"	2
	2	Ploughed with Watt's or Kaisar Plough, which goes to a depth of 5"	2
	3	Ploughed with native plough ...	4
	4	Ditto ditto ...	4
II	1	Same as plot No. 1 of series I ...	2
	2	Ditto " 2 ditto ...	2
	3	Ditto " 3 ditto ...	4

Since 1886-87 the number of ploughings in each plot has been doubled, and the plots of series II manured with cowdung at the rate of [illegible] per acre, the plots of series I remaining unmanured as before. In other respects the plots are treated alike and all are sown with wheat.

The following table gives the outturn of each plot of the two series:—

Series.	Serial number.	Description of ploughing.	Outturn per acre. 1891-92. Grain.	Outturn per acre. 1891-92. Straw.	Average since 1882-83 to 1890-91. Grain.	Average since 1882-83 to 1890-91. Straw.
			lbs.	lbs.	lbs.	lbs.
I	1	Four times with Collin's plough.	621	1,239	842	1,510
	2	Four times with Kaisar plough.	628	1,309	663	1,304
	3 & 4	Eight times with native plough.	573	1,198	520	1,076
II	1	Same as in No. 1 of series I ...	1,027	2,096	797	1,567
	2	Ditto " 2 ditto ...	1,021	2,179	865	1,743
	3	Ditto " 3 ditto ...	1,077	2,200	721	1,313

Taking the average of the two series, the outturn of the plot ploughed 9" deep in the present year differs by only 3 lbs from the outturn of the plot ploughed 5" deep, and the outturn of the deep ploughed plots is a little in excess of the outturn of the shallow ploughed plots, which means that for a crown rooted crop like wheat a ploughing of 5" depth is as good as one of 9" depth, and that four ploughings with an improved ploughs made at the Station have the same effect as deep ploughing with the native plough. Small bullocks and buffaloes of the value of Rs. 15 to Rs. 30 a pair used in cultivation in the neighbourhood of the Station easily plough land to a depth of 5" with one of the ploughs made at the Station, and as the time taken to plough an acre of land with the improved plough must be the same or rather less than the time taken to plough the same with a native plough, it follows that ploughing with a Station plough costs no more an acre, irrespective of the value of the plough itself.

24. Early and late sowing.—This experiment was conducted in two fields. In one maize was sown and in the other cotton. The early sown plots were sown between the 20th and 23rd May, and the late sown between 18th and 20th July. During the interval between the sowing of the early sown plots and the advent of the rains maize was irrigated twice and cotton three times, besides the watering which was required to prepare the land for sowing. The other treatment of the early and late sown fields was similar.

25. The following table shows the produce of the two fields.

Series.	Serial number.	Crop.	Time of sowing.	Produce per acre in 1891-92. Grain of maize and lint of cotton.	Produce per acre in 1891-92. Stalk of maize and seed of cotton.	Average produce per acre in 1886-87 to 1890-91. Grain of maize and lint of cotton.	Average produce per acre in 1886-87 to 1890-91. Stalk of maize and seed of cotton.
				lbs.	lbs.	lbs.	lbs.
I	1	Maize ...	May 20th ...	1,843	3,689	1,344	6,063
	2	" ...	July 18th ...	1,59[illegible]	3,070	1,062	6,252
II		Cotton—					
	1	Varadhi ...	May 23rd	130	295		
	2	Bani ...		115	281		
	3	Dharwari ...		135	447		
	4	Berodha ...		172	417		
	5	Louisiana ...		172	429		
	6	Tree ...		63	192		
	7	Country ...		172	345		
		Average ...	...	142	341	141	307
	1	Varadhi ...	July 20th	60	102		
	2	Bani ...		30	62		
	3	Dharwari ...		42	110		
	4	Berodha ...		32	67		
	5	Louisiana ...		27	45		
	6	Tree ...		23	46		
	7	Country ...		22	24		
		Average ...	...	33	64	70	164

26. The extra cost of irrigation before the rains of early sown plots, and the value of increased outturn obtained by sowing early, are stated below:—

Crop.	Extra cost of watering, including water dues, per acre.	Value of increased produce, per acre, in 1891-92.
	Rs.	Rs.
Maize	5·25	7·1
Cotton	6·5	22·6

In both crops the early sowing left a margin after covering the cost of irrigation. In places where water is available, it will be advantageous to sow maize and cotton, especially the latter, a month or six weeks before the advent of the autumn rains. The plants thus get a start by the time the rains commence, and are not choked up by weeds, which is very often the case when the rains prevent their outlet. The advantage of-tte ftrlr wwwg of cotton is recognized in the Meerut and Agra Divisions, w bm n»n ttu.^ one-fourth I U total area under pure cotton u prepared liy irrigation •ad sown Wore the rein*.

:. DUfcwnt method of wiring injart«ie.-Tl.if experiment is to determine whrtW OH t method I wiring ngwtuw u followed in the West Indies " U ther, than that Mully adopted in the* J A W M. I* « « eowJwU*! in two fields !'1« • * •own with f^urdiAr ent varieties ii« of J i. I Excepting: tfc» dtffaww in dw ••»»* * towing the trritin- ent of the :wu fold* wa* i exactly alike.

The following fijjnrw »Uuw the i<wluce oluinod by the two methodi In 1887-88 to 1891-ML

Yw,		Pr tarn ;T *;«N		
		Sown after the West 1*1.*. fuku«.		Sown in the native way. lbs.
[illegible]	M.	t.r.*> ion)	—	[illegible]
UMMI	—	[illegible]	—	[illegible]
[illegible]	—	[illegible]	—	[illegible]
[illegible]	—	[illegible]	—	[illegible]
!»,r ««	—	UK t*tto)	—	11,11* (dim).

The figures of this year do notibow any noticeable difference between the two methods of sowing cane. Th results of the preceding fonr years were invariably in faTor of the nati™ method.

28. Restrictin S tn* growth of pl»nt when maoing to k»£—Thi. experiment was tried DO wlmt in » 6*W which <m divided inl« thnw part*.' In .«<• p[1]" the plants. W*M gtwed by >hwp whM about • t « t high, in U» otbrt tWjr wrre nil nibbled with »lieklt, add in thr third UM CMP WM If ft untouched. Tbt tmtawnt of three i*rt» in every othw rwfect m exactly

Th« following table shows the «ottuni of the three parts :—

I	Special treatment.		1891-92.	1890-91.	1889-90.
			lbs.	lbs.	lbs.
1	Grazed by sheep	Grain	[illegible]	[illegible]	[illegible]
		Straw	[illegible]	[illegible]	[illegible]
2	Nibbled with a sickle	Grain	[illegible]	[illegible]	[illegible]
		Straw	[illegible]	[illegible]	[illegible]
3	Left untouched	Grain	[illegible]	[illegible]	[illegible]
		Straw	[illegible]	[illegible]	[illegible]

W. Th* o»Unn> »f tb« UUM> j.i.-i. in the (wnr. U«t rwr ib- molt WM mut I * r«<i|l „r thi. •*|*ntniinl tniatt th» winter tain* and of iti» mmp. u • »n Mrljr and I «rwiM t. >»y WWelr |-ff.rm' .• -"-u »rr out «are t!nti » fK,t hik-h wiUioat uy detrittent la it* u'tlD yield.

30. 8«wiwi crop »f md MVB ta the prftMdinf ;— ^;— —[1] •" •l*« (»«•,.„. «»M4«ntr.i' - ,lh,f h.d »t»pnl .t« .. «(la"

The outturn of the two fields is shown below :—

Number.	Variety of cane.	Outturn per acre in gur.	
		Of crop planted in 1891-92.	From stocks of crop planted in 1890-91.
		lbs.	lbs.
1	[illegible]	2,018	3,289
2	[illegible]	2,079	[illegible]
3	[illegible]	2,834	[illegible]
3	[illegible]	3,235	[illegible]
	Average	[illegible]	3,121

31. The result of 1890-91 was considerably in favour of the second year's growth. The same was the case in 1890-91, but in 1888-89 and 1889-90 the outturn of freshly-planted cane exceeded [illegible] preceding year's growth. The outturn of the several years' cultivation is noted below :—

Year.	Outturn per acre.			
	Of cane planted during the year.		Of cane planted in previous year.	
	Weight of juice.	Weight of gur.	Weight of juice.	Weight of gur.
	lbs.	lbs.	lbs.	lbs.
1888-89	[illegible]	1,011	[illegible]	1,016
1889-90	9,418	[illegible]	[illegible]	[illegible]
1890-91	[illegible]	[illegible]	[illegible]	[illegible]

32. If the climatic differences of the two years be neglected and the produce of the first year's growth compared with the produce of the second year's growth, then the following results are obtained. The weight of gur shown in this table for 1889-90 and 1890-91 has been calculated from the weight of juice by adopting the proportion in which they stood in 1888-89.

Year in which cane planted.	Produce in the first year.	Produce in the second year.
1887-88	1,540	1,016
1888-89	1,612	1,452
1889-90	1,529	1,351
1890-91	1,298	3,121
Average	1,470	1,865
Value of average produce	Rs. 88·6	72·4
Deduct additional cost of cultivation during first year owing to cost of planting	„ 29·0*	—
Net gain in retaining stocks for next year	—	20·6

33. *Varieties of seed.*—Imported and indigenous varieties of the undermentioned crops were tried.

Kharif.	Rabi.
Cotton.	Barley.
Sugarcane.	Oats.
Maize.	Rye grass.
Rice.	Lathyrus.
Wheat.	Potatoes.

	Rs.
* Ploughing	10
Seed	8
Sowing	2
Two extra weedings and hoeings	9
	29

The following table shows the results of each variety. Some of these varieties were experimented with in the preceding two years; their figures for those years are quoted for comparison.

Crop.	Variety.	Outturn per acre. In 1881-82.		In previous years.	
		lbs. Fibre.	lbs. Seed.	lbs. Fibre.	lbs. Seed.
Cotton	Upland Georgian	54	181	119	272
	Louisiana	40	129	137	309
	S. H. Mosey	29	64	99	150
	Shine's Early Prolific	18	43	68	143
	Jone's Improved	20	59	98	175
	Sea Island	54	135	137	333
	Hybrid	55	139	128	305
	Egyptian	62	163	124	293
	Tree Cotton	92	181	125	287
	Garo Hills	103	186	120	281
	Hinganghat	64	155	117	274
	Varadhi	85	198	—	—
	Bani	72	171	—	—
	Dharwar	113	279	—	—
	Baroda	102	257	—	—
	Cawnpore	97	184	126	279
		Gur.		Gur.	
Sugarcane	Dhaul (from Behar)	3,052		1,554	
	Dikchan (from Saharanpur)	3,079		1,563	
	Baraukha (from Moradabad)	2,863		1,469	
	Matna (Cawnpore)	2,084		1,761	
		Grain.	Stalk.	Grain.	Stalk.
Juar	Aligarh	871	—	—	—
Maize	American	Failed.			
	Jaunpur	1,707	3,379	—	—
Wheat	*Indian*—				
	Muzaffarnagar	1,334	3,122	1,097	2,638
	Munda	408	2,551	1,159	2,329
	Dusar	913	2,055	1,147	2,361
	Red Punjabi	942	3,516	—	—
	Sindhi	629	2,311	974	3,050
	Australian and Canadian—				
	Adelaide	1,016	2,973	820	2,979
	Ladoga	210	473	587	1,404
	Red Fern	42	513	97	431
	Judkett	73	266	215	409
	White Fife	97	290	104	601
	Red Fife	542	1,053	135	505
	Saponka	67	313	140	654
Barley	*Indian*—				
	White huskless	823	1,706	1,009	2,449
	Chocolate	679	1,459	1,213	2,326
	Green	583	967	1,097	2,061
	Cawnpore (ordinary variety)	1,062	1,706	1,564	2,379
	Canadian—				
	Potter six rowed	300	1,056	620	2,431
	Danish Chevalier	180	733	242	1,162
	Beardless	300	1,840	1,125	2,409
	Swedish	624	1,844	1,462	2,309
Oats	*Canadian*—				
	Prize Cluster	240	1,128	820	3,142
	Canadian Triumph	246	1,053	787	2,137
	Brodie's Prize	228	942	473	1,505
	Welcome	240	[illegible]	708	2,307
	Bonanza	252	[illegible]	797	2,338
	White Egyptian	300	885	947	2,628
Rye grass	—	8,338	5,736	—	—
Lathyrus	—	Failed	—	—	—
English potatoes	Twenty varieties	Only one and in some cases two tubers of each variety were received. The tubers produced on the Station are very inferior to those imported. They have been carefully stored for trial in the next year.			

34. *Mixed Crops.*—The following mixed crops were tried during the year. The fields in which they were sown were treated in the native way.

1. Indigo and maize.
2. Juar and arhar.
3. Bajra and arhar.
4. Cotton, castor, til and urd.
5. Cotton, arhar, til and urd.
6. Wheat and rape-seed.
7. Wheat and safflower.

The following figures show the outturn of each crop in the above mixtures:—

Mixture.	Individual crop.		Outturn per acre. lbs.		lbs.	
Kharif—						
Indigo-maize ...	Indigo	...	—	—	9,232	Green plant.
	Maize	...	Grain	42	1,906	Straw.
Juar-arhar ...	Juar	...	do.	682	6,571	do.
	Arhar	...	do.	696	1,670	do.
Bajra-arhar ...	Bajra	...	do.	95	1,498	do.
	Arhar	...	do.	218	736	do.
Cotton, castor, til and urd.	Cotton	...	Fibre	35	69	Seed.
	Castor	...	Seed	432	—	
	Til	...	do.	32	—	
	Urd	...	Grain	61	403	Straw.
Cotton, arhar, til and urd.	Cotton	...	Fibre	36	81	Seed.
	Arhar	...	Grain	1,396	4,110	Straw.
	Til	...	Seed	89	—	
	Urd	...	Grain	195	928	do.
Rabi—						
Wheat and rape-seed ...	Wheat	...	[illegible]	[illegible]	[illegible]	[illegible]
	Rape-seed	...	[illegible]	[illegible]	—	
Wheat and safflower ...	Wheat	...	[illegible]	[illegible]	[illegible]	do.
	Safflower	...	Flower	3	—	

35. *Rust.*—The object of the experiment, made with wheat, was twofold: (1) to decide whether the germs of rust fungi are inherent in the seed or float in the air and are propagated by atmospheric conditions suitable to their growth; (2) to ascertain whether pickling the seed with copper sulphate kills the germs supposed to be inherent in the seed. Seed-grain of 7 varieties of wheat were sown in small pots in duplicate. In one set of these, seed was sown after it was soaked in a solution of copper sulphate, and in the other seed was sown without any preliminary treatment. The seed germinated freely, and [illegible] till the winter rain arrived; rust appeared in all the pots. Unfortunately the pots all happened to be close to the canal distributary, where another field of wheat sown with unpickled seed was attacked with rust. Thus the present year's experiment proves that pickling with copper sulphate is no preventive for rust, but the question whether the germs of rust fungi are inherent in the seed or float in the air still remains to be decided by future experiments.

36. The following appendices are attached to the present report:—

I.—A statement containing the results of all experiments tried at the Station during the season 1890-91, with a table showing the character of rainfall in each month of the year.

II.—Statement showing the cost of cultivation of the principal experiments tried during the last ten years.

III.—A map showing the position of the plots and fields in which experiments are conducted.

CAWNPORE:
The [illegible] 1892.

L. [illegible] H[illegible],
Offg. Assistant Director.

APPENDIX I.

Table showing the character of rainfall at the Cawnpore Agricultural Experiment Station, during ten years 1881-82 to 1890-91.

Year	Autumn. (Kharif.)	Winter. (Rabi).
1881-82.	Excessive in the beginning and scanty towards the end.	Almost nil.
1882-83.	Fairly good.	Very abnormal; a fall of about three inches happened on a single day accompanied by high winds.
1883-84.	Late and scanty.	No rain.
1884-85.	Heavy and inopportune.	Almost nil.
1885-86.	Ditto	Very favorable.
1886-87.	Fair in the beginning, with a long break in the middle and a severe hailstorm at the end.	Favorable.
1887-88.	Heavy and continuous.	Favorable.
1888-89.	Very heavy, nearly double the normal fall.	Rather heavy, with continuance of cloudy weather.
1889-90.	Very favorable.	Late and partial.
1890-91.	Rather heavy in the beginning, with a pretty long break in the middle, but on the whole not very prejudicial.	Heavy and accompanied by high winds.

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	AUaanaM*.		bra*	tar.	t^thItMIaMat.	Chrttan per HI !• IW.										oatlan talte	IIHII — pcrut* inIW (OH-nunxl plot is the	
						«i-a.	1M»«.	MS44.	UM4E.	IMU&	1MM7.		IMS-Bft.	Utfi.90.	UUM..			
					y»f>«|im —Mini,	Oak.	Onto.	Ofaf>.	Oiaia.	Onta.		Onta.	(irabL		Ontn.	Oate.	Onto.	
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Statement showing results of experiments tried at the Agricultural Experiment Station, Cawnpore, during the 10 years 1881-82 to 1890-91.

N.B.—Except [redacted] columns the treatment of every plot in each series in regard to ploughing, weeding, watering, manure and seed was exactly similar.

Class.	Experiment.	Crop on which tried.	Series.	Serial number.	Special treatment.	1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	Average outturn per acre in lbs.	Increase per acre in lbs. over the unmanured plot in the series.	Remarks.
						Outturns per acre in lbs.												
						Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	
1.—Manure.	To determine the effect of nitrogenous and non-nitrogenous manures.	Wheat ...	III		*Nitrogenous manures.*													[illegible]
				1	Saltpetre 240 lbs. per acre ...	1,742	1,078	1,355	1,624		1,234	1,161	1,137	1,646	1,487	1,425	420	
				2	Cow-dung 132 cwts. ...	916	1,713	1,429	943		1,326	1,245	980	1,601	1,527	1,410	395	
				3	Sheep-dung 132 cwts. ...	—	—	—	892		1,234	1,430	1,010	1,730	968	1,336	295	
				4	Poudrette 132 cwts. ...	—	—	—	1,074		1,422	1,277	1,224	1,700	1,360	1,322	317	
					Nitrogenous and non-nitrogenous manures.													
				5	Saltpetre 240 lbs. and bone dust 200 lbs. per acre.	1,205	1,546	[illegible]	1,170		1,343	1,323	1,210	1,118	1,207	1,420	43	
				6	Saltpetre 240 lbs. and bone superphosphate 240 lbs. per acre.	—	—	[illegible]	[illegible]		1,138	1,112	[illegible]	1,582	1,648	1,325	33	
				7	Ditto 240 lbs. and ashes of 132 cwts. cow-dung per acre.		—	[illegible]	[illegible]		1,102	1,012	[illegible]	1,843	1,404	1,352	[illegible]	
				8	Cow-dung 132 cwts. and bone-dust 200 lbs. per acre.		1,394	[illegible]	1,016	1,898	1,234	1,319	[illegible]	1,707	1,742	1,397	412	
				9	Cow-dung 132 cwts. and gypsum 240 lbs. ...		1,712	[illegible]	897	1,867	1,162	1,310	[illegible]	1,322	1,707	1,309	373	
				10	Sheep-dung 132 cwts. and bone-dust 200 lbs. ...		—	[illegible]	825	1,436	1,040	986	[illegible]	1,419	1,718	1,304	294	
				11	Ditto 132 cwts. and gypsum 240 lbs. ...		—	[illegible]	736	1,134	1,307	1,428	[illegible]	1,319	1,092	1,229	274	
					Non-nitrogenous manures.													
				12	Ashes of 132 cwts. cow-dung per acre ...	[illegible]	1,362	[illegible]	704	962	851	811	[illegible]	1,416	1,362	[illegible]	[illegible]	
				13	Bone dust 200 lbs. per acre ...	[illegible]	1,082	—	—	—	—	—	—	—	—	[illegible]	[illegible]	
				14	Bone superphosphate 240 lbs. per acre ...	[illegible]	1,346	—	—	—	—	—	—	—	—	[illegible]	[illegible]	
				15	Gypsum 240 lbs. per acre ...		966	—	—	—	—	—	—	—	—	[illegible]	[illegible]	
				16	No manure ...		1,062	[illegible]	622	918	1,045	588	[illegible]	1,367	1,232	[illegible]	[illegible]	
		Do. ...	IV		*Nitrogenous manures.*													
				1	Saltpetre 240 lbs. per acre ...	[illegible]	[illegible]	[illegible]	1,741	1,604	1,426	1,046	[illegible]	1,670	1,319	[illegible]	[illegible]	
				2	Cow-dung 132 cwts. ...	[illegible]	[illegible]	[illegible]	1,402	2,021	1,370	1,022	[illegible]	2,850	1,779	[illegible]	[illegible]	
				3	Sheep-dung 132 cwts. ...	[illegible]	[illegible]	[illegible]	1,446	1,394	1,742	1,234	[illegible]	1,468	1,701	[illegible]	[illegible]	
				4	Poudrette 132 cwts. ...	[illegible]	[illegible]	[illegible]	1,462	1,460	1,700	1,307	[illegible]	2,043	1,372	[illegible]	[illegible]	
					Nitrogenous and non-nitrogenous manures.													
				5	Saltpetre 240 lbs. and bone dust 200 lbs. per acre.	[illegible]	[illegible]	[illegible]	1,634	1,059	1,801	2,003	847	2,130	1,742	[illegible]	[illegible]	
				6	Saltpetre 240 lbs. and bone superphosphate 240 lbs. per acre.	—	—	[illegible]	2,957	1,404	1,470	[illegible]	750	1,367	2,059	[illegible]	[illegible]	
				7	Saltpetre 240 lbs. and ashes of 132 cwts. cow-dung per acre.	—	—	—	1,586	1,373	1,390	[illegible]	871	1,428	1,670	[illegible]	[illegible]	
				8	Cow-dung 132 cwts. and bone dust 200 lbs. per acre.	[illegible]	1,435	2,874	1,510	1,301	1,754	[illegible]	871	1,634	1,718	[illegible]	[illegible]	
				9	Cow-dung 132 cwts. and gypsum 240 lbs. per acre.	[illegible]	[illegible]	2,004	1,806	1,069	1,486	[illegible]	944	1,513	1,706	[illegible]	[illegible]	
				10	Sheep-dung 132 cwts. and bone dust 200 lbs. ...	[illegible]	[illegible]	2,350	1,512	974	1,268	[illegible]	1,064	1,631	2,003	[illegible]	[illegible]	
				11	Sheep-dung 132 cwts. and gypsum 240 lbs. per acre.	[illegible]	[illegible]	2,061	1,870	1,329	1,364	[illegible]	1,365	1,537	2,130	[illegible]	[illegible]	
					Non-nitrogenous manures.													
				12	Ashes of 132 cwts. cow-dung per acre ...	[illegible]	1,417	2,233	1,893	1,340	858	[illegible]	811	1,730	1,735	[illegible]	[illegible]	
				13	Bone dust 200 lbs. per acre ...	[illegible]	1,468	—	—	—	—	—	—	—	—	[illegible]	[illegible]	
				14	Bone superphosphate 240 lbs. per acre ...	[illegible]	1,371	—	—	—	—	—	—	—	—	[illegible]	[illegible]	
				15	Gypsum 240 lbs. per acre ...	[illegible]	1,154	—	—	—	—	—	—	—	—	[illegible]	[illegible]	
				16	No manure ...	[illegible]	999	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

Statement showing results of experiments tried at the Agricultural Experimental Station, Cawnpore, during the 10 years 1881-82 to 1890-91.

N.B.—Except the special treatment noted in column 6, the treatment of every plot in each series in regard to ploughing, weeding, watering, manure and seed was exactly similar.

Class.	Experiment.	Crop on which tried.	Series.	Serial number.	Special treatment.	1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	Average outturn per acre in lbs.	Increase per acre in lbs. over the unmanured plot in the series.
						Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.
I.—Manure.	Green soiling ...	Wheat ...	V	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
				2–11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			VI	1–5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			VII	1–3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Experiment with certain combinations of mineral manures to discover the element in which the deficiency of the farm soil lies.	Ditto ...	VIII	1–6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	To determine the effect of certain manures ... on maize.	Maize ...	IX	1–8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Crop destroyed.

Statement showing results of experiments tried at the Agricultural Experiment Station, Cawnpore, during the 10 years 1881-82 to 1890-91.

N.B.—Except the special treatment noted in column 6, the treatment of every plot in each series in regard to ploughing, weeding, watering, manure and seed was exactly similar.

Class.	Experiment.	Crop on which tried.	Series.	Serial number.	Special treatment.	1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	Average outturn per acre in lbs.	Increase per acre in lbs. over the unmanured plot.	Remarks.
						Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	
I.—Manure.	To determine the value of cotton seed and certain oil-cakes as manure and of the dung obtained from cattle fed on these against the dung obtained from cattle to whom no concentrated food is given.	Wheat ...	XA	1	Mustard cake 400 lbs. per acre ...	—	—	—	—	1,779	1,039	1,024	1,057	1,176	—	1,242	241	
				2	Ditto 800 lbs. " ...	—	—	—	—	1,801	1,304	1,207	1,260	1,301	—	[illegible]	327	
				3	Ditto 1,200 lbs. " ...	—	—	—	—	1,453	—	—	—	—	—	[illegible]	363	
				4	Cake fed dung 36 cwts. " ...	—	—	—	—	2,041	1,201	862	838	1,132	—	[illegible]	67	
				5	Ditto 72 cwts. " ...	—	—	—	—	1,964	1,480	840	812	947	—	[illegible]	214	
				6	Ditto 146 cwts. " ...	—	—	—	—	1,851	—	—	—	—	—	[illegible]	262	
				7	Cow-dung 146 cwts. per acre, obtained from cattle which had not received any cake, or other nutritious food.	—	—	—	—	909	1,458	979	1,230	1,242	—	[illegible]	172	
				8	No manure	—	—	—	—	1,488	1,013	742	807	914	—	1,002	—	
			XB	1	Cotton seed fed dung 36 cwts. per acre ...	—	—	—	—	1,140	1,051	824	981	1,120	—	1,031	−70	
				2	Ditto 72 cwts. " ...	—	—	—	—	1,119	1,079	1,155	1,044	1,240	—	1,124	87	
				3	Ditto 146 cwts. " ...	—	—	—	—	2,057	939	—	—	—	—	1,142	−104	
				4	Polished cotton seed 400 lbs. " ...	—	—	—	—	1,470	814	912	1,107	1,270	—	[illegible]	−11	
				5	Ditto 800 lbs. " ...	—	—	—	—	2,722	1,180	1,186	1,283	1,213	—	[illegible]	410	
				6	Ditto 1,200 lbs. " ...	—	—	—	—	1,394	—	—	—	—	—	1,094	351	
				7	Cow-dung 146 cwts. per acre, obtained from cattle which had not received any cake or other nutritious food.	—	—	—	—	938	774	804	1,170	1,300	—	1,033	−69	
				8	No manure	—	—	—	—	1,033	902	751	1,053	1,150	—	—	—	
			XC	1	[illegible]ke 400 lbs. per acre ...	—	—	—	—	1,063	—	—	—	—	—	[illegible]	133	
				2	800 lbs. " ...	—	—	—	—	1,740	—	—	—	—	—	[illegible]	190	
				3	1,000 lbs. " ...	—	—	—	—	990	—	—	—	—	—	—	−220	
				4	36 cwts. " ...	—	—	—	—	1,402	—	—	—	—	—	—	−212	
				5	72 cwts. " ...	—	—	—	—	1,527	—	—	—	—	—	—	−12	
				6	146 cwts. " ...	—	—	—	—	996	—	—	—	—	—	—	−351	
				7	[illegible]	—	—	—	—	1,349	—	—	—	—	—	—	—	
	To determine the residual value of certain manures.	Ditto ...	XI	1	[illegible] 220 cwts. per acre ...	—	—	—	—	—	—	1,319	[illegible]	826	1,313			
				2	[illegible] 146 cwts. " ...	—	—	—	—	—	—	987	847	699	990			
				3	[illegible] 220 cwts. " ...	—	—	—	—	—	—	714	774	664	909			
				4	[illegible] 36 cwts. " ...	—	—	—	—	—	—	730	678	650	927			
				5	[illegible] and bone dust 141 cwts. per acre ...	—	—	—	—	—	—	702	714	704	900			
				6	[illegible] 220 cwts. per acre ...	—	—	—	—	—	—	702	690	649	946			
				7	[illegible] used with residual ...	—	—	—	—	—	—	617	663	632	908			
				8	[illegible] 240 lbs. per acre ...	—	—	—	—	—	—	620	714	744	1,022			
				9	[illegible] chloride 240 lbs. per acre ...	—	—	—	—	—	—	620	702	730	979			
				10	No manure	—	—	—	—	—	—	583	871	744	895			
			XII	1	Calcic superphosphate 180 lbs., ammonic chloride 138 lbs., potassic sulphate 96 lbs., and calcic sulphate 98 lbs. per acre.	—	—	—	—	—	—	—	653	908	947			
				2	All except calcic superphosphate ...	—	—	—	—	[illegible]	—	—	581	923	903			
				3	Ditto ammonic chloride ...	—	—	—	—	[illegible]	—	—	620	948	1,041			
				4	Ditto potassic sulphate ...	—	—	—	—	[illegible]	—	—	638	871	1,010			
				5	Ditto calcic sulphate ...	—	—	—	—	[illegible]	—	—	646	946	610			
				6	No manure	—	—	—	—	[illegible]	—	—	666	744	942			

Statement showing results of experiments tried at the Agricultural Experiment Station, Cawnpore, [illegible] 10 years [illegible] to 1890-91.

N.B.—Except the special treatment noted in column 6, the treatment of every plot in each series in regard to ploughing, [illegible] watering, [illegible] was exactly similar.

Class.	Experiment.	Crop on which tried.	Series.	Serial number.	Special treatment.	1881-82	1882-83	1883-84	1884-85	1885-86	1886-87	1887-88	1888-89	1889-90	1890-91	Average outturn per acre in lbs.	Increase per acre in lbs. over the unmanured plot.	Remarks.
						Outturn per acre in lbs.												
I.—Manure.	To determine the effect of kainit applied with other manures.	Cotton ...	XIII	1	Fresh silt from canal 360 cwts. per acre.	—	—	—	—	—	—	—	Fibre. 159	Fibre. 121	Fibre. [illegible]	[illegible]	Fibre. 47	
				2	Kainit 220 lbs. and gypsum 220 lbs. per acre.	—	—	—	—	—	—	—	191	97	[illegible]	[illegible]	[illegible]	
				3	Farmyard manure 122 cwts. and gypsum 110 lbs. per acre.	—	—	—	—	—	—	—	[illegible]	73	[illegible]	[illegible]	[illegible]	
				4	Ditto ditto and kainit 110 lbs. per acre.	—	—	—	—	—	—	—	[illegible]	87	[illegible]	[illegible]	[illegible]	
				5	Woollen refuse 88 cwts. per acre ...	—	—	—	—	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
				6	No manure	—	—	—	—	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
		Wheat ...	XIV	1	Kainit 3 cwts. per acre and green hemp ploughed in.	—	—	—	—	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
				2	Hemp ploughed in	—	—	—	—	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
				3	Farmyard manure 140 cwts. and kainit 3 cwts. per acre.	—	—	—	—	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
				4	Farmyard manure 140 cwts. per acre ...	—	—	—	—	—	—	—	[illegible]	[illegible]	1,782	[illegible]	[illegible]	
				5	Woollen refuse 140 cwts. and kainit 3 cwts. per acre.	—	—	—	—	—	—	—	[illegible]	[illegible]	1,408	[illegible]	[illegible]	
				6	Woollen refuse 140 cwts. per acre ...	—	—	—	—	—	—	—	[illegible]	[illegible]	1,604	1,503	[illegible]	
				7	No manure	—	—	—	—	—	—	—	[illegible]	[illegible]	1,041	980	[illegible]	
	To determine the effect of gypsum on leguminous crops.	Indigo ...	XVA	1	Gypsum 240 lbs. per acre, applied at the time of sowing.	—	—	—	—	—	—	Plant. 14,487	[illegible]	Plant. [illegible]	[illegible]	Plant. 10,629	[illegible]	
				2	Gypsum 240 lbs. per acre applied as a top-dressing when the plants were 6 inches high.	—	—	—	—	—	—	—	6,007	[illegible]	5,457	6,020	[illegible]	On the average of three years' figures.
				3	No manure	—	—	—	—	—	—	12,360	3,303	[illegible]	4,371	8,000	[illegible]	
		Peas ...	XVB	1	Farmyard manure 80.5 cwts. and gypsum 8 cwts. per acre.	—	—	—	—	—	—	—	Grain. 1,703	[illegible]	Grain. 549	Grain. 924	[illegible]	
				2	Ditto 73 cwts. only per acre.	—	—	—	—	—	—	—	1,675	[illegible]	892	747	[illegible]	
		Grass ...	XVC	1	Farmyard manure 80.5 cwts. and gypsum 9 cwts. per acre.	—	—	—	—	—	—	—	1,080	[illegible]	1,742	1,565	[illegible]	
				2	Ditto 73 cwts. only per acre.	—	—	—	—	—	—	—	1,309	[illegible]	1,216	1,304	[illegible]	
Miscellaneous ...		Wheat ...	XVI	1	[illegible] refuse 68 cwts. per acre ...	—	—	Grain. 2,508	Grain. 1,176	Grain. 1,053	[illegible]	Grain. 472	Grain. 641	[illegible]	Grain. 629	Grain. 1,000	Grain. 301	
				2	[illegible] cwts. per acre ...	—	—	1,323	1,020	1,065	[illegible]	506	690	[illegible]	906	986	177	
				3	[illegible] 180 cwts. per acre ...	—	—	—	—	968	[illegible]	453	631	[illegible]	1,476	909	404	
				4	[illegible] 212 cwts. per acre ...	—	—	—	—	908	[illegible]	732	729	[illegible]	729	926	287	
				5	[illegible] 132 cwts. weeds per acre ...	—	—	1,750	1,083	1,001	[illegible]	678	537	[illegible]	1,416	940	[illegible]	
				6	[illegible] 132 cwts. weeds and saltpetre [illegible] per acre.	—	—	2,184	1,809	1,240	[illegible]	829	1,028	[illegible]	782	1,096	[illegible]	
				7	Ammonia chloride 220 lbs. per acre ...	—	—	2,005	1,448	1,213	720	[illegible]	537	[illegible]	480	927	[illegible]	
				8	No manure	—	—	1,652	880	838	448	[illegible]	593	[illegible]	702	729	[illegible]	
		Potatoes ...	XVII	1	Poudrette 140 cwts. and sulphate of iron 4 cwts. per acre.	—	—	—	—	—	—	—	Bulbs. 11,613	[illegible]	Bulbs. 15,379	Bulbs. 12,409	2,500	Increase over the plot treated with cow-dung.
				2	Woollen refuse 140 cwts. and gypsum 8 cwts. per acre.	—	—	—	—	—	—	—	10,363	[illegible]	13,737	11,921	2,018	
				3	Poudrette 140 cwts. and kainit 2 cwts. per acre.	—	—	—	—	—	—	—	[illegible]	[illegible]	14,882	10,137	234	
				4	Castor cake 800 lbs. and gypsum 8 cwts. per acre.	—	—	—	—	—	—	—	[illegible]	[illegible]	[illegible]	11,822	1,919	
				5	Cow-dung 140 cwts. per acre ...	—	—	—	—	—	—	—	4,620	[illegible]	[illegible]	9,903	—	

Statements showing results of experiments tried at the Agricultural Experiment Station, Cawnpore, during the 10 years 1881-82 to 1890-91.

N.B.—Except the special treatment noted in column 6, the treatment of every plot in each series in regard to ploughing, weeding, watering, manure and seed was exactly similar.

Class.	Experiment.	Crop on which tried.	Series.	Serial number.	Special treatment.	1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	Average outturn per acre in lbs.	Increase per acre in lbs.	Remarks.
						Outturn per acre in lbs.												
						Fibre.	Fibre.	Fibre.	Fibre.	Fibre.						Fibre.	Fibre.	
II.—Ploughing.	To determine the effect of deep and shallow ploughing.	Cotton ...	I	1	Ploughed with the native plough ...	177	99	130	47	120	[illegible]	—	—	—	—	111	—	
				2	Ditto with Watt's or Kaiser Plough, which goes to a depth of 5"; the number of ploughings being only half that of plot I.	158	112	141	49	220	[illegible]	—	—	—	—	122	11	Increase computed with the plot ploughed with the native plough.
				3	Ploughed with Collin's Plough, which goes to a depth of 9"; the number of ploughings being only half that of plot I.	—	105	130	61	210	[illegible]	—	—	—	—	117	10	
			II	1	Ploughed with the native plough ...	—	—	59	81	218	[illegible]	—	—	—	—	88	[illegible]	
				2	Ploughed with Watt's or Kaiser Plough, which goes to a depth of 5"; the number of ploughings being only half that of plot I.	—	—	105	25	229	[illegible]	—	—	—	—	98	[illegible]	Ditto.
				3	Ploughed with Collin's Plough, which goes to a depth of 9"; the number of ploughings being only half that of plot I.	—	—	113	27	224	[illegible]	—	—	—	—	102	[illegible]	
							Grain.	Grain.	Grain.	Grain.	Gr.		Grain.		Grain.	Grain.		
	Ditto ...	Wheat ...	III	1	Ploughed with the native plough ...	—	390	407	554	413	[illegible]	—	720	[illegible]	708	510	[illegible]	
				2	Ploughed with Watt's or Kaiser Plough, which goes to a depth of 5"; the number of ploughings being only half that of plot I.	—	775	670	800	210	409	—	823	[illegible]	807	609	104	Ditto.
				3	Ploughed with Collin's Plough, which goes to a depth of 9"; the number of ploughings being only half that of plot I.	—	1,096	1,236	721	226	207	—	994	[illegible]	1,000	843	234	
			IV	1	Ploughed with the native plough ...	—	—	728	437	535	129	—	731	1,134	1,003	721	—	
				2	Ploughed with Watt's or Kaiser Plough, which goes to a depth of 5"; the number of ploughings being only half that of plot I.	—	—	1,006	545	415	243	—	842	1,018	1,336	805	[illegible]	Ditto.
				3	Ploughed with Collin's Plough, which goes to a depth of 9"; the number of ploughings being only half that of plot I.	—	—	1,804	736	413	509	—	723	1,416	1,352	927	[illegible]	
						Fibre.	Fibre.									Fibre.		
	To determine the effect of early and late ploughing.	Cotton ...	V	1	Early ploughed ...	252	165	—	—	—	—	—	—	—	—	205	[illegible]	
				2	Late ploughed ...	159	140	—	—	—	—	—	—	—	—	150	[illegible]	
						Grain.	Grain.	Grain.	Grain.	Gr.						Grain.		
III.—Irrigation.	To determine the relative merits of canal and well water.	Wheat ...	IA	1	Irrigated from well ...	1,313	1,391	804	1,029	[illegible]	—	—	—	—	—	1,004	[illegible]	
				2	Ditto canal ...	1,330	1,327	720	642		—	—	—	—	—	804	—	
			IB	1	Ditto well ...	—	—	1,824	1,305	[illegible]	—	—	—	—	—	1,333	191	Ditto.
				2	Ditto canal ...	—	—	1,579	916		—	—	—	—	—	1,104	—	
	To ascertain the effect of irrigation in increasing the outturn.	...	II	1	Ditto once ...	696	413	709	309		763	—	—	—	—	627	[illegible]	
				2	Ditto twice ...	513	491	812	402		909	—	—	—	—	713		
				3	Ditto thrice ...	951	631	[illegible]	891	[illegible]	1,062	—	—	—	—			
				4	Ditto four times ...	1,104	695	[illegible]	1,016	[illegible]	1,346	—	—	—	—			Increase over the unirrigated plot.
				5	Ditto five ...	1,309	—	1,228	1,135	[illegible]	1,307	—	—	—	—	[illegible]		
				6	Unirrigated ...	815	500	450	505	[illegible]	750	—	—	—	—			

Class.	Experiment.	Crop on which tried.	Series.	Serial number.	Experiment.	Outturn per acre in lbs.										Average.	Increase per acre in lbs.	Remarks.
						[illegible]	[illegible]	1893-94.	[illegible]	1895-96.	1896-97.	1897-98.	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]	[illegible]	I.	1	[illegible]											[illegible]	[illegible]	[illegible]
				2	[illegible]													
		[illegible]	II.	1	[illegible]											[illegible]	[illegible]	[illegible]
				2	[illegible]													
Ditto	[illegible]	[illegible]	III A.	1	[illegible]											[illegible]	[illegible]	[illegible]
Ditto	[illegible]	[illegible]	IV.	1	[illegible]											[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	V.	1	[illegible]											[illegible]	[illegible]	Ditto.
[illegible]	[illegible]	[illegible]	[illegible]	1	[illegible]											1.7W	[illegible]	[illegible]
Ditto	[illegible]	Ditto	[illegible]	1	[illegible]											711	[illegible]	Ditto.
				2	Ordinary way										1.40	1,117		
Ditto	[illegible]	[illegible]	VIII A.	1	[illegible]											[illegible]	[illegible]	[illegible]
				2	[illegible]													
		[illegible]	[illegible]	1	[illegible]													[illegible]
		Indian turnips	VIII C.	1	[illegible]													Ditto.
				2	[illegible]													

Statement showing results of experiments tried at the Agricultural Experiment Station, Cawnpore, during the 10 years 1881-82 to 1890-91.

Class.	Experiment.	Crop on which tried.	Series.	Serial number.	Variety.	1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	Average outturn per acre in lbs.	Increase per acre in lbs. over the local variety.	Remarks.
						Outturn per acre in lbs.												
V.—Seed ...	To determine the relative merits of the different varieties of seed.	Cotton ...	I.	1	[illegible]	Fibre. 181	Fibre. 150	—	—	Fibre. —	—	—	Fibre. —	Fibre. —	[illegible]	Fibre. 120	Fibre. —12	[illegible]
				2	[illegible]	113	—	—	—	—	—	—	128	160	[illegible]	119	16	
				3	[illegible]	—	—	—	—	—	—	—	97	134	[illegible]	127	22	
				4	[illegible]	—	—	—	—	—	—	—	—	—	[illegible]	95	—8	
				5	[illegible]	—	—	—	—	—	—	—	24	150	[illegible]	88	—19	
				6	[illegible]	—	—	—	—	—	—	—	24	140	[illegible]	68	—33	
				7	[illegible]	—	—	—	—	—	—	—	24	180	[illegible]	58	—19	
				8	[illegible]	—	—	—	—	—	—	—	97	104	[illegible]	127	20	
				9	[illegible]	—	—	—	—	—	—	—	83	158	[illegible]	129	16	
				10	[illegible]	—	—	—	—	—	—	—	97	104	[illegible]	124	17	
				11	[illegible]	—	—	—	—	80	—	100	—	—	[illegible]	92	8	
				12	Tree Cotton	—	—	—	—	—	—	—	121	146	[illegible]	123	18	
				13	Garo Hills	—	—	—	—	—	—	—	160	134	[illegible]	120	42	
				14	Hinganghat	108	—	—	—	—	—	—	111	153	[illegible]	117	—17	
				15	Kalpahar	141	—	—	—	—	—	—	—	—	[illegible]	101	—31	
				16	Cawnpore	252	179	97	—	—	—	97	—	130	[illegible]	120	—	
												Juice.				Juice.	Juice.	
		Sugar-cane	II.	1	Bhuri (from Behar)	—	—	—	—	—	—	10,524	—	—	—	8,437	—1,006	
				2	[illegible] (from Shahjahanpur)	—	—	—	—	—	—	—	—	—	—	8,363	—1,080	
				3	[illegible] (from Moradabad)	—	—	—	—	—	—	—	—	—	8,555	7,767	—1,656	
				4	[illegible] (local Cawnpore)	—	—	—	—	—	—	13,779	—	—	6,880	9,443	—	
																Grain.	Grain.	
		Maize ...	III.	1	[illegible]	—	—	—	—	—	—	—	—	—	—	2,859	2,184	
				2	[illegible]	—	—	—	—	—	—	—	—	—	—	2,042	973	
				3	[illegible]	—	—	—	—	—	—	—	—	—	—	1,059	—	
					[illegible]	Grain.	Grain.	Grain.		Grain.	Grain.					Grain.	Grain.	
		Wheat ...	IVA.	1	[illegible]	1,757	1,697	—	—	398	—	—	2,373	—	—	1,097	408	
				2	[illegible]	—	—	—	—	—	—	—	1,052	—	—	1,150	—	
				3	[illegible]	—	—	—	—	—	—	—	—	—	—	1,422	231	
				4	[illegible]	—	—	—	—	—	—	—	—	—	—	979	—511	
				5	[illegible]	—	—	—	—	—	1,863	—	1,403	—	—	1,147	—42	
				6	[illegible]	—	—	—	—	—	—	—	1,007	—	—	974	—215	
					[illegible] and Australian wheats.													
			IVB.	1	[illegible], Rough chaff	114	473	—	—	—	—	—	—	—	—	298	—806	
				2	English, Red bearded	293	—	—	—	—	—	—	—	458	—	370	—819	
				3	Adelaide (Australian wheat)	—	—	—	452	—	—	—	871	1,314	—	820	—303	
					Canadian wheats.													
			IVC.	1	Ladoga	—	—	—	—	—	—	—	—	—	591	591	—606	
				2	Red Fern	—	—	—	—	—	—	—	—	—	97	97	—1,002	
				3	Fultz	—	—	—	—	—	—	—	—	—	515	515	—974	
				4	White Fife	—	—	—	—	—	—	—	—	—	194	194	—999	
				5	Red Fife	—	—	—	—	—	—	—	—	—	188	188	—1,010	
				6	Saxonka	—	—	—	—	—	—	—	—	—	146	146	—1,044	

Statement showing results of experiments tried at the Agricultural Experiment Station, Cawnpore, during the 10 years 1881-82 to 1890-91.

Class.	Experiment.	Crop on which tried.	Series.	Serial number.	Variety.	Outturn per acre in lbs. 1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	Average outturn per acre in lbs.	Increase per acre in lbs. over the local variety.	Remarks.
						Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	Grain.	[illegible]	Grain.	
					Indian barleys.													
V.—Seed.	To determine the relative merits of different varieties of seed.	Barley	VA.	1	Cawnpore barley, the ordinary variety of North-Western Provinces.	1,201	2,018	2,463	2,168	1,277	—	1,074	1,074	1,340	—	[illegible]	—	
				2	Basell, naked or huskless barley of Kangra	820	1,121	1,760	797	338	—	374	1,780	1,362	—	[illegible]	—271	
				3	Chocolate coloured barley	—	—	—	—	1,109	—	507	1,547	1,094	—	[illegible]	—252	
				4	[illegible]	—	—	—	—	—	—	540	1,313	1,110	—	[illegible]	—879	
					[illegible] barleys.													
			VB.	1	Gold[illegible]	1,099	[illegible]	1,711	1,072	—	—	—	—	—	—	1,203	[illegible]	
				2	[illegible]	805	[illegible]	1,423	407	—	—	—	—	—	—	528	[illegible]	
				3	[illegible]	741	[illegible]	1,246	809	—	—	—	—	—	—	927	[illegible]	
				4	[illegible]	—	[illegible]	—	1,670	—	—	—	—	—	—	1,670	[illegible]	
					[illegible] barleys.													
			VC.	1	[illegible]	—	—	—	—	—	—	—	—	—	629	629	—	
				2	[illegible]	—	—	—	—	—	—	—	—	—	242	242	—	
				3	[illegible]	—	—	—	—	—	—	—	—	—	1,135	1,135	—	
				4	[illegible]	—	—	—	—	—	—	—	—	—	1,452	1,452	—	
	Ditto	Gram	VI	1	Wh[illegible]	602	[illegible]	—	—	—	—	—	—	—	—	630	—	
				2	[illegible]	1,249	[illegible]	—	—	—	—	—	—	—	—	870	—	
				3	[illegible]	1,862	[illegible]	—	—	—	—	—	—	—	—	1,412	—	
					Cape and English oats.													
	Ditto	Oats	VIIA.	1	Cape oats	1,700	[illegible]	[illegible]	2,146	1,639	—	—	—	—	—	[illegible]	—	
				2	English, black Tartary	87	[illegible]	—	—	—	—	—	—	—	—	[illegible]	—	
				3	English, [illegible]	209	[illegible]	—	—	—	—	—	—	—	—	[illegible]	—	
				4	English, [illegible]	102	—	—	—	—	—	—	—	—	—	[illegible]	—	
					Cereal													
			VIIB.	1	[illegible] Chester	—	—	—	—	—	—	—	—	—	[illegible]	530	—	
				2	[illegible]	—	—	—	—	—	—	—	—	—	[illegible]	787	—	
				3	[illegible]	—	—	—	—	—	—	—	—	—	[illegible]	473	—	
				4	[illegible]	—	—	—	—	—	—	—	—	—	[illegible]	708	—	
				5	Bonanza	—	—	—	—	—	—	—	—	—	[illegible]	787	—	
				6	White Eg[illegible]	—	—	—	—	—	—	—	—	—	[illegible]	847	—	
								Seed.	Seed.							Seed.	Seed.	
	Ditto	Linseed	VIII	1	Red, as [illegible] the N.-W. P.	—	—	—	—	—	—	—	—	—	—	836	—	
				2	White [illegible]	—	—	625	—	—	—	—	—	—	—	472	—17	
				3	Riga linseed	—	—	776	—	—	—	—	—	—	—	773	483	
		Rapeseed	IX	1	Ordinary Cawnpore	—	—	—	531	—	—	—	—	—	—	[illegible]	—	
				2	German rapeseed	—	—	—	489	—	—	—	—	—	—	[illegible]	—98	
									Root.								Root.	
		Carrot	X	1	Belgian	—	—	—	76 cwts.	—	—	—	—	—	—	[illegible]	—135 cwts.	
				2	Country	—	—	—	231 cwts.	—	—	—	—	—	—	[illegible]	—	
		Mangold	XI	1	English, golden tankard	—	—	—	69 cwts.	204 cwts.	—	—	—	—	—	[illegible]	—	
		Turnips	XII	1	Dallas	—	—	—	63 cwts.	—	—	—	—	—	—	[illegible]	—	

Statement showing results of experiments tried at the [illegible] Agricultural Experiment Station, Cawnpore, during the 10 years 1881-82 to 1890-91.

Class.	Experiment.	Treatment.	Series.	Serial number.	Crops.	Outturn per acre in lbs. 1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	Average outturn per acre in lbs.	Remarks.
							Grain.	Grain.	[illegible]	[illegible]			Grain.	Grain.	Grain.	Grain.	
VI.—Indigenous crops.	To determine the outturn of indigenous crops.	Cultivated in the native way.	I.		1. Cer[illegible]												
				1	W[illegible] ([illegible])	—	[illegible]	1,564	[illegible]	—	—	—	—	—	—	575	
				2	Ba[illegible] ([illegible] vulgare)	—	—	1,498	[illegible]	—	—	—	—	—	—	1,455	
				3	Rice (Oryza [illegible])	—	—	—	[illegible]	—	—	—	—	—	—	[illegible]	
				4	Maize (Zea [illegible])	—	—	1,236	[illegible]	—	—	—	—	—	—	[illegible]	
				5	Juar (Sorghum vulgare)	—	—	—	[illegible]	—	—	—	—	960	902	1,032	
				6	Bajra (Penicillaria typhoidea)	—	—	—	[illegible]	—	—	—	425	1,027	600	561	
				7	Mandua ([illegible] coracana)	—	—	—	[illegible]	—	—	—	121	461	121	253	
				8	Kodon ([illegible] scrobiculatum)	—	—	—	[illegible]	—	—	—	—	605	450	542	
				9	Sawan ([illegible] frumentaceum)	—	—	—	[illegible]	—	—	—	206	220	393	328	
				10	Kakun ([illegible] italica) ...	—	—	—	[illegible]	—	—	—	—	—	—	300	
																436	
			II.		2. [illegible]												
				1	[illegible]	—	—	—	561	—	—	—	—	—	—	561	
				2	[illegible]	—	—	—	1,308	—	—	—	—	—	—	1,308	
				3	[illegible]	—	—	—	653	—	—	—	—	—	—	652	
				4	[illegible]	—	—	—	1,039	—	—	—	—	—	—	1,039	
				5	[illegible]	—	—	—	833	—	—	—	—	—	—	843	
				6	[illegible]	—	—	—	405	—	—	—	450	736	—	159	
				7	[illegible]	—	—	—	141	175	—	—	73	174	205	156	
				8	[illegible]	—	—	—	150	878	—	—	121	157	133	290	
				9	[illegible]	—	—	—	579	238	—	—	700	121	182	414	
				10	[illegible]	—	—	—	—	381	—	—	313	710	79	911	
				11	[illegible]	—	—	—	—	802	—	—	1,716	828	603	802	
			III.		3. [illegible]				Seed.	Seed.				Seed.	Seed.	Seed.	
				1	[illegible]	—	—	—	542	—	—	—	—	—	—	542	
				2	[illegible]	—	—	—	231	—	—	—	—	—	—	331	
				3	[illegible]	—	—	—	656	—	—	—	—	—	—	656	
				4	[illegible]	—	—	—	817	—	—	—	—	—	—	817	
				5	[illegible]	—	—	—	—	180	—	—	—	121	109	187	
				6	[illegible]	—	—	—	1,113	—	—	—	—	303	—	705	
			IV.		4. [illegible]												
				1	[illegible]	—	—	—	—	—	—	—	—	—	—	—	
				2	[illegible]	—	—	—	—	—	—	—	—	—	—	—	
			V.		5. [illegible]		Fibre.	Fibre.	Fibre.	Fibre.		Fibre.	Fibre.	Fibre.	Fibre.		
				1	[illegible]	—	179	47	—	57	—	97	81	180	40	105	
				2	[illegible]	—	—	—	548	—	—	—	250	557	710	536	
				3	[illegible]	—	—	—	348	—	—	—	—	—	—	[illegible]	
			VI.	—	6. Dyes—Indigo (Indigofera tinctoria)	—	—	—	—	—	—	—	—	—	Plant. 11,923		
			VII.	—	7. Drugs—Poppy (Papaver somniferum)	—	—	—	—	—	—	—	Opium. 16	Opium. 10	—		

Statement showing results of experiments tried at the Agricultural Experiment Station, Cawnpore, during the 10 years 1881-82 to 1890-91.

N.B.—Except the special treatment noted in column 6, the treatment of every plot in each series in regard to ploughing, weeding, watering, manure and seed was exactly similar.

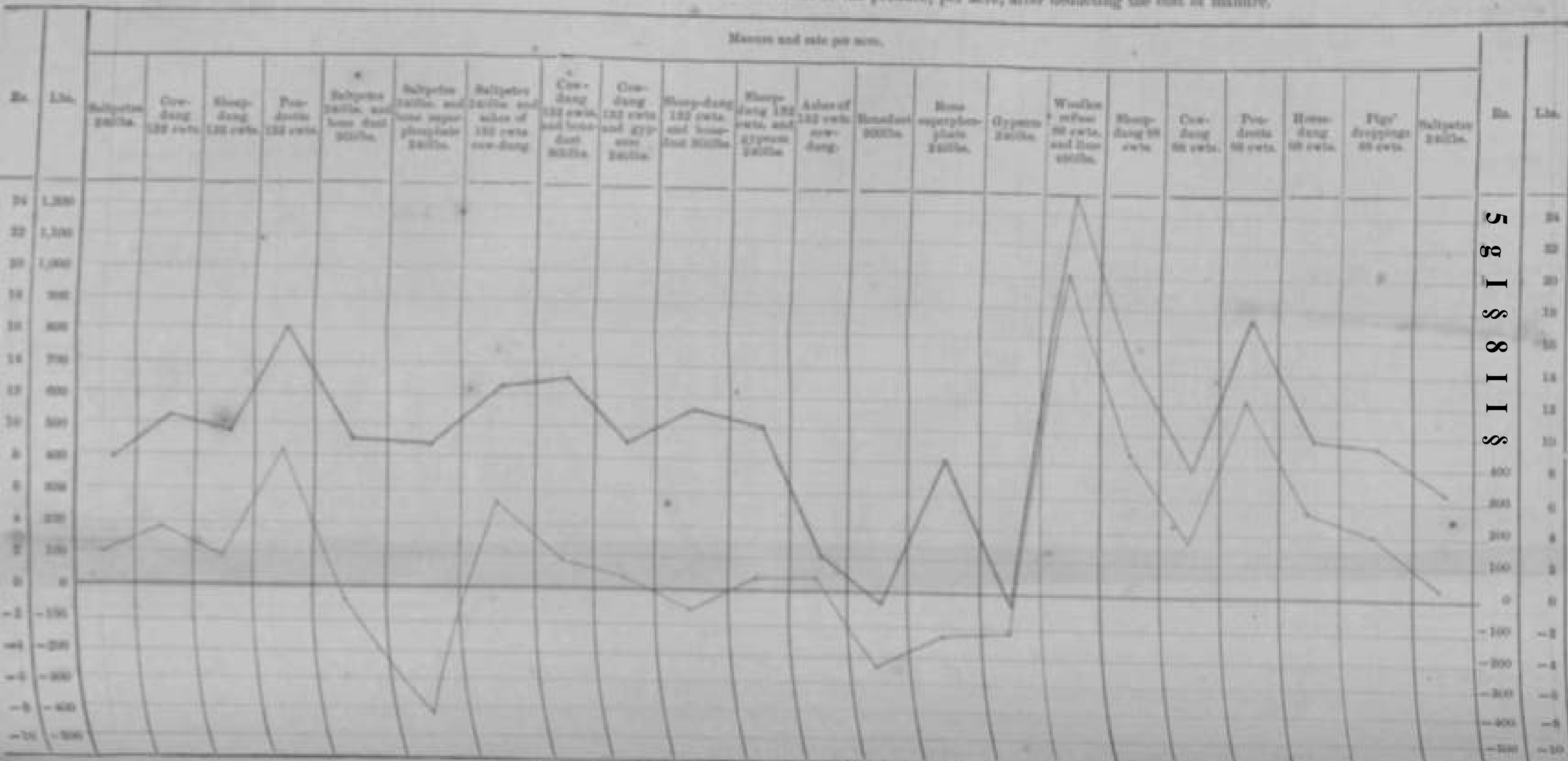
Class.	Experiment.	Crop on which tried.	Series.	Serial number.	Special treatment.	Outturn per acre in lbs. 1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	Average outturn per acre in lbs.	Increase per acre in lbs.	Remarks.
													Grain.	Grain.	Grain.	Grain.	Grain.	
VII.—Miscellaneous	Restricting the growth of plant when running to leaf.	Wheat ...	I	1	Grazed by sheep when 1' high.	...	...	...	...	...	...	...	1,016	1,103	2,148	1,422	398	Compared with the plot left untouched.
				2	Nibbled with a sickle when 1' high.	...	...	...	...	...	...	...	1,080	1,122	1,053	1,108	84	
				3	Left untouched ...	...	...	...	...	...	...	...	1,041	1,100	931	1,024	...	
								Fibre.			Fibre.	Fibre.				Fibre.	Fibre.	
	To determine the effect of ratooning a cotton crop preserved for next year.	Cotton ...	II	1	Ratooned	...	...	85	...	...	130	85	...	...	...	100	−13	Compared with the unratooned plot.
				2	Unratooned	...	...	108	...	...	142	89	...	...	...	113	...	
													Juice.	Juice.	Juice.	Juice.	Juice.	
	Retaining sugarcane for a 2nd crop.	Sugarcane ...	III	1	Outturn of cane planted in the preceding year.	...	...	...	...	...	...	...	5,862	7,480	10,100	7,814	−292	Compared with 1st year's growth.
				2	Outturn of cane planted during the year.	...	...	...	...	...	...	...	8,225	9,428	6,665	8,106	...	
						Grain.		Grain.		Grain.						Grain.	Grain.	
	Preserving the seed from animal depredations by soaking the seed in Jey's purifier.	Wheat ...	IV	1	Soaked in Jey's purifier ...	...	...	1,529	...	...	...	...	...	...	...	1,529	209	Compared with the ordinary way.
				2	Not soaked ditto ...	...	...	1,320	...	...	...	...	...	...	...	1,320	...	
	To determine the effect of alternating wheat with linseed.	Do. ...	V	1	Alternate with linseed ...	1,395	...	2,284	...	1,488	...	...	...	...	...	1,722	324	Compared with the plot in which wheat is sown every year.
				2	Wheat every year ...	1,380	...	1,503	...	1,313	...	...	...	...	...	1,398	...	

APPENDIX II.

A.—Diagrams illustrating the effect of certain manures on maize.

No. 1.—Drawn in green, shows the average increase per acre of grain in lbs. over the unmanured plot.

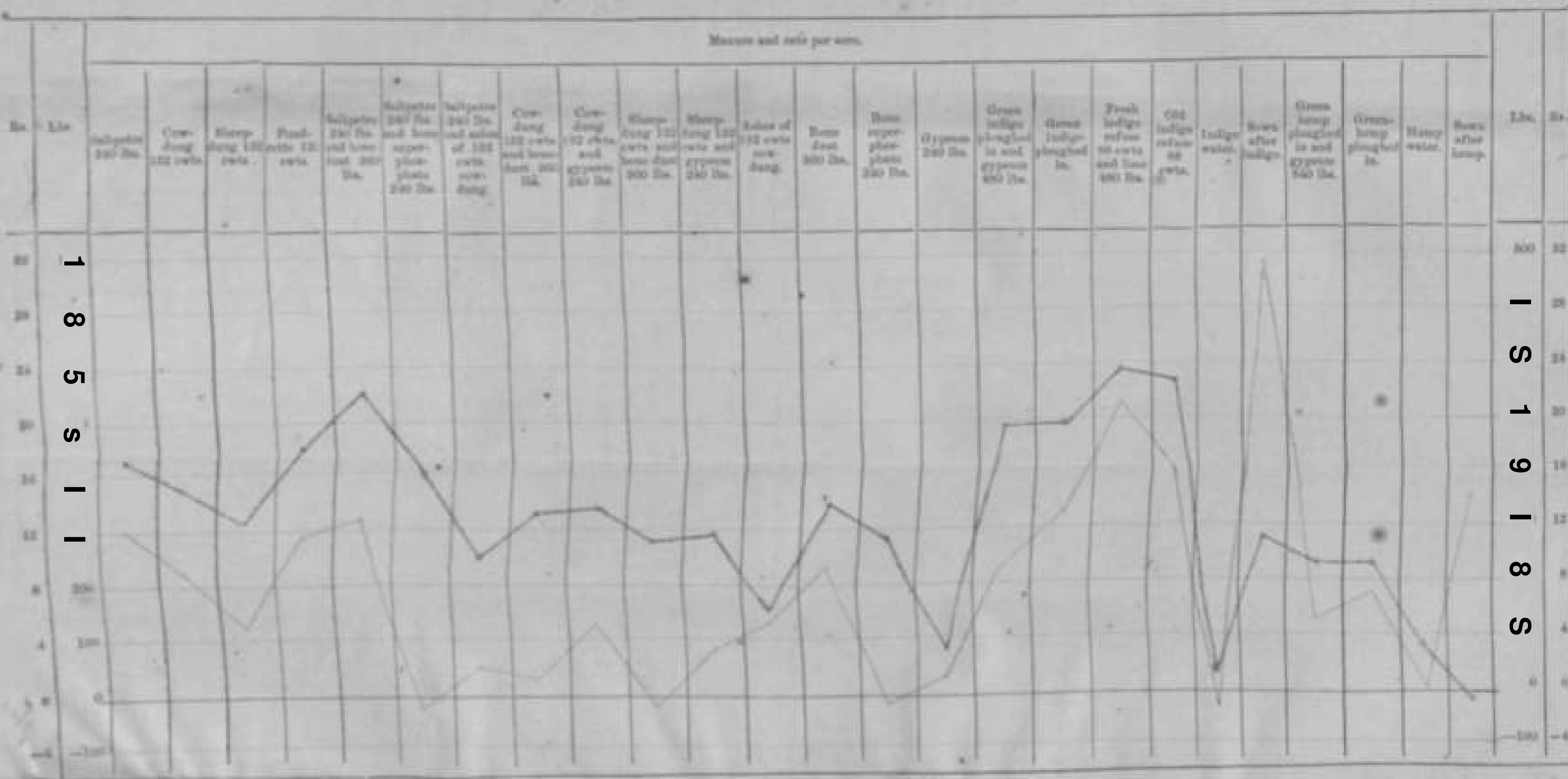
No. 2.—Drawn in red, shows the average net increase in the value of the produce, per acre, after deducting the cost of manure.



R.—Diagrams illustrating the effect of certain manures on wheat.

No. 1.—Drawn in green, shows the average increase per acre of grain in lbs. over the unmanured plot.

No. 2.—Drawn in red, shows the average net increase in the value of the produce per acre, after deducting the cost of manure.

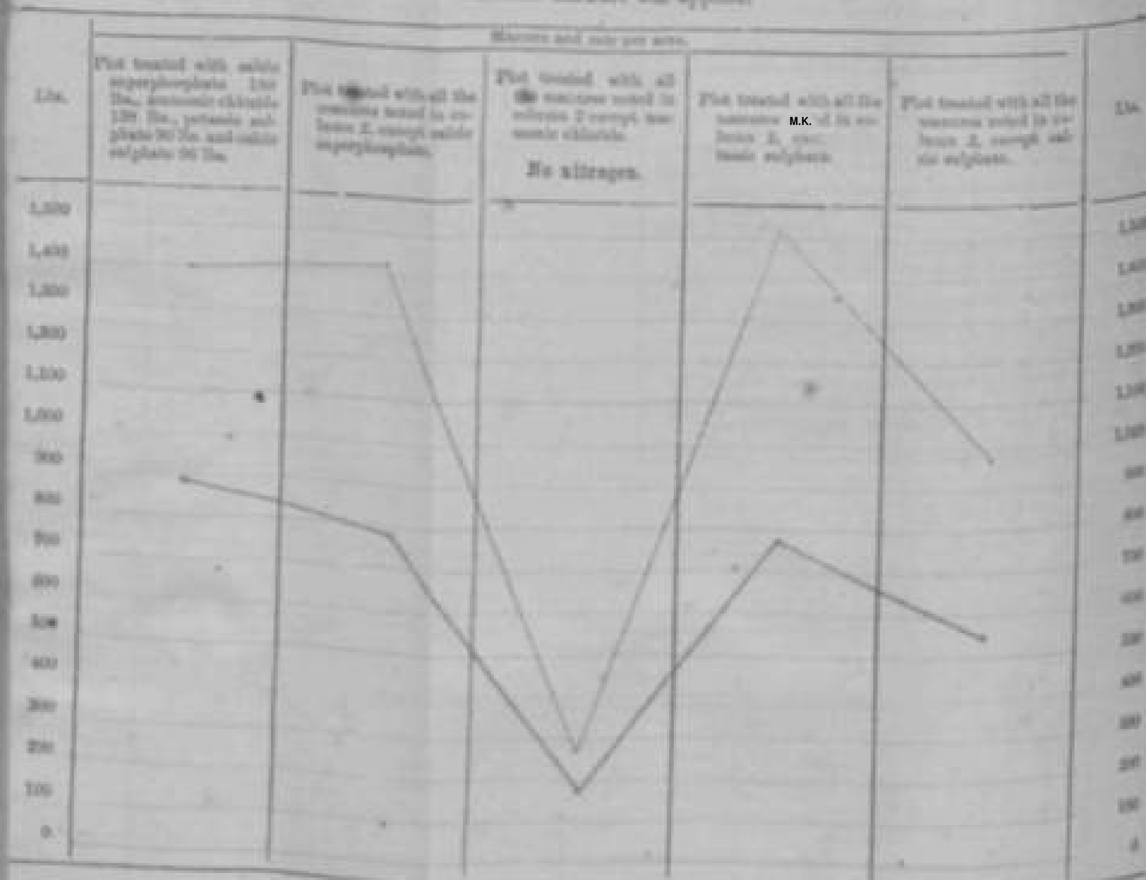


(a) These diagrams are based on the average produce given in Appendix I.

C.—Diagrams illustrating the [illegible] of withholding the supply of nitrogen from a wheat crop.

No. 1 [illegible] green, shows the increased produce, per acre, of gr[illegible] in lbs. over the outturn of the plot to [illegible]

No. 2 Drawn in red, shows the increased produce, per acre, of straw in lbs. over the outturn of the plot to which no manure was applied.



D. Diagrams [illegible] *the effect of irrigation in increasing the outturn of wheat and (b) the relative merits of canal and well water.*

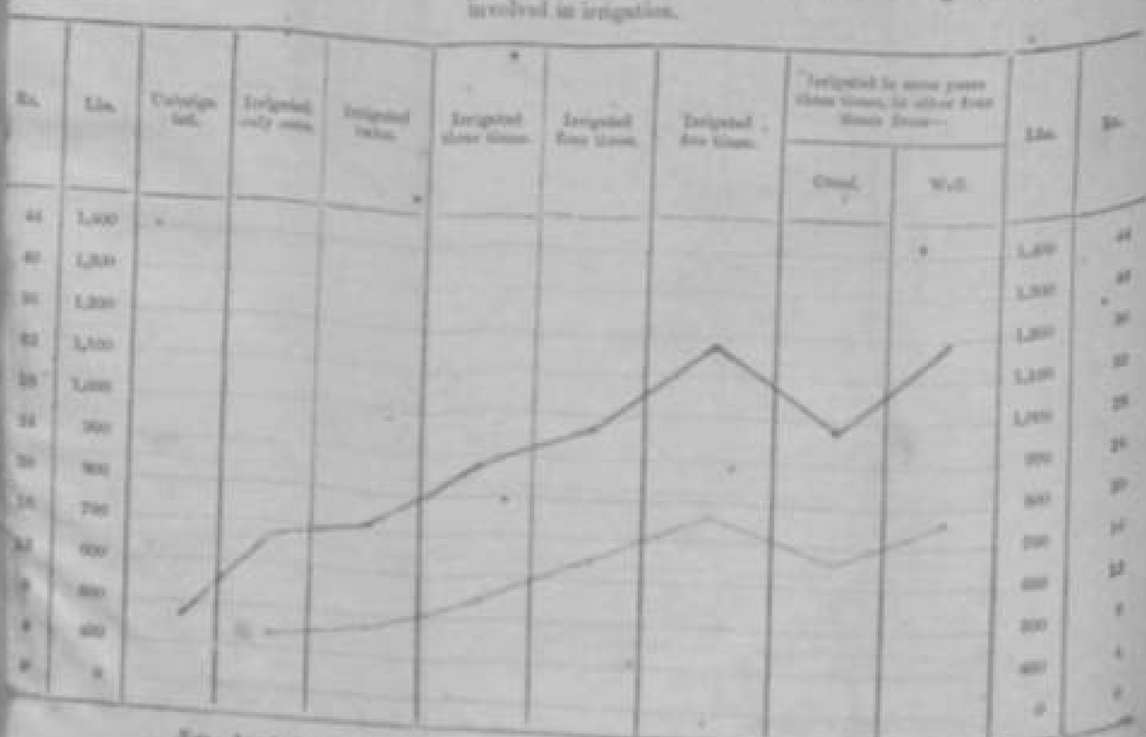
No. 1 Drawn in green, shows the average produce of wheat (grain) per acre—

(a) on unirrigated land;

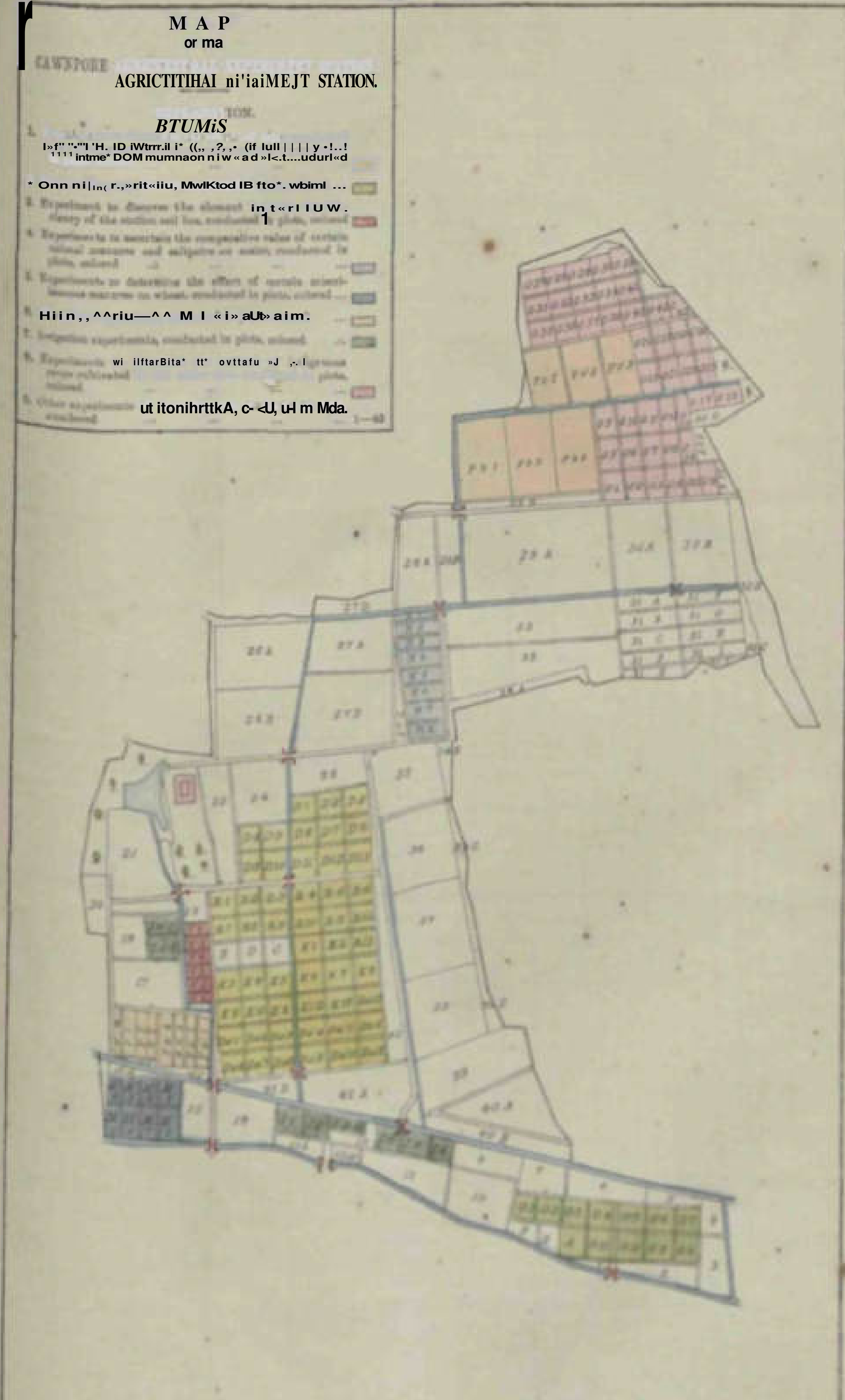
(b) on land watered from one to five times from Canal, and

(c) on land a portion of which was watered from canal and another from well;—

No. 2 Drawn in red, shows the net increase per acre in the value of produce after deducting the extra cost involved in irrigation.



Note.—In calculating the value of produce, value of both grain and [illegible]


MAP
OF THE
CAWNPORE
AGRICULTURAL EXPERIMENT STATION.

Errata to the Report on Cawnpore Experimental Farm for 1892-93.

Page 1, tine US, after "THupitnUwew" *rtad «lh\u" /or " &en."*

,, *, ,, 1,/w " oio*Uy" r«rf"mnuu«lly."

,, 10, ,, IS, /<w " indigo »f ase" read' " iudigjo fUllui."

,, 11, x«n. SO, UQ« \,*/OT* "acclimatise" *read* "acclimatize."

No. 699 P.

DEPT. OF LAND RECORDS AND AGRICULTURE, N.-W. P. AND OUDH.

DtUi CattnjxMrt, ti 8<* NoctmbtT* 1893.

FROM

J. (^MILLER, ESQ.,

DIMCTO* or LIKD BKOKDS AHD AGSICUITUM,

HTU-WBTKBK PKOUXCO AND Ot'DM,

To

TUB CHIEF SECRETARY TO GOVERNMENT,

NOITU-WHTKUI PHOVINCM A* I) OI

Su,

I *tun* the honor to forward the annual report on the Cawnpore 1 Experimental Farm for tin- ymr Iv.t2.9s. The Farm i* under the managcmt. Auutant Director, Saiyid Htihammad Itadi, but owing to hit aUenw on aick leave, Babti l^chtnan Farohftd wa« in charge from July to October and from the middle of < iry to April 20th,

S. LMI yoar a very complete reriew of the experiment* conducted at the Farm t.2 thfl prewdin^ ***n* veare wu •nbmitU'd, which hae funitehed the Agricultural nirt to the O> • iih matorial* for an analyti* of the work ot the Farm, which I have been permitted to attach to the annual report. 1 on*; ;«rim«nU will 1M earned on in communication with tl> : int, and hi* adri« hu already been taken ae to thoffogramnw for nest aeaeon.

I U nnneeeaeary Tor me to add to the rmarks recorded by the Agricnlturel tid the Am*Unt PtrectAr on the reenlta c»U the long eonr»e of' npr It is tatirfactory to find Ihat, though the detail* of a few of tboae rxperi- ti might hare been alwrwl with adwiUjje, the Ftarro ha. itill.in Dr. opir, aluable w •. Witt bit remark, a* to the wwwty of (rwat in the wttgbmente I entirely agree, and it will be undmtnod |krf ..n theee oeeaerane is an i—entiit part of the Auiitant DirvctoKi dutiM. During tli* *nbi* eeaaon, n«w report*! on, the Awiirtant Direotor ptmonally euperrUed the w menu, a:,d the AffHcttUural I *himtdt* wai prewrat at many of tliem, A> cxprmwl eome doubta i*x»nl in ff the »«w«7 *ot* the tyftem of wmghment il it only fair to note that Di r wa« epccully rtruck I t^uiMw, and' WII inclined to think that it erred on the tide ot ovcr-rcfiwrnrnt (page MO of h

t. The return, of the part year ihow that there wni| fand an tiooeJly (tood me* harvest at the farm. The f«Iu» of the khahf wu partly and partly h in"p«™«wed management. The permanent >«dent wu d •«• <sf *Oatact,* and •i wu deficient in *f%V'* "« **• "T 1 * ^ "T » prartieal agri- under whom a rery gr«t impromwnt in the fUte of the Farm hu *htm* The pemaaeat Stiperintmdeot Uu reoeoUy ntenwd aod leepmiii charge.

5. The stallion sent to [illegible] ago [illegible] fifty [illegible] during the year.

[illegible] Two [illegible] to try the experiment recommended [illegible] using brood-mares in the plough. They were broken [illegible] acting Superintendent, Muzaffar Khan, and are now easily driven by any of the Farm servants.

6. Apart from its value as an experimental station, [illegible] useful purpose as a centre for the distribution [illegible] information as to agricultural methods and [illegible] example, has been taken in the stacking [illegible] customary in the northern and western districts, [illegible] for making silage and for keeping manure also attract the [illegible] neighbourhood. The enquiries made [illegible] selected are [illegible] improved implements and agricultur[illegible] widespread interest [illegible] of agricultural improvement accompanied by a belief in its possibility.

I have the honour to be,

Sir,

[illegible] most obedient [illegible]

J. O. MILLER.

Dir

I; i: I < > R T

ON THE

CA WNPORE EXPERIMENTAL FARM,

FOE THE KHARIF AND RABI SEASONS 1892-93.

Rainfall.—TV mint comment*! in June, an<I in * that and the following three months wen normal in their total amount, but were • ill-distribuW, *heavy* downpour* alte-tuting with [K*riodn of hot uttubiBo. The muwtoos cea*«l *t an early dale, Towird* the end of SvpUniW llip rains became ti^ht, ami in October, » strong contrast t.j the previoni iwuion, JIO rain ML In January ami February then were copioui cold »i-uon rains, and the weather was untwinlly damp an I cloud v. The tuUl raitifali wu 31'72 incbet, which it wnuwliat abow the normal, though much Wrnr the amount recorded in the prtcocdiny *ynr.* The number of rainy day* wa» 68, u compared with « Ust yew. The following table ehowi the amount and diftribalion of tbe rainfall during the year :—

Month.	Rainfall.			Rainy days.			IIMM.-U
	UU.M	UWW	Normal.	1 K'i-W	1WJ.03	Normal.	
	[illegible]	[illegible]	[illegible]	[illegible]	—	[illegible]	
June	[illegible]	[illegible]	311	[illegible]	[illegible]	[illegible]	
	[illegible]	[illegible]	low	[illegible]	[illegible]	[illegible]	
August	[illegible]	[illegible]	[illegible]	[illegible]	i»	[illegible]	
	tl-fl	aeo	411	[illegible]	I	[illegible]	
	•w		[illegible]	[illegible]	[illegible]	[illegible]	
Swttmhtr	—		—	—	' l	—	
December	—		M	—	[illegible]	[illegible]	
January	[illegible]		•6*	[illegible]		[illegible]	
February	[illegible]	[illegible]		[illegible]	I	[illegible]	
kUrtk	—	—		—	—	[illegible]	
April	—	—	[illegible]	—	—	[illegible]	
Total ...	[illegible]	tin l	at ta	[illegible]	[illegible]	[illegible]	

2. **General character of the MMOO.**—Tln> Umdjr oMiinniioMwot of th. monsoon facilitated plauffhinjf operation (or Uw»uturon cropt; but The nuixe and wttoa eropi in some parti of the Pana tiiffrnd •evin'Iy I n n un*euon*bU wMtbrr lat*r uu, The raid weather raint proved very bftwfioial to the ipnng crop*, and the ool-turn of wbtal anu unotually. jfood. It baa beta the nparinw* of recent you* tltat the cultira of kbarif crop* depeodi to largoly on viciuitudnt of »«MOO M to detract largely front the •CMntifie value of ciperimrnU made in that Mtwn, and th« reourd *»t* th« part year confirm* thii remit. Maoy of the experiment mu.i tmle«d be prMoaooetl inconclus:ve, aa they were is the two prroedinff yaan.

3. The experimeata oarrM on at the Farm are elaawd M « ^ m n « (" uj " t *mforarf,"* the former bring conducted on the time plot* from year to year for an indefinite period; and the latter heir* arranged from time to to. >• the n<vrwiy for fnah experiment! ariar*. Of the "*j*rm*9*ut"* elate, tba no*t important an thaw wbieb are directed to diewrning the elfecU of different manum on QUIM in tbr autumn aeaeoo, aad on wheat in faring. Onipnally the experiment* w*re aUrted to compare the effevt of nitrogMioaa and non-nitrog«M>n* mannr« bat »• the manurial vahM ol the latur claaa pnnred to b* exlmncly imall, the ' form of the experi-neat wae changed ; aad tt loa for the latt 10 yean been dinetod to comparitij; the •Sfot of eartaia aitrogenoui manure* with mtrogeiwu* aad non-nitrogenous manures mixed.

«. The method of coaductiag the pcrmaarnt nperimmtt bae hem folly deecribed ta prtvioM reporla. Than at* four series of plots '- with] 3 plots la each. O» » cropped m r y year with ataiaa, atwUxr wtth wheal—UMM tw* being known a» the l * }

• SUndwd Mri*.;" wUU in UM otto two, which «» knowa M the " Dnplktt* *nu" BUU* a«d »IM*I BI» fnvwn in MUIMO.

In tfe* *yrmt,* io whM MM Mrica l«»r. «hnt. thi *other* to a BUUM cr>pF and vice

EHAEIP SEASON fIPERIMENTS

&. TV [otUwiojt >ui. mm[1] give the »a|i« of tbt " Steixknl" wxl " 1 Duplicate" muu *i|<nttwoU Uiinnif tbe *jtmt maim* rvjv.rt. sad Mttpwv tbow with ll» •«•»«• tnu1t« ol *fnmiiag jmn* -.—

KHAREEF STATEMENT No. *I.—&*mJ*rJ S*n,l.— \l*m*tt ttfm*ent with Maize.

Serial number.	Manure per acre.	Outturn per acre: Grain: Average of three years.	Grain: Year under report.	Stalks: Average of three years.	Stalks: Year under report.	Increase or decrease per acre as compared with unmanured plot: Grain: Average of three years.	Grain: Year under report.	Stalks: Average of three years.	Stalks: Year under report.
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Cow-dung, 150 maunds + bone dust, 4½ maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	Ditto do. + gypsum, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	Ditto do.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	Ashes of 150 maunds of cowdung	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	Saltpetre, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	Ditto do. + bone superphosphate, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	Sheep-dung, 150 maunds + bone dust, 4½ maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	Ashes of 150 maunds of cowdung + saltpetre, 3 maunds	[illegible]	[illegible]	[illegible]	lJMt	[illegible]	[illegible]	[illegible]	[illegible]
9	Poudrette, 150 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	Sheep-dung, 150 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	Saltpetre, 3 maunds + bone dust, 4½ maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	Sheep-dung, 150 maunds + gypsum, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	Unmanured	[illegible]	[illegible]	[illegible]	[illegible]	...	...	...	...

Note.—In 1867 and 1868 the maize crops failed altogether; these years have therefore been left out of account in striking averages.

KHAREEF STATEMENT No. 11.—*Kist.f Jm/Jteml* #*—Manure experiment with Maize.

Serial number.	Manure per acre.	Outturn per acre: Grain: Average of last 3 years.	Grain: Year under report.	Straw: Average of last 3 years.	Straw: Year under report.	Increased or decreased outturn per acre as compared with the unmanured plot: Grain: Average of last 3 years.	Grain: Year under report.	Straw: Average of last 3 years.	Straw: Year under report.
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Cow-dung, 150 maunds + bone dust, 4½ maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	it*O	•'fl
2	Ditto do. + gypsum, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	Cow-dung, 150 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	Ashes of 150 maunds of cowdung	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	Saltpetre, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	Ditto do. + bone superphosphate, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	Sheep-dung, 150 maunds + bone dust 4½ maunds	H	*»	[illegible]	[illegible]	[illegible]	•tor	*tjot	[illegible]
8	Ashes of 150 maunds of cowdung + saltpetre, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.us*	flg
9	Poudrette, 150 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	Sheep-dung, 150 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	Saltpetre, 3 maunds + bone dust, 4½ maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	Sheep-dung, 150 maunds + gypsum, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	'M»l	[illegible]	[illegible]	[illegible]
13	Unmanured	Mt 1	M;	\i.v	[illegible]	...	[illegible]	[illegible]	...

6. Both series of plots ' *** *.'»n MI Utr MW JIT (I* (»th at June—with 12 lbs of seed per acre. On the fallo[illegible] ry downpours of rain, followed by a few .Ur. «f dry scorching weather, which led to the formation of a

hard crust on the surface of the soil, and seriously interfered with the germination of the seed and with the growth of the young shoots, when germination had taken place. To soften this crust, a watering was given to the "Standard" plots on the 9th July, but the result was unfortunate, as heavy rains lasting for several days commenced on the 10th. It was intended to water the plots of the "Duplicate" series on the 10th, but, owing to the rain, this was unnecessary. In both series of plots the yield was exceptionally poor; but it was somewhat better, contrary to usual experience with maize, in the "Duplicate" than in the "Standard" series. The difference is attributable to the fact that the heavy rains of the 10th July and succeeding days caused more injury to the irrigated plots in the "Standard" series than to the other which had not been artificially watered. When crops suffer so seriously from climatic conditions, it is impossible to draw conclusions of any value as to the effect of various manures. Some of the plots are on a slight slope and are more liable to injury from heavy rains, while some of the manures can be more easily washed out than others. It thus becomes impossible to say how far differences in outturn are due to differences of value in the manures, and how far to unequal injury from unseasonable rains.

7. **Miscellaneous manure experiment with maize.**—This experiment was intended to be a permanent one to ascertain the comparative value of certain animal manures and saltpetre on maize; but as the Agricultural Chemist has expressed some doubt as to its value, it will probably be discontinued or altered. The experiment is conducted in 8 plots, each of which is treated exactly alike, except in respect of manure. The following is a detail of treatment adopted in the case of these plots:—After harvesting the preceding maize crop, the plots were left undisturbed till December, when there was a slight shower of rain, and they were ploughed once with the Watt's plough. Two more ploughings were given in the months of January and May respectively with the same plough. About the end of May, all the manures, except saltpetre, were applied on the respective plots and ploughed in with the country plough and levelled down. In the beginning of June, after a light shower, they were ploughed, once with Watt's and once with country plough, and levelled with the *patela*. On the 13th of June saltpetre was applied to its plot and mixed with the soil at the rate of 1½ maunds per acre in furrows opened by the country plough. The plots were then levelled at once. When the crop was 16 days old, a watering, which was needed, was given and proved very beneficial. The plants were thus well advanced before the heavy showers of rain in July, which, in the case of the experiments mentioned before, interfered with the healthy growth of maize; and these plots were not seriously injured. The plots received the first weeding on the 9th of July, and the second on the 1st August. During the process of second weeding the plants were earthed up. The crop was harvested on the 15th September.

8. The produce of each plot for the year, and the average outturn of the last five years, are given in the subjoined table:—

STATEMENT No. III.

Serial number.	Manure per acre.	Outturn per acre.				Increased or decreased outturn per acre as compared with the unmanured plot.			
		Grain.		Stalk.		Grain.		Stalk.	
		Average of last 5 years.	Year under report.	Average of last 5 years.	Year under report.	Average of last 5 years.	Year under report.	Average of last 5 years.	Year under report.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1	Woollen refuse, 120 maunds, and lime 12 maunds	1,687	1,815	8,766	6,945	+1,200	+702	+5,064	+4,223
2	Sheep-dung, 120 maunds	1,412	3,073	6,997	7,591	+925	+1,960	+3,295	+4,869
3	Cow-dung, 120 maunds	1,093	1,909	6,020	3,719	+606	+796	+2,318	+997
4	Poudrette, 120 maunds	1,392	2,347	6,516	5,284	+905	+1,234	+2,814	+2,562
5	Horse-dung, 120 maunds	1,074	2,129	6,449	4,428	+587	+1,016	+2,747	+1,706
6	Pig's dung, 120 maunds	1,145	2,119	6,048	5,576	+658	+1,006	+2,346	+2,854
7	Saltpetre, 2 maunds	808	2,057	5,941	4,900	+321	+944	+2,239	+2,178
8	Unmanured	487	1,113	3,702	2,722	...	...	...	...

9. [illegible] yield in these plots was unusually high in the year under report, being in [illegible] cent. or more [illegible] five years, but in some of these years the crops were very poor. [illegible] the year under report is due to the fact that these plots were sown [illegible] "Standard" and "Duplicate" plots, and 22 days earlier than they were sown in the preceding year, and by the time the heavy showers of rain commenced, they were so well advanced in growth, [illegible] irrigation, [illegible] benefited rather than injured by the rains. The fact that the yield increases by early sowing is sufficiently established by the early and late sowing experiment described in paragraph 11.

10. **Manure experiments with cotton.**—This experiment is to determine the effect of various manures on country cotton. The following is a description of the manner in which it was conducted :—

About the end of May, the plots were watered and ploughed once with the Watt's plough. [illegible] rain they were ploughed a second time similarly, and levelled with the *patela*. On the 19th of June manures were spread and seed sown broadcast the next day at the rate of 24lbs the acre. [illegible] country plough and [illegible] variety. [illegible] fore, irrigated [illegible] which seriously damaged [illegible] inevitable result that the yield both of fibre and seed turned out to be considerably less than the average [illegible] July, [illegible] time, and on the 23rd August the second and the last [illegible] lasted till [illegible] turn of each plot and the quantity and description [illegible]

[illegible] experiment with cotton.

Serial number.	Manure per acre.	Outturn per acre.				Increased or decreased outturn per acre as compared with the unmanured plot.			
		Cleaned cotton.		Seed.		Cleaned cotton.		Seed.	
		Average of last four years.	Year under report.	Average of last four years.	Year under report.	Average of last four years.	Year under report.	Average of last four years.	Year under report.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1	Fresh silt from canal, 300 maunds.	142	23	[illegible]	47	+ 45	− 21	+ 79	− 33
2	Kainit, 4 maunds, and gypsum, 4 maunds.	137	28	294	113	+ 30	+ 6	+ 98	+ 23
3	Farmyard manure, 180 maunds, and gypsum, 1 maund 14 seers.	170	70	336	166	+ 63	+ 26	+ 140	+ 76
4	Farmyard manure, 180 maunds and kainit, 1 maund 14 seers.	174	52	324	114	+ 67	+ 8	+ 128	+ 24
5	Woollen refuse, 120 maunds	220	73	411	120	+ 113	+ 22	+ 215	+ 79
6	Unmanured	107	44	196	90	—	—	—	—

All the manured plots, except that treated with fresh silt from canal, gave a better yield than the unmanured plot. The circumstance of this plot yielding a fairer outturn than the unmanured plot is attributable to the soil of the former containing a very much higher percentage of clay than that of the latter, and being thus liable to sustain a greater damage by excess of rain.

11. **Experiments in early and late sowing.**—This experiment is conducted with maize and cotton. In the case of maize it is directed merely to comparing the effect of early and late sowing, but with cotton the experiment is intended also to show the outturn of different varieties.

The early sowings of maize were made on June 4th, and the late sowings on June 19th; the crops were harvested on September 4th and September 12th respectively. Cotton was sown on June 3rd and on June 19th; the picking in both cases commenced in October, and ended in April. The following statement shows the result of the experiment:—

Kharif Statement V(a).—*Early and late sowing of maize.*

Number of plot.	Date of sowing.	Produce per acre. Grain. Average of past three years.	Grain. 1902-03.	Stalks. Average of past three years.	Stalks. 1902-03.
		Rs.	Rs.	Rs.	Rs.
25 A	June 19th	[illegible]	[illegible]	[illegible]	7,724
25 B	June 4th	1,465	1,209	4,903	6,514

Kharif Statement V(b).—*Early and late sowing of cotton.*

Number of plots.	Varieties of cotton sown.	Cleaned cotton. 1901-02.	Cleaned cotton. 1902-03.	Seed. 1901-02.	Seed. 1902-03.
		Rs.	Rs.	Rs.	Rs.
[illegible] Sown before rain.	[illegible]	[illegible]	[illegible]	[illegible]	223
	Bani	115	[illegible]	[illegible]	124
	Dharwari	[illegible]	[illegible]	[illegible]	209
	Baroda	172	[illegible]	[illegible]	208
	Louisiana	172	138	[illegible]	280
	Jari	[illegible]	[illegible]	[illegible]	208
	Com[illegible]	[illegible]	[illegible]	[illegible]	533
P[illegible] & P. [illegible] Sown after rain.	Va.	[illegible]	[illegible]	[illegible]	145
	Bani	[illegible]	[illegible]	[illegible]	108
	Dharwari	[illegible]	110	110	218
	Baroda	[illegible]	[illegible]	[illegible]	145
	Louisiana	[illegible]	[illegible]	[illegible]	125
	[illegible]	[illegible]	[illegible]	46	185
	[illegible]	[illegible]	[illegible]	24	250

The experiments made at the Farm appear to establish conclusively, the result, that [illegible] cotton before the rains, so that they may get a good start before the heavy rains, by which the young plants are liable to be injured, set in.

12. Experiments with different varieties of imported cotton [illegible] commenced in 1885, with a view to determining whether [illegible] foreign varieties of cotton can be cultivated successfully in the [illegible].

Eleven plots are allotted to this experiment, each being sown with a different variety of foreign cotton, and subjected [illegible]. Dates of tillage and other cultural operations performed on the plots are shown below:—

Date.	Operations.
[illegible]	Watering.
9th	One ploughing with Watt's plough and levelling with patela.
[illegible]	[illegible] at the rate of 110 maunds per acre.
[illegible]	One ploughing with Watt's plough and levelling as before.
13th	Seed dibbled at the rate of 12 lbs. per acre.
14th July	Weeding.
31st August	Weeding.

Picking commenced [illegible] April. [illegible]

Kharif Statement No. II.—Outturn of foreign cotton.

Serial No.	Names of varieties.	1888-89.		1889-90.		1890-91.		1891-92.		1892-93.	
		Fibre.	Seed.	Fibre.	Seed.	Fibre.	Seed.	Fibre.	Seed.	Fibre.	Seed.
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	[illegible] Georgian	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	Tree cotton	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	Louisiana	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	Sea Island	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible] Prolific	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	Jone's Improved	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

13. [illegible] that no variety shows either a regular rise or fall in the yield. [illegible] of similarity in [illegible] of each variety. No [illegible] The experiment [illegible] of [illegible] During the year under report "Sea Island" [illegible] "Egyptian" third, and "Hinganghat" fourth. All the varieties, except "Garo Hills," have produced a better yield during this than [illegible] that, as compared with the yield of [illegible] experiments, "Sea Island" [illegible] "Garo Hills" have given [illegible] outturns. In future, [illegible] greater interest.

14. [illegible] year to ascertain [illegible] the more common combinations in which crops [illegible] ordinary cultivators. [illegible] crop in [illegible] last year.

Kharif Statement No. VII.—Mixed crops.

Serial No.	Crops.		Produce per acre [illegible] year.		Produce per acre last year.		[illegible]
	Name.	Quantity of seed sown.	Grain or cleaned cotton.	Straw or seed of cotton.	Grain or cleaned cotton.	Straw or seed of cotton.	
		Rs.	Rs.	Rs.	Rs.	Rs.	
I	Indigo	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
II	Maize	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Cotton	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	Arhar	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	Til	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	Urd	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
III	Bajra	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Arhar	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
IV	Juar	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	Arhar	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
V	Castor	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Cotton	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	Til	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	Urd	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

RABI SEASON EXPERIMENTS.

15. Tb« moit important experiment* in tbe cold wc*lli«r art those winch already Wn refrrn-J to in j«r.i .>Wve, Ua? details oi wlurli a •., u,e following »UleiifM- :—

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a	L-Mw.d.me. !•*• M M *	I.:«C	M74			*-MI	+ B74	+7*1	4-ai
4	Atfanof 110 BUB** of e™-dmf.	1^71			»^04	+ 1			
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7	8b»H.iif 1K> MSadi + boo* *»D*.. I| MHMM^M.	MM	iKSi	UM	MM	+ «	+74S	+?n	+ 7S9
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I"	Bbwp-luu*. *l*>* n*iu«U			3.HIS	MM	+ MU	+ 1.1W		+ 1.471
tI	tmtprix, 3 MMMb • boa* 4wc	1^4*			UN	+ »4	+ 4H>	+ 4M	+17«
u		,»M	j.77;	MM	4,101	+ «B ,	+ 14TT	*i* ;.t»	
u		^7*	1.W0	1.111	1.10D	...	!		•a*

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ktn on the ttliu]* given I he Lest rc«u >' "Du|>licale" B*ri<w mtizo follows wheat in the ume year, ami the Jainl oUaio> i-ut a short ntt, while after the ra»i*e crop. Die land lies fallow far orera yoor before the wheat i* »wn.

20. Rjtm STITKMI No. II.—$ie*i*$ rtnUtt of experiment to dtttrmine tie tfeH vf Grttn maturing en wheat.

Serial number.	Manure applied.	Outturn per acre. Grain. Average for the last five years.	Grain. 1902-03.	Straw. Average for the last five years.	Straw. 1902-03.	Increased or decreased outturn per acre over unmanured via the manure. Grain. Average for the last five years.	Grain. 1902-03.	Straw. Average for the last five years.	Straw. 1902-03.
1	CM \nd\ga trtam ISO maunds.	[illegible]	J,MS	[illegible]	U19	[illegible]	+*«	< UN	[illegible]
2	Fiwb indigo maunds, »DJ Urn* « maunds.	Lisa	1.SO0	[illegible]	a.uo	+1.1W	—	[illegible]	[illegible]
3	Indigo water, XOOOmKe feet.	m	140	[illegible]	—	-Gfl	[illegible]	+1*	+7K
4	K^nla, 3,000 cubic feet.	mi	[illegible]	[illegible]	MM	[illegible]	[illegible]	-MO	«|W
5	Unmanured	[illegible]	[illegible]	[illegible]	[illegible]	...	...	...	...
6	Hemp stump ploughed in	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	Green hemp ploughed in	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	..•. r i, I h Jitf-j |Uuti« lwl ia	[illegible]	[illegible]	[illegible]	[illegible]	+ M1	[illegible]	[illegible]	[illegible]
9	Indigo stump ploughed in	[illegible]	[illegible]	[illegible]	[illegible]	+ M»	[illegible]	[illegible]	[illegible]
10	Green Indigo ploughed in with 6 maunds of gyp- • i	1,109	[illegible]	[illegible]	[illegible]	+ Iil	[illegible]	[illegible]	* .MI7
11	Qnt* br»p pj with 4 MMMA at (rp- HM.	MM	[illegible]	[illegible]	[illegible]	+ 131	[illegible]	[illegible]	[illegible]
*12	lucern.	m	lucern standing.	[illegible]	lucern standing.	[illegible]	—	[illegible]	—
*13	Vial •hanaflag with lucern.		[illegible]	[illegible]	J.JW	[illegible]	[illegible]	[illegible]	[illegible]

21. Th«« ara 13 ploU utid»r lUi* «p*ria»nt, whioh are oro^xd yrar after year * with wlunt. The following n(f UW* |pTH all Lba o))mtiotu earned on r each plot :—

Serial number.	Manures applied.	Tillage and other operations.
1	on indigo refuse 120 maunds	(a) Two plM«UBf* afta* UM *dn*t «f ntaa whk W• ... plough. «Jil>« MMtl (i« *M J,) 1'W.ii* in ..{ tWi»>n• ... Watt's plough ... a harrow. (c) One ploughing in the beginning of October. (d) Levelling. Jicsir with native plough. • tt|MI •« Ik* Ma at 13U »• tlwun. pmil'MI of MfcMaM Wai. aalariaaa; "iJlaf MM,
2	Fresh indigo refuse and lime	As in No. ... is spread 2 days before sowing and ploughed in and levelled.
3	Indigo water	DM* ditto ditto.
4	Hemp water	Ditto ditto ditto.
5	Unmanured	(a) ... Ploughing ...
6	!)••. p stump ploughed in	(b) Hemp stalks aw »d Manp kfl HiapplimWlii U.nn»i,s. I,
7	Green hemp	As in No. (1).
8	Ot ... indigo	Do. do.
9	Indigo stump	As in No. (1).
10	Do. and ...	As in No. (1).
11	CtTM bHHK Wttk «7M«	As in No. (1).
*12	WM nlhira«Ut aritk I. lucern	Lucern standing.
*13	Wheat alternating with lucern	As in No. (1).

* N.B. - U both these plots wheat is taken after lucern, so that when one plot bears wheat the other bears lucern.

22. Referring to *rabi* statement No. III it will be seen that all the plots that are kept under green fallow have, during the past five years, been producing better results than that kept bare fallow. The yield of the unmanured plot during the year was unusually high. Other facts worthy of mention are—

(1) that taking the average outturns for the last five years into consideration, the plots cropped or treated with indigo refuse or indigo water have given much better results than those cropped or treated with hemp or hemp-water, respectively;

(2) that plots manured with green stalks of indigo or hemp have yielded higher outturns than those from which these crops had been cut and removed, roots alone being left, with a view to enriching the land;

(3) that old indigo refuse gave the highest yield during the year under report, fresh indigo stalk and gypsum ranked second, and fresh indigo refuse alone came third.

But taking the average for the last five years into consideration, fresh indigo refuse with lime have proved superior to the rest of the green manures.

23. One of the most valuable results of experiment is to ascertain the effect on unmanured land by continuous cropping with the same crop. In the "Standard," "Duplicate," and "Green manuring" series, the yield of the unmanured plot has been as follows:—

Year	Standard series.	Duplicate series.	Green manuring series.
	Rs.	Rs.	Rs.
1881-82	777	771	...
1882-83	1,085	939	...
1883-84	1,051	2,191	1,215
1884-85	[illegible]	1,085	629
1885-86	[illegible]	1,119	
1886-87	1,041	1,208	[illegible]
1887-88	909	907	
1888-89	893	617	[illegible]
1889-90	1,307	1,371	1,464
1890-91	[illegible]	1,207	[illegible]
1891-92	[illegible]	[illegible]	400
1892-93		1,234	[illegible]

The yields vary [illegible] from year to year according to the character of the season, but the outturn in recent years has, on the whole, been quite as high as in the earlier seasons of experiment, and no deterioration from over-cropping can yet be traced.

24. **Deep and shallow ploughing.**—This experiment was carried on in two series of plots from 1886-87 to last year, and the results were fully noticed in last year's report. In the year under report the experiment was continued in [illegible] series of three plots. The first plot was ploughed four times, [illegible] by working one Watt's plough behind another in the same furrow; the second was ploughed four times, five inches deep, with the Watt's plough, and the third plot, eight times, three inches deep with the country plough. All the plots were then levelled with the *patela*, and sown with wheat behind a country plough at the rate of 120lbs per acre. They were then levelled

with the potels as before, and were watered once about three weeks after sowing. Weeding followed after a week. The crops were harvested in the first week of April. The following tabular statement gives the outturn of each plot.

Rabi Statement No. IV.—[illegible] ploughing.

Serial number.	Kind of plough used.	Depth of ploughing.	Number of ploughing.	Outturn per acre. Grain.	Straw.	Increased outturn as compared with the plot ploughed with country plough. Grain.	Straw.
				lb.	lb.	lb.	lb.
1	Watt's plough	9"	1	[illegible]	[illegible]	[illegible]	+ 40
2	Ditto	6"	4	[illegible]	[illegible]	[illegible]	[illegible]
3	Country plough	[illegible]	8	[illegible]	[illegible]	...	...

The plot ploughed four times, 6 inches deep, has not only produced better results than that ploughed eight times, 4" deep, but also better than that ploughed four times, 9" deep. The latter circumstance was likely due to the fact that, in case of plot (1), the [illegible], which was not so well exposed to the atmospheric action as the surface soil and which therefore contained a smaller proportion of plant food, when incorporated with the surface soil, [illegible] of organic matter and other available nourishing materials.

25. Experiments with foreign grains.—This is a temporary experiment started in 1890-91, with the view of acclimatising certain foreign grains. The outturn in each year is shown in the following statement:—

Rabi Statement No. V.—Experiments with foreign grains.

Name of crop.	1890-91. Grain.	1890-91. Straw.	1891-92. Grain.	1891-92. Straw.	1892-93. Grain.	1892-93. Straw.	Remarks.
	lb.	lb.	lb.	lb.	lb.	lb.	
Wheat (1)—Adelaide	...	...	[illegible]	[illegible]	[illegible]	[illegible]	
(2)—Ladoga	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(3)—Red Fern	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(4)—[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(5)—White Fife	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(6)—Red Fife	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(7)—[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Barley (1)—[illegible], six rowed ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(2) Danish Chevalier, two rowed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(3)—[illegible], two rowed ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(4)—Swedish, two rowed ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Oats (1) Prize Cluster ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(2)—Canadian Triumph ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(3)—[illegible] Prize ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(4)—[illegible] ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(5)—[illegible] ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
(6)—White Egyptian ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Rye	...	...	[illegible]	[illegible]	[illegible]	[illegible]	

26. The attempts to acclimatise foreign wheat have been unsuccessful, and the experiment will probably be discontinued, as the Agricultural Chemist has expressed some doubt of the value of this experiment. Barleys have done somewhat better. The Canadian oats yielded a magnificent crop of green fodder, but the outturn of grain was poor.

27. Experiments with varieties of barley.—Another experiment that has been carried on since 1889 with several varieties of barley, has given somewhat better

results ; [illegible] ordinary Cawnpore variety :—

Statement No. VI.—*Experiment with varieties of Barley.*

Serial number.	Varieties of Barley.	Grain or Straw.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.
1	[illegible]	Grain	1,313	1,110	1,533	303	846
		Straw	2,672	1,080	2,614	507	1,613
[illegible]	[illegible]	Grain	1,247	1,084	1,433	478	809
		Straw	2,164	2,517	2,432	1,338	1,635
[illegible]	[illegible]	Grain	1,793	1,302	1,407	820	833
		Straw	[illegible]	2,116	2,220	1,760	1,204
[illegible]	[illegible]	Grain	1,574	[illegible]	1,394	1,065	1,404
		Straw	4,080	1,775	2,033	1,700	2,008

Experiments made in grinding specimens of the various barleys gave the following results :—

Description.	Weight of barley ground.	Proportion of— Flour.	Bran.	Remarks.
	Seers.	Chittacks.	Chittacks.	
I. Hull-less—				
(1) Chocolate	1	[illegible]	[illegible]	
(2) Green	1	[illegible]	[illegible]	
(3) Grey	1	14½	2	
II. Husky—				
(1) Country, white	1	14	2	
(2) [illegible]	1	14	2	
(3) Danish Chevalier	1	14	2	
(4) [illegible]	1	14½	1½	
(5) Polar, six-row	1	14½	1½	
(6)	1	14½	1½	

RESULTS ESTABLISHED BY THE EXPERIMENTS TRIED AT THE FARM.

19. With regard to the general results established by the series of rabi experiments, I subjoin two statements; one showing the average yield of wheat for the last 12 years (including the year under report), and the other, the financial results of each manure applied.

Statement showing the average yield of wheat during the last 12 years.

No.	Manure.	Rabi standard. Average yield from 1882 to 1893.	Rabi standard. Number in order of yield.	Rabi duplicate. Average yield from 1882 to 1893.	Rabi duplicate. Number in order of yield.	Remarks.
		lbs.		lbs.		
1	Saltpetre	1,429	7th.	[illegible]	7th.	
2	Cow-dung	1,433	6th.	[illegible]	4th.	
3	[illegible]	1,408	9th.	1,513	8th.	
4	Poudrette	1,468	3rd.	1,569	2nd.	
5	Saltpetre + bone-dust	1,491	1st.	1,598	1st.	
6	Saltpetre + bone superphosphate	1,453	5th.	[illegible]	5th.	
7	Saltpetre + lime	1,311	13th.	1,434	11th.	
8	Cow-dung + [illegible]	[illegible]	2nd.	[illegible]	10th.	
9	Cow-dung + gypsum	1,433	4th.	[illegible]	9th.	
10	Sheep-dung + bone-dust	1,319	11th.	[illegible]	3rd.	
11	Sheep-dung + gypsum	1,458	[redacted]	1,602	6th.	
12	Ashes	1,440		1,380	12th.	
13	Unmanured	1,028		1,214	13th.	

Statement [showing] the financial return of each manure applied.

Serial number.	Manure.	Cost.	Field standard. Value of increased outturn.	Difference.	Number in order of yield.	Field duplicate. Value of outturn.	Difference.	Number in order of yield.
		Rs.				Rs.	Rs.	
1	Saltpetre ...	[illegible]	[illegible]	[illegible]	1st.	[illegible]	[illegible]	2nd.
2	Cow-dung ...	7·00	[illegible]	[illegible]	2nd.	[illegible]	[illegible]	8th.
3	Sheep-dung ...	8·00	[illegible]	[illegible]	7th.	[illegible]	[illegible]	[illegible]
4	Poudrette ...	7·50	12·00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	Saltpetre + bone dust	10·50	10·78	[illegible]	4th.	[illegible]	[illegible]	[illegible]
6	Saltpetre + superphosphate	17·25	[illegible]	[illegible]	—	[illegible]	—	[illegible]
7	Saltpetre + ashes	7·25	[illegible]	[illegible]	9th.	[illegible]	[illegible]	10th.
8	Cow-dung + bone dust	11·50	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—
9	Cow-dung + [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	Sheep-[illegible]	12·50	10·18	[illegible]	—	[illegible]	[illegible]	[illegible]
11	Sheep-[illegible]	9·50	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	[illegible]	1·25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	Unmanured ...	—	—	—	—	—	—	—

N.B.—Price of wheat calculated at 14 seers per rupee.

30. Remarks [on] yield.—Generally speakin[g] [illegible] such as saltpetre [illegible] sheep-dung applied [illegible] calcic m[anures] [illegible] bone dust, bone [illegible] better results than when applied alone. [illegible] equally well-[illegible] of [illegible] land.

Again, manures containing a high percentage [of] readily [avai]lable nitrogen [illegible] as mixture of saltpetre and bone dust, have better effect on w[heat] [t]han those [con]taining a smaller [illegible] available nitrogen, such as a mixture [illegible] and [illegible] dust.

It [illegible] mixed with superphosphate does not produ[ce] such good effect on wheat [illegible] mixed with bone dust, consider[ing] however that the percentage of nitrogen [illegible] is about double [illegible] [superp]hosphate. The conclusi[on] [illegible] phosphatic manure, the more [illegible] is for being used as an un[illegible] trated nitroge[n] [illegible] at phosphorus, though applied [illegible] [avai]lable [illegible] [effe]ct on whe[at] unless supplemented with [a] sufficient quantity [illegible]

31. [illegible] point of view, application of [illegible] to lands, from wh[ich] [illegible] crop of wheat is ta[ken] [illegible] mical, and there cannot [illegible] among the native [culti]vators. The only [illegible] it cannot [illegible] very-where [illegible].

Poudrette [is] nearly as economical as saltpetre, but a majority of common cultivators ha[ve] serious objections to manipulating [illegible] religious grounds [a]nd owing to [illegible] repugnance.

Cow-dung comes next in respect of economy.

A mixture of bone dust and saltpetre, th[illegible] yielding [illegible] petre or poudrette, approaches cow-dung closely, [illegible] the highest margin of profit where wheat is taken in rotation wit[h] [illegible] for th[illegible] manures, and shows [illegible] purely economic reasons.

C[illegible] saltpetre [illegible]

Sheep-dung is expensive, and on that ground less profitable, than the above manures, though it pays better than a mixture of cow dung and b[one] dust.

[illegible] of crude potassium nitrate to the ashes of cow-dung makes it nearly as valuable as a mixture of cow-dung and bone dust, and when applied so mixed, it yields only 2·32 loss per acre as compared with cow-dung.

[illegible] hitherto mentioned, [illegible].

[illegible] good [illegible] series."

[illegible] been possible to do [illegible] the [illegible] the [illegible] 1884-85, 188[illegible] -90, 189[illegible] any considerable [illegible] total[illegible]y destroyed, or had [illegible] the [illegible] statements.

Statement showing the yield of maize.

Number.	Manure.	Kharif standard.		Kharif duplicate.		Remarks.
		Average yield.	No. in the order of yield.	Average yield.	No. in the order of yield.	
		Rs.		Rs.		
1	Saltpetre	[illegible]	[illegible]	[illegible]	[illegible]	
2	Cow-dung	[illegible]	[illegible]	[illegible]	[illegible]	
3	Sheep-dung	[illegible]	[illegible]	[illegible]	[illegible]	
4	Poudrette	[illegible]	[illegible]	[illegible]	[illegible]	
5	Saltpetre + bone dust	[illegible]	[illegible]	[illegible]	[illegible]	
6	Saltpetre + bone superphosphate	[illegible]	[illegible]	[illegible]	[illegible]	
7	Saltpetre + ashes	[illegible]	[illegible]	[illegible]	[illegible]	
8	Cow-dung + bone dust	[illegible]	[illegible]	[illegible]	[illegible]	
9	Cow-dung + gypsum	[illegible]	[illegible]	[illegible]	[illegible]	
10	Sheep-dung + bone dust	[illegible]	[illegible]	[illegible]	[illegible]	
11	Sheep-dung + gypsum	[illegible]	[illegible]	[illegible]	[illegible]	
12	Ashes	[illegible]	[illegible]	[illegible]	[illegible]	

The [illegible] the financial [illegible] shown in the foregoing [illegible] :—

Number.	Manure.	Price of manure.	Kharif standard.			Kharif duplicate.			Remarks.
			[illegible]	[illegible]	[illegible]	[illegible]	Difference.	Number in the order of yield.	
1	Saltpetre	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Price of maize is calculated at 12 lbs per rupee.
2	Cow-dung	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
3	Sheep-dung	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
4	Poudrette	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
5	Saltpetre + bone dust	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
6	Saltpetre + bone superphosphate	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
8	Cow-dung + bone dust	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
9	Cow-dung + gypsum	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
10	Sheep-dung + bone dust	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
11	Sheep-dung + gypsum	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
12	Ashes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

33. **Remarks on the yield of maize.**—[illegible] phosphatic or calcic manures to organic nitrogenous manures is more [illegible] addition of [illegible] same to an inorganic nitrogenous [illegible]tilizer. Concentrated nitrogenous, phosphatic or calcic manures, either applied singly or in mixtures, have not shown any remarkable

fertilsinj enVu, TV \>\\>*c* mantm on tlw other hand seem to bo very effective in increasing the yieM of *mMOtfnp,*•hawing tli«t presence of organic matter in the soil is very aueatuil f jr tfai* pUnt, Antony the dun<* nun are- tried at the Finn on mnuut, pouJrette hM, on toe whole, yietdoi the UrgMt outturn. A m:.xture eowJung »nj boae^lnit tmnk* 0ext.

3+, Financial retoltl-—Application of p->U''!i¥tt* to *mtuie* crop pay* bwt, and ciwdunjj CORK* next. A mixtun) of wltpfltw and ulus is not any way less :aying tiun cow-dung. Cowdung mixed with bo&O dust also occupies » (jool position in point of economy,

35. The following appending are attached to this report :—

Appe<iif<* I to* T/.—Six sUtement< showing the financial results of various manures applied to maim and wheat in the permanent experiment*.

*Appt**ii I'll.*—R*p«rt on Cawnporo Eipwiroenul Farm by Dr. J. W. Lather, Agricultural Cherai*t to the GoT«raineDt <tf India.

CAWXFOU : } SAIYID MUHAMMAD MAM, M.I.A.C., M.R.A.S.,

The 12th October Lew. } *Assistant Director.*

APPENDIX No. I—KHARIF STANDARD SERIES, *vide* KHARIF STATEMENT No. I.

Statement showing financial result of manures applied.

Serial number.	Manure per acre.	Price of manure.	Grain or stalk.	Increase or decrease over the outturn of the unmanured plot per acre. — Average of last five years.	Increase or decrease over the outturn of the unmanured plot per acre. — 1892-93.	Value of the increased or decreased outturn. — Average of last five years.	Value of the increased or decreased outturn. — 1892-93.	Total value of the increased outturn. — Average of last five years.	Total value of the increased outturn. — 1892-93.	Net profit or loss after deducting the cost of manure. — Average of last five years.	Net profit or loss after deducting the cost of manure. — 1892-93.	Remarks.
		Rs.		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
1	Cow-dung, 150 maunds + bone-dust, 4½ maunds.	11·20	Grain ...	552	472	10·43	9·17	12·65	10·89	1·45	—·41	The outturn has been calculated at the following rates— Grain 22 Rs per rupee. Stalks 1312 Rs per rupee.
			Stalks ...	3,045	3,306	2·22	1·62					
2	Cow-dung, 150 maunds + gypsum, 3 maunds.	8·50	Grain ...	530	447	10·13	8·53	11·73	10·37	3·23	1·77	
			Stalks ...	2,110	2,214	1·60	1·08					
3	Cow-dung, 150 maunds	7·00	Grain ...	591	217	11·17	4·17	12·92	4·17	5·92	—2·83	
			Stalks ...	2,304	—	1·73	—					
4	Ashes of 150 maunds of cow-dung.	1·25	Grain ...	297	40	5·61	—·54	7·42	—·52	6·17	—1·77	
			Stalks ...	2,364	250	1·81	—·43					
5	Saltpetre, 3 maunds ...	6·00	Grain ...	297	109	5·51	2·25	7·02	2·60	1·02	—2·47	
			Stalks ...	1,592	400	1·21	·33					
6	Nitre + bone-superphosphate, 3 maunds.	17·25	Grain ...	658	217	12·62	4·17	13·24	5·12	—4·01	—12·13	
			Stalks ...	779	1,256	·59	·95					
7	Sheep-dung, 150 maunds + bone-dust, 4½ maunds.	12·50	Grain ...	723	847	14·02	16·28	16·38	17·04	4·45	4·54	
			Stalks ...	3,105	1,004	2·36	·76					
8	Ashes of 150 maunds of cow-dung + saltpetre, 3 maunds.	7·25	Grain ...	666	48	12·80	·92	15·23	1·14	7·98	—6·11	
			Stalks ...	3,134	290	2·43	·22					
9	Poudrette, 150 maunds	7·50	Grain ...	755	105	14·51	2·00	17·06	4·91	9·56	—2·59	
			Stalks ...	3,022	3,702	2·25	2·83					
10	Sheep-dung, 150 maunds	8·00	Grain ...	668	72	12·80	1·38	15·86	3·06	7·86	—4·94	
			Stalks ...	4,017	2,214	3·06	1·68					
11	Saltpetre, 3 maunds + bone-dust 4½ maunds.	10·20	Grain ...	488	121	9·29	2·32	11·35	2·69	—·04	—7·51	
			Stalks ...	2,720	485	2·06	·37					
12	Sheep-dung 150 maunds + gypsum 3 maunds.	9·50	Grain ...	772	520	14·69	10·00	16·42	11·14	6·92	1·64	
			Stalks ...	2,017	1,503	1·53	1·14					

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Ai-pssmi No. IT.—Riusf* DtiruuAn SKUU, KiiAitfr STATRMBKT I!. Cnr, MU/.K.

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[illegible] STATEMENT No. III.

Statement showing the Financial result of manures applied.

Serial number.	Manure per acre.	Cost of manure.	Grain or stalks.	Increase or decrease of outturn over unmanured plot per acre: Average of last 5 years.	Increase or decrease: 1892-93.	Value of increased or decreased outturn: Average of last 5 years.	Value: 1892-93.	Total value of increased or decreased outturn: Average of last 5 years.	Total value: 1892-93.	Net profit or loss after deducting the cost of manure: Average of last 5 years.	Net profit or loss: 1892-93.	Remarks.
		Rs.		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
1	Woollen refuse 120 maunds + lime 12 maunds.	3·40	Grain	1,200	202	29·45	13·07	32·71	22·28	27·31	19·08	The value of the outturn has been calculated at the following rates:—
			Stalks	3,064	4,223	2·90	3·21					
2	Sheep-dung [illegible] maunds	2·90	Grain	222	1,300	17·73	[illegible]	20·30	[illegible]	[illegible]	33·74	Grain, 27 lbs the rupee.
			Stalks	3,202	4,596	2·51	[illegible]					Stalks 1,312 lbs the rupee.
3	Cow-dung 120 maunds	4·50	Grain	508	722	20·92	33·30	13·69	16·18	[illegible]	[illegible]	
			Stalks	2,218	1,017	1·77	·77					
4	Poudrette 120 maunds	2·90	Grain	505	1,224	17·18	20·73	[illegible]	25·21	16·06	20·73	
			Stalks	3,214	2,602	[illegible]	[illegible]					
5	Horse-dung 120 maunds	4·50	Grain	587	1,016	[illegible]	19·24	13·98	20·65	[illegible]	16·29	
			Stalks	[illegible]	1,786	2·09	1·91					
6	Pig's dung 120 maunds	3·30	Grain	423	1,065	12·07	20·48	[illegible]	22·65	3·94	17·35	
			Stalks	2,540	2,800	2·47	2·17					
7	Saltpetre 3 maunds	4·00	Grain	361	944	6·72	19·13	8·42	[illegible]	2·42	13·61	
			Stalks	2,293	2,179	1·70	1·40					

Appendix No. IV.—Rabi standard series, vide Rabi Statement No. I, Crop, Wheat.

Statement showing the Financial results of manures applied.

Serial number.	Manure per acre.	Cost of manure.		Increase or decrease of outturn over the unmanured plot: Average of five years.	1902-03.	Value of increased or decreased outturn: Average of five years.	1902-03.	Total value of increased or decreased outturn: Average of five years.	1902-03.	Net profit or loss during the cost of manure: Average.	1902-03.	Remarks.
		Rs.		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
1	[illegible]	[illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Straw	[illegible]	[illegible]	[illegible]	[illegible]					
2	[illegible]	[illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
			Straw	[illegible]	[illegible]	[illegible]	[illegible]					
3	Cow-dung 180 maunds	7.00	Grain	[illegible]	[illegible]	[illegible]	[illegible]	12.96	[illegible]	[illegible]	[illegible]	
			Straw	741	[illegible]	[illegible]	4.87					
4	[illegible]	[illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
			Straw	[illegible]	[illegible]	[illegible]	[illegible]					
5	Cow-dung 180 maunds + [illegible]	[illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
			Straw	[illegible]	[illegible]	[illegible]	[illegible]					
6	Sheep-dung 180 maunds	[illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
			Straw	[illegible]	[illegible]	[illegible]	[illegible]					
7	[illegible]	[illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
			Straw	[illegible]	[illegible]	[illegible]	[illegible]					
8	Sheep-dung 180 maunds + bone-dust 4½ maunds	[illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
			Straw	[illegible]	[illegible]	[illegible]	[illegible]					
9	[illegible]	[illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
			Straw	[illegible]	[illegible]	[illegible]	[illegible]					
10	[illegible]	[illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
			Straw	[illegible]	[illegible]	[illegible]	[illegible]					
11	[illegible]	[illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
			Straw	[illegible]	[illegible]	[illegible]	[illegible]					
12	[illegible]	7.25	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.42	15.04	
			Straw	455	[illegible]	[illegible]	[illegible]					

Appendix No. V.—Rabi Duplicate Series, Crop Wheat, vide Rabi Statement No. 11.

Statement showing the Financial results of manures applied.

Serial number.	* Manures per acre.	Cost of Manure.	Grain or Straw.	Increase or decrease over the outturn of the unmanured plot per acre: Average of last 5 years.	Increase or decrease over the outturn of the unmanured plot per acre: 1892-93.	Value of increased or decreased outturn: Average of last 5 years.	Value of increased or decreased outturn: 1892-93.	Total value of increased or decreased outturn: Average of last 5 years.	Total value of increased or decreased outturn: 1892-93.	Net profit or loss after deducting the cost of manure: Average of last 5 years.	Net profit or loss after deducting the cost of manure: 1892-93.	Remarks.
		Rs.		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
1	Saltpetre 3 maunds ...	0·00	Grain ...	120	252	3·17	9·53	9·75	10·87	20·70	4·87	The outturn has been calculated throughout at the following rate:— Grain 23½ lb per rupee. Straw 205 lb per rupee.
			Straw ...	622	262	3·02	1·77					
2	Saltpetre 3 maunds, + bone-dust 4½ maunds.	10·50	Grain ...	518	330	13·20	12·10	23·11	14·34	12·61	3·84	
			Straw ...	940	433	4·91	2·24					
3	Cow-dung 180 maunds ...	7·00	Grain ...	405	140	17·60	5·90	22·27	4·90	15·27	−2·14	
			Straw ...	908	−30	4·67	−·14					
4	Cow-dung 180 maunds + bone-dust 4½ maunds.	13·50	Grain ...	187	460	8·00	10·42	7·70	22·20	−3·80	10·70	
			Straw ...	431	1,236	2·10	5·84					
5	Cow-dung 180 maunds + gypsum maunds.	9·50	Grain ...	54	333	1·92	10·07	3·45	23·59	−2·05	15·00	
			Straw ...	353	808	1·53	3·92					
6	Sheep-dung 180 maunds ...	8·00	Grain ...	313	521	7·60	18·60	11·59	22·38	3·59	14·38	
			Straw ...	818	773	3·99	3·78					
7	Ashes of 180 maunds of cow-dung.	1·25	Grain ...	140	121	3·00	4·92	4·79	5·45	3·53	4·20	
			Straw ...	365	108	1·79	·53					
8	Sheep-dung 180 maunds + bone-dust 4½ maunds.	13·50	Grain ...	1,833	521	47·60	18·60	51·25	27·33	38·05	14·83	*
			Straw ...	731	1,503	3·65	8·73					
9	Saltpetre 3 maunds, + bone super-phosphate 3 maunds.	17·25	Grain ...	202	417	8·63	17·17	10·79	22·34	6·46	4·47	
			Straw ...	290	−1,432	1·41	−6·58					
10	Sheep-dung 180 maunds + gypsum 3 maunds.	9·50	Grain ...	807	860	14·17	30·71	18·51	36·43	8·01	26·93	
			Straw ...	904	1,174	3·59	5·72					
11	Poudrette 150 maunds ...	7·50	Grain ...	436	711	13·64	30·93	22·45	38·23	14·95	25·73	
			Straw ...	1,250	1,619	8·43	8·43					
12	Ashes of 180 maunds of cow-dung + saltpetre 3 maunds.	7·25	Grain ...	95	655	3·30	22·67	5·25	25·16	−2·00	17·95	
			Straw ...	902	479	1·90	2·53					

APPENDIX No. [illegible]—RABI EXPERIMENT WITH GREEN MANURING, CROP—WHEAT, [illegible] RABI STATEMENT No. III.

Statement showing the Financial Results of manures applied.

Serial number.	Nature of plot.	Cost of manure.		Increase or decrease over the [illegible] of the unmanured plots: Average	Increase or decrease: 18[illegible]	Value of the increased or decreased outturn: Average of last [illegible]	Value: [illegible]	Total value of the increased or decreased outturn: Average	Total value: 18[illegible]	Net profit or loss after deducting the cost of manure: Average of last [illegible] years	Net profit or loss: 18[illegible]	Remarks.
		Rs.		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
1	Old indigo refuse 120 maunds	[illegible]	Grain / Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	The [illegible] has been calculated throughout at the same rates as in the Standard Duplicate [illegible] Grain [illegible] Rs. per [illegible] Straw [illegible] per [illegible]
2	[illegible]	[illegible]	Grain / Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
3	[illegible]	[illegible]	Grain / Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
4	[illegible]	[illegible]	Grain / Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
5	Hemp stump ploughed in	...	Grain / Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
6	[illegible]	[illegible]	Grain / Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
7	[illegible]	[illegible]	Grain / Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
8	Indigo stump ploughed in	...	Grain / Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
9	Green Indigo ploughed in + [illegible] 6 maunds.	[illegible]	Grain / Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
10	[illegible]	[illegible]	Grain / Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
11	[illegible]	...	Grain / Straw	[illegible]	...	[illegible]	[illegible]	[illegible]	...	[illegible]	...	
12	Wheat alternating with Lucerne.	...	Grain / Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

APPENDIX VII

Report on the Cawnpore Experimental Farm by Dr. J. W. Leather, Agricultural Chemist to the Government of India.

[illegible] but [illegible] Agriculture, and [illegible] then remained [illegible] of the Assistant D[illegible] from 1882-84 [illegible] Pitcher, from 1884 [illegible] under [illegible] Muhammad [illegible] it.

2. Many of the experi[illegible] however, some exceptions, f[illegible] XIV, XVB, XVC, a[illegible] unnecessarily man[illegible] there [illegible] recourse has been had to a different and less accurate method of arriving at the outturn than [illegible] whole [illegible] a equivale[illegible] produce [illegible] any inequality in the 10[illegible] selected, and indeed [illegible] little errors which are ever present in the determination[illegible] the outturn per acre are multiplied by 50 or 60, whereas, if the whole produce of each plot (about $\frac{1}{12}$ acre) be threshed out and weighed, the errors only multiplied by 12.

The latter plan has been re-adopted this year, and I would recom[illegible] be adhered to in the future.

3. No opportunity [illegible] offered itself [illegible] the present of having [illegible] &c., employed in the exper[illegible]le, analysed. [illegible] can, however, now [illegible] Agricultural Chemist to the Government [illegible] India, and [illegible] an advantage if average samples of all those materials which [illegible] readily [illegible] were forwarded [illegible] By this means [illegible] the different [illegible] may be determined.

4. Most of the plots [illegible] very small, measuring about 400 [illegible] yards each. In manurial experiments the errors which are ever present, due for instance to [illegible] qualities of soil, manuring, sowing, &c., &c., are so great that plots should not measure less than ¼ acre [illegible] had such been adopted at Cawnpore. This farm has, however, [illegible] small plots, which are [illegible] other[illegible] fairly [illegible] would seem best to leave them [illegible] present at least.

[illegible] perhaps be most convenient, if I refer [illegible] in some cases singly and in others in [illegible] and point out [illegible] where it might [illegible] 1881-82 to 1890-91 [illegible] year 1891-92.

[illegible] oldest experiment and was initiated by Mr. [illegible] 1880, [illegible] simplified [illegible] has been retained and consists in the manuring of four series of plots on which wheat and maize have been grown with different manures.

* See Report on Experimental Farm, 1891-92.

On Series I maize only, and on Series III wheat only, has been grown year by year. On Series II and IV wheat and maize have been grown alternately. In each series there are now 13 plots, and the corresponding plot of each series is treated with the same special manure at its fellow. Plot I of each series, for instance, has been manured with saltpetre for «cbcr»ji it has Wne. IV cultivation of each plot has been otherwise identical

Several of the manures, which have been employed in this experiment, */., sheep dung, dung and bone dust, dung and gypsum, are altogether useless for purposes of experiment; these dungs from different animals are t lietntelre* mmewliat indefinite, and it can answer no good purpose to be pitted one Again tt the other. Not M • mis ture of . -mi; and bone or dung and gypsum a pntttal manure. It would never be used by cultivators.

In adilii t o U reranrkod that the dung probably contains nearly much phosphate and gypsum at the extra dressing of bone or gypsum.

In the case of the application of saltpetre, moreover, this should be applied as a " top dressing " to the crop after it has come up above ground and not with the seed, In the latter case the manure being freely soluble in water it apt to be washed out of the reach of the young plant before it has emerged from the germinating *ugo.

The plots which are of value are 1 saltpetre, & cow dung, * poudratta, S saltpetre and bone dust, o saltpetre and «ujKrrpbo»phaUi, 7 saltpetre and ashes of cow dung, 12 ashes of cow dung, IS bone du#t, H «nper, 16 gypsum, 16 no manure. Of these No*. 13, 1* "d 1& B*M> ***B discontinue. But since the experiment has been carried out in its present form so long, I would not recommend any alteration. It is always undesirable to introduce change if they can be avoided.

Looking now at the results, which will be found at page 17 and 18 of the report, 1*91-92, we find that in the main they aw fairly Wacordant and show quite clear It tke Taluc of a nitrogenous manure for wheat and maize u distinguished from s phr-, phatic on"- This result in the case of wheat it a corroboration of what English experiments have proved, and UM retail » a valuable one. The experiment has now been in progress for more than 19 years.

7. The experiment, Series V, VI and VII, U called "Green soiling." \ no,, i>pri»U' n»in- be " Onm mammring," but it JIM* n<t entirely consist in this, for nM part of the experiment is to les*n the value of growing wheat after a leguminous crop ju* been grown and thaa off the land, and again the manurial value of indigo refuse is also M'luded.

The results which luvo been bioaghl not *o far are mnelutiva at to the value of ploughing in of a green crop, and the value of indigo refuse as a manure it ahw thowtj. Growing wheat. afi*r an indigo crop, Jus Uwn Ulwn off, it likewise shown to be advantageous, but the wheat crop grown after " ***p " (really " falw hemp " mUUtrim juncea, or ther kkjuminana plut) has not been inorMMd, either iu the tune lm\ tion or even regularly. I:, :i(rre out of ,t wriss uf tii year the outturn ha* been .«* than that gf , t p . « . «Uii*i lh*> outturn after indigo showed an increase in each year but lb« h at (1890-91), and then there ''''** ottI y * '"t-" difference. Some of the applications are useless. There can be little good in adding trypsum fploi lj until we know that i;rj.»um it a valuable tnauur. t^emp, a fact which it being teste I in anaUwr e*rK- of experiments *- Itldi ff° »»1 ""mp wau-r applications an «(ual)T usrifls. for the rm*r«u hardly soota* much plant d aod would I* uted by the ryot «m]ity ai irrigation waur when* • be at hand, wniltt M regards the latter (hemp water) it is not, I believe, in the ryot 'I poeSMtwm.

The u*rful pt.iU in tin. eiperimenl are New. 2, t, *, fl, 8, 10 and 11, and I woald recommend that these be retained, tagsibw with plot No. IS (not tnUnd i» the mutU) on which lueerc*> it grown in alWraaW* wilh wbeat,

[illegible]

[illegible] plots, 1, 5, 7, 9, 11 [illegible] well to introduce other crops such as *dal* or *arhar*, after which to grow wheat, and if rape could be got to grow in August (which I am afraid is doubtful), it might be ploughed in as a green crop. [illegible] plot 7 arhar [illegible] alternation [illegible] t be tried on plot 5 or 9 and ploughed in, if it were [illegible] to cultiv[illegible] plots would then [illegible] —

(1) [illegible] and wh[illegible] *alternately*.
(2) [illegible]
(3) Fresh indig[illegible] (ditto).
(4) [illegible] (ditto).
(5) [illegible] d in (ditto).
(6) Indigo and wheat *alternately*.
(7) *Arhar* and wheat *ditto*.
(8) Hemp ploughed in (manure.
(9) [illegible] al *alternately*.
(10) [illegible] *ditto*.
(11) *Nil*.
(12) [illegible] *alternately*.

[illegible] wheat [illegible] manured *directly* by ploughing in a y[illegible] for the purpose, whilst, on the other hand, it tests the question whether a cereal crop is benefited generally [illegible]

It is [illegible] suggested new treatments [illegible] continued.

8. [illegible] "*Fields*" series [illegible] principle [illegible] foods, is applied on one plot (No. 1), whilst in t[illegible] plant foods is excluded; [illegible] here we have proof of the value of a nitrogenous man[illegible] phosphatic [illegible]

9. Experimental Series XVA [illegible] object of testing the effect of manuring indigo [illegible] d it is a [illegible] experiment. Plot 2 is, however, unnecessary. [illegible] ble substance such as gypsum. It might be well [illegible] to test [illegible] it is *sulphate* or *carbon*[illegible] lime which [illegible] this could be done by manuring plot 2 with carbonate [illegible]

[illegible] ent, in which the effect of farmyard manure as against farmyard manure and gypsum is tested, is useless—the dung itself containing gypsum, and there can be no good purpose in continuing it.

10. The exper[illegible] ll more or [illegible] of the [illegible] mass, he would put all the [illegible] flow, an[illegible] would not (in India at leas[illegible] Moreover, if such an exp[illegible] number of factors into consideration, the chief among which would be the amounts of water [illegible] of plant fo[illegible]

Then, again, [illegible] Series [illegible] materials are of such [illegible] is worth having [illegible]

In the case of Series X, the testing of the value of refuse from seed-crushing may be important both in relation to the dung which is produced by feeding it to cattle, as likewise to the direct application of such material to the land. In fact, as far as the refuse castor cake is concerned, I think it would be well to apply it in the case of any new experiments being commenced in the future.

But the determination of the value of dung produced by animals fed on the above materials (oil cakes, castor pomace excluded) is a much more complex matter and would require a great deal of time and attention in carrying it out. Moreover, I am doubtful whether this question has a direct bearing on Indian agriculture at present.

11. *Ploughing experiments, Series I—IV (Appendix II).*—The results obtained in these, some of which were initiated by Mr. Fuller and have been continued since, afford ample evidence that the improved plough is advantageous, and this experiment in one form or another might be continued more with the object of demonstrating the value of the implement to the cultivators than to find out anything new.

12. *Irrigation (Page 11).*—For several reasons I consider this experiment quite useless. It has now stopped, but it may be remarked (1) that when we compare well water with canal water we are only experimenting with the water of one well in one district, whereas the water in wells in different parts of the country may, and probably does, vary considerably in composition, and (2) the cultivator irrigates according to whether there is much or little rainfall and does not decide beforehand how often and when he will irrigate.

13. *Methods of sowing (page 23).*—Some of these are practically useless experiments, such, for instance, as those in Series I and II (early and late sowing); but it may be desirable to know if a crop will do best when broadcast or in lines, and at what distance apart; but I cannot think that any definite result can come from sowing on the top as distinct from the sowing on the side of a ridge.

14. *Varieties of crops (Series 21 and 26).*—These experiments are valuable and should be continued. It is necessary, however, that they should be continued in a systematic manner; the seed or crop of each variety should be critically examined each year by experts, and those varieties which prove unsuitable should be "weeded out" and the useful ones only retained. For instance, when the series of experiments on different varieties of cotton was commenced, the cotton was annually submitted to an expert for valuation, but this has latterly been omitted and merely a record of the weight of crop kept. But the value of an experiment is much enhanced if we know the better varieties as well as those which produce the greatest weight. Then, if after testing a certain variety for a few years the outturn is not large and the quality poor, in other words, if the variety gives no encouragement to grow it, it should be weeded out and only the better ones retained in the experiment.

Experiments on different varieties of sugarcane, cotton, potatoes and oils may thus yield valuable results.

On the other hand, I am doubtful if any good end can be served by testing different varieties of wheat and barley, as those which are indigenous are known to be excellent for the purposes of the people.

In the case of the experiments with sugarcanes, it would be well if the juice of the different sorts were analysed at the time of cutting.

15. The experiment on the outturn of fodder—green and dry—is a good one, and will in the course of a series of years give valuable information.

16. *Conclusion.*—It will be seen from the foregoing that there is ample evidence that the Cawnpore Farm has been productive of valuable information. From its experiments we learn that in India, as in England, wheat is benefited more by an

application of t nitTOfrnon* •»«•«» than by a phospUatic one, that i he same holds good for mane, lhat tbe wheat crop is increased by a preceding leguminoo* crop, and that it is also increased by ton ploughing in of a green eropi

Among imi>l.'in*tiU, to, we fiml continual evidence of the advantage winch ar«u« in ti»inj- lh,- dftpai plough aod lix> *A* • has been [• m ,, t economical water-raising appliaw* *U* reruin depths, and baa been adopted by lb« surrounding du tin tors.

17. I re, very deiirable that those eiperinn-iit« which have been well planned »bould continue without inUrruption. I understand that t ^n*-ferriofr Ibis farm to Lwcknow is n under consideration by tbe «overo> and 1 would ulc- tbu opportunity of | Fsrm on iU pneent ettc for the sake of m eontinui nU, The te-tinp of tbe value of different manorial lubtUn* cannot he bvooght t* •uceestfnl conclution in me or twg years only—generally indeed a eerie* of at least. yean >s necwetry in order to arrive at any positive mult. Abo it f r pens tliat for two or three year* afUr ft new experiment ha* commenced, the reeul different plots are irregular owing to the diff«vnl treatment « m»y previously reoem-d. Tbe Cawnpore Farm would appear to possess ft •mlaUe rite, •oil is similar to ft great part of the Gangce-Jumna Doab. It i» fairly level, and ftre ft number of valuable eiperiments in progwa. wWck should be wntin«d. It would therefore be a pity t • with it.

18. Again, th« rmdeoea of the Assistant Dirwtor of Land Rocord* ar. i tnre, who has ehargv of tbe nperimenU, w at tbe Farm, which emlJesmm ' more dtrwt sop^rrUion to it than tf be lived etsewhere. Indeed, it i» r*U* that tbe Farm ifaould hav«f prominent claim on *the* time of the Aanstar * at ^riain critical periods. For imUnw, bf sbmiU b» abb to devote the whole of b»» time to it whilst the threshmjr proewds, «ad tb* w«ghrng of all the crops should be underUken Uy him personftlly. Any allshW made at this time ar* psr<i«l«'ly arrioos, and would vitiate the malts. At tbe time of patting on U* different manor**, too, bis preatme* would be a great advantage in otder to ewmra their bwojt pot right plots. Theee an matter* which sbould not be left to lbs working Soperin"-dent, wbuee edueation has never fitted him for «uch aevnute work.

I cannct help thinking that some of the tmgnUritM* which ap))>ear in ibe tabte* of n*ulte, an du* to mistakes Wring been mad* at OM or other of these stage*.

It. Agricultural esparummu always OMMJM tome considerable <mUay, and unless the work is throughly done, th* results obtained eaonol be depended upon, and the expenditure is ia a great measure thrown away.

to. In Bngtaad, wherever such experiments: are enttttted to th* care of » farm baJKf, they are ranly prodMtm ef «k* definito rasatU ae would warrant o« placing mu«h relianae upon them, aftd the n*td of th* eonsttnt att of an educated ofieer has been esUUtshed. 1 fuel the neeessitx «f raferrtog I be<wi»« m two MM durring my recent viaU, wetfbings wbieh wer* tftkeo by lh l«riatondettt wtre incomet tone, V N a t mu«b aa $0 ft*, wrong), and althou|c)>»pp«n«d to M of no gn»t o«Msqn*nc*t they war* MV*itbele*> soppMed to be c« aad an rawtqpekUy caampks of what might •*«, '»e» when sa«h would be •er.uiM. Tb* praarat Fan i m*a for tbe post t Wis iMiyetw and has ma heart tbor«aghly in tbe work net expect him to perform datte* tor which bis treiuiag has nerer fitted

11. Finally, I add a aeto on some «tperimeuU *tt* a tomearhat different naf wbich tuv* bem cawri»! .j^J Barmah on ..me land, whit is doee to the site of U» BxptrimenUl Farm, and which appear to mt to U derabkTftlM.

J w\i,ri.i; LIATHIB,

Jgti.mltmtti Cktmitt it H 0«t*tmmtmt* t;

NOTE ON BABU LACHMAN PARSHAD BARMAH'S FARM.

Close to the site of the Cawnpore Experimental Farm is a plot of land which, a few years ago, was so cut up by ravines, that it was rapidly going out of cultivation. A rent of Re. 2 *per acre* could not be obtained for it.

It was taken up in 1885 by Babu Lachman Parshad Barmah, Personal Assistant to the Director, Land Records and Agriculture, who has since displayed not only great energy, but has likewise met with success in its reclamation. In addition to this, he has carried out a number of experiments upon it on the growing of crops, the results of which are embodied in Appendix A of the Farm report for 1890-91.

The reclamation was effected by levelling and embankments, and in this way practically the whole of the area of 18 acres has been brought under excellent cultivation. Moreover, the ryots, who had failed to make a living by the cultivation of the land in its former state, have returned, and there is now a flourishing village which has sprung up entirely during the last few years.

Besides the reclamation and the manurial experiments to which reference has been made, there is a fuel reserve of babul and *dhak* (*Butea frondosa*) trees, which were planted in 1888-1889. It occupies 1¾ acre (·88 acre of each sort of tree), and is intended to demonstrate the value of cultivating firewood, in order to set the dung at liberty for manurial purposes.

The first cutting of firewood has just been made; about ⅓ of the babul plantation has given 80 maunds. Babu Lachman Parshad informs me that this quantity is sufficient to supply three cultivator's families for one year. Thus the *babul* plantation is propagated by self-reproduction.

The *dhak* plantation has not yet been cut.

The operations on this farm form an excellent object lesson. The reclamation is now almost completed, and it is satisfactory to know that it has been a financial success. Regarding the "Fuel Reserve" experiment, the results obtained so far are satisfactory; but such an experiment should be watched for a considerable period after the commencement of cutting. The area, the number of trees, the number of people (or families), using the plantation and the *weight of wood* should be recorded, as also the method employed in propagating the reserve, whether by self-reproduction or otherwise, and what measures adopted for its protection against wilful damage and for the distribution of the firewood.

It seems very desirable that advantage should be taken of any information which may be obtained from this experiment, and with which the owner would no doubt willingly provide the Director, Land Records and Agriculture. If at a future time Babu Lachman Parshad should be compelled, through promotion or other cause, to leave Cawnpore, it would be a great advantage if an arrangement could be made whereby the permanent carrying out of this experiment would be effected.

J. WALTER LEATHER,

Agricultural Chemist to the Government of India.

No. ^ of 1894.

DEPT. OF LAND RECORDS AND AGRICULTURE, N.-W. P. AND OUDH.

Dated Cawnpore, ike)tt September 169i.

FROM

F. E. TAYLOR, *Esq.,*

Offa. Diwctoi Of L*KD RECORD* AND AoircutTrn,

NoiTti-Wssms Ptovixcn AJID OUBK,

To

TB» C1UKF SECRETARV TO GOVERNMENT,

Nomi-WemiK Pwviwcw INDOCHH.

SIR,

I HAVE the honor to inbmit the report on the Government Experimental Farm at awnjwre for the y»r !1893-94. The Far>*a* * nnder the control o£ the Awutnnt Director, WyM Muhammad Hadi, ind the r-port hai boon written V.y him. The delay in the robmiwwn of the report w dnc to it living Wn found neocmry by my pndeoeawr to return the fint draft of the report to the Anutant Director for •t plans lion* on certain point*.

8. The permanent Farm StiprrintenJent, Saiviil Ali Bonn, ivinrnrd from Poona where he h»l been ...ing at the College of Science, w*[1] «*amed charge of hU «l uties «n l»t (k-tober 1893. Tho weiRbinc nf mwiurw at the time they were applied to the hod and or the pmd«oe of the kbimf and r»hi cropt were carried cut in the prwenoe of UK A>i»Unt Direetor.

S. It it Dot neomur for roe to pre • detailed reriew of the conduct ilunng the y«w of the «pwiment» omrrii*! out on th» ?»""• J wou U - bowtrw, noto that •- some of the ploU .offer from w%ter-l>jnnng when mnrh rain LIU w.tim a limited period. This is notice,) io irvml p»rt. of the report and I also [illegible] *w *>'• -» in,1 lllin K « ra y "• ent visits to the Farm. It is evident that if one plot hal... Uttllyto&n from nowofnouture the crop on it •nwt be hal,it«ally p...er, with the result that «V mannr* applied to iueh a plot will Uil to *y*ive results capable of comparison with the effects of ,tb,, mMnIW appl W t• better si>utMl plot.. The AiwrtMl Director will be wired to make propotal. for ia.51owing th• .lraiw of the le •" '*"*• ^^ uf tbe P*rWt

4.* Tbe Arabttaliwn which «M »-nt to Ui* r'arm in May 1681 w well u tlte two brood mam »n rtiU wrf for p»o»«Bmf. The .ullion Mffd +6 man* durinK Uie year. „he result of the ove•ritisT' '* not yet k''''wn 'n '• "****'* • o' tn<l '•emaindw • .' eight were failures, five mares have >k«d «nd one appmin to be in foal. One of the brood mare* bwM about five months ago.

t The dwtiibutwn of #e^d* an.) i«p!«*menU WM *9MHamti* .lurintf the ywr and the IUUI of applk»tioi» for informalwn «n »«rictiltor»] qu^tiom La* iocreMed.

I hare the honor to bt,

B.i,

Vo«r mxt obedient tortMit,

Offg. Director.

REPORT

OK Till

CAWNPORE EXPERIMENTAL FARM,

FOB THE

KHARIF AND RABI SEASONS, 1893-94.

General character of the season.—Tin- *jmt* under report ni not • good agricultural ywur on tlw wbok TV rains in Jui*y*, August an1 September we» exce•tire and the total rainfall traa emjriderably above I*he* norm J, The following •tatement iliown the amount and dUlribution of rainfall during the year :—

Hnntltt				IUioML			Rainy days.		
				1WIUS.	MM!	Kamal.	MM	IV..3-IM	Normal.
*)>nl	ISM				"o-ei	•ll			1
JUB.					ew	M I	0	U	1 4
Jilt					21 i;.	m::.	10		IS
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					<m>	W			t
JUHTJ	ISM					S4	4	1	1
Mnan				. .		. .	S	3	l
torch "			«.		<K«	is			
	Taul			SIM		111!	B	•	41

Gnwrtllr fpeakinff all Kbarif cmpi except maiu were injured more or *Urn* by Uw •U«M of rain wh'cb, 1>*owever*, ca><*ted gtmiar* damage to Uw rain cm]*. The American and Khandesh varieties of cotton suffered particularly during the Kbarif Miidi. The effect of weather have been fully noticed under the various ci]»enma>ta deacribed hereafter.

2, TV njlij.tined tal»l« rompara the average and masintum yield of wheat and maize during ihe year onder report with that in tbe two jmowding yearf :—

*StaUm*ni tie**** •>>•""»• "*' attract jttlJ of wktoi and* M.*aize.*

				i n n n jkM pur *ma**.		Maximum yield per acre.	
				Wheat.	Maize.	Wta*	Maize.
				lb.	lb.	lb.	lb.
1893-94				IJM		LtM	
1892-93							
1891-92					I.TW		

3. TV <*xperiment*• trwt at thefann are elaamed a* ' Permanent' and ' T«m[iurary.'

Tht' l'wnia!,*ent ' expe*-nwmta are earriod on year alter year on the note nkfc of Uud awl -iih (I.*- MM aurt *»t* tmtntent

The ' Temporary ' rvperiaKflU are to o»Il«J with rrf«t»oe to thnr dunUon aad the land *m*.

Tba ' IVrtimtirnt ' nperimenti arc dinvtol to »how the effects of—

(«) CViU.n uitrogotoua a&d aos-lutrqreiHHU manure* 90 mais« awl wbeat;

(4) Deep and shallow ploughing on wheat;

(5) Certain green manures on wheat.

The temporary experiments are tried in the kharif chiefly with cotton and indigo, and in the rabi with oats, potatoes, and gram.

A detailed account of these will be found in the succeeding paragraphs.

KHARIF SEASON EXPERIMENTS.

4. Kharif Statements I and II.—*Manurial experiments.*—This experiment is carried on in two series of 13 plots each. In the first which is called the 'Standard Series' maize is sown year after year without any change of treatment. In the second or 'Duplicate Series' maize alternates with wheat, and is sown about three months after the removal of the wheat crop, the object being partly to verify the results of the 'Standard Series' and partly to determine the economy of growing maize in rotation with wheat. The manure applied to one plot of the Standard Series is also applied to the corresponding plot of the Duplicate Series.

5. The 'Standard Series' plots were watered with canal water on the 30th and 31st May to soften the soil for the final ploughing, but before the 'Duplicate' plots could be treated similarly, rains fell early in June dispensing with the necessity of adopting similar treatment for them. Seed was sown behind the country plough on the 6th and 7th June and germinated in a week. A heavy shower of rain fell on the 1st of July causing great accumulation of water in all the fields. It was drained off from all the plots except Nos. 3, 4 and 9 of the Duplicate Series from which it could not be got rid of owing to their low situation. Hence these plots were damaged and gave a poorer outturn comparatively.

6. An unusually heavy storm on the 9th July knocked down some plants in the Standard Series, but the damage was not considerable. The season was otherwise very favorable for maize.

7. The following statement shows the results of the Standard Series:—

KHARIF STATEMENT NO. I.—*Standard Series.—Manurial experiments with maize.*

Number of plot.	Manures applied per acre.	Outturn per acre: Grain: Average of four previous years.	Grain: Year 1897.	Stalks: Average of four previous years.	Stalks: Year 1897.	Increase or decrease per acre as compared with unmanured plot: Grain: Average of four previous years.	Grain: Year under report.	Stalks: Average of four previous years.	Stalks: Year under report.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	Cow-dung, 150 maunds + bone dust, 4½ maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	Cow-dung, 150 maunds + gypsum, 8 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	Cow-dung, 150 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	Ashes of 150 maunds of Cow-dung	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	Saltpetre, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	Saltpetre, 3 maunds + bone superphosphate, 3 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	Sheep-dung, 150 maunds + bone dust, 4½ maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	Ashes of 150 maunds of Cow-dung + Saltpetre, 3 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	Poudrette, [illegible] maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	Sheep-dung, 150 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	Saltpetre, 3 [illegible] + bone dust, 4½ maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	Sheep-dung, 150 maunds + [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	...	[illegible]	[illegible]	[illegible]	[illegible]	...	...	...	[illegible]

Note.—In 1896 the maize crops failed altogether; that year has therefore been left out of account in striking averages.

[illegible] mixed [illegible] have given the highest outturn. Ashes of cow-dung and saltpetre rank next, but the constituents of the mixture not yet fully known to the common cultivator. The results of the mixture have been equally favorable in the rabi season.

Poudrette has acted more effectively than cow-dung [illegible] the latter [illegible] bone dust and with gypsum. The addition of concentrated manure, to cow-dung has naturally had a more beneficial effect upon the yield than cow-dung alone. Saltpetre alone has given poor results in both the rabi and kharif [illegible] being capable of [illegible] only nitrogen and potash, but its value [illegible] above [illegible] the addition of [illegible] to it. Its property of too quick decomposition in the presence of [illegible] of [illegible] manure apparently renders it an unprofitable manure for crops grown during the [illegible] out of the reach [illegible]

9. The following statement shows the outturn, &c. of the Duplicate Series:—

maize.

No. of plot.	Manure applied per acre.	Outturn per acre. Grain. Actual.	Grain. Year under report.	Stalks. Actual.	Stalks. Year under report.	Increased or decreased outturn as compared with the unmanured. Grain. Year under report.	Grain. Average of four previous years.	Stalks. Average of four previous years.	Stalks. Year under report.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
4	Cow-dung, 180 maunds + bone-dust, 4½ maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+2,294	−1,416
5	Cow-dung, 180 maunds + gypsum, 3 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	+424	[illegible]	[illegible]	[illegible]
3	Cow-dung, 180 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+774
7	Ashes of 180 maunds of cow-dung	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	Saltpetre, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	Saltpetre, 3 maunds + bone superphosphate, 3 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	−100
8	Sheep-dung, 180 maunds + bone dust, 4½ maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	Ashes of 180 maunds of cow-dung + saltpetre, 3 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	Poudrette, 180 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	Sheep-dung, 180 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	Saltpetre, 3 maunds + bone dust, 4½ maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	Sheep-dung, 180 maunds + gypsum, 3 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	Unmanured	[illegible]	[illegible]	[illegible]	[illegible]	—	—	—	—

In this series of plots the yield [illegible] inferior [illegible] compared with the Standard Series owing to the fact that [illegible] months' [illegible] previous wheat crop and the sowing of the maize, whereas between the [illegible] of the previous [illegible] crop of maize in the Standard Series there is a fallow of about 8 months before the next crop of maize is sown. Among these plots sheep-dung and poudrette have given [illegible] and the mixture of saltpetre and ashes also produced a fairly good [illegible] Standard Series. Plots [illegible] particularly from stagnation o[illegible]

10. It will be noticed that the plots to which bone dust was applied have given a very much higher outturn in the Standard Series than in the Duplicate Series. This is due to the fact that [illegible] require a long time to decompose, and therefore a greater portion of the residue left by one crop of maize in the Standard Series becomes fit for use of the succeeding crop by slow decomposition during the long fallow of 8 months, while in the Duplicate Series, only a smaller portion of the residue left by the previous wheat crop becomes available for the succeeding maize crop, the period of fallow between the wheat and the maize being of only 2 months.

11. The [illegible] results of the [illegible] table:—

KHARIF STATEMENT IIA.—*Showing Financial results.—Manure experiment with maize.*

Manure applied per acre.	Cost of manure per acre.	Standard Series: Cost of cultivation (including rent, seed, labour, &c.) per acre.	Total cost of cultivation per acre.	Value of produce per acre in 1893-94, @ 60 and 400 lbs. the rupee of grain and straw, respectively.	Net profit or loss.	Order according to profit.	Duplicate Series: Cost of cultivation (including rent, seed, labour, &c.) per acre.	Total cost of cultivation per acre.	Value of produce per acre in 1893-94, @ 60 and 400 lbs. the rupee of grain and straw, respectively.	Net profit or loss.	Order according to profit.
	Rs. a.		Rs. a.	Rs. a.	Rs. a.			Rs. a.	Rs. a.	Rs. a.	
Cow-dung, 180 maunds + bone dust, 4½ maunds	16 1	Rupees 16-8 per acre.	32 9	60 7	+27 14	VII	Rupees 16-8 per acre.	32 9	22 15	− 9 10	XII
Cow-dung, 180 maunds + gypsum, 3 maunds	10 10		27 2	61 3	+34 1	VI		27 2	34 2	+ 7 0	VIII
Cow-dung, 180 maunds	5 6		21 14	47 6	+25 8	VIII		21 14	39 2	+17 4	IV
Ashes of 180 maunds of cow-dung	5 6		21 14	39 9	+17 11	XI		21 14	23 0	+ 1 2	XI
Saltpetre, 3 maunds	9 0		25 8	44 12	+19 4	X		25 8	39 5	+13 13	V
Saltpetre, 3 maunds + bone superphosphate, 3 maunds	30 0		46 8	59 0	+13 8	XII		46 8	27 2	−19 6	XIII
Sheep-dung, 180 maunds + bone dust, 4½ maunds	16 1		32 9	76 5	+43 12	I		32 9	37 3	+ 4 10	X
Ashes of 180 maunds of cow-dung + saltpetre, 3 maunds	14 6		30 14	70 1	+39 3	IV		30 14	50 7	+19 9	III
Poudrette, 180 maunds	5 6		21 14	58 13	+36 15	V		21 14	58 3	+36 5	II
Sheep-dung, 180 maunds	5 6		21 14	68 4	+42 6	III		21 14	58 6	+36 8	I
Saltpetre, 3 maunds + bone dust, 4½ maunds	19 11		36 3	47 13	+11 10	XIII		36 3	40 13	+ 4 10	IX
Sheep-dung, 180 maunds + gypsum, 3 maunds	10 10		27 2	69 10	+42 8	II		27 2	35 11	+ 7 9	VII
Unmanured	—		16 8	39 12	+23 4	IX		16 8	24 6	+ 7 14	VI

The results vary considerably as compared with those of [illegible] the dissimilarity is due mainly to the fact that during the twelve months (October 1892 to [illegible]) [illegible] water drain was made upon the Duplicate plots by raising 2 crops, [illegible] while the Standard plots produced only [illegible]

13. [illegible] manure experiment with maize.—The object of this experiment is to [illegible] the comparative effect of certain artificial manures [illegible] pulse on maize. [illegible] and were sown on 7th June [illegible] Plot 7 was [illegible] considerable [illegible] lation of [illegible] on the [illegible] of July, which could not be drained off owing to the low situation. Plot 6 [illegible] for the [illegible] but to [illegible]

14. The subjoined table gives the outturn of each plot during the year, [illegible] of the eight years during which the experiment has been under trial:—

KHARIF STATEMENT No. III.

Serial number.	Manure applied per acre.	Outturn per acre: Grain: Average of last 9* years.	Grain: Year under report.	Stalk: Average of last 9* years.	Stalk: Year under report.	Increased or decreased outturn per acre as compared with the unmanured plot: Grain: Average of last 9* years.	Grain: Year under report.	Stalk: Average of last 9* years.	Stalk: Year under report.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	Woollen refuse, 12[illegible] maunds and lime, 12 maunds	2,014	3,802	5,149	[illegible]	[illegible]	+ 2,893	+ 4,034	+ 8,023
2	Sheep-dung, 120 maunds	1,800	3,351	7,347	13,765	+ 1,332	[illegible]	+ 3,742	+ 9,736
3	Cow-dung, 120 maunds	1,339	[illegible]	5,452	7,598	+ 871	+ 1,259	[illegible]	+ 3,394
4	Poudrette, 120 maunds	1,663	3,130	3,745	7,617	+ 1,095	+ 1,731	+ 2,583	[illegible]
5	Horse-dung, 120 maunds	1,404	2,467	4,008	7,899	+ 746	[illegible]	+ 2,391	[illegible]
6	Pig-dung, 120 maunds	1,401	[illegible]	4,890	7,441	+ 742	[illegible]	+ 2,709	[illegible]
7	Saltpetre, 3 maunds	1,075	[illegible]	3,218	4,002	+ 417	+ 212	+ 1,819	+ 333
8	Unmanured	658	899	2,306	[illegible]	—	—	—	—

*This includes the year under report.

During [illegible] sheep-dung has given [illegible] year. Plots [illegible] and 4 of this [illegible] in most of the previous [illegible] outturn than the corresponding plots of the Standard Series, owing to the fact that they enjoy the [illegible] advantage of being situated on a higher [illegible] not stagnate [illegible]

1V. Tho subjoined table give* the financial remit* of tlie experiment showing that among manure* ordinarily available cheep-dung and poadrette are almost equalh- economical. The net profit U bued on the average outturn of tlie present and seven

Kiumr STiTKyxKT No. I1l A,—*Skewing financial retulUof mitetlUntont manure t tried on maize.*

Serial number.	Mionr* ipjiltad ptr ten.	Cent nf 111*1.titf pCTBCt*.	Cwtof toiiii.lion. rent, seed, &c., per acre.	Total «Mt per acre.	IVil of the average jiHiUurm per awi for I!,. U.t years.	Set pcoflL	III
1	Woollen rrfutr. 110 miundt And lime, 12 raiumii	H*. S	10 *- t 5 0	R.. ..	47 8 0	IU •, p f7 /1)	I
2	Sheep-dung, 110 maunds ...	10 0	16 80	M t O	U t 0	IS 9 0	111
3	Cow-dung, 120 maunds ...	to • <	8 0	90 S 0	M t 0	S IS 0	VI
4	*Pmmktm*, !.'" MM i.	ts o	6 0	21 t 0	30 U 0	15 9 0	II
5	Horwdaaf. 1*0 in»ut»ti .	to o	16 8 0	W) s o	31 I U	10 15 0	V
6	Pin-danf, ISQmwmU ...	10 0	IS 8 0	10 2 0	3] 11 o	11 9 0	IV
7	S*lt»tra, I maunds b ...	0 0	Ifi 8 0	• B O	27 0 0	1 U 0	MI
8	...	...	16 8 0	16 B a	17 a o	O II (,	Mil

•Tliii iorlmk* tb» *ymt* owW rr|<>rt,

16. Thii experiment has been given up at the raggertiim of the Agriculture! Chemist, as, 1» aaid, it waa not customary with the ealtmton to store up the dungs of various i animals separately, and the conducting of «ucb experiment would not there- fore be of much practical value. The following are the general cuneloaonj drawn from th- remit u of th« part eight yean :—

(1) That woollen refuve mixed with lime acU more beneficially than any other amiml manure;

(!) That «heep<dong it more raitatble for maiu than the dung of any otlier animal \

(3) That iwudrafjf is also a T»luabte fertiliser for the cr..,, ,

[Vf That hone-ddng and pig'*-dung are buth superior to cow-dung.

16. Manure experiment with country cotton :—The object of this experiment, winch is ooodneted on 9 ploU of 4ou square yard* each, i* to aacertain the effect of diflrrent manures on country cotton. The ploU were manured on the 2Otb of March and town on the +th Jane at Stlbs of teed per acre.

The rraulU are given in the following tablu :—

Kiuarr STITIMBTT NO. IV.—JTd«ar« *exptrimtni trill totlcm.*

i	Uuun »rf^IW P*' acre.	Oultnra pf acre. Cl«M«l rot to*. Average of last years.	Year under report.	Seed. Arrt- | age of last five* years.	under report.	Increased or decrease •etc u cuwi and >iU (W unoNumml. Cleaned cotton. Average In* years.	Year under report.	Seed. JMTf.	Year under report.
1	Fnak «)t *ttem* maund, 200 maunds.	ua	243	KM	443	+ 33	i + 100	• si	+ 172
2	†Kainit, 4 maunds and gypsum, 4 maunds.	170		M	411		+ 97	+ 115	+ 152
3	Farm-yard manure, 180 maunds and gypsum, 1 maund 14¼ seers.	•a	HJ	m	47S	479	+103	+ in	+ 204
4	Farm-yard manure, 180 maunds, and kainit, 1 maund 14¼ seers.	120	in	re	401	+ 76	+ 58	+ 158	+ 133
5	Woollen refuse, 120 maunds.	M	171	471	SII	+ 134	+ 37	1 MI	+ 79
6	Unmanured	UH	134	221	268	...	...	...	...

• I h w n IH»-»0 I ud 1892-93 in which the crop failed owing to unfavourable season, have not k— UtM bta account in striking averages.

† Kainit is a potassic manure containing sulphate and chloride of potassium, also chloride and sulphate of magnesium and chloride of sodium.

Note.—The cost of cultivation may be taken [illegible] including all charges except that on account of manure. [illegible] the rupee of cotton fibre, and @ 60 lb. the rupee of seed. At these rates, the profit [illegible] would be [illegible] years would respectively be Rs. 9-8, 14-1 and 20-5.

17. [illegible] Owing to the exceptionally early advent of the rain (about the end of May), the crop was sown on the 4th of June, that is, about a fortnight earlier than the usual time for sowing country cotton. The plants [illegible] to escape the effects of unfavourable weather which followed and injured other plots of cotton [illegible] Kharif Statement V(4) and V [illegible] *infra*. The plot treated with woollen refuse, however, did not give the highest outturn as in the previous years, for the crop in the plot advanced very rapidly in growth of foliage, and owing to the shade the soil remained too damp at a time when [illegible] decidedly injurious, inviting an attack of the insect [illegible], and imperfect development of the bolls. The [illegible] high yield from the [illegible] may be due to the very high percentage of organic matter in the soil obtained and applied during the year.

18. Experiment in early and late sowing:—The object of this experiment is to determine the effect of early and late sowing on maize and cotton, as well as to ascertain the comparative outturn of different varieties of cotton.

The following tables give the results of the experiment:—

Kharif Statement No. V (a).—Early and late sowing of maize.

Number of field.	[illegible]	[illegible]	Outturn per acre. Grain. Average of last two years.	Year under report.	Stalk. Average of last two years.	Year under report.
			lb.	lb.	lb.	lb.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

N. B.—The cost of cultivation is [illegible] while in the case of [illegible] it is increased by Rs. [illegible] on account of irrigation. The value [illegible] lb. of grain and Re. 1 per [illegible] lb. of stalk for fodder. According to these rates the outturn of the [illegible] sown plot during the year under report was worth Rs. 20-13, and that of late sown Rs. 25-5, the profits on the plots being respectively Rs. 17-7 and Rs. 18-13. The average [illegible] of early sown plot, Rs. 16-6, and in the [illegible] -13.

Kharif Statement No. V (b).—Early and late sowing of cotton.

Number of field.	Time of sowing and variety of cotton sown.		Outturn per acre. Cleaned cotton. Average of last two years.	Year under report.	Seed. Average of last two years.	Year under report.
			lb.	lb.	lb.	lb.
17	Sown before rains	Varadhi	137	53	259	93
		Buri	99	85	220	28
		Dharwar	114	22	272	78
		Narodha	110	20	246	109
		Louisiana	150	42	300	136
		Jari	90	52	210	128
		Country	153	114	262	257
*A.C. Series	Sown after rains	Varadhi	60	113	133	139
		Buri	43	34	66	87
		Dharwar	70	37	104	150
		Narodha	46	43	102	152
		Louisiana	96	54	82	162
		Jari	48	64	115	150
		Country	67	74	137	146

* "A.C." is an arbitrary name given to the plot.

As in previous years the early sown crop of maize gave a higher outturn than the one sown late.

The cotton crop in the early stages was severely damaged by the larvæ of an insect locally called *Ujunka*. Though the grubs were destroyed by sprinkling soap-water and tobacco decoction, yet the crop could not recover its full vitality, and the yield was therefore very poor, contrary to previous years.

19. **Experiment with different varieties of imported cotton seed.**—This experiment was started in 1888 to ascertain whether certain foreign varieties of cotton can be grown successfully in this part of the country. The tilling and other operations were similar to those of previous years.

The following table shows the outturn of cleaned cotton and seed during each year since the commencement of the experiment :—

KHARIF STATEMENT No. VI.—*Outturn of Foreign Cotton.*

Serial number.	Name of cotton.	Produce per acre.													
		1888-89.		1889-90.		1890-91.		1891-92.		1892-93.		Average of the five years 1888-89 to 1892-93.		1893-94.	
		Cleaned Cotton.	Seed.	Cleaned Cotton.	Seed.	Cleaned Cotton.	Seed.	Cleaned Cotton.	Seed.	Cleaned Cotton.	Seed.	Cleaned Cotton.	Seed.	Cleaned Cotton.	Seed.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	Upland Georgian...	111	233	100	305	103	228	54	131	80	171	103	233	34	102
2	Tree Cotton ...	128	282	148	354	116	252	82	181	100	201	117	254	21	71
3	Louisiana ...	111	203	194	437	126	319	50	128	192	222	135	278	15	77
4	Garo Hill ...	97	203	134	306	93	137	105	186	98	217	117	222	80	157
5	Hybrid ...	100	245	182	445	103	203	55	136	100	299	123	277	29	83
6	Sea Island ...	93	207	134	314	91	251	54	135	183	303	121	204	33	70
7	Egyptian ...	97	235	194	434	80	194	65	102	155	309	118	267	15	99
8	Hinganghat ...	9	221	183	417	103	253	64	158	123	306	103	279	20	66
9	S. B. Mealy ...	24	48	180	320	60	100	29	64	79	134	73	133	23	39
10	Shine's Early Prolific.	24	48	140	280	40	100	18	43	91	134	63	131	23	71
11	Jone's Improved.	24	48	150	302	40	120	20	58	41	99	66	130	65	97

20. The yield of each plot was very poor during the year under report. This was due to two causes, viz. :—

(a) In the early stages the plants were badly attacked by a grub. Specimens of the grub were sent to the Museum, but could not be identified. As the practical way of getting rid of the pest, weak tobacco decoction was sprinkled over the plants and leaves. These measures resulted in the destruction of the grubs, but the crop could never regain sufficient vigour.

(b) The untimely and frequent rains prevented the full development of bolls and spoilt the quality of fibre in those that burst, as the weather was rainy.

21. Samples from these varieties were sent to two experts of the Muir Mills Company, Cawnpur) for opinion as to quality, and their opinion together with my remarks on each was forwarded to the Agricultural Chemist. The Agricultural Chemist and myself having agreed

upon the exclusion, from the experiment, of the following varieties, their cultivation will be discontinued :—

(1) Upland Georgian.
(2) S. B. Mercy.
(3) Jone's Improved.
(4) Shine's Early Prolific.

22. Steps are being taken to obtain fresh seed from America of the American varieties retained in the experiment. Fresh seed of the "Garo Hill" has already been obtained from [illegible] season, and that of Hinganghat will be obtained from the Central Provinces.

23. The opinions of the experts and my remarks referred to above are given in the following statement :—

Serial number.	Name of cotton.	Opinion of the Managing Director of the Muir Mills Co., Cawnpore.	Opinion of the Managing Director of [illegible] Mills Co., Cawnpore.	Remarks by the Assistant Director, Land Records and Agriculture, North-Western Provinces and Oudh.
1	Upland Georgian	A very fine staple cotton, but staple short as compared with other varieties—what might be called a medium variety.	No remarks	Should be rejected as both the yield and the quality are poor.
2	Tree cotton	An exceedingly fine stapled cotton, some staples as long as 1½ inches, clean, but seeds appear abundant.	Ditto	I shall grow this variety next season from the seed we have got at the Farm, but fresh seed will be ordered from America.
3	Louisiana	A fine staple but considerable irregularity in length, the seeds in this variety also abundant.	Ditto	Ditto ditto. This is worth giving further trials
4	Garo Hill	A [illegible] harsh cotton, runs ¾ to 1 inch staple.	Garo Hill is a short staple (¾") and something like our Madhogarh cotton.	This is one of the best varieties of Indian Cotton. I have obtained some fresh seed this year from Garo Hill will be sown [illegible] season.
5	Hybrid	A nice fine staple silky cotton somewhat similar to Khandesh staple medium.	No remarks	Cultivation to be con[illegible]
6	Sea Island	A very silky fine staple cotton, some of the fibres over 1½ inches long used to be considered the finest cotton in the world with a mean staple of 1·8 inches, the Edisto Island variety having staple over 2" long.	Is undoubtedly the finest cotton having a staple 1½" long and is a fine soft yet strong fibre.	Ditto ditto ditto.
7	Egyptian	Similar characteristics to American cotton but somewhat short stapled.	No remarks	Though the staple is short yet the variety yields a fair outturn [illegible]
8	Hinganghat	This cotton appears to me to be somewhat different from the best Hinganghat cotton, being less silky and having a weaker staple. The [illegible] itself [illegible] has a fibre varying from 1 to 1¼" inches. Of course a good spinning cotton.	Ditto	[illegible] varieties [illegible]. Fresh seed [illegible] the [illegible] Land Records [illegible] tried next season.
9	S. B. Mercy	The usual characteristics of American cotton, very silky appearance and if anything a finer staple.	Ditto	Not worth keeping on. Cultivation should be given up.
10	Shine's Early Prolific.	A very silky soft cotton—fibres beautifully fine and long, but not very strong, staple 1 to 1¼ inches long and fairly regular—a splendid spinning cotton.	Ditto	The outturn has always been very poor. However fine this variety may be for spinning purposes, its cultivation would never be a financial success; I therefore propose to discontinue its cultivation.
11	Jone's Improved	A similar but not as good cotton as "Shines early" and fibres and apparently less abundant, good color but a little leafy.	Ditto	This is admittedly inferior to the last mentioned variety and its cultivation should be given up.

24. **Experiment with mixed crops.**—This experiment has been under trial for the last three years. The object is to ascertain the comparative outturn of the various crops in the commoner mixtures in which they are generally grown by the native cultivators.

The subjoined table gives the yield of each crop :—

Kharif Statement No. VII.—*Experiment with mixed crops.*

Serial number.	Crops.	Quantity of seed sown per acre.	Outturn per acre during the year under report: Grain or ginned cotton.	Outturn per acre during the year under report: Stalks or seed of cotton.	Outturn per acre last year (1902-03): Grain or ginned cotton.	Outturn per acre last year (1902-03): Stalks or seed of cotton.	Cost of cultivation including cost of seed, rent, labor, &c., per acre.	Value of outturn, i.e., seed, stalks, &c.	Profit or loss.
		lb.	lb.	lb.	lb.	lb.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1	Arhar ...	1	[illegible]	[illegible]	197	506	16 8 0	23 1 0	—
	Cotton ...	[illegible]	[illegible]	[illegible]	5	[illegible]		0 [illegible] 0	—
	Til ...	[illegible]	—	—	—	—		—	—
	Urd ...	1	[illegible]	[illegible]	21	[illegible]		1 8 0	—
							16 8 0	42 9 0	+25 1 0
2	Bajra ...	1	[illegible]	2,430	[illegible]	4,037	14 8 0	7 4 0	—
	Arhar ...	1	[illegible]	2,302	371	1,160		24 [illegible] 0	—
							16 8 0	33 2 0	+16 10 0
3	Juar ...	2	[illegible]	[illegible]	[illegible]	[illegible]	10 [illegible] 0	[illegible] 10 0	—
	Arhar ...	1	[illegible]	2,210	1,424	3,400		24 11 0	—
							16 8 0	34 5 0	+17 13 0
4	Cotton ...	1	[illegible]	—	807	—	16 8 0	[illegible] 11 0	—
	Cotton ...	[illegible]	16	2	1	[illegible]		0 5 6	—
	Til ...	[illegible]	—	—	—	—		—	—
	Urd ...	[illegible]	[illegible]	223	7	56		[illegible] 1 [illegible]	—
							16 8 0	13 3 6	− 3 4 6

1 seer of Arhar seed calculated @ 16 lb. the Rupee, and of Arhar stalks @ 500 lb. the Rupee; of cotton fibre @ [illegible] per Rupee, and of cotton seed @ 60 lb. the Rupee; of Urd seed @ 20 lb. the Rupee, and of Urd stalks @ 150 lb. the Rupee; of Bajra seed @ 40 lb. the Rupee; of Juar seed @ 30 lb. the Rupee, and of Juar stalks @ 432 lb. the Rupee.

The highest money profit was obtained from mixture 1.

25. **Experiment to determine the comparative effect of gypsum and other manures on indigo.**—This experiment was taken up during the year under report with the object of ascertaining the comparative effect of gypsum, bone dust and farm-yard manure on indigo crop. Four plots each measuring 1,210 sq. yards have been allotted to the experiment. The plots were watered on the 29th April to soften the soil and manures applied on the 2nd May which were ploughed in the same day. The seed was sown on the 4th of May at the rate of 12 lb. per acre. Two waterings were given, one on the 20th of May and the other on the 17th of June, and the crop was cut on the [illegible] of August.

The following table gives the outturn of each plot :—

Kharif Statement No. VIII.—*Experiment to determine the comparative effect of gypsum and other manures on indigo.*

Serial number.	Manure applied per acre.	Cost of manure.	Outturn of green indigo per acre.	Increased or decreased outturn over the unmanured plot.	Value of the outturn.	Net profit or loss.
		Rs. a. p.	lb.	lb.	Rs. a. p.	Rs. a. p.
1	Cow-dung, 150 maunds ...	3 2 0	12,136	+ 4,736	12 11 0	+19 8 0
2	Gypsum, 2 maunds ...	5 4 0	10,656	+ 3,116	10 [illegible] 0	+ 5 2 0
3	Bone dust, 20 maunds ...	43 12 0	10,660	+ 3,292	10 11 0	−33 14 [illegible]
4	Unmanured ...	—	7,260	—	—	—

Cow-dung has given better result than either gypsum or bone dust, and the latter has proved anything but economical from a financial point of view.

25. At the request of the Upper India Chamber of Commerce, an interesting experiment was tried with indigo seeds varying from 1 to about 5 years old [illegible] their comparative vitality and productive power.

The seeds were sown in 5 different plots each measuring 684 square yards. The following is a detail of operations performed in the fields :—

Date.	Operation.
17th April 1898	First [illegible] for ploughing ;
18th "	Ploughing ;
18th "	[illegible] watering ;
19th "	" ploughing ;
1st May 1898	Third watering ;
20th "	Fourth watering ;
5th August 1898	Stalks cut down for sale and stumps 6" high left in the soil. These stumps gave off new shoots which produced the seed.
20th to 30th September ...	Weeding.
14th December	Harvesting.

The result of the crop is detailed in the subjoined table :—

KHARIF STATEMENT No.

Serial number.	Detail of seeds.	Outturn per acre. Plant.	Outturn per acre. Seed.	Cost of cultivation, seed, rent, labor, &c.	Value of the plants.	Value of the seed.	Total value of the produce.	Net profit or loss.
		lb.	lb.		Rs. a.	Rs. a.	Rs. a.	Rs. a.
1	Indigo [illegible] harvested in 1897.	5,849	150	Rs. 19 per acre.	29 8	6 6	35 14	16 14
2	Indigo seed 1 year old ...	5,718	172		32 6	6 13	39 3	20 3
3	" " 2 years ...	6,563	157		28 3	5 4	33 7	14 7
4	" " 3 " ...	6,362	132		23 3	6 1	29 4	10 4
5	" " 5 "	5,322	142		17 6	5 10	23 0	4 0

The results of plots 2 to 5 show that the older the seed the poorer is the yield, both of stalks and of the seed, but this [illegible] hold good [illegible] of plot 1 in which the crop was attacked [illegible] [illegible]. [illegible] is noteworthy that [illegible] a belief among the native culti-

RABI SEASON EXPERIMENTS.

27. The programme of [illegible] by me and approved by the Agricultural Chemist, and they were conducted [illegible] of the modifications made thereby in the old experiments will be [illegible] experiments.

28. The season was on the whole unfavourable at Cawnpore as it was in many other districts of the N.-W. Provinces.

The wheat crop suffered generally from [illegible] excessive rains in February, and certain plots were besides injured more or less by rust. The hail storm of 6th February 189[illegible] did a certain amount of damage to the crop generally, and the excess of moisture caused by the winter rains resulted in the too luxuriant growth of straw. The grain therefore became thin and small.

29. The most important experiments with wheat [illegible] two series each consisting of 15 plots of 400 square yards each.

One series in which wheat is grown year after year is called the "Standard" and the other in which a crop of maize is taken alternately with wheat is called the "Duplicate." The manure applied to each plot of the one series is also applied to the corresponding plot [illegible] tillage operations in both the series are similar in all other respects.

30. The following statements show the results of the Standard and the Duplicate Series:—

RABI STATEMENT No. I.—*Standard Series.—Manure experiment with wheat.*

Number of plot.	Manure per acre.	Outturn per acre.				Increase or decrease in outturn per acre as compared with the unmanured plot.			
		Grain.		Straw.		Grain.		Straw.	
		Average of last five years.	Year under report.	Average of last five years.	Year under report.	Average of last five years.	Year under report.	Average of last five years.	Year under report.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
4	Cow-dung, 180 maunds + bone dust, 4½ maunds.	1,706	1,700	3,105	3,300	+225	[illegible]	+738	+1,128
5	Cow-dung, 180 maunds + gypsum, 3 maunds.	1,610	1,610	3,079	3,122	+429	+492	+643	+941
3	Cow-dung, 180 maunds ...	1,591	1,798	3,014	3,333	+400	+542	+587	+1,112
7	Ashes of 180 maunds of cow-dung.	1,327	1,412	2,413	2,614	+148	+300	−16	+423
1	Saltpetre, 3 maunds ...	1,421	1,630	2,776	3,327	+233	+484	+340	+1,143
9	Saltpetre, 3 maunds + bone superphosphate, 3 maunds.	1,378	1,869	3,008	3,252	+207	+723	+581	+1,071
8	Sheep-dung, 180 maunds + bone dust, 4½ maunds.	1,584	[illegible]	2,937	3,990	+403	+917	+510	+1,809
13	Ashes of 180 maunds of cow-dung + saltpetre, 3 maunds.	1,445	2,048	[illegible]	3,763	+263	+902	+211	+1,582
12	Poudrette, 180 maunds ...	1,609	1,728	3,611	4,264	+318	+582	+1,184	+2,083
6	Sheep-dung, 180 maunds ...	1,610	2,015	3,423	3,279	+429	+869	+996	+337
2	Saltpetre, 3 maunds + bone dust, 4½ maunds.	1,480	1,633	2,806	2,886	+299	+500	+229	+705
10	Sheep-dung, 180 maunds + gypsum, 3 maunds.	1,748	1,880	3,009	[illegible]	+567	+700	+582	+1,328
11	Unmanured ...	1,181	1,140	2,427	2,181	—	—	—	—

RABI STATEMENT No. II.—*Duplicate Series.—Manure experiment with wheat.*

Number of plot.	Manure applied per acre.	Outturn per acre.				Increase or decrease in outturn per acre as compared with the unmanured plot.			
		Grain.		Straw.		Grain.		Straw.	
		Average of last five years.	Year under report.	Average of last five years.	Year under report.	Average of last five years.	Year under report.	Average of last five years.	Year under report.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
7	Cow-dung, 180 maunds + bone dust, 4½ maunds.	1,392	1,262	3,182	2,533	+232	+157	+707	+381
9	Cow-dung, 180 maunds + gypsum, 3 maunds.	1,228	1,712	3,078	3,423	+169	+605	+503	+1,279
6	Cow-dung, 180 maunds ...	1,719	1,102	3,243	2,946	+430	+375	+670	+792
8	Ashes of 180 maunds of cow-dung	1,096	1,474	2,635	2,237	+46	+327	+153	+119
4	Saltpetre, 3 maunds ...	1,422	1,736	2,681	3,086	+62	+629	+206	+932
11	Saltpetre 3 maunds + bone superphosphate, 3 maunds.	1,363	1,936	2,303	3,461	+206	+829	−170	+1,307
10	Sheep-dung, 180 maunds + bone dust, 4½ maunds.	2,082	2,023	2,336	3,345	+1,322	+926	+881	+1,221
3	Ashes of 180 maunds of cow-dung + saltpetre, 3 maunds.	1,564	2,184	2,819	2,736	+204	+1,077	+421	+602
2	Poudrette, 180 maunds ...	1,868	1,875	3,944	4,233	+508	+768	+1,469	+2,099
1	Sheep-dung, 180 maunds ...	1,602	1,730	3,086	3,794	+242	+623	+993	+1,689
5	Saltpetre 3 maunds + bone dust, 4½ maunds.	1,556	1,742	3,034	3,566	+200	+635	+559	+1,412
12	Sheep-dung, 180 maunds + gypsum, 3 maunds.	1,324	1,968	3,579	4,283	+564	+850	+1,104	+2,129
13	Unmanured ...	1,060	1,107	2,475	2,154	—	—	—	—

31. The operations carried on in these plots were similar to those reported in full last year, and the only alteration in the [illegible] (3) and (9) of the Standard, and (4), [illegible] Series as a top-dressing [illegible] that manure being ploughed in [illegible]

32. The results of this year only confirm the fact established by the trials made during the 13 preceding years that nitrogenous manures are the best for wheat. Sheep-dung and a mixture of sheep-dung with bone dust or gypsum have given very good results in this series. There is not the slightest doubt as to the value of the [illegible] of these manures; as a fertilizer it appears to contain a higher percentage of nitrogen than the dung of other animals—a fact which has yet to be determined by a series of chemical analyses. Ashes of cow-dung with saltpetre have given the highest yield this year in the two series. The mixture was first [illegible] among the Duplicate plots, and [illegible] among the Standard, and similar results have been obtained by the application of the mixture elsewhere [illegible] at the Farm, tending to show that the [illegible] of nitrogen caused by the burning of the dung is amply recompensated by the addition of saltpetre to the ashes.

33. The application of saltpetre as a top-dressing has proved more beneficial, as the yield of the plot to which it was applied this year has been considerably higher than the average of the past [illegible] years in which it was [illegible] to be [illegible]. This is a fact substantiating the theory that nitre being a quickly decomposable manure should be applied best at the time when the crop is sufficiently advanced to fully utilise its main fertilizing agent, the nitrogen.

34. Saltpetre mixed with superphosphate has given higher outturn than Saltpetre alone, a fact which is in accordance with the principles of science. Cow-dung alone has given poorer results this year than it did in most of the previous years. In the Duplicate series [illegible] by [illegible]. The old manure pits at the Farm were flooded by water from an adjoining tank owing to excessive rains and most of the manure ingredients were consequently washed into the tank. The value of the manure left in the pit was highly doubtful and it was preferred therefore to apply dung collected in another pit at the [illegible] during the rainy season. As this dung was comparatively fresh, probably it could not fully decompose during the partial growth of the wheat, and the whole of nitre was not therefore assimilated by plants. This would explain the low yield of the cow-dung plots. The experiment suggests the conclusion that cowdung does not produce its best effect unless applied to wheat in a thoroughly rotten condition.

35. The following statement shows the financial results of the experiments:—

RABI STATEMENT II (a).—SHEWING FINANCIAL RESULTS.

Manures applied per acre.	Standard Series. Cost of manure per acre.	Cost of cultivation per acre.	Total cost.	Value of produce.	Net profit or loss.	Order according to profit.	Duplicate Series. Cost of cultivation per acre.	Total cost.	Value of produce.	Net profit or loss.	Order according to profit.
	Rs. a. p.		Rs. a. p.	Rs. a. p.	Rs. a. p.			Rs. a. p.	Rs. a. p.	Rs. a. p.	
Cow-dung, 180 maunds + bone dust 4½ maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	IX	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cow-dung, 180 maunds + gypsum, 9 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	VIII	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cow-dung, 180 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	V	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ashes of 180 maunds of cow-dung.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	X	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Saltpetre, 3 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	VII	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Saltpetre, 3 maunds + superphosphate, 3 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	XIII	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sheep-dung, 180 maunds + bone dust 4½ maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	III	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ashes of 180 maunds of cow-dung + saltpetre, 3 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	IV	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Poudrette, 180 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	VI	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sheep-dung, 180 maunds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	I	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Saltpetre, 3 maunds + bone dust, 4½ maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	XII	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sheep-dung, 180 maunds + gypsum, 9 maunds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	II	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Unmanured	—	[illegible]	[illegible]	[illegible]	[illegible]	XI	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The best economical results have been obtained from (a) sheep-dung applied singly or with artificial manures, (b) poudrette, and (c) mixture of saltpetre with ashes which mixture seems to be the best available inorganic manure suitable for wheat.

36. The following statement shows the ratio between grain and straw in the series taking grain as a basis :—

RATIO STATEMENT II (a).

Serial No.	Manure applied.	Ratio between grain and straw during 1893-94. Main series.	Duplicate series.
1	Saltpetre, 3 maunds	1 : 2·04	1 : 1·71
2	Saltpetre, 3 maunds + bone dust, 4½ maunds ...	1 : 1·75	1 : 2·05
3	Cow-dung, [illegible] ...	1 : 1·97	1 : 1·99
4	Cow-dung, 180 maunds + bone dust, [illegible] maunds	1 : [illegible]	1 : 2·31
5	Cow-dung, 180 maunds + saltpetre, 3 maunds	1 : 1·99	1 : 2·03
6	Sheep-dung, 180 maunds	1 : 1·87	1 : 2·18
7	Ashes of 100 maunds of cow-dung ...	1 : 1·79	1 : 1·47
8	[illegible] maunds	1 : 1·93	1 : [illegible]
9	Saltpetre, 3 maunds + [illegible], 3 maunds	1 : [illegible]	1 : 1·79
10	[illegible]	1 : [illegible]	1 : 2·18
11	Unmanured	1 : [illegible]	1 : 1·95
12	Poudrette, [illegible] maunds	1 : [illegible]	1 : 2·27
13	Ashes of 180 maunds of cow-dung + saltpetre, 3 maunds	1 : 1·94	1 : 1·20

The highest percentage of straw was yielded by the poudrette plot in both the series. In the standard it was unusually high showing that on account of the excessive nitrogenous manure at the time of winter rains, it promoted the growth of straw at the expense of grain.

Green manuring Series.

37. This experiment was started in 1884, and there are 13 plots under it, each 400 square yards in area.

The object of the experiment is really a double one. On the one hand either a green crop or an organic vegetable manure is ploughed in to act directly upon wheat. On the other it is determined from the root residue of a leguminous crop benefits the succeeding cereal crop. The experiment has been admitted to be a valuable one by the Agricultural Chemist, who has, however, modified the treatment of certain plots of this series.

The alterations are as follows :—

No. of plot.	Treatment up to 1892-93.	Agricultural Chemist to the Government of India.	Treatment adopted during the year.
3	Indigo water, 5,000 cubic feet	Rape (Sohada) to be ploughed in.	Wheat grown. (Sohada will be grown next August).
4	Hemp water, 5,000 cubic feet ...	Gram and wheat alternately ...	Gram sown.
6	Wheat sown after hemp crop had been cut.	Hemp and wheat alternately ...	Wheat sown.
10	Green indigo ploughed in, and [illegible] maunds.	Urd and wheat alternately ...	Wheat sown.
11	Green [illegible] ploughed in, and [illegible] maunds.	Arhar and wheat alternately	Wheat sown.

The tillage and other operations carried on in the other plots were identical

38. The following statement shows the outturn, &c., of the plots of this series:—

RABI STATEMENT No. III.—*Showing results of experiments to determine the effect of green manuring on wheat.*

Serial number.	Manure applied per acre.	Outturn per acre. Grain. Average for the last five years.	Outturn per acre. Grain. Year under report.	Outturn per acre. Straw. Average for the last five years.	Outturn per acre. Straw. Year under report.	Increased or decreased outturn per acre as compared with the unmanured plot. Grain. Average for the last five years.	Increased or decreased outturn per acre as compared with the unmanured plot. Grain. Year under report.	Increased or decreased outturn per acre as compared with the unmanured plot. Straw. Average for the last five years.	Increased or decreased outturn per acre as compared with the unmanured plot. Straw. Year under report.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	Old indigo refuse, 120 maunds ploughed in.	1,644	1,543	3,673	4,197	+550	+666	+1,647	+2,417
2	Fresh indigo refuse, 120 maunds ploughed in.	1,624	1,349	3,427	3,526	+530	+472	+1,501	+4,108
3	Rape to be ploughed in, wheat this year.	953	736	2,011	1,957	−141	−121	+86	+227
4	Gram and wheat alternately, gram this year.	—	1,113	—	1,222	—	—	—	—
5	Unmanured	1,094	877	1,926	1,730	—	—	—	—
6	Hemp and wheat alternately.	1,087	1,031	1,914	2,139	−7	+154	−12	+409
7	Green hemp ploughed in	1,302	905	2,431	1,794	+208	+28	+505	+64
8	Green indigo ploughed in	1,442	750	2,573	1,957	+348	−127	+647	+227
9	Indigo and wheat alternately.	1,202	696	2,350	1,576	+108	−181	+424	−154
10	[illegible] and wheat alternately. Urd will be sown next [illegible]	1,312	905	2,460	1,878	+218	+28	+534	+148
11	Arhar	1,167	1,028	2,272	2,154	+73	+151	+346	+424
*12	Lucerne and wheat alternately, wheat this year.	869	1,108	1,907	2,965	−225	+231	−19	+1,235
*13	Lucerne and wheat alternately, lucerne this year.	946	Lucerne standing.	1,878	Lucerne standing.	−148	—	−48	—

Note.—The cost of cultivation may be taken @ Rs. 27 per [illegible] of manures. For calculating value of produce the following rates have been taken:—
(a) Grain @ 32 Srs. the Re.
(b) Straw @ 240 Srs. ,, Re.

The value of the outturn of [illegible] giving a net profit of Rs. 7-7. For the [illegible] 5-1. The net profit this year of Nos. 1, 2, and [illegible] the previous five years was Rs. 29-14, Rs. 27-11 and Rs. 7-12, respectively.

* These two plots are so arranged that when one plot bears wheat the other bears lucerne.

The best results were obtained from plots Nos. 1 and 2. [illegible] results obtained during the [illegible] have been [illegible] of clover in Eng[illegible].

Hemp [illegible] extent [illegible] roots.

Green [illegible] after indigo (plot 9) [illegible] crop having been seriously damaged by the [illegible] *Gobdhi* [illegible].

Plot No. 12 [illegible] plot, growing wheat year after year [illegible] lucerne. In 1893-94 a crop of wheat was taken for the first ti[illegible] with reference to this plot, therefore, [illegible] denote the [illegible] outturn during the year under report.

39. An experiment [illegible] certain other green leguminous crops was [illegible] on a plot of ground elsewhere [illegible] Farm. This plot was comparatively inf[illegible] crops

were sown on 4th June 1893, and ploughed in on 3rd August 1893. Wheat was sown on [illegible] November 1893, and watered twice. The results are shown in the subjoined

A.

STATEMENT SHOWING THE OUTTURN OF FIELD No. 27.—*Rabi Experiment,* 1893-94.

No.	Treatment.	Outturn per acre.		Increase or decrease as compared with the unmanured.	
		Grain.	Straw.	Grain.	Straw.
		lb.	lb.	lb.	lb.
1	Green hemp ploughed in	[illegible]	3,147	+[illegible]	+[illegible]
2	[illegible] ploughed in	858	[illegible]	+[illegible]	+[illegible]
3	[illegible] ploughed in	[illegible]	[illegible]	+175	+[illegible]
4	Unmanured	[illegible]	[illegible]	—	—

It is clear that all these crops benefit the succeeding wheat crop. [illegible] which might be sown [illegible] with advantage for the purpose of green manuring. It gives slightly better results than hemp.

40. Ploughing Series.—The object of this experiment is to determine the effect of deep and shallow ploughing on the growth of wheat without the application of a manure. There are 3 plots under this experiment, each 2,450 square yards in area. Nos. 1 and 2 are ploughed [illegible] deep, respectively, with an improved plough (the Cawnpore [illegible]) and the third ploughed 3 times with the ordinary native plough. In other respects the treatment of all the 3 plots is alike. The following statement shows the results of the experiment:—

STATEMENT No. [illegible].—Ploughing experiment with wheat.

No.	Treatment.	Cost of ploughing per acre.	Outturn per acre. Grain. Average of the last years.	Grain. Year under report.	Straw. Average of the last years.	Straw. Year under report.	Increase or decrease as compared with the native plough. Grain. Average.	Grain. Year under report.	Straw. Average.	Straw. Year under report.
		Rs.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	Ploughed 9" deep 4 times with improved plough	3	[illegible]	1,078	2,402	2,388	+[illegible]	+7[illegible]	−47	−[illegible]
2	Ploughed 5" [illegible] with improved plough	3	[illegible]	[illegible]	[illegible]	2,221	+[illegible]	+70	+[illegible]	−[illegible]
3	[illegible] with country plough	6	[illegible]	1,003	[illegible]	2,494	—	—	—	—

N.B.—The cost of cultivation [illegible] Rs. 21 per acre, including [illegible] of ploughing. The value of produce, at a reasonable estimate, [illegible] of grain and Rs. [illegible] straw. According to this estimate the outturn of the first plot was worth Rs. 43-6, of the second plot worth Rs. 42-8, and of the third plot worth Rs. 41-8. Deducting from these [illegible] cultivation (viz., Rs. 21) plus cost of ploughing noted opposite each plot, the profit [illegible] Rs. 19-6, Rs. 18-8, [illegible] 13-8, respectively, showing [illegible] ploughing with the improved plough [illegible] with the native plough.

41. The yield in each case was inferior as compared with the average of the past five years, owing to the unfavorable character of the season. There was no remarkable difference between the outturns of plots 1 and 2, but the results [illegible] go to prove that deep ploughing [illegible] economical, as shown in previous years, than shallow ploughing with a native plough.

42. Remarks on the quality of the grain.—With regard to quality, the produce of the Standard Series was, generally speaking, the best. The Duplicate Series came next in this respect. The most plump, white and uniform grains were found in

the produce of the plot treated with saltpetre in both the series. Plots treated with sheep-dung and cow-dung mixed with bone dust produced fine plump grains, but not equally good in color. The grain from the saltpetre and superphosphate plot was superior in quality to that of the cow-dung plot in the Standard Series.

43. In the green manuring series the produce of plots 11 and 7 was superior in [illegible] of quality to that of the rest, but inferior in every respect to the best [illegible] of the Standard and the Duplicate Series.

44. In the ploughing series the plot ploughed [illegible] produced the best quality of grain in the lot, but inferior to the best [illegible] of grain [illegible].

45. Experiment with Gram.—The experiment was made this year with the object of determining the relative manurial effect of [illegible] of lime (gypsum) upon the leguminous crop, and [illegible] ground Kankar [illegible] carbonate of lime in comparison with Farm-yard manure and bone superphosphate. The [illegible] was selected at the same time and [illegible]. The object was to find out whether lime would be beneficial to a leguminous crop if applied in the form of carbonate (which [illegible]) as well as in the form of sulphate. The [illegible] consisted of:—

(1) Ploughing, 3 times with the Watts' ploughs.
(2) Ditto [illegible] with the country plough.
(3) Levelling with the [illegible].
(4) Sowing at the rate of [illegible], per acre.

The following table gives the outturn of each plot:—

RABI STATEMENT No. V.—Showing the effect of different manures on gram in 1893-94.

No. of plot.	Manures per acre.	Outturn per acre.		Increased or decreased outturn as compared with the unmanured plot.	
		Grain.	Straw.	Grain.	Straw.
		lb.	lb.	lb.	lb.
1	Farm-yard manure, 100 maunds ...	1,543	1,083	+607	+156
2	Gypsum, 3 maunds ...	1,780	1,470	+874	[illegible]
3	Ground Kankar, [illegible] mds. ...	1,193	1,031	+257	+56
4	Bone superphosphate, 3 mds. ...	[illegible]	929	+272	—2
5	Unmanured ...	[illegible]	985	—	—

46. The value of gypsum as a special manure for leguminous crop has been recognised in England after years of experiments, and the results obtained in the experiment above show that it is capable of producing equally good effect in this country under favorable circumstances. The gypsum plot, though it gave better results than plots 1 and 2, has outstripped the superphosphate plot. It seems that lime is also beneficial to gram if applied in the form of carbonate in which it is very commonly found in nature. The profit or loss on each manured plot was as under:—

(1)	...	+11 12 0
(2)	...	[illegible] 4 0
(3)	...	[illegible]
(4)	...	[illegible]

This shows that gypsum is a profitable manure.

The rate at which the produce of each plot has been calculated in the above statement is given below:—

Grain [illegible] the Re.
Straw [illegible] the Re.

EXPERIMENTS WITH FOREIGN GRAINS.

47. Experiments relating to the acclimatization of foreign varieties of wheat and barley have been discontinued at my suggestion, and with the Agricultural Committee's

approval, but the experimental cultivation of Canadian oats carried on during the past 3 years has been allowed to continue with a view to obtaining more definite result. The outturn of the different varieties of oats is given in the subjoined statement :—

STATEMENT No. [illegible].—*Showing outturn of Canadian oats.*

Variety of oats.	Weight of crop, cut green, at [illegible] 8 Jan.		[illegible]	
	Green.	Dry.	Grain.	Straw.
	lb.	lb.	lb.	lb.
(1) [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(2) [illegible] Triumph	[illegible]	[illegible]	[illegible]	[illegible]
(3) [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(4) Welcome	[illegible]	[illegible]	[illegible]	[illegible]
(5) [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(6) White Egyptian	407	[illegible]	[illegible]	[illegible]

Date of sowing of each plot, 27th October 1893.

48. The outturn of grain is at once very poor as compared with the yield of Cape oats which produced 14 maunds or 1,120 lb. per acre, on an average, at the Experimental Station during the year. An attempt was made in the earlier stages of the growth of the Canadian oat crop to check the too luxuriant development of straw by nibbling the tops with a sickle to the extent of about [illegible] inches and thus to give the crop a chance of yielding greater outturn in grain, but this was unsuccessful. The crop grew inordinately in spite of the previous treatment—the plants giving off larger number of shoots most of which did not bear ear. Canadian oats appear therefore to be excellent for raising heavy crops of nutritious green fodder.

49. *Manurial experiment with country potatoes.*—This was started during the year with the approval of the Agricultural Committee on five plots with the object of determining the effect of certain nitrogenous manures as compared with the Farm-yard manure on the Farrukhabad potato, which is a most favourite variety with the natives. The following full detail of the operations carried on :—

STATEMENT A.—*Details of potato cultivation.*

Date.	Operations.
May [illegible] to 9th [illegible]	[illegible] country plough.
30th October 1893	Manuring.
[illegible]	Ploughing in the manure.
[illegible] and 14th October 1893	Ridging. The ridges were damaged by rain, hence,
[illegible] October 1893	Ploughing again.
[illegible]	Ridging again.
20th November 1893	Tubers planted on ridges 2 feet apart @ the rate of 10 maunds per acre.
14th "	[illegible] top dressing [illegible]
15th "	1st Watering.
22nd to 28th November 1893	Earthing up.
6th December 1893	2nd Watering.
17th to 19th December 1893	Earthing up.
23rd December 1893	3rd Watering.
4th to 8th January 1894	Earthing up.
15th January 1894	4th Watering.
29th "	5th Watering.
28th February 1894	Harvesting.

The sowing was delayed a fortnight, owing to late arrival of the consignment of the seed from Farrukhabad. The statement below shows the yield of the various plots :—

RABI STATEMENT No. V II.—Manure experiment with potatoes.

Serial No.	Manure applied per acre.	Cost of manure per acre.	Outturn (tubers) per acre.	Increase or decrease in outturn over the unmanured plot.
		Rs.	lb.	lb.
1	Farm-yard manure, 200 maunds	6	10,170	+2,977
2	Poudrette, 200 maunds	8	5,953	−1,240
3	Castor oil cake, 12 maunds	12-12	11,410	+4,217
4	Bone superphosphate, 4 maunds + saltpetre, 4 maunds	40	11,906	+4,713
5	Unmanured	—	7,193	...

NOTE.—Taking the cost of cultivation, exclusive of manure at Rs. 64 per acre, and the average rate at which potato was sold at Rs. 1 per 100 lb., the financial result of the experiment is as follows :—

	Rs.	a.	p.
(1) Profit	11	11	0
(2) Loss	[illegible]	[illegible]	[illegible]
(3) Profit	[illegible]	[illegible]	0
(4) "	[illegible]	[illegible]	[illegible]
(5) "	[illegible]	[illegible]	[illegible]

10. The highest yield was obtained from plot 4. Plot 3 stood next with a slightly lower outturn. It is a popular belief that castor oil cake is a beneficial manure for potatoes. In this experiment this manure has produced the best financial result. The tubers of this plot were far more numerous, though much smaller in size, than those of other plots.

The yield of plot 1, though less in quantity than that of plots 3 and 4, was superior to all the rest in quality, the potato varying from 4 to 12 ounces in weight and averaging about 8 oz. This is explained by the fact that Farm-yard manure being more bulky than other manures, renders the soil more loose, and the tubers find greater scope for development.

In the poudrette plot the growth of plants was too luxuriant owing to the highly stimulating effects of the manure, and they were seriously knocked down by the rain accompanied with hail storm on 7th of February, hence the yield was considerably lower than that of the unmanured plot. The potatoes of this manured plot were not only small but uniform in size; the largest weighed about 4 ounces.

According to the Kumaon dealers, the best potatoes for seed use were those produced from the Farm-yard manure plot.

11. Similar experiment was tried with hill potatoes [illegible]. The seed was obtained from Naini Tal through a contractor. The results will appear from the following table :—

RABI STATEMENT No. V III.—Experiment with hill potato.

Serial No.	Manure applied per acre.	Cost of manure per acre.	Outturn (tubers) per acre.	Increase or decrease in outturn over the unmanured plot.
		Rs.	lb.	lb.
1	Farm-yard manure, 200 maunds	6	[illegible]	[illegible]
2	Poudrette, 200 maunds	8	[illegible]	[illegible]
3	Castor oil cake, 12 maunds	12-12	2,656	+1,575
4	Bone superphosphate, 4 maunds + saltpetre, 4 maunds	40	2,981	+1,900
5	Unmanured	—	1,081	—

The crop was almost a total failure owing to very scanty germination and the experiment will be repeated next year.

MISCELLANEOUS.

52. Fodder crops:—Some experiment* were tried with fodder crops oVing the year under report, of which the most important and interesting was the on? relating to eattiation of Egyptian or Barsimi-l-wr (7VI/VI/I'»» Atex.i*>trt**m) tho s«d nf which waa obtained *h*om Egypt. It arrivwl at Cawnpore aiwut the middle of November I S'J3, and was tiiwn tint on the £l«t November. The fallowing are briefly the prol•.able conclusion* that can be drawn from the result* obtained by tbe experinrents trie: on different plot*:—

1. That the clover can be grown •uceeaaf ully in this part of the country ;

2. That Mil 1<»m is the most suitable soil for the crop, and that in a ftiff clay <wit tbe crop it almost a failure;

3. That early sowing in winter i* wwntial for its tucceuful growth ;

4. Thai manure it not essentially necessary, and that probably heavy manuring <lof* more barm than good ti> the crop ;

6. That weeding and irrigs'ation in the earlier stages of growth arc beneficial.

Tbe twoMtity for producing an much teed as possible prevented the determination this year of the number of cutting* that can be Uken during the growing period, and of the totail yield per acre of the pa-en food. Theae potnU will he attended to nexi year. Green clorer i» eaten with reliih by the cattle and *ikantt,* and *to* u the clover hay, and neither «een» to produce cofttvtmtns or#flatulon«. As tho experiment is quite new, I subjoin • itatomcnt(fivingfull details of the treatment »nd yield of the several pi->u • a which it v>i tried.

MISCELLANEOUS STATEMENT No. I.—*Showing experiments with clover* (*Rabi*, 1893-94.)

Serial number.	No. of Field as per farm map.	Area in square yards.	Class of soil.	Treatment.	No. of ploughings.	Seed sown per acre.	Method of sowing.	Date of sowing.	Date of reaping.	No. of weedings.	No. of waterings.	Average height of plant.	Actual outturn per plot.			Outturn per acre.		Remarks.
													Flowers.	Grain.	Straw.	Grain.	Straw.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
						Lbs.						Ft.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	
1	27. (Corner)	869	Light loam.	No manure.	2	6	Sown in the furrow opened by a country plough.	21-11-93	3-5-94	0	5	3 ft.	28	2¼	36¼	28	479	This plot which had been lying fallow during the rains was artificially irrigated before sowing and ploughed twice. The seed was then sown behind the country plough and buried about 3 inches deep. Germination did not take place until after 15 days after sowing. A light watering had to be given before germination, and the crust found at the surface softened by *kharpi*. The seed did not germinate where it was buried too deep in the ground. The crop was irrigated 5 times from December 1893 to March 1894. It began to flower early in February 1894, and the growth of stems continued till the end of March. When fully grown, the average height of the plants was about 3 feet. The flowers were white in color. The seed began to form about the end of March and was of yellow brown color in the end of April when fully ripe. Before formation of seed, two kinds of bees were frequently seen hovering about the flowers and these were probably the fertilizing agents. This plot gave the highest outturn of seed showing that early sowing in winter and light soil are apparently essential for successful cultivation of the crop in this part of the country.
2	34	842	Heavy loam.	Ditto	3	6	Broadcast	5-12-93	3-5-94	2	4	2½ ft.	41	$\frac{1}{16}$	40$\frac{1}{16}$	2¼	345	These two plots which had yielded kharif crops before, were first irrigated and then ploughed 3 and 7 times owing to stiff nature of the soil. The seed was sown broadcast and covered over with earth. The germination was even and uniform. The plants did not grow as high as in case of plot Serial No. 1—and the number of flowers was considerably less, the sowing of seed having been done a fortnight later. The land had received no manuring during the past 3 years.
3	17	490	Light loam but containing somewhat high percentage of clay.	Do.	7	6	Do.	5-12-93	2-5-94	1	3	2¼ ft.	69	¼	47¼	8¼	633	Plot No. 3, whose soil was lighter than that of plot 2, gave a comparatively higher outturn of seed and straw.
4	A.D. plot I	1652	Heavy loam.	Do.	6	6	Do.	7-12-93	2-5-94	1	5	2½ ft.	106	22	110¼	8¾	302	The treatment of this plot was similar in all respects to that of plot 2. The yield of grain was about the same in both, but that of straw from plot IV was much inferior.
5	23	946	Stiff clayey	Liquid manure.	2	6	Do.	27-12-93	2nd & 3rd May 1894.	1	3	2½ ft.	123	1	122	5	604	The soil of this plot was exceedingly rich from a manurial point of view. The growth of plants was therefore very luxuriant in the beginning and the crop "lodged" before flowering. The seed was sown very late, purposely in order to compare results. The yield of seed was very poor, but that of straw was fairly high.

53. Another experiment has been starts] during the year 1 to determine the relative economy nf towing meant by 3 different method* shown in tbc mbji>iued table :—

MIfctLLiXEOL'l StATitMiXt No, II—*Skewing effect of idfferrn! mttkodt of towing on Zwemt,*

Serial number.	.	llrtl.od of towing.	Oirtlnm prr u ».		
			IMioa Ant mt-Hat.	TwUIM cuttiuf.	Total.
1	C •	1. Sown broadoMt	lit	254	ITS
2	B •	I Sown to fomrm	Mt	we	m
	A •	S. oWnooridtM	U N	617	1.7OI
4	i M*nurisf jilol 13	4,	V M	U12	[illegible]

• A. B. C. *tn* I i trUtnHlf ifiin, to ciruin j.lou f_r f^ilitj of nfmu.

All tbe plot* wcry town on find November. The »nil in tfca firat three phti either failed to germinate or germinated ao Mantily that they had to be town again on 18ih January 18M, I"ho lergert quantity of green fudder wu yielded by the. two ploU in whieh the crop wu town on ridges, but the result has to 1, wttcUed in the nieceediDg yean in order to arrive at aome definite conclunon.

54. Among other fodder mpt growa were Sorghum S« charatttro, Reana Ituuriana, Mangel wvrvl, and Ouinea graaa. Tbe produce of each was utilixed fur foedin^r the Farm cattle and tbc brood marei bought lut year and btol en in the]itough.

55. EmiUp.—(1i'-'i>H fodder, if *f*«P*Aj* prwamd in $_r$it«, pMridee exeolleni food fi»r (rattle in winter when green forage w naturally M W . Dunng the year under report fodder wu atioed in two pitt. A detail of operatioQi and rwulu it giren bdow:—

Pit Jte. (1). *Squart • tajmtitf,* 21« «*»« *f*H.*~Tbc j^it w» ftrvt allowed to get perfectly dry in the tun. On 27tfa June 1993, nuke plaot* of wbii-A voU bad been removed, were fir»t hud at the bottom till a layer uf about 1 fout wu formed and a etmilar layer about 8 inchea thick wu nude ronud tia bar walli imide tbc pit. Eighty nunoda of green maize «ulkx Ml lh"« cut with a chaff-cutter, filled Ea by instalments in tbe »il» in oourae of S day*, and well truddan down by labourer*. \ layer of maise <t*lk*. 1 foot thick, wu thi-n vproad over tbe oompreaasd fodder, and the pit covered over with earth. The autface wu then IfaonfUjr rammed and «lope« made la in order to prevent prttaiKility *tl* damage by rain water. At the mrfaoe sank owing to ahri&kaf* of fodder more earth wu put up and rammed.

The pit wu opened 00 let January 169*. The topmoil layer of about 1 foot depth, wu found unmtitable for uae u cattle food owing to bad im. 11, bat the tUage Wow thi« layer wa* perfectly good, and wu eaten by cattle witb much reh»h. Tb» total weight of ediUo fodder obtained wu, bowwr, only *tl* maundi. Tbe loai of carbonaceous matter due to fomentation wu apparently ronttderable.

/•fc AY (I). *CifKitj.* 480 *ewtie/Mi.*—Thb wu filled aimilarly in Sepumiber with 104 maund* of ehopnod dry nui» atolki, but u rain fell while tbe ailo wu being filled, tbe nperiment proved uniucceMrul; the pit when opened in March 18»* having been found to oontain hufUy fermented and totally deoompoevd fodder quite unfit for oosummpQon.

M. Tbe two tablra given brlow fbow the effect of continuom cropping on us-manured land :—

(«) with oat and the aatne emp;

(t) with two crept (wheat and maue) uk«a in rotauun.

MISCELLANEOUS STATEMENT No. III.—Showing effect of continuous cropping with one and the same [illegible]

Year.	Outturn per acre of unmanured wheat year after year.		Outturn per acre of unmanured plot cropped with maize year after year.		Outturn per acre of unmanured plot of A, B, series, cropped every year with cotton.
	Rabi Standard Series.	Green manuring series.	Kharif Standard Series.	Kharif miscellaneous or mineral manure series.	
	lb.	lb.	lb.	lb.	lb.
1881-82 ...	777	—	1,239	—	—
1882-83 ...	1,065	—	1,062	—	—
1883-84 ...	1,031	1,215	930	—	—
1884-85 ...	625	623	1,044	684	—
1885-86 ...	313	1,307	329	581	—
1886-87 ...	1,041	847	435	1,222	—
1887-88 ...	908	786	Crop destroyed.	145	—
1888-89 ...	883	653	Do.	Crop destroyed.	145
1889-90 ...	1,307	1,404	279	268	87
1890-91 ...	1,222	1,162	871	169	94
1891-92 ...	902	820	2,030	730	129
1892-93 ...	1,340	1,300	218	487	44
1893-94 ...	1,146	877	1,645	299	134

N.B.—Wheat is sown in October and harvested in April, and the land [illegible] fallow till the next October.
Maize " June " September " " " " June.
Cotton " " " " " " " " "

MISC. STATEMENT No. IV.—*Showing effect of continuous cropping with two crops raised alternately.*

Year.	Outturn per acre of unmanured plot cropped with wheat and maize alternately.				Remarks.
	Duplicate Series A.		Duplicate Series B.		
	Wheat.	Maize.	Wheat.	Maize.	
	lb.	lb.	lb.	lb.	
1881-82	771	—	—	—	In these two plots wheat follows maize after an interval of about 12 months, and maize follows wheat after an interval of about three months.
1882-83	—	924	990	—	
1883-84	2,091	—	—	902	
1884-85	—	564	1,025	—	
1885-86	1,119	—	—	[illegible]	
1886-87	—	295	1,258	—	
1887-88	—	—	—	Crop destroyed.	
1888-89	—	Crop destroyed.	617	—	
1889-90	[illegible]	—	—	902	
1890-91	—	811	1,307	—	
1891-92	[illegible]	—	—	620	
1892-93	—	927	1,734	—	
1893-94	1,107	—	—	265	

The variations in the successive yields of the various plots were due to the effects of [illegible] season, but the outturn in the recent years has been sufficiently high in most cases to show that no exhaustion [illegible] place on account of the continuous cropping.

The yield of maize in the [illegible] Series [illegible] the cro[illegible] [illegible] after [illegible] 3 months rest is generally inferior to the yield of maize from the unmanured plot of the Standard Series which gets a rest of about eight months between two crops. This result is [illegible] consistent with reason.

CAWNPORE;
The 13th June 1894.

SAIYID MUHAMMAD HADI, M. R.A.C., M.R.A.S.,
Assistant Director.

J. A. D'M.—P. No. [illegible] Press Dept.

REPORT

ON THE

Cawnpore Experimental Farm

FOR THE

Kharif and Rabi Seasons, 1894-95.

ALLAHABAD:
PRINTED AT THE NORTH-WESTERN PROVINCES AND OUDH GOVERNMENT PRESS.
1895.

No. 1515 of I 8 » ,

OEPT. OF LAND RECORDS A>JD ACRICULTURE, N.-WP. AIMDOUDH.

Doled Camnp'ire, He 2Sr/ *Stp'.tmh:r* 1895.

FROM

C. HOPE, Esq., c.s.,

OFFB. DUIECTOK *Of* Li-tD RECORD AX© AOBICCLTPRS, NoBTU-WsnuV PlloVIXr ES iXO I Oudh,

To

Tun CHIEF BEC&BTABY n I OVERNMENT,

North-Western Provinces • Asr. I Oudh.

Su,

I HAVE tlic honor to forward UH Annual Report on the Cawnpore Farm (or 1894-95.

2. The report lias bwn draws up on the IfBH n ggested by the Agrricnlhiw] Chemist to the (Jovcrnmontof India, and tfatsmagtanat *9* tharefbfi different from, that adopted in ptrioMjua It » the record ofa»auoii that w« I>y a,, *meuu* wti»facWy fn.ni an ttpanmaota] point of view. Ttw *txatminly m** weather damaged ,)l() *e* rops etptoklly the kliartf crop., and delayed the. prepann tion of the ground for t ,]8 gprin^ crop». The outturn was thmia many ca«a extraordinarily knr, an.1 it maid be unvn«r to attach too much importance to the ruiutti.-. At UH MM timo my prvdecewor wag not aatistied that the pair nsulti *mn* Mtfaoljrowisg to the bad weather, and he waa obliged to make WIM clange in the •nnnKeiiwnla for tiu i control of the operations at the farm.

3. The moat important rxperimenta wore : those conducted I with ^uraut*, which dcriw a apMial valuu from tlwanalytic road. Igrieoitanl Cbtmift, IUI.I diiuuMed by htm in hi» note which form* an appewlix to tl the report. In tlww province* cxnn of the *p.n,n,U* vanoljf. are nut urdmarilv n for the production of sugar ; ,hUt ^ w-> »howi» by an npariaaat D»d« bj UM Principal of Uw AgrMaltttnl School, to kttefit <>f ilia »Lu.l.!il», tfaaU excellent gur could be made from the *pu**4i* i groirn in U» neighbourhood of ;lie farm by ordinary cultivator. Tb«M var: un? much mi in- e«t«fa] ami txpMI • Ih.- ordinary kind), (nit limy triveavrry mu< h hbjbtr oottam per acre; «nd ir the exporuomi m made this year .(% nwcwsful when r*i*at^I on a blfff Male,! *grvx* impetus should be given to thetr cultivation aa acauenula! f manofa l«tD(f tiperimet)ti<d with at the Urin ; ami tho anah »i< u .. by the Ag rfoullural Chemist next year will tie *liuM* forward to with tnUnsl, a» Ih.r n-.ulu oftkeit i experiments may prove to be of very great practical importance.

4. Ttw ulkw inn* introduced from A- by Mr. Darrah thfJVK well ti> May, when the hot waatber killad thuni. It will he iweaaary to repeat the experiment to aittrttain whether they can, with proper precautions., mrrhn the hot MMOD; but the price oUkiaaUf for the *m* at preaent M> low tin I doubt whether thfrtpfrimrnt will prove a financial •••«•.

5. Tlte rialiion ki*pt at tl»e Unn h-w prowl nniuc^ewful, ..,r at I>.»<t my m„- »• • t«fel*Krttrr, and I>aa bren rrplaccd by moUwr. *Then* i< already a fairly good demand for the »eni«a of a aUltion, but. a* the AnwiUnt Director • points out, the •area Mat are not alwaya of a p''»l Uttedinff *claa* or ap«, and it toaj be necessary »o aoae ca«« lo r»fu*» the KtvicM of the rt*lli<>ti in future.

1 liaw t!i honor to ht,

In,

Your most obedient utrut,

C. HOPE,

Officiating Director a/ *Land Records and Agriculture.*

REPORT

ON THE

CAWNPOHK EXPERIMENTAL FARM

roB THE

KHAR1F AMD RABI SEASONS, 1894-95

In compliance with G. O. No. j-, dated Rth May 1895, encloting copy of Cironlar from Government of India, No. g ~ > dated 2find April 1895, together with a note from the Agricultural Cherout to Government of India on the recording and publication of rcsu'.U of tEptriMBtl carried out on farm* in India, the form of thin report hat boon altered thi* year and the information embodied herein clasiified under the following head* :—

I. History of the farm.

It. Genera] character of the *ea»on.

III. Trial of manure*.

IV. Method* of cultivation.

V. Trial of implement!.

VI. VarietiM of crop, including fodder*.

VII. Diitribution of implement*.

VIII. Ditto of seeds.

IV Sericulture.

\ Ilone-hreeding.

XI. Cattle ud cattle-breeding.

I. HISTORY OF THE FARM.

I. The OoteramMit Farm, Cawnpow, i» tituaUd in riltage Gotaia al. out three milr. t^nth-w-t of Cawnpow dtj. It *i** n«r the lUwstpur lUtiou of the Borabajr, Baroda and Central lulia Railway, and iU di.Ut.ee from the Cawopore Eait Indtin Railway itatwa i« abool four mil«,

Th« bnd ocewpwd *•• originally rental *ftmi,* tlir Mtafadafi ->f Ootaia in M*i- 1851, and in tUal)«*r »'••• imp«'"*»'>t manurial M[*rimenl» *till ctrriwi on in the standard " and " duplicate " tenw, *mUe\i* «ill he described proaenlly, w«c »Urt«l by Mr J. H Fuller Within a ihort *iM—M* »f the farm prwniaef, a mull workihop for making and »|»iriD5 agricultural ijnplemeoU and a «eed-«U)re w,-re erected.

During th* firrt *yt*n* of management tl« an» of ihr farm underwent fr*ju«nt ihwigra. Iml of late year* it ha* not varied. The farm j.M|*r, «f wbich a map • att»ched, extends to 61*t atrw, eiclnJini: *»< t»nd covered by tlw canal di»lnl>uUry

It rtj<7» apeeial facilitief for irrigation, being traTerml by a diatribatary fwmtb* Ganges Canat.

Th« aoil pf the farm maj be accepted a> a fair vample of tU h'ghl reddiah loam which «««re *»»r a Urge portion tit the «angt».Jttmn» Do4l> It w*a cheuically

•naiyW HUM limr before 1882 by Mr. S. A. Hill. BSc., Meteorological Reporter to A t l» x< run.. »' • •' the North-Western. Province*, and the analysis is given below :—

Constituents.							Composition per cent.
Combined water	...	...	...	...	...	...	2·04
Organic matter	...	...	...	...	...	...	trl
Carbon dioxide	...	...	...	...	...	...	0-1*
Ammonia	...	...	...	...	...	...	\ Ml
	...	...	...	...	...	...	(Til
Cfclwuw	...	...	...	...	...	...	
Sulphur trioxide	...	...	...	...	...	...	Do.
Phosphorus pentoxide	...	...	—	...	...	...	0·51
Silica and tungstic oxide	...	...	...	...	...	...	0·13
Alumina	...	...	...	...	...	...	4·20
	...	...	...	...	...	...	S!
U M	...	...	...	...	...	...	0·14
Magnesia	...	...	...	...	...	...	
M a *	...	...	...	...	...	...	(Ftl
Soda	...	...	...	...	...	...	
o*r J-T..PP-J bj u, s o» Uamiu out* <4 i«"	...	...	...	...	...	...	•akll
	...	...	...	...	...	...	FWM

Several fields had been f..un-l l,r ntpmmr* to wfor (root waUrlogfpitf wbrft much rain Ml within * limttetl pshod. Ttt* *U\A* «f tuch flatib WM raited l«>" m powil>:« to do so) in 189-i *j B M M of *pn«duifc «rtli -lojf oat from uncultivated .trip* of land «lj<>inifli!, in urdsr to impwf* tba dnuu«* Lwy* qoaatitiM of earth •taken from tli* w u l dutri^uUry wrn >pr«ad for •imilar porpoM on a plot (field No. 9 nn tb* map) wtucb natd to U oadnvmUr In th« gnatrr part of UM niny season every year.

II. GENERAL CHARACTER OF THE SEASON.

3. TV *rmt* uder wport WM mv vpi»TtMnU* *tm* agricultural operations. The total niafall WM v#ry Imw, Utnk' nwrr tUn donUe of tlw nnrnut. IV rains mmowuMd at tb» propdr tiiM in Jq»» but mottmied, with few lm«kt, to ao exceptionally late prnod. The following statement shows the amount and distribution of rainfall dttrinn tin- *jmt* nnd«r rtpor- and the previous year :—

Months.	Rainfall: Normal.	Rainfall: In 1893-94.	Rainfall in 1894-95: Rainfall in Cawnpore as published by the Meteorological office.	Rainfall in 1894-95: Rainfall at the Government experimental station as registered at the station.	Rainy days: Normal.	Rainy days: In 1893-94.	Rainy days: In 1894-95.
April	0·11	...	...	...	1	—	1
May	0·32	0·62	0·52	0·35	1	3	10
June	3·11	4·10	4·90	7·86	4	10	12
July	10·23	21·45	10·67	9·80	12	16	23
August	10·06	12·14	10·71	10·02	12	9	9
September	4·93	9·60	9·32	10·12	7	8	8
October	1·22	7·17	12·20	10·12	2	9	7
November	...	0·24	3·02	3·04	...	1	2
December	0·34	...	0·60	·98	1	—	8
January	0·64	0·02	2·02	2·01	1	2	1
February	0·28	0·56	0·32	·32	1	2	1
March	0·24	0·02	0·40	·30	1	—	[illegible]
Total ...	31·13	59·62	64·43	62·98	43	55	73

The continuance of rains considerably interfered with the weeding of crops in the *kharif* season and the ploughing up of fields intended for *rabi* crops.

reatly damaged by the excess of rain, while *bajra* and t-ii ww» MspUtoty tUrtrojf,].

TU plot, uftdn ranAMi of sugarcane . M U I H J «ra«t tnjwy ftMM floods, and a severe •Una > IW wl «| July last Utf « o « * e4rUia ollut plot*. The rain: ordinarily heavy fall in October proved extremely injurious to cottons of all kinds, and delayed the preparation of tilth land for the succeeding rabi. Further delay was caused by heavy showers in the beginning of November, and it was found impossible to commence the rabi sowing until the 23rd of November. The continuance of wet or cloudy weather in the months of January and February resulted in the appearance of rust, which caused great damage to a number of plots under wheat.

The subjoined table compares the average and maximum yield of wheat and maize during the year under report with that in the three preceding years :—

Year.	Average yield per acre at the farm.		Maximum yield per acre at the farm.		Remarks.
	Wheat.	Maize.	Wheat.	Maize.	
	lbs.	lbs.	lbs.	lbs.	
1904-05	901	890	1,727	1,288	
1903-04	1,252	1,041	2,784	2,551	
1902-03	1,792	1,123	2,777	3,072	
1901-02	1,133	1,780	[illegible]	1,815	

The average yield of wheat from unirrigated area during the year under report was 1,18[illegible] lbs. per acre, while that from the irrigated area was only 798 lbs.

CLASSIFICATION OF EXPERIMENTS.

4. The experiments conducted at the farm are classed as "permanent" and "temporary."

The former are conducted on the same plots year after year for an indefinite period and are directed to show the effect of different manures on maize and wheat and of deep and shallow ploughing on the latter. The "temporary" experiments are arranged from time to time for limited periods, and are at present tried in the *kharif*, chiefly with cotton, sugarcane and indigo, and in the *rabi*, with potatoes, peas, gram and certain varieties of crops.

III.—TRIAL OF MANURES.

(a).—*Permanent manure experiments with maize.*

5. The experiment is tried on two series of plots called the "standard" and "duplicate" series. In the standard series, which consists of 13 plots (plots K1 to K13 on the farm map attached) maize is taken year after year after a fallow of nine months. The duplicate series consists of two sets of 13 plots each, namely, plot A1a 1 to A1a 13, and A1b 1 to A1b 13. Each set is cropped alternately with maize and wheat, maize follows wheat after a fallow of about three months and wheat follows maize after a fallow of nearly 13 months. Thus, when one of the two sets bears maize the other remains fallow.

The object of the experiment is to determine the effect of certain manures on the yield of maize of the same variety when grown year after year on the same plots and when taken alternately with wheat. The manure applied to each plot in one series is always applied to the corresponding plot in the other. The experiment was originally started in 1881, but the trial of certain non-nitrogenous manures applied singly was subsequently dispensed with, and other manures added to the experiment until the latter assumed its present form in 1884.

The method of cultivation followed is alike in case of both the series.

The plots of the duplicate and the standard series were flushed with canal water on the [illegible] and [illegible] June previous to ploughing, and sown on the 20th and 21st of June, respectively, with seed at the rate of 12lbs per acre. Rain fell continually from [illegible] 22nd to 29th. The total rainfall during these days amounted to nearly 7·5 inches, of which 4 [illegible] inches fell during the three days which immediately followed completion of sowing. Cloudy weather with showers continued from 2nd to 9th July, and the total rainfall during this period amounted to [illegible]. The [illegible] the fields greatly interfered with gonnmftli- a All pa«ib)« tnwwnrti w«r* lakm to Jw it of, but with imperfe• (IMCMM. Tlirrr wai • *Utmk* bttwMn 16th and **th J uly neces*«U(u>g irrigation of the enp, an 1 HK plot* wff* wal»-ml on the 27th ami 28th of July. Tin* wa*t bowf-vrr. tacwnlMl ttnioniiAtrir \>*y* hrm*y tb''»er« of ratn «biib continued thr•nr'i.'-Mt UM MMog, Uwra Uinf ao 1«M tlun 8S nunv Jar* in August »'oot with a total rainfall of'' 19 inclxx.

l'lou X<». 4,5, 9, 9, 11 ID.) 13 of th»fa»iUnlMnMMd 3,4,9,6, 13 iwl H of the duj.iiv»i* Mriat wart graatly duBagcd by Uw M O M o(nun ; all theolhir pl<** alto •t.fl.TMt nv<r<-T)«-»« mlh (1* «an* can**, kid the tmttiirn in both the Bprtm *« *verj* pA»r on the wholr, a* nouUl «fijw (ran UM foUowmif •.'.aU-m«ttt*in wbich *On-'* ratalU are UbttlaUd.

Th» *M** baviDif t.iff^rel to amaiimly fn.m tUe nin, it i* na«t« U tin'' any conclusions about the effects •f tuiouiT Moat of the plots of the duplicate series, which are on a somewhat higher lent UH! tbrrrfotr In* liaU« tn «ftUrWggin tbat> the standard ploU, liate, ronlivy to tbr rwuld obUmWl in good ynum, girM b-tter yield tbaa the *Und*nt plots, abowittg tlut in ut lUonnmJly mt ywt auit< is particularly liableI to injury in bwlyiog field* j- which w >tn n.ar ttigutr.

Statement showing the outturn of the Sharif standard series.

Outturn per acre in lbs.

Plot number.	Plot area.	Treatment with reference to manure per acre.		1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.
K1	Each plot—400 square yards.	C. [illegible] maunds	grain	650	484	1,720	1,032	[illegible]	[illegible]	Crop destroyed by rain.	48	1,210	488	[illegible]	600	[illegible]	1,101
			straw	—	498	3,479	6,198	[illegible]	[illegible]		254	6,470	027	[illegible]	4,146	[illegible]	6,806
K2		C. [illegible] maunds	grain	1,218	758	1,644	1,014	[illegible]	[illegible]		—	1,150	246	[illegible]	605	[illegible]	1,077
			straw	—	283	3,733	7,869	[illegible]	[illegible]		237	7,187	67	[illegible]	2,064	[illegible]	9,210
K3		C. —	grain	633	169	1,462	[illegible]	[illegible]	[illegible]		—	1,300	66	[illegible]	435	[illegible]	702
			straw	—	823	3,516	[illegible]	[illegible]	[illegible]		131	7,247	[illegible]	[illegible]	750	[illegible]	6,408
K4		[illegible] dung —	grain	723	52	1,073	[illegible]	[illegible]	[illegible]		24	805	[illegible]	[illegible]	160	[illegible]	278
			straw	—	89	3,165	[illegible]	[illegible]	[illegible]		169	7,817	[illegible]	[illegible]	1,300	[illegible]	3,730
K5		[illegible] —	grain	—	2,100	1,066	[illegible]	[illegible]	[illegible]		34	1,041	[illegible]	[illegible]	357	[illegible]	423
			straw	—	2,176	3,715	[illegible]	[illegible]	[illegible]		494	6,870	[illegible]	[illegible]	1,210	[illegible]	4,876
K6		[illegible] maunds + bone-superphosphate	grain	—	—	[illegible]	[illegible]	[illegible]	[illegible]		Crop destroyed by rain.	1,240	[illegible]	[illegible]	455	2,408	738
			straw	—	—	[illegible]	[illegible]	[illegible]	[illegible]			1,468	[illegible]	3,624	2,006	10,345	4,919
K7		[illegible] maunds + bone-dust 44 maunds	grain	—	—	[illegible]	1,316	[illegible]	[illegible]			1,627	[illegible]	[illegible]	1,065	3,291	1,140
			straw	—	—	[illegible]	6,626	8,780	[illegible]			6,180	[illegible]	[illegible]	1,734	12,957	7,829
K8		cow-dung + saltpetre	grain	—	—	[illegible]	1,314	725	[illegible]			1,162	[illegible]	[illegible]	200	3,122	460
			straw	—	—	—	6,195	6,508	[illegible]			9,535	[illegible]	[illegible]	1,040	10,866	4,508
K9		[illegible] —	grain	1,[illegible]	—	—	1,022	461	726			1,012	[illegible]	[illegible]	327	2,[illegible]	472
			straw	—	—	—	7,958	3,173	820			8,204	[illegible]	[illegible]	4,452	8,[illegible]	6,244
K10		[illegible] dung —	grain	—	—	—	1,316	290	701			1,198	[illegible]	1,212	200	3,055	611
			straw	—	—	—	6,095	1,073	372			9,862	[illegible]	5,680	2,764	10,466	7,071
K11		[illegible] + [illegible] maunds	grain	—	—	[illegible]	1,044	436	[illegible]			1,271	[illegible]	605	210	[illegible]	520
			straw	—	—	[illegible]	6,633	2,698	[illegible]			10,376	[illegible]	1,004	1,730	[illegible]	4,053
K12		[illegible] dung 190 maunds + [illegible] 8 maunds	grain	—	—	[illegible]	1,269	330	847			1,200	[illegible]	1,108	738	[illegible]	774
			straw	—	—	[illegible]	5,779	2,000	6,376			6,904	[illegible]	3,249	2,321	11,447	8,040
K13		No manure	grain	1,289	1,002	[illegible]	1,044	[illegible]	433			279	[illegible]	544	219	1,640	194
			straw	—	7,125	[illegible]	5,773	[illegible]	3,747			4,247	5,324	5,069	750	7,315	3,327

N. — 1 maund = 82 lbs.

Statement showing the outturn of the Kharif duplicate series.

Plot number.	Plot area.	Treatment with reference to manure per acre.	1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.
			Outturn per acre in lbs.													
Ala 7	Each plot—480 square yards.	Cow-dung … maunds … {grain / straw	—	—	[illegible]	[illegible]	[illegible]	[illegible]	Crop destroyed by rain.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala 8		Cow-dung … maunds	—	—	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala 6		Cow-dung	—	—	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala 9		Ashes of … maunds of …	—	—	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala 4		Saltpetre	—	—	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala 11		Saltpetre manured … superphosphate	—	—	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala 10		Sheep-dung	—	—	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala 3		Ashes of manured	—	—	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala 2		Poudrette	—	—	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala 1		Sheep-dung	—	—	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala 5		Saltpetre … do	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala 12		Sheep-dung	—	—	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala 13		Unmanured … {grain / straw	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

N. B.—One maund = 82lbs.

(I)—Permanent manure ffptrimrnf mti tektet.

fl. Like the permanent manure experiment with maiw, this experiment i* tri^l M two teritM of 1$ ploU each. In tbo one called tu> " «Undard " aerie*, wheat i» mown jear after year, and in the other callnl" duplicate " §eri*», it is takmi in rotation with maize in the manner elated in detail under the maize experiment in paragraph &.

The objw-t of ili-' eiperiment b lo determine :—

(a) the effect of ordinary ami artificial manures on wheat ;

(6) tbe utility of rotation ;

(r) tbe length of tbe period for which wheat can I* tuccctsfully grown year after year on tbe fame land.

TV .•x|>rrunent auumed iU prwent form in 188-t aiul has ti&dergonn no modifi^a-tk>M siwe then. Tbe aeed wed ii of tin- Sf*at*affimagar variety and io sown at the rate of 120IU per aero. Manure i§ appliwl before sowing bi all the ploU euvpt thoae tn«W with («) wltpatre, {«) laiipetn anil bmi*-duit,and (•) taltpelre and bone fuper-phoephaU, in WIIOM caae the «ali]*'trc U uxsl ac a topdreawing when the plant* are fairly »p. Only one watering wa* required (hu year in plaoe of the three usually given.

On account of woeaaive rain» in October and the tint week of November the ra&iaeaton ploughing cauId n*>t uonunance xwoer tliati tn> IStb, and towing »uU not be done until the 23rd of November, *i.e.,* more than a month after it fthould. have beei i in an ordinary drjwaion. T[1]— tropwaa bunettod en th<' 11th-f April. Tbe out* turn froi a 1S4US2 to 189 W5 i* »hown in the two iUtemcnbi following :—

Manure experiment with wheat standard series.

Plot number.	Plot area.	Treatment adjacent to manure.		1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.
				Outturn per acre in lbs.													
[illegible]	Each [illegible] square yards.	Cow-dung + bone-dust 4½ maunds	grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Cow-dung + gypsum 3 maunds	grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Cow-dung	grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Ashes of cow-dung	grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Saltpetre	grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Saltpetre [illegible] maunds + superphosphate [illegible]	grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Sheep dung + bone-dust	grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Ashes of [illegible] maunds [illegible] cow-dung +	grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Poudrette	grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		N	grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Saltpetre + bone-dust	grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Sheep dung + gypsum	grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Unmanured	grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

N. B.—One maund = 82 lbs.

Manure …

Plot number	Plot size	Treatment with reference to manure.	Outturn per acre in lb.
A1b1	[illegible]	Cow…	[illegible]
[illegible]	[illegible]	Cow…	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	2 cow-dung	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	… + bone superph.	[illegible]
[illegible]	[illegible]	… ½ maund	[illegible]
[illegible]	[illegible]	Ashes of … manure	[illegible]
[illegible]	[illegible]	Poudrette	[illegible]
[illegible]	[illegible]	Sheep-dung	[illegible]
[illegible]	[illegible]	Saltpetre … saw-dust	[illegible]
[illegible]	[illegible]	Sheep-dung + gypsum	[illegible]
[illegible]	[illegible]	Unmanured { grain / straw	[illegible]

N.B.—One maund = 82 lbs.

The yields were generally poor as compared with the majority of the past years, the crop having been under the [illegible] a shorter period of growth on account of the particularly late sowing. These plots, however, completely escaped the attack of rust, which caused considerable damage to other experimental crops of wheat.

Speaking generally with reference to the effects of manures, the effects of sheep-dung applied alone or with other artificial manures are, as in previous years, particularly marked, and the results may be taken, on the whole, to be in favour of the value of this particular kind of dung. Sheep-dung [illegible] and sheep-dung with gypsum, produced the highest yields in the duplicate and standard series respectively. Sheep-dung alone gave very fair results in both the series. The plot to which nitrate of soda alone was applied as a top-dressing [illegible] second in the standard series, and third in the duplicate series. [illegible] a better outturn than all other plots in the duplicate series except [illegible], though the [illegible] did not [illegible] in the standard. Sulphate of ammonia with superphosphate acted more beneficially this year than with [illegible] of sheep-dung. The yield from poudrette, which is [illegible] in nitrogen, was greater in each series as compared with the outturn from cow-dung. Cow-dung with bone-dust produced more grain in both the series than cow-dung alone. These results [illegible] the fact reported in previous years that sheep-dung is the most useful fertilising agent for wheat.

The highest quality of straw was obtained in the standard and duplicate series, respectively, [illegible] both of which are nitrogenous. The proportion of straw to grain [illegible] in the case of the [illegible] sheep-dung plots of the standard series, [illegible] and in the duplicate series [illegible] in the case of the cow-dung and [illegible] plots. The poudrette plot is [illegible] series also gave a high proportion of straw to grain.

(c.)—Manurial experiment with indigo.

7. The object of this experiment is to determine the manurial effect of gypsum and bone-dust as compared with cow-dung on the yield of indigo, an unmanured plot being also included in the experiment. It was started in the year 1893-94 in field No. [illegible].

The plots were sown early in May after a preliminary watering. The crop received three waterings subsequently and was cut on the [illegible] September.

The following statement gives the details, &c., of each plot.

Statement showing the comparative effect of gypsum and other manures on indigo.

Plot number.	Plot area.	Manure applied per acre.	Outturn of green indigo stalks in pounds. 1893-94.	1894-95.	Remarks.
[illegible]	Each plot = 1210 square yards.	Cow-dung [illegible] maunds	12,130	2,214	
[illegible]		Gypsum [illegible] maunds	10,400	1,664	
[illegible]		Bone-dust [illegible] maunds	10,050	2,072	
[illegible]		Unmanured	7,000	2,204	

N. B.—One maund = 82lbs.

The yield was considerably below the average, due to a very bad attack of the insect *godahi* ([illegible]) in the early stages of the growth.

(f.)—*Sugarcane experiment.*

8. Two experiments were tried with sugarcane in 1894-95 under instructions from the Agricultural Chemist to the Government of India. One of these which was to determine the effects of certain manures on sugarcane crop was conducted in a series of nine plots, each plot being [illegible] of an acre in area. The plots were ploughed twice with the [illegible] plough and each ploughing was followed by levelling the ground once with the *patela*. They were then ploughed eight times with the country plough, and cow-dung was applied to plots 2 and 3. Two more ploughings were made with the [illegible] plough subsequently and the land was levelled with the *patela*. Cuttings of cane of the [illegible] variety were then planted on 8th March 189[illegible] [illegible] the country [illegible] in [illegible] made by a native plough, and the experimental manures were put in the furrows immediately before planting. The cuttings had been previously kept in a pit for ten days and covered over with earth which was moistened with water every alternate day. The fields were again pressed with the [illegible], and this was followed by the making of [illegible] and dividing the plots into small irrigation beds. The plots were watered three times and weeded and [illegible].

There was a long break from [illegible] to 29th of July 1895, and the crop had therefore to be artificially irrigated from [illegible] to 29th July; but there was unfortunately a heavy fall of rain immediately after the irrigation, and that fall was followed by continuous heavy rain up to the middle of September, when there was a break of only about ten days, and then there were heavy rains [illegible] 18[illegible].

A considerable number of plants were laid in consequence of the storm accompanying the rain of 29th July in plots 7, 8 and 9; plots 1, 2 and 3 also suffered from the same, though to a less extent. Attempts were made to raise the laid plants which died totally, being followed by the breaking up of such plants. The storm [illegible] of 4th October proved still more injurious. Under such unfavourable circumstances the action of manures would not naturally be as good as it would have [illegible], and it is therefore [illegible] to draw conclusions about the comparative efficacy of manures from the results obtained.

9. The Agricultural Chemist to the Government of India [illegible] the crop [illegible] some of the plots and analysed samples of juice and [illegible]. The [illegible] separately from the laid [illegible]. Likewise their *gur* was [illegible] expert who used a mixture for clarifying the juice. It is prepared and used in the following manner:—

Bugl[illegible] and *bhindi* [illegible] ([illegible]) are steeped in 12 lbs. of water for 24 hours [illegible] between [illegible] and the liquid strained through a fine piece of muslin. One tola or about three drams of powdered alum is added to the liquid. The latter is then boiled till it is reduced to half its original bulk. [illegible] piece of cloth and [illegible] mixture is added to each [illegible] has been removed in the [illegible] taken off. The mixture keeps only for a week.

10. Generally speaking, the *gur* from laid cane [illegible] and sugar crystals to that from the standing cane, and sold at a less price.

11. *Results.*—The results obtained from the nine plots are summed up in the following table :—

Plot number.	Plot area.	Treatment with reference to manure.	Weight of yield per acre in pounds.			Percentage of			Weight of green tops.	Weight of dried leaves.	Total weight of tops and leaves.
			Cane.	Juice extracted from cane.	Gur made of juice.	Juice expressed.	Gur. In juice.	Gur. In cane.			
									lbs.	lbs.	lbs.
23/1	Each plot = 1,210 square yards.	Unmanured	39,234	19,300	3,102	47·82	16·48	8·12	4,053	912	4,945
23/2		Cow-dung 7 tons ...	36,414	19,150	3,134	52·61	16·36	8·37	4,401	608	5,009
23/3		" 14 " ...	34,712	17,780	2,936	51·22	15·95	8·17	4,128	604	4,732
23/4		Bone superphosphate 5 cwts.	37,440	18,929	3,195	50·55	16·80	8·54	4,300	724	5,030
23/5		Saltpetre 2 cwts. ...	35,272	18,058	3,106	51·05	16·98	8·71	4,501	704	5,262
23/6		Bone superphosphate 5 cwts. + saltpetre 2 cwts.	30,032	15,062	2,656	49·29	17·63	8·60	3,837	606	[illegible]
30A/1		Bone-dust 5 cwts. ...	47,376	24,924	3,484	52·49	13·98	7·32	4,574	1,373	5,947
30A/2		" + 2 cwts. saltpetre.	41,808	21,630	3,076	51·98	14·19	7·35	3,587	507	4,357
30A/3		Unmanured	43,120	21,646	2,976	50·20	13·75	6·90	2,363	508	2,871

The highest yield of gur was given by plot No. $\frac{30A}{1}$, and the lowest by plot No. [illegible] [illegible]

12. A fact of some interest [illegible]

This is sufficiently clear from the results obtained with particular care in case of plots $\frac{30A}{2}$ and $\frac{30A}{3}$, which [illegible] proportion of laid cane. The results are given in the following table :—

Plot No.	Kind of cane.	[illegible]	[illegible]	Weight of gur.	Percentage of juice expressed.	Percentage of gur. In cane.	Percentage of gur. In juice.	Remarks.
		lbs.	lbs.	lbs.				
30A/2	Standing cane ...	4,315	2,406	407	50·21	9·28	16·43	With a view to obtaining these results the quantity noted in column 3 was crushed separately in case of [redacted] kind of cane for a [illegible] was separately boiled down to gur.
	Laid cane ...	4,207	2,164	302	50·53	6·73	13·29	
30A/3	Standing cane ...	3,342	1,650·5	261	47·06	7·81	16·30	
	Laid cane ...	7,480	3,611·5	453	[illegible]	[illegible]	[illegible]	

[illegible] laid cane was also decidedly inferior in quality to the gur made from standing cane [illegible] these two points are proved [illegible] years, they [illegible] conclusion that highly stimulating manures, which may cause too luxuriant a growth, are not suitable for sugarcane.

{e}.—Xjptrimtnt with tvielitt of tuyareant.

15. Tlit8 experiment WM triwl to determine which of four rariclitw of cane pave the Itfit outturn of *gur*. It ahould [irogierly come utnl.-r the beading " varieties of crop*/' but it is mi *re* oonranittt to deal with i.he m^ar-une experiments together. Tba plot! sadar kbj *tout* varietiea of cane were manured with farmyard manure at the rate of 300 nuuudtpr Jiore. ID other respect* their methyl of cultivation wan th« saroo as that of the nine ploU nmler the mannrinl ftj><>rimi'»t ' Ail the plot* wore very injurioutly •ffcci'-l *by* t be flw«J* of AugtiNt and again of October, but the Baraukha and Sarauti ploU, which were more tubject to waterlogging, rafltnd jiartiuularly. The yield whioli was consequently muuti below tliu average ia sbuwn iu tin euhjoined table :—

St.tUmeut tivicinj tkl outturn of four varies iti of sugarcane.

Plot No.	Plot area.	Treatment with reference to manure.	KVH of variety.	Outturn.				Percentage of			
				Weight of cane per acre.	Weight of juice per acre.	Weight of *gur* per acre.	Weight of refuse per acre.	Juice expressed.	*Gur* in cane.	*Gur* in juice.	Refuse in cane.
				Rs.	Rs.	Rs.	Rs.				
33 / 1			Matna (Cawnpore)* ...	—	—	—	—	...	...	...	...
n / I	i		Dhaul (Delra)† ...	10,117	4,929	837	4,448	48·71	8·27	16·98	43·56
33 / 3			.. w OtaiV	10,280	5,442	M	4,112	51·46	8·53	16·71	39·94
•a / 4		i	Baraukha or ... iUn Uwk) and ...†	kfl	2,090	822	2,016	44·28	6·82	15·41	49·71
33 / 1		S	Sarauti (Fyzabad)† ...	4,277	1,922	288	1,922	45·01	6·73	14·96	45·61

rj.-0MMu4.Hai,

* Not crushed—left for seed.

t Caat *trim* | of cath plot <ru cat UMI *matfd* *nt tit* Join 1-ilnJ IDIO jmr. tU remaining ½ was left far)>'u»liBf purfi-i Tl» «*Uura t«r *ttr* W U«P t*k«l*M fro m the quantity actually crushed.

(f).—Experiment witk pounda M *ne.*

14. Now Cawnpon and in U e province I (reoerally it i» a popular belief that *ti.ii,* wbieh ar* well known *m* ieties of e ragaruane, a« twt oash for I ;;«r, atvl th« tludento «f Uw A^ni uiiural Mwol had no doubt in their mindt Uw corrw-'trii^or tbe bolarf.

\\ .MI a virw to detnoMlraU to tb«n tbat *pmumfot* can I* uaed for *gur*-making, and to Wat iheir abaolut* wid «*!«]>•»« tive value when m»d M anch, a tmall p ot of /«•«*/# crop uf the Madraai vrnficty vu bought from a cultivator at Jubi near Oawnportr by tlw Prin«i«l of tt* Agricultural SdwoJ, in ordn to try the rxprriment. TW ana from which U»r *j>a»*da* cue WM cut WM 181 a<juat« yanla. H *mm* crj»hed ia 111* u»ual maaber and thr juiw Uulcd dawn to *$mt.* Tbe following iigurw *thow* Uw tt»ult of lita vxprrimvBt :—

... ...	33,760
	Rs.
Weight of canes per acre	33,720
„ tops and leaves	13,280
„ Juice per acre	53,000
„ refuse per acre	17,720
„ *gur* per acre obtained from boiling the juice	10,080

4

gar was of very good quality. tad Ita wld par am WM about 3 OS tinw the h%btat ottttara obtained froia Uat *wutimm* warty.

16. A *oU by Dr. J. W. I*»tba-, Agtiddtaml CIMOM to the Government of India, on UM abiaataal oompnaitioa of aofaraa* aod •ugaraaa* JUIM and of tbe r»» augat obUiBMl in UM varioa* aagaiaaaa «sparimmta ia ap p*ad*d to Urn report («•*« Appaadis A).

*(g).—Pfrmt*t*t ttp*nm*t with frtn* anm'a;.

S**i»- A.

IS. Hat nprriaaest m atariad ia UM-8t. It bw lar it* obj* I ii determination of UM maasjial aAect oa wkaat of—

(a) UM ploughiag itt ot a gnaa crop ia UM ratof pf*c*lia(UM ruitmtwa of wheat;

(*; the root Mddw of a bpuaiMBa crop Ukrn inuaadUuly W o n wheat

The *mtnt* tnatnMatofpbto), «,«, lOaad 11 WM adoptad oaty la*t year in accordance «ilb UM vine* of tb* Ajrieultafal Cbcmut to Uw Go*ernai«nt of India, aadtaalr prtmu, baUaMat ia aaowa iaj UM aubjoiiMd •utravnt uadrr preceding years.

Of fttl tb* cxptriatBUl plot* ond«r wb«t, U» plot* of LhU MOM nffmd mart from UM rSfcU of iiawoMbU WMUMT, owing pmrtly to tbeir low Mtuaban *"A* partly to Uw awn ntmlira Mtar* of Utnr •oil. Uw fivjurtit iwry abowtn «* July ud Aagaatitrtafftn4 witi tat plottgbiaf unuJiy doat ia UM rainy afAtoo, and tba */'»*• *[Mr*m* Miira) mm oa plot S bilod to famiaata. Tb» ovtrflo* ofaUakiBUwaaafhboaraood and UM nub of iraUr from aa arijmninf oaaaJ <distri-UUry ioodad tbt plota « Uw Mb Oetobar, waaa tarn «a. a bll of MT fa 24 hours and tbo water which atafoaud oa *ii*m* van«d from IV* to 1} f««t in d«i>tb.

Tba aUadiac crop* of bnap tad a*, on | loU ? and 10 nr. Mcompletely destroyed, and «r4*r on plot 11 partially <kaa(*d. Raiw ooattaaad ttnttl UM 4ta of November aad tba field* oöold not pi lafflaliiUy dry to admit of ploa«Hk»ff opmlkaa tinul tb« 19th of NoTftabtr, *i. t,* abaai a mooth later Uiaa UMJ tbonkj hart bam atva.

Tb* grand wa* Um pnpand for •owtaf ai <jakkly aa poanbb. bat U»ar« w*» •» time I for bamwhv or cbaaina; UM field* TVy «m oown w>0> wad at Uw *nU* of 120IU. per ac» oa tf'Jnl Xovaaabar lhffi.

RBJ4 BMJJO ita appaataaoa ia all ploto aboat UM aad «f Jaamary, and p trtiouUHf damage ploU «, 3, t,7, 6 and » Tbt crop wa* barraatad oa 8th April aw) tb* yiald waa uucb poonr tbao m any of ib« (molding yaara. Tat folWwia; uU« abow* the result.

RABI STATEMENT.—*Showing the result of experiments to determine the effect of "green manuring" on wheat.*

Plot number.	Plot area.	Manure applied per acre.		Outturn per acre in lbs. 1891-92.	1892-93.	1893-94.	1894-95.	1895-96.	1896-97.	1897-98.	1898-99.	1899-1900.	1900-01.	1901-02.	1902-03.	1903-04.	1904-05.	Remarks.
G1	Each plot=400 square yards.	Old indigo refuse, 120 maunds ploughed in	Grain ...	...	...	2,580	1,430	1,313	1,307	1,370	1,206	1,013	1,742	1,301	1,042	1,348	617	
			Straw ...	...	...	4,048	1,809	2,420	2,267	3,398	2,077	4,068	3,478	2,848	4,319	4,187	1,173	
G2		Fresh indigo refuse, 120 maunds ploughed in ...	Grain ...	...	...	2,336	1,081	1,379	1,452	1,486	1,429	1,742	1,742	1,706	1,500	1,349	269	
			Straw ...	...	...	4,846	2,003	2,038	2,517	2,964	2,408	3,713	4,199	3,042	3,110	3,338	774	
G3		Rape to be ploughed in ...	Grain ...	...	...	...	...	...	...	...	...	...	...	...	...	...	280	
			Straw ...	...	...	...	...	...	...	...	...	...	...	...	...	...	730	
		Indigo water, 3,000 c.ft. ...	Grain ...	...	...	2,000	994	1,113	738	865	730	1,333	1,016	665	1,137	...	...	
G4		Wheat and gram alternately. Wheat this year ...	Grain ...	...	...	...	...	...	...	...	...	...	...	...	...	...	306	
			Straw ...	...	...	...	...	...	...	...	...	...	...	...	...	...	730	
		Hemp water, 3,000 c.ft. ...	Grain ...	...	...	2,170	995	1,269	774	678	738	1,162	1,186	690	1,325	...	...	
G5		Unmanured ...	Grain ...	...	...	1,514	622	1,367	847	786	653	1,404	1,162	690	1,500	877	287	
			Straw ...	...	...	2,091	1,133	2,083	1,900	1,379	1,367	2,735	2,433	1,512	1,583	1,730	787	
G6		Hemp and wheat alternately	Grain ...	...	...	...	...	1,116	641	1,041	883	1,900	999	641	...	1,031	408	Until now, wheat has been taken in plot G6 after removal of a green crop of hemp, i. e., before it produced seed.
			Straw ...	...	...	...	...	2,310	1,292	2,039	1,615	2,110	1,210	1,361	...	2,139	1,041	
G7		Green hemp ploughed in ...	Grain ...	...	...	...	1,209	1,138	871	807	1,029	1,972	1,128	1,004	1,079	935	420	
			Straw ...	...	...	...	2,352	2,200	1,612	2,408	1,553	4,005	2,336	1,612	2,300	1,794	1,089	
G8		Green indigo ploughed in ...	Grain ...	...	...	2,358	1,944	1,494	1,370	920	714	1,670	1,084	1,370	1,573	730	281	
			Straw ...	...	...	4,735	2,472	2,052	2,064	1,924	1,779	2,077	2,536	3,097	2,214	1,097	7,200	
G9		Indigo and wheat alternately	Grain ...	...	...	1,500	1,107	1,701	1,268	1,379	885	1,088	1,136	1,318	...	636	287	
			Straw ...	...	...	2,612	1,778	3,104	2,209	3,049	1,072	2,650	2,287	2,090	...	1,376	774	
G10		Urd and wheat alternately ...	Grain ...	...	...	...	...	...	...	...	...	...	...	...	...	...	439	
			Straw ...	...	...	...	...	...	...	...	...	...	...	...	...	...	986	
		Green indigo ploughed in and gypsum, 6 maunds	Grain ...	...	...	2,300	2,100	1,845	1,597	617	702	1,319	1,452	1,307	1,038	...	...	
		Arhar and wheat alternately		...	...	...	...	...	...	...	...	...	...	...	...	...	...	
G11		Green hemp ploughed in and gypsum, 6 maunds ...		...	...	2,260	1,476	1,069	1,319	871	832	1,452	944	1,307	1,295	...	...	
G12		Lucerne and wheat alternately (lucerne this year) ...	Grain ...	...	...	...	...	1,701	36	902	907	1,174	847	...	1,053	1,108	...	
			Straw ...	...	...	...	...	3,521	2,860	1,830	629	2,202	1,706	...	2,100	2,055	...	
		No manure ...	Grain ...	...	...	1,318	622	1,367	847	786	623	1,464	1,162	690	...	...	...	
G13		Lucerne and wheat alternately (wheat this year) ...	Grain ...	...	...	...	...	...	...	...	...	...	...	...	...	...	402	This was an unmanured plot until the year 1891-92 and its outturn up to that year is also given.
			Straw ...	...	...	...	...	...	...	...	...	...	...	...	...	...	762	

N. B.—One maund=82 lbs.

(i)— *Grta mi—rif ttptnmttt.*

Sixia* B.

17. Tbu Mf*rin»»nt wu Ukm up fewl _?««r with * new to ftacertaiaiag tk* awao* ti»l i flf«ct on wheat of the ploti^liing in of aartatn krgnmuHXM emr« other tl>»n tb taammte 1 in the fnrrp-inji »prriia«al. Tba frata crop* whi h wcrojpwn oft)rt of July 1-*i w^rc plnURlinJ id oo the S6ta Septembvr and wbait Mft on 2' Kvnnbcr »t tht rate of 120 0*. p»r ••re.

Tbt following tabt* *b»w« tbo otttsn —

Plot number.	Plot area.	1.«!,.-.! .,.. ,eference to manure.		Outturn per acre in lbs.	
				1903-04.	1904-05.
27a / 1	1,210 sq. yards per plot.	Green hemp ploughed in	..^.6	837	264
			Straw	2,147	683
27a / 2		Green ... ploughed in	Grain	858	306
			Straw	LNI	808
27a / 3		Green sod ploughed in	Grain	720	279
			Straw	1,336	1,124
27a / 4		Unmanured	Grain	341	414
			Straw	1,300	1,0[illegible]

TBM plou wrr. Ulir wd im IMm|j Ota«l»d with nut dam* the rainy aad etoady w«tb«r of J»., ,urT, the «aawi«»d pl«t kant^r wftVnd the taut frot that cause. Th. yrW WM poor both a> r»g*nU qmlity aad Haaab(r and th» i results obtained 1 ihU ym do aot therefore lead *U>* any ooMltiuoti a* *U>* tbr f ff«t ol U»» green manures.

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(ii).—*Experiments with gram and peas.*

18. TV i object of these experiments is to determine the relative manurial effect of (a) gypsum, (b) ground *kankar* (crude carbonate of IIHW), fr) f.rmrmrd w»a*re and (d) bone superphosphate on the yield o* U» Iwt. kttmiaoM wopt. *Tbtn* » also an B>tt«ml plot in «ca «ipm«Mi(|o nmpu* lb» mult mla.

The experiment with gram was »ur!nj in lb»3 «od DM! wtla *fm** taken up in the year under report.

In October, which was the proper tiW f r-.w.!k«, (f»-«.| !.rf. were under water. The soil remained so wet in consequence, that it was not bajat practicable to plough it up sooner than the 7th of December, and there was no time then to leave the land exposed to atmospheric action or to thoroughly clean it.

Seed was sown in both the series of plots on 10th December, when there was yet abundance of moisture in the soil.

The germination was not bad, but the plants were stunted in growth and looked very weak and sickly. The crop of gram was a failure and the yield of peas very poor, as would appear from the subjoined statement.

RABI STATEMENT.—*Showing the effect of certain manures on gram and peas.*

Plot number. Gram.	Plot number. Peas.	Plot area.	Treatment with reference to manure.		Outturn per acre of gram in lbs. 1893-94.	Outturn per acre of gram in lbs. 1894-95.	Outturn per acre of peas in lbs. 1894-95.
31b/1	31a/1	Each plot = 400 square yards.	Farm yard manure 150 maunds ...	Grain	1,543	324	580
				Straw	1,080	449	1,783
31b/2	31a/2		Gypsum 2 maunds	Grain	1,730	324	203
				Straw	1,470	530	411
31b/3	31a/3		Ground kankar 2½ maunds	Grain	1,150	35	327
				Straw	1,031	187	665
31b/4	31a/4		Bone superphosphate 3 maunds ...	Grain	1,128	61	315
				Straw	920	182	435
31b/5	31a/5		Unmanured	Grain	856	21	184
				Straw	588	85	254

N. B.—one maund = 82 lbs.

Experiments with country potatoes:

19. These were taken up in [illegible] the effect of certain nitrogenous manures [illegible] Farrukhabad potato, a famous variety [illegible] seed-potato being obtained from the Cawnpore market. This experiment was [illegible] the year under report the area of each plot was extended to [illegible] square yards, with a view to [illegible] results.

The [illegible] operations were delayed owing [illegible] the land, [illegible] hurriedly prepared, was not in a fit state for sowing until the 28th November, when tubers were planted at the rate of 820lbs. per acre.

The germination was slow and uneven, owing to the rains that followed planting, and on digging at the spots where plants had failed to come out the seed tubers were found to have rotted. In a case like this, an ordinary cultivator should have planted fresh tubers, but in an experiment, it was impossible to do so.

The outturn was low and is shown in the appended table.

Statement showing the effect of certain manures on country potato.

Plot No.	Plot area.	Treatment with reference to manure.	Outturn per acre in lbs. 1893-94.	Outturn per acre in lbs. 1894-95.
			lb.	lb.
28/1	Each plot = 750 square yards.	Farmyard manure, 200 maunds ...	10,170	4,103
28/2		Poudrette, 200 maunds	5,053	6,153
28/3		Castor cake, 12 maunds	11,410	2,200
28/4		Bone superphosphate and saltpetre, 4 maunds each.	11,300	2,400
28/5		Unmanured	7,190	1,718

N.B.—1 maund = 82 lbs.

IV.—METHODS OF CULTIVATION.

20. The object of this experiment, which was started in 1887, is to ascertain the effect of early and late sowing on the yield of maize.

The early [illegible] ploughed and [illegible] between the [illegible] and [illegible] of [illegible], the late sown plots [illegible] and sown on the 19th. They were [illegible] respectively, on the 15th of August and the 5th of September. The plots were [illegible] by the [illegible] towards the end of July and in the first week of August, and were, moreover, flooded [illegible] of August by the overflow of the adjoining tank. On [illegible] portion of [illegible] wholly or partially rot[illegible] in both the plots [illegible] very poor, and, contrary to experience in the majority of past years, it was [illegible] in the early sown plot, [illegible] damage from waterlogging.

The results are [illegible] in the following statement :—

[illegible] sowing of maize.

Plot No.	Area.	Quantity of manure applied.	Description of sowing.		Outturn per acre in lbs.							
					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Field No. 21	Plot area—1,822 [illegible]	Farm-yard manure, 250 maunds per acre.										
21a			Early sown	Grain	734	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
				Stalk	2,731	2,487	7,000	7,000	[illegible]	[illegible]	[illegible]	[illegible]
21b			Late sown	Grain	810	[illegible]	[illegible]	423	[illegible]	[illegible]	[illegible]	[illegible]
				Stalk	4,004	2,962	3,640	3,124	3,073		[illegible]	

N. B.—1 maund = 82 lbs.

(b)—Experiment in early and late sowing of cotton.

21. The object of the experiment is to determine the effect of early and late sowing on certain varieties of cotton and to ascertain their comparative outturn. It has been under trial since the year 1891.

The early sown plots were watered on 21st May 1894, ploughed on [illegible], manured on the 24th, and sown on the 27th of May with seed at the rate of [illegible] per acre. The same operations, with the exception of watering, which is not done in the case of the late sown plots, were carried on in the latter between 16th and 20th June. Both series of plots were weeded and hoed four times.

Picking commenced on the 16th of October and was over on [illegible] December. The heavy fall of 5·2 inches accompanied with storms on the 4th October severely damaged the crops. The flowers and the bolls were knocked off [illegible] in [illegible] cases.

The following statement shows the results.—

Early and late sowing of cotton.

Plot number.	Plot area.	Treatment (manure).	Variety.		1891-92. Fibre.	1891-92. Seed.	1892-93. Fibre.	1892-93. Seed.	1893-94. Fibre.	1893-94. Seed.	1894-95. Fibre.	1894-95. Seed.
$\frac{17}{1}$ A.C.			[illegible]	Early	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	09	[illegible]	[illegible]
				Late	[illegible]	108	[illegible]	145	[illegible]	[illegible]	[illegible]	[illegible]
$\frac{17}{1}$ A.C.			Bani	Early	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
				Late	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
$\frac{17}{}$ A.C.			[illegible]	Early	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	78	[illegible]	30
				Late	41	[illegible]	[illegible]	[illegible]	97	[illegible]	[illegible]	[illegible]
$\frac{17}{4}$ A.C.	1 square yards.	8 maunds of farmyard manure per acre.	[illegible]	Early	171	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
				Late	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
$\frac{17}{}$ A.C.			[illegible]	Early	[illegible]	[illegible]	[illegible]	[illegible]	43	[illegible]	[illegible]	[illegible]
				Late	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
$\frac{17}{}$ A.C.			Jari	Early	[illegible]	[illegible]	119	238	[illegible]	[illegible]	[illegible]	[illegible]
				Late	[illegible]	[illegible]	75	[illegible]	[illegible]	[illegible]	[illegible]	30
$\frac{17}{7}$ A.C.			Country	Early	[illegible]	[illegible]	[illegible]	[illegible]	114	[illegible]	[illegible]	[illegible]
				Late	[illegible]	[illegible]	111	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

N.B.—One maund = 82 lbs.

Though the yield is poor, yet the results are distinctly in favour of early sowing, [illegible] also show that, as compared with other varieties, the country variety is [illegible] capable of standing the effects of bad weather, and [illegible] satisfactory outturn.

(c.) *Experiment with mixed crops.*

This experiment was started four years ago, with the object of determining:—

(a) the comparative outturn of certain kharif crops in some of the more common mixtures in which crops are generally grown by the ordinary cultivators.

(b) the mixture whose produce yields the most profitable outturn.

The field was prepared in the ordinary native fashion, and the mixtures were sown broadcast. The following statement shows the outturn:—

Experiment with mixed crops.

Plot number.	Plot area.	Name of crop.	Quantity of seed sown per plot in lb.	Outturn per acre in lb. 1868-69.	1869-70.	1870-71.	1871-72.	1872-73.	1873-74.	1874-75.	Cost of cultivation including cost of seed, rent, labour, &c., per acre.	Value of outturn, seed, straw or fibre.	Net profit or loss.	Remarks.
											Rs. a. p.	Rs. a. p.	Rs. a. p.	
M.C. 1	Each plot = [illegible] square yards	[illegible]	1	—	—	—	1,806 4,133	137 308	1,380 2,655	808 2,452	16 8 0	21 13 10	—	Price of arhar seed calculated at the rate of 40lbs. the rupee, of arhar stalks at 800lbs. the rupee, of cotton fibre at 4lbs. the rupee, of cotton seed at 30lbs. the rupee, of urd seed at 16lbs. the rupee, of urd stalks at 320lbs. the rupee, of juar seed 30lbs. the rupee, and of juar stalks 240lbs. the rupee.
		[illegible]	2	—	—	—	30 81	5 12	1 5	19 21		3 9 4	—	
		[illegible]	1	—	—	—	80	—	—	—		—	—	
		[illegible]	1	—	—	—	186 328	21 209	21 215	42 192		4 12 8	—	
											16 8 0	30 0 10	+13 8 10	
M.C. 2		[illegible]	1	37 —	37 —	37 —	215 734	371 1,310	742 2,302	— 1,194	16 8 0	2 2 3	—	
		[illegible]	2	— 308	2,038	— 308	85 1,408	524 4,007	280 2,404	— —		—	—	
											16 8 0	2 2 3	—14 5 9	
M.C. 3		[illegible]	1	203 —	203 —	387 —	606 1,670	1,494 3,400	336 2,220	500 1,341	16 8 0	15 6 11	—	
		[illegible]	2	[illegible]	3,040	3,314	692 6,071	700 8,308	343 3,052	22 3,315		10 13 9	—	
											16 8 0	26 4 8	+9 12 8	
M.C. 4		[illegible]	1	—	—	—	451	807	285	—	16 8 0	—	—	
		[illegible]	3	—	—	—	93	1	2	7		3 0 11	—	
		[illegible]	4	—	—	—	60	3	2	11		—	—	
		[illegible]	4	—	—	—	52	—	—	—			—	
		[illegible] Grain		—	—	—	53	7	20	65				
		Stalk	4	—	—	—	600	86	325	155		4 14 10	—	
											16 8 0	6 15 9	—9 8 3	

The bajra and til crops, while in flower, were completely destroyed by excessive rains; castor also failed, and the outturn of cotton and *urd* was poor.

As in the past year, the largest money profit was yielded by plot 1.

(d). Experiment with old and new indigo seed.

23. The object of this experiment is to determine the comparative quality and productive power of indigo seed varying from four months to over four years old. It was started in 1893, at the request of the Secretary to the Chamber of Commerce. The fields were flushed with canal water early in May and ploughed up; seed was sown at the rate of [illegible] per acre on 8th May, and the crop received three waterings between 17th of May and 12th of June, and was weeded twice. It was cut on the 30th of August and the green stalks sold for dye. The stumps were left to ratoon and produce seed. The seed crop was harvested in the middle of January and seed thrashed out.

The following table shows the outturn.

Experiment with old and new indigo seed.

Plot number.	Serial number of plot.	Plot area.	Detail of seed.		Outturn per acre in lbs. 1893-94.	1894-95.
15/1	1	Each plot 605 square yards.	Indigo seed 4 months old	Stalk	8,840	10,204
				Seed	150	115
15/2	2		Ditto 1 year and 4 months old	Stalk	9,710	11,102
				Seed	173	111
14/1	3		Ditto 2 years and 4 months old	Stalk	6,063	8,048
				Seed	137	99
14/2	4		Ditto 3 years and 4 months old	Stalk	6,063	6,808
				Seed	152	98
14/3	5		Ditto 4 years and 4 months old	Stalk	5,222	3,608
				Seed	142	18

As in previous year, the yield of green stalks saleable for extracting indigo was highest in plot 2, and the Secretary to the Chamber informed me that it was identical with what had been obtained by experiment elsewhere. The yield of seed in 2 was, however, slightly smaller than in 1. The experiment will be continued with a view to confirming the result.

(e.) Experiment with lucerne.

24. This was started last year with a view to determining the relative economy of sowing lucerne by the three different methods shown in the subjoined table:—

Plot number.	Plot area.	Manure applied.	Treatment.	Outturn per acre in lbs. 1893-94.	1894-95.	Remarks.
A.	Area = 400 square yards.	Farmyard manure 300 maunds per acre.	Sown on ridges	1,219	8,129	
B.			Sown in furrows	771	7,206	
C.			Sown broadcast	325	6,085	
G13.			Green-manuring plot, series A	3,050	*	* This [illegible] in 1894-95.
G12.			Ditto ditto	†	2,018	[illegible] under wheat [illegible]

N.B.—1 maund = 82lbs.

[illegible] was sown in the same time [illegible] on the [illegible] of [illegible] failed to germinate and had to be resown [illegible] after [illegible]. The crop was [illegible] from [illegible] and [illegible] up to the [illegible] of May. [illegible] from each plot between the 13th of March and the 14th of [illegible]. As in the [illegible] year, the largest yield [illegible] the plot in which the crop was sown on ridges, and the least [illegible] in which [illegible] plot sown [illegible] plots.

To [illegible] of the [illegible] plot of the green-manuring series [illegible] furrows as in case of plot B, and the [illegible] outturn is due to the presence of an [illegible] amount of moisture [illegible] having [illegible] during [illegible] rains.

V.—TRIAL OF IMPLEMENTS.

(a) Permanent experiment [illegible]

[illegible] in 1882. Its object is to [illegible] deep [illegible] yield of wheat. [illegible] under the experiment, No. 1 [illegible] plough; No. [illegible] with the [illegible] plough; while No. [illegible] ploughed [illegible] with the country plough [illegible] in the (Cawnpore [illegible]); the treatment of all [illegible] being [illegible] in all other respects.

The main point in the experiment is to [illegible] whether, with reference to the [illegible] of labour and time, it [illegible] to substitute [illegible] in [illegible] to the native plough.

All the plots [illegible] with [illegible].

As will appear from the [illegible], the two plots ploughed with the improved [illegible] than the [illegible] of the third plot, but from a [illegible] point of view the experiment was, on the whole, a failure during the year under report, owing to [illegible] weather.

Ploughing series.

Plot number.	Plot area.	Treatment.		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
P1	[illegible]	Ploughed [illegible] inches [illegible]	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
P2		Ploughed [illegible] inches deep with improved plough.	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
P3		Ploughed [illegible] inches with native plough.	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

(b) Testing of new or improved implements.

Of the [illegible] during the year under report the following [illegible]:—

1. Water-lift.—[illegible] The lift consists of two galvanised iron troughs, each having a valve at the bottom opening upwards. They are hinged on a wooden beam fixed on the ground at the discharging level and are raised and let down alternately by means of a system of pulleys and ropes.

Only one bullock is required to work the lift, and it has to go round and round without ever having to reverse its motion. Recently an arrangement has been provided whereby the loss of water in course of raising is minimised and water lifted from greater depth than before.

It is a useful contrivance for lifting water from wells and canal, from a depth of three to five feet. Price Rs. 30.

II. — [illegible] mill. — The mill was received from the Government of India for trial. It consists of an arrangement of discs and rollers which by the [illegible] in [illegible] and [illegible] respectively, which [illegible] grain is passed into a box, divided into four [illegible] provided with iron sieves [illegible] different degrees of [illegible] fine and coarse [illegible]. The mill is to be worked by bullock-power only.

Difficulty was experienced at first in setting and working it, but was got over with the help of Mr. Chater, Engineer to Messrs. Cooper, Allen & Co., Cawnpore.

The mill, however, gave unsatisfactory results, the [illegible] the one in which from one [illegible] of wheat ground in [illegible] minutes the quantity of fine and coarse flour obtained was 1 lb. and 3 lbs. respectively, and of bruised and kibbled grain [illegible]. The last-named product was not at all fit for making [illegible].

The [illegible] was noticed in full detail in the list of implements tried, which went to Government in October 1894. Steps have been taken to make its working successful, and further experiments are in course of progress, the result of which will be noted in the next report.

III. — *The [illegible] thresher.* — This has been lately brought out by Messrs. Thomson and Mylne. It is composed of four sections, each section being the shape of a wheel which is made to move round on [illegible] prop in order to [illegible] out the grain. One, two, or more sections can be worked at a time according to the area of the threshing floor.

Trials with this implement were — At the Government Dairy Farm, Chherat, Aligarh, and the Cawnpore Experimental Farm. At Chherat it was tried with a crop of paddy of the [illegible] variety called "*ramgi*."

Three sections of the machine were worked at a time with one pair of bullocks.

In an hour [illegible] lbs. of [illegible] were obtained from [illegible] lbs. of paddy.

Employing [illegible] at the same time to [illegible] down [illegible] of paddy by the ordinary treading method, 319 lbs. of [illegible] were obtained from [illegible] lbs. of paddy [illegible] minutes.

The [illegible] threshed by the Bebee thresher [illegible] from [illegible] and none of it was left in the straw. The financial [illegible] was distinctly in favour of the Bebee thresher, which cost nearly one anna and nine pies to thresh 1,000 lbs. [illegible] the cost of threshing the same quantity by the ordinary method was not less than two annas and nine pies.

In the past rabi harvest a trial was made at Cawnpore by the Superintendent of the Government Experimental Farm with wheat sheaves. Only two sections of the machine were worked together at a time, the other two sections received at the farm having been called back by the makers. Two lots of wheat sheaves of 1,394 lbs. each [illegible] the other worked by the machine with one pair of bullocks, the arrangement of toothed plates [illegible] the same as was kept when testing the work of the machine in the case of paddy. By the former method the work was completed in 28 hours, and by the latter in 30 hours, the straw obtained by the former method being finer. As regards the separation of grain there was nothing special in favour of either method. The treading under bullocks gave more grain, but that was due to the [illegible] belonging to a better field. The machine could have probably finished the work more quickly had there been three

•Mtum at work, at in the east of ut paddy, n wa* m u w w ——— a larger quantity of »hr»r« a«d with the twtb lamed outwanl., Vut k-r..n- thi. «oM bv arra«(t«d for, ib* makon prM»4 th« ^p-rtmaot bf a morn of tho •»*«•!•" t-tok it back for trial •towbcr*. lu m.l wiih *Ut ahoarw a* -»"•» """] wu ttMtrfora inompteu. and tba rwntu mown. 'w'> n*0" lti<li **** * ' with th. .b«»tw «f ibo tio«lU« and ap» <«t«: •«»• »f tbi fonnrf »od SM*»- «• the Uttor bw»s thmhcd. r«aprrtiT*)y, in UM «mm of 10 «»«l « **•"* In tb* """* ONthritnvwu wliwl t., tb* d«.ir*l.l- lUwlvdof fineom, but in the fottMf i wu «it, aa the «prri««t bad to b* brought to a eloM abruptly, ia tnlw to rfttrt U tnlh.

VI.-VARIETIES OF CROPS INCLUDING FODDERS.

W *Krperimt* with Jr*

TV ibMMjwnnwtiaUiMmpawt^ywklofd.r , cotton > mioeabicUof tWmarrm^t ' ih'* wl clim»l« of tiii* part of tbe oottnt:

ThonpcrioMtwuaUruaiB li^. Oriffiwlly tb«» «m 11 TaiWtiw trial. IQ tin yMr IS»5-»1 cpinwa. o[tw« •!]«•«• w«« oldatnwl aa *'' of tba ptwliw* oMaiwd at tb» fara. »ml *ih«t* with tb- B|»pro«a] of tlw Agw"'» „ Ch#mirt o tb* t of Ir> p i *. ..». tb. u l (Awun). TW •nftWr^wrt

TliophiU with «Ml wster oa Cftlb M»y. r»t* *U* UIU paracra. Tba «m b«d

Uk*oUwr w.lton fWLU. UMOT plot* «u- ifr from ,of «»•• lt «l*m».r »irf 6o» nf»1 . "d •»«• Hin^nglat tuffrml taMt from th* 1^ . roW *nJ ^otmiml till th* ISUi of Oacawbtr.

TV folk'WintC I'M* K"M *JM «ail«ifn of •*. h j.!..t from IM

Plot number	Plot area	Name of cotton		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Remarks
[illegible]	[illegible]	Upland Georgian	Fibre	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	
			Seed	[illegible]	[illegible]	[illegible]	til	ml	M	—	
[illegible]		Tree cotton	Fibre	[illegible]	[illegible]	[illegible]	[illegible]	tw	U	[illegible]	
			Seed	[illegible]	[illegible]	[illegible]	[illegible]	Ml	11	41	
[illegible]		Louisiana	Fibre	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	»		
			Seed	[illegible]	[illegible]	[illegible]	[illegible]	a»	n	[illegible]	
[illegible]		Garo Hill	Fibre	[illegible]	[illegible]	[illegible]	[illegible]	M	M	—	
			Seed	[illegible]	[illegible]	[illegible]	[illegible]	UT	in	—	
[illegible]		Hybrid	Fibre	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
			Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	a	

Plot number.	Plot area.	Name of cotton.		1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	Remarks.
				Outturn per acre in lbs.							
41A/6		Sea Island	Fibre	97	104	91	64	152	32	38	
			Seed	235	514	252	135	363	70	69	
41B		Egyptian	Fibre	97	104	60	65	155	15	30	
			Seed	231	434	194	162	300	90	70	
		Singangliat	Fibre	111	183	109	64	153	30	23	
			Seed	235	427	251	188	300	68	41	
		S. B. Mealy	Fibre	24	180	60	20	73	33	...	
			Seed	48	320	100	64	124	90	...	
		Shine's Early Prolific.	Fibre	24	140	40	18	91	23	...	
			Seed	48	280	100	43	184	71	...	
42/6		Jone's Improved	Fibre	24	180	60	22	41	66	...	
			Seed	48	360	120	58	93	97	...	

It being desirable to change the seed, steps have been taken to obtain fresh seed from America, of the American varieties included in this experiment.

(b) *Experiments with varieties of cotton obtained from Central Provinces and Assam.*

28. This was started during the year under report, with a view to determining whether the varieties named in the following table could be successfully grown in the Doab. The seed was obtained through the Directors of Land Records, Central Provinces, and Assam. The land was prepared in the same manner as in the case of the foregoing cotton experiments, and sown with 8 lbs. of seed per acre. The Garo Hill plot was sown on the 22nd of June, and the other three plots on the 3rd of July. Although none of these plots could escape the detrimental effects of the unfavourable season, yet the bolls of the Garo Hill variety were larger in size than the farm had produced before, and the fibre was very fine and long. The following statement shows the outturn.

Statement showing the outturn of varieties of cotton imported from the Central Provinces and Assam.

Plot number.	Plot area.	Treatment with reference to manure.	Varieties of cotton.		Outturn per acre in lbs., 1894-95.	Remarks.
18/1	1,210 square yards each plot.	Nil	Jari (Central Provinces)	Fibre	17	
				Seed	34	
18/2			Bani (Ditto)	Fibre	10	
				Seed	24	
18/3			Jaintiya (Assam)	Fibre	5	
				Seed	13	
42/5 and 42/4	600 square yards.	Farm-yard manure.	Garo Hill (Ditto) (sown broad-cast)	Fibre	10	
				Seed	30	
42/4 and 42/3	Ditto.	Ditto.	Garo Hill sown in [illegible] kind the [illegible]	Fibre	17	
				Seed	33	

N.B.—One maund = 82 lbs.

(•) JttnJltn.

29. A ooarw variety of paddy eailad Baa Dban, which u nid to produce high outturn in Anun, WM obtain*! from A«eam at UM in»taiK* of Mr Parrah, and *>wn at the farm in tba ordinary way. Tbe plot WM Vi6 tp&re yardi in ansa and UM ; yield 12 Iba. TU oataalated yWld par aert aavmaU t> I.J74lbi., which i* above UM I average yield of most of the coarse varieties of dhan common in the plains of these provinc*.

{i) £*f*nmnt with kill fUitm.

30. Tbia WM itarted ia 1>?3 with th* MJM obJMt M UM OM nMntion«d mad ond« UM cxpMinuat with eountry j^tatcpw, M alao of dtttnnining whethw hill pot*W» could U moMM/uUy P » D on lh« to.) of Um fana. Tht MM! WM oUain*.! from the Sa[xrinUnd»nt. Motwar Nomry, Kumiun. at n nrt ooat of tta. &-1S-0 p« ma and (MB«). Tfiii «Ki>cnmenl WM a futon in 1(193 on aocooatof waMwhat luw fitoat«m of th - pt«t« on which it WM tiM. Plot, aitwtodon a higher kvtl wtM lhcrrf»»» albttad (or tUl txfwimtol in tU y<w «nd« report. Tht field operations were .miilar to thoM cwried oat in th« CM. »t tbe)Mt BMwtion«) manam) «tptrinwnt with Pamkhabad p.,tato«. " &rt* * (n t tabtr.) wen town at U* r»U of «6«fl«. p* am on UM W DwwaW, Tkearop WM nhNqwatly WM«Udandwatend tbiM and few time*, mpwtiwly, and b*n«Ud on the &h of April iHff&. TU ofltta m u shown in UM unt»d lUUOMt and may b. Uk« a. fairly tfood.

TU prodvo, whkh WM of good qnaJUy, WM told locally at U» rate of 4 lbs. UM rupee.

fertilising effects of manu ... but nothing MII U Mki M ta thrir tvktiv. Tahao until UM nptriurot u continued tor •out yean to MM.

Experiment with hill potatoes.

Plot number.	Plot area.	Manure applied per acre.	Outturn per acre in lbs. 1903-04.	Outturn per acre in lbs. 1904-05.	Remarks.
			lbs.	lbs.	
[illegible]	Each plot = 750 square yards.	Farmyard manure, 200 maunds	1,004	7,424	
[illegible]		Poudrette, 200 maunds	[illegible]	[illegible]	
[illegible]		Castor-oil cake, 12 maunds	[illegible]	[illegible]	
[illegible]		Bone superphosphate 4 maunds, and saltpetre 4 maunds.	[illegible]	[illegible]	
[illegible]		Unmanured	[illegible]	[illegible]	

N.B.—One maund = 82 lbs.

with Canadian oats.

•1. ThM rtt^mptfi, whidi winai111 in 1»W, W Uw> fctpt oe daring tt*; year iiwl-t r»(-»rt. Tb« *iu of Iht nptTinvnt WM htirrwr ahumii. wad no wanort was •pplt»l to UM wop dvriag Ib* jwx mdw t*poHf fa ftffer to >M wtt«tW that measure wcttU tnwmit Uw nlnwfdinarilj Imamnt crowtb of itnw at UM otpmM of grain, which KM alwa/i kw UM Hart pri\ai»mitmUtn of UM fM«lu obulwd at UM farm with UMM varieties.

A. la case of other tabt crops, the preparation of the ground •„ considerably delayed on account of unusual humidity in the soil, and the seed could not be sown earlier than the 8th of December. The fo ^ ^ of grain was na lurally datay*!- in consequence of the late sowing, and while the seed was yet imperfectl y d.Tri.»H. th' but wtfid* oi April dried up the ears, causing the grain to become thin. TUyWIdof p«*« was poor, but that of straw was high in proportion to the grain, as mal. Th* ra»oll«

still *go* to indicate that tbe crop ii more luitaUe to be grown for green fodder thai for grain. Tbo following table givet details of outturn :—

Sitftmrtit tkowing ih« outturn 0/ Canadian eati.

		VtrMjof Ml*.		Outturn p<r *ten* la ft*.					Bimuk*.
1 I .1	*i* i			1M04L	UU4B.	WM M.	IMM*	*taum.*	
i	t	PrittCUttrr M	f Oi»in ...	MO	B40	8 U	178	14S	
			(BUft» «		IJM		MCC	MM	
		Cuullu TriotapL 1	f Oimla ...	787	Ml	110	100	71	
			(fbaw ...	i m	UNO	MID	MM	8,517	
		R« •>!*•• PriM ... I	f Gnla ...	471	106	3-)	6U	164	
			(Stn* ...	i. .-	PH	ua	IMM	MM	
	i		(Onto ,,,	m	t40	41S	too	71	
		*" 1	Siirnw ._	MM	m	0.7*0	MM	MM	
	i		f Onis -	787	US	»77	sin	UN	
M		B*—"* ''' I	tin* ...	MM	Olt	IMK	IMH	t.o»o	
	l	TOUKm(ta:	f Onto ...	647	900	151	i n	M	
		l,w••••		MM	Ml	7,110	MM	MM	

It *tnty U* remarked that the outturn of *grain* oLiuned at tbe farm from » good crop 0* CapaoaU wu 1.9SSII*. pet acre daring U» year under report, showing iUmperiontj onr the Canadian *»U a* » gTain-jrivMing vanetjr,

(*/*) *Effplitn QT* funi'm f/wrr *fTrij'etiuut At,xa*<lriw*m),*

32. Thta foddor crop, which «n> rmuad with tome raoceN in the part year fror awd Unportwl from Egypt, completely failed during tbe year under report. S«td produced at the (arm is 1893-94, a* well M the old wed originally obtained from Egypt, wttre mm am and over again in each plot aaugwd to tbe espcrimont, bot both failed to germinate, owing probably to abundaaoe of moisture in Uw toil. Fneh Mtd hai betn again obtained from Egypt, and vill be tried in tbe next *nil* season.

It may ba remarked tUt tht coed distributed to other farms for trial fuled similarly I*> germinate at thow fame during the year under rqmrt.

VII. DISRTIBUTION OF IMPLEMENTS.

33. Tbor* *i§* » small worktop attached to Uw Esperimeutal Farm in whic improrcd impWm«nw aro maatLtactural and ropairad by native workmen. Tbe mun imporUDt part* of oerUin implement* are, however, imported from England.

The following aUUment ahowi tbe distribution of implement* during the ye*r •ading 31st March 18»6 r-

Name.	Sold.	btMieaWat	'oiiwosblj*,	Total.	*UctzuU*
	14			SI	
	IM			101	
Total					

The• ptoitgli which bat bad tbe krgert mk WM tbt OM tailed tbt BaUoo pi rough, nantd after the tnraitur, who originally made it at tbe workshop.

Ita price WM raieed from t U l l o B * . t-B, ia ordw to mart tbt Mtra eott of mak-tog it itronger tnd rnort efficient. It ia gaining tome popularity among tbt native cultivator*. Some uf tbrm who had gt«n it » fair trial cant on foot from Farrukh-»bmd ia get a few of thaw from the farm. Tbt efficiency of tbe ebain-|»mp for lifting water from tanka and canal it asknawbdgtd aartatrndl/ by thot* who baft seen it at work, and iU <am among taltivatort of fair moan* will, it m hoped, increase •totdily.

IndetiU for chain-pomp* war* laetivtd doriug tiw year from Bengal and Sindh.

In accordion* with a wiah nun—ml by tbt Local Ooftrnmnt in 1891, atUOj w*rt made to aetl tbt pumpt on tbe bin tytteta, but only funr ban been told under that tyrtam «not then. A wattr-oft rattabb for Unk irrigation and invttr ed by Baldeo ia attracting tome attention and bat bam indented for by ctrtats tetaUe.

Tht R. Hunt kibbler and chaff-cotter «tcit* tome iatereat among tbt pablie at the agricultural fain, and art willingly porebaetd by lamtadan who can afford to have them.

VIII. DISTRIBUTION OP SEED.

3». A Mtd etore u abo k»pt up at tbe farm, with tbe object of tapplyiag ••lected agricultural wad to tbt public. Bead prodnoed at tbe farm and pawhattd from ouUtdr ia. after being thoroughly cleaned ana pta»*d through the eaad ttfarator, ie*u*d to indentors.

TW f..IIowing Ubk tbowt the diatnhmtioo <1 Htd donagtlMytv tiling 31»' March 1M& -

K m	Quantity.	Remarks.
	ftk	
Wh<M — — — „	HUM	
> M U ... —	[illegible]	
Maize — — — —		
Sorghum — — — —	26	
— — —	11	
**—— '——*'-* — — -	M	
Oats —		
li*m ~ — — —	74	

Dur•if tbt ytar tb«rt bat btw a tall ia tbt dtjnutd for oatt, of wbiifa th<** WM a largt balaaot In ttodt at tat tad of the *ymr.*

Tbt demand for Iwerot utd aorghttai i»rtwililjwiirattiiiq. ml tbtl (or Oatot* grass is conside r»Uy larger than Lht farta it eaoabk) of laming tilbar from if 0WP produce or *inn* purcfaaatd stock. *Boa** taatatt *tot* Uutaw f i w tt*J w«t tattaA«d after the close of Itu j car.

IX SERICULTURE.

35 Under tbtordan of Mr II, Z. Dkrrab, tbe UU Officiating Director, some live cocoons of rn etlWuim (/'4t/*»j««w *rimm)* wtte obtained for rearing purposes from Assam i in June 169ft. Tbe atlkworau »crt roaml at the farm and fed on bwee of tbt ratter tU ptaat. TWy pnaaetd a** eyelet up to the beginning of April U*t MMI ttriwJ wall tmtil then, yiakliag cocoons similar and even superior in quality W tkoM olitamed from Aamm. Il«t tbe ofatt of tbt hot wMlber was very Mtroto indfttd.' TU m.ith* that «m*tfai from tbt opcoost ia tbe Ufiwnaf *et* the hot ,,»..n dwd in matidmble numUf* bator« layuV *HtS* Tlw«> tbat escaped death at this Mga laid ft «ajjr M • n «, awl tb> wora* tbat cam* oat fn,m them died altog rrtUt is int comnaot a w«k. Cocoon* •*! wortnt bad ab» bam dfatobattl for «M>ng lo pnvftU ptnoat la tbt aaiiblwaibotd ** **'' hm and la U*«tww, and with, tbtrn, loo, »ll tbt wonai died Ly tU lOtb*ot* M«y. Tbt Ugh Uot|»i»iui« of the

plains of [illegible] April and May [illegible] obviously [illegible]
matter [illegible] this industry, and [illegible] to be [illegible]
[illegible] cost. A fresh supply [illegible] continued on a
[illegible] arrival the experiment [illegible]
from [illegible]
very limited scale.

X.—HORSE BREEDING.

36. The Arab stallion "Kishmish," whose work was noticed in previous reports, continued at the farm during the year. The subjoined table shows the result of coverings done by him in the year, under report and the preceding year:—

Result.	1893-94.	1894-95.	Remarks.
1. Foaled	8	2	
2. Reported to be in foal	—	3	
3. Failure	38	9	
4. Results of covering not known yet ...	—	*30	*One of these mares died three months after covering.
Total ...	46	44	

The high percentage of failures in the past year cannot be attributed solely to defects in the stallion, but is also due to the fact that a large number of mares served were past the age of foal-getting. Of the two brood mares kept at the farm, one foaled twice during these two years, but in the case of the other the coverings were unsuccessful.

The results having on the whole been unsatisfactory, the stallion was at the close of the year under report replaced by another from the Civil Veterinary Department, which is reported to be a more successful foal-getter. It is intended to reject in future the mares that are obviously unfit for breeding purposes.

IX.—CATTLE [illegible]

(a) *Cattle-breeding.*

37. A young bull of the Kosi (Muttra) breed was kept at the farm throughout the year for breeding purposes. It covered 17 cows, of which eight have calved and nine are in calf. The calves hitherto produced are very promising. The bull commenced its work only in the past year, and cows were received only from the neighbouring villages. Endeavours are being made to make known to the public the presence of a good bull at the farm, and as it becomes more widely known it is hoped there will be an appreciable rise in the number of coverings. One bull of the Kanwaria [illegible] was procured by the farm [illegible] who has located it at the Demonstration Farm for breeding purposes.

(b) *Veterinary hospital.*

38. A veterinary hospital was [illegible] small scale in the year under report, and placed in the [illegible] nary Assistant, who has undergone a short course of practical training at Babugarh. The necessary surgical instruments and drugs were obtained from the Civil Veterinary Department. The hospital began to receive patients in the beginning of November 1894. No fee was charged on account of treatment, and medicines were dispensed gratis.

The following statement shows details of work done until the close of the year under report:—

Number.	Disease.	Number of patients treated.	Number of patients cured.	Number of patients found to be incurable.	Number of patients that died.	Remarks.
	1	2	3	4	5	6
1	Black quarter ...	1	1			
2	Pneumonia ...	2	—	—	—	
3	Indigestion ...	3	3	—		
4	Fever ...	13	12	—	—	
5	Lameness ...	5	5	—	—	
6	Diarrhoea ...	2	2	—	—	
7	Cough ...	1	1	—		
8	Fracture ...	1	—	—	—	
9	Dislocation ...	2	2	1	—	
10	Catarrh ...	2	2	—	—	
11	Mange ...	1	1	—	—	
12	Other diseases ...	13	13	—	—	
	Total ...	46	42	1	3	

(e) *Miscellaneous.—Yield of cattle dung.*

39. In order to determine the weight of manure obtained from farm cattle in course of a year, the cattle shed at the farm was divided into two sections, in each of the which straw, dry grass or leaves were spread as bedding at certain intervals. Seven bullocks were housed in each section at night.

From section A dung was removed daily and stored in a pit, while the litter, soaked with urine, was removed once a month and preserved in another pit.

In section B the dung and the litter were allowed to remain throughout the month and were removed together at the end of the month to a third pit.

Each pit was sheltered with a *chhappar* thatched over it. The weights of dung and litter for each section were recorded in a register immediately after removal, and the quantity and kind of food and of bedding used were also noted regularly. The contents of each pit were weighed at the close of the year after having undergone decomposition.

The results of both the sections put together indicated that on an average 21,403lbs of fodder and concentrated food were allowed to each pair in 12 months and 984 lbs of litter were used for each pair in the same period.

According to the weighments made at the time of each removal of the manure from the two sections the total quantity of fresh manure, including litter, came to 19,596lbs for a pair of cattle in a year, but the weight of the rotted farmyard manure obtained at the end of the year was only 9,722lbs for each pair. The average weight of fresh dung and urine (excluding litter) for a pair in a year amounted to about 19,600 lbs.

CAWNPORE, } SAIYID MUHAMMAD HADI, M. R. A. C.,
The 12th July 1895. } *Assistant Director.*

APPENDIX A.

Note by Dr. J. W. Leather, Agricultural Chemist to the Government of India, on the chemical composition of Sugarcane and sugarcane juice and of the raw sugar obtained in the experiments made at the Cawnpore and Poona Farms during 1894-95.

In the following note the results of a number of analyses of sugarcane juice and of the raw sugar are submitted, and in addition reference will be made to the results of several analyses of the whole cane.

The analyses obtained at these two farms are discussed in one note, with the object of comparing, as far as may be, the differences which occurred in the quality of the juice and of the gur.

1. Juice.—The amount of cane-sugar was determined in a number of samples of juice from the cane immediately after pressing at Cawnpore and at Poona, and the results are tabulated in Statement I.

Statement I.—Percentage of cane sugar in juice.

Plot number.	Treatment.	Per cent. cane sugar.
	Cawnpore sugarcane juice.	
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	10·81 / [illegible] / [illegible] / [illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	14·40 / [illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
10	[illegible]	14·4B
11	[illegible]	[illegible]
12	12 tons poudrette	[illegible]
13	[illegible]	[illegible]
14	[illegible]	10·10
15		17·17
[illegible]	[illegible]	[illegible]
[illegible]	½ normal water allowance	[illegible]
30	Normal water allowance	[illegible]
[illegible]	[illegible]	[illegible] / 14·11
[illegible]	[illegible]	[illegible]

Plot »••'	* — *	Per cent. cane sugar.
M	rwnttU	u-u
1*	ClH(It>Wl	i*«t Ut»t

A» will ba ma, tb* pertmUtfe of nyw (port* of rugae per 100 parta of jtrit* '/ vri'yi/} v*ri*d »ery much not* at Cawapor* than at Pooaa. Tbia *it,* in all j>rou» owiag to tb» fast tbat al *Cammpn* tbe crop >u tery modi [4)] laid " ia all tb* pl«t» by ire raia.

ft>ar aaaplaa of the jaio* of ttcb eaa* w*r* ao*1*»*J and, a» will I* wen, tie percentage of lugar ia three of I ben »ae MtM*d«rabty lower than Itiat of the jtuec of tb* ling-"cane. The pcrotatage of ra^ar ia tb* jaw* of tlta "«Uaduag" from Mooawntt uwltr liparoeat. ap to a* much at II » pereeat. Tbe » aa exceptional Gjjur*. and tae pamaUge of eugar in the jiuo* of la« Cawapof may be taltea to bavt varied from *\!tb* to 15 4 percent. Tbe peneaaUg* of •agar ia lb« jnioc of tb* J*,PMM mgareaDe *enf* wa» d^tamitMd in a much larger bar of sample*, ami ia tb*a» tber* waa rery mocfc gnaUr aoifornity titan in the jn M at Cawapnra, Tbe crop wa* ia BO eaat " laid " by raia to any extent, aad i fact* takes together teed a eertaia aaoaat of rapport to UM opinion T* that tbe jtiioe of " U*d " can* w ill coataia a lower peroentaf a of eaa* i tbat of cam* not ao bad.

i. Mm Mmt ("ear " **r *'fMt"),*~Tbe Stataawat* II aad tit eibiUl tbe »n*-lyaia of eamplea of taw eugv from UM Cawaper* aad. Vooaa ParsM, In fcdJ u thoogbtiiwnUa to aaalya* aotM of lie *fwr* prepared by (u!iii»lor». Tacy all eamptcs aelavted from tbe Nonb-We«Urn Provtsea* daiUicla. Savpte* ofcal-atora' *§mt* ptrpam) aear Pwaa wen act aoalyaid tbi* year, OM amount o(baving Ucotae already too gnat to admit of it at pretest*

STATEMENT II.—*Samples of gur from Cawnpore.*

Description.					Cane sugar.	Glucose.	Water.	Ash.
Cawnpore Plot I								• M
					*7->I			
-							!I*I	KI
nt						MI	HIT	
m							I M	
							I H «	I'M
					n u	H i	ira«	*i-m*
TH					Til*		u «	
Mil		«,			rtfj	ay		r»»
. \IIlbtf				—	t-I T»		it-j	1 *
tt					M I	lrwl		M I
ieM	-	,,		—	A	it»i	irr*	I «
							• al	r M
						ft u	• u	» «
•aMUa					T«*4	I U	ia«a	» i *
HaJF	*m*						M M	r«*
IWOH«f«	-							j*ti
ta*a					*>•*	10-11	U M	rt*
							1MB	re*
							• M	»«*

STATEMENT III. *Samples of gur from Poona.*

Description.	Cane sugar.	Glucose.	Water.	Ash.

In the case of the raw sugar, it was possible to determine not only the amount of cane sugar, [illegible]

[illegible] determined in [illegible] the amount of [illegible] acid.

[illegible] suppose [illegible] relating [illegible] 70 per cent. to [illegible] 10·9 [illegible] ter.

[illegible] samples of [illegible] seen, the percentage of cane sugar was [illegible] were separately analysed an [illegible]

[illegible] coincide [illegible]

[illegible] being laid by [illegible]

[illegible] varieties of cane grown on [illegible] subject to waterlogging than that of plots [illegible] that [illegible] aged that the weight of sugar obtained is, I believe [illegible] it ought to have been. [illegible] of the juice and "*gur*" of some of [illegible] the surprising [illegible] find that the percentage of cane sugar is [illegible] glucose and water generally lower than in the "*g*[illegible]" of the adjacent crop of "matna" cane [illegible] X). The proportion of [illegible] of these four varieties of cane were made, and it is not [illegible] what [illegible] crops these varieties [illegible] were really good [illegible] sug[illegible] might [illegible] these varieties [illegible] other year's results may throw light [illegible] feature in their composition.

In the third division of Statement II are exhibited the analyses of several samples of "*gur*" prepared by cultivators [illegible] column. They are, on the whole, of about equal quality to that prepared on the farm. Their worst feature was the amount of dirt, bits of cane and earth which they contained.

This is of course readily understood when it is borne in mind that the juice at the farm was all passed through a cloth before being boiled down, and this of course the cultivators can readily do as soon as there arises any call for it in the bazar.

In Statement III are exhibited the analyses of the various samples of raw sugar ("gul") selected from that prepared in the Poona experiments. The percentage of cane sugar varies from 69·1 to 79·2, and in the majority of samples it was higher than that prepared at Cawnpore.

The glucose, however, with one exception was distinctly higher than in the Cawnpore samples. It varies from 9·53 to 13·88, one sample, however, containing only 5·89 per cent.

The moisture, with the exception of one sample, which contained only 4·8 per cent., varied from 7·1 to 11·35 per cent., and was generally less than what the Cawnpore "gur" contained.

The proportion of mineral matters varied from 1·16 to 1·88, which is distinctly less than that in the Cawnpore "*gur*."

It may be well in concluding this paragraph to refer briefly to one or two points in connection with the quality of the Cawnpore Farm "*gur*" and the Poona "*gul*." Both names apply to the raw sugar obtained by boiling down the juice until it will solidify on cooling. Doubtless it is, from the cultivators' point of view, the most important thing to produce as great a weight of sugar as possible, irrespective of any niceties of composition, and judging by the analyses of the five sam[illegible] "*gur*" exhibited in the third div[illegible] [illegible] better purposes their [illegible] there-fore, we find that [illegible] [illegible] [illegible] as much raw sugar per acre is produced at Poona as at Cawnpore, it w[illegible] be evident th[illegible] this result must, at present at any rate, bear a value very much above that of the composition [illegible]

It is, however, to be noted that in the neighbourhood of both these farms refined sugar is being made on a large scale, and it will not be out of place if, whilst determining the variety of cane, and the mode of growing it, which will produce the most raw sugar, we bear in mind that there will probably be a demand for raw sugar for refinery purposes. It is for this reason that I draw attention in the next place to the amounts of glucose and mineral matters in the raw sugars which have been produced at the farms. The percentage of cane sugar was much about the same in the two sets of samples. But the proportion of glucose is distinctly less in the Cawnpore samples than in those from Poona. It may be that this is to be referred to some inherent quality of the juice of the cane; but I think it may in part be owing to the fact that at Cawnpore a mixture of po[illegible] and a mucilaginous substance was added to the juice, in order, on the one hand, to neutr[illegible] [illegible] the juice and thus prevent to a greater or less degree the inversion (*i. e.*, glucose formation) of a part of the cane sugar, and, on the other hand, to cause a precipitati[illegible]n of the albuminoids of the juice, and the analyses would indicate th[illegible]at the alk[illegible] has really had the above indicated effect to [illegible] certain extent. This is a po[illegible]int which wi[illegible] worth while experimenting with another [illegible]

I am inclined to think that potash is not the most suitable alkali to employ, and it may prove better to add some caustic lime or carbonate of lime instead. The other point to be noted is the distinctly higher percentage of "mineral matter" in the Cawnpore *gur* than in that made at Poona. Possibly the higher proportion at Cawnpore is to be referred in part to the addition of potash to the juice (as above mentioned). That it is important for refinery purposes to keep the proportion of mineral matter low, will be appreciated when it is mentioned that refiners consider that one part soluble mineral matter will prevent five parts of crystal[illegible]ble sugar from crystallising. All the mineral matter in the raw sugar is not soluble, and the amount of soluble mineral matter was determined in only three samples, in which it amounted to 2·06, 2·79 [illegible] per cent., respectively. It may be of value, however, to bear this point in mind [illegible]

4. *The total sugar in the cane.*—When the cane is crushed in an ordinary mill such as those employed by the cultivators, only a portion of the juice, and consequently of the sugar also, is extracted. A certain portion remains behind and is lost.

An '.(.tempt wns m iJo to dctornrne the amount of tins in two way*. The one WM by determaining tlw amount of *sag*** '''^ ln ''i0 rt'fusa crushed fa no, the other by determining the total anw I pw in tlw eatui tram whtcli would)« subtracted that) the ju;-. The results of ncitli-r oMthod were, however, satisfactory. Difficulties, which need not be here entered upon, won* mot witli ant] it matt be left to * future ceuuion to perfvot the methods employed and thin writ-eat the result.

An approximate estimate ha« bcon made by an indirect method, (he net result of which KOe« to *h>w that at Poem frura 2 to 3'5 per utnt. of »ujar was thus lo»t, whilst at L'awnpore the low WM not Iww than 5 per cent. The Utter amount is certainly very large, MMDBting to (ally two-fiftlu uf iliu total *tag* ir in the MMO The CWIF« of thu must not be hastily put down t> the millt employed. On the contrary, the resulti obtained with tlw *'P*»*t*'* can*, e'm<> of which WM oraebtd by Mr, SuUhiah at the Cawnpore Karro, «how a very tiifffrtnt re«ult. In the *nut* of the"matoa" cane, whirh ni tlit- main crop in 'h' "jiwnp^re experiment', only 5> p>r cont .if juice WM eitnu-ted, whilst no \>-*n* than d-1.1 per cent. of juice KM ubi liiwJ from tha *I'aunfa* cane with a wrrwpoii-ing proportian of *ytr,* ami altlioag't n<> analywa were maJ« of the *Pamad,,* cane or its juice, there cannot have been ;ii ire than i per c«?nt. of nuijar left in the refuse, an-! it WM probably mioli lem Tiio amonnt "f *w* obtaiH I «*a- f.ir higher than any grown at tbe farm, »nd the proportion " • , n»m.'ly, 13-7 from 100 part* of emne, was distiactly hi^h. Tbh *"Pi**d-t"g*t* g»T« th* bllowiag rc*ulL» un anatysia *—

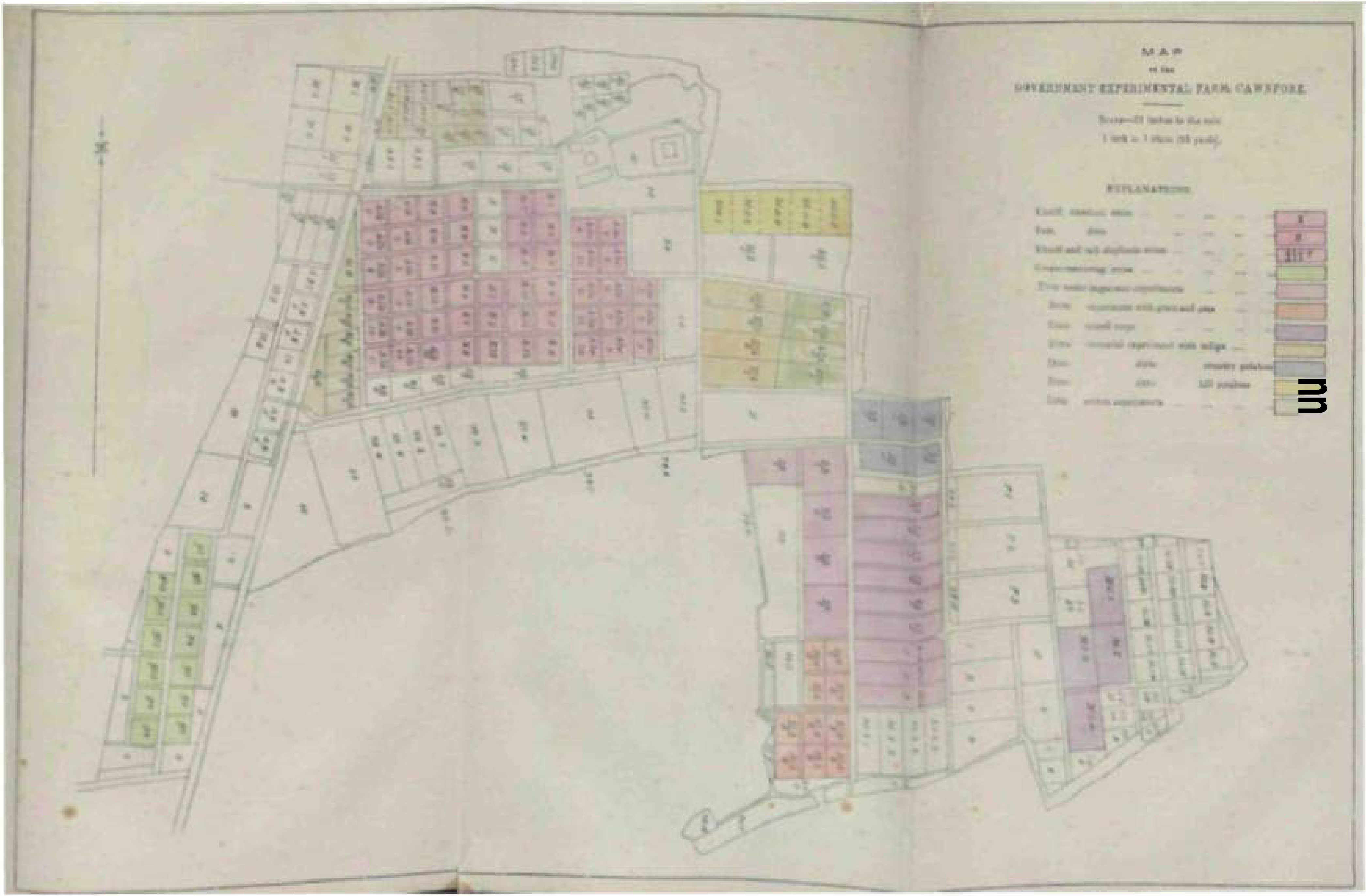
M» mfv.	Olscow.	*k%b.*
76-70	111"	1·92

showing it to U i ^ • • I i»Jipl« "i raw an :"•• ^ W TM'^ ^PP***! tharefire, that the high proportion of sugar r »"t *t*tr4* ated at Cawnpor* w*« • ere likely occasioned by the quality or liinlnta* ol ttu If ; and if ihts iboaM prove to be the ewe, it will show the dentrobtlity of growing a cane from whiilt a high proportion <f tbe juice may be extracted.

5. 7i# *amount »/ Pkotpkoric 4<*d and Mtrofem /« tit tHfarcaw* ero/>.*— The fUKarcano irop i« generally mppowd U> be a *ery "nhamting" orop, and it u therefore of intcrwt *U* dr^rmine a* aonrauly as pmaible the a«outit of nitrogen and photpboric add, tiflU and pota*h which it Ultft from the wil. An attempt waa made t> di-tenuiti.* iho nitr^cn and phoapboric acid ; bo* in this oaae, ai in the determination of t N t>Ul »utf»r, difficullic* were expericooed, cnn»U(iiiK ettkfly in gtrttin^ what were nally wpwiMrtatiw mmpl« of iht- nataebb, and a funhi-r endeavour to overcome l!if Jittivulli'f ati>l m»Le more «i»i:t dct*rmin»!joni will be utulortaken next y*ar. So tar, b>wever, M one can jaigt *hy* *uoh analyw* AS bave been rnide, tlit ami»unt« of nitrogen aoJ pho-i^aric acid in the i-rop. at the two farroa, reapwtivdy, an a< followa ;—

A*»uming W.000 poundt of cane and t,000 t^pa per acre to reprewnt tha Cawnpore crop, the (,»Ul amount of pho.pbone acid wan .tout *U\)m.* and the nitrogen 34 pw,nds per acre,.. In *t\a* ciiHi »f the Poona crop and awuming l00,W)Oft», of rane and 14,000lbs. of tops pram the toUl UBoat of phoaphooo acid <w about 5IIIW and the oilrox*n abjul fltlb* p-'f *Uf.*

A wbwt crop of flUOll*. of *gnia* i*r ten will including (be straw) remove about 8 pounds of phosphor:- »ciJ anJ »'-«t 1J P"*nds of nitrogen per acre.


MAP
of the
GOVERNMENT EXPERIMENTAL FARM, CAWNPORE
EXPLANATIONS

REPORT

ON THE

Cawnpore Experimental Farm

FOR THE

Kharif and Rabi Seasons, 1895-96.

AhhABABAU:

Printed at I** *Xertk. Wfltrn frvrimrf nntt (hath Gotvmwmt* Press.

No. IT9-1 of 1896.

DEPARTMENT OF LAND RECORDS AND AGRICULTURE, N. W. P. AND OUDH.

flated Cavmfwrt, the]9th Ottaber 189$.

FROM

SAIYID Ml liAMMAD MAPI, M. R. A. C,

ASST. DIltMTOIl IX CIlAKflK OP TUE DtFtBTXEXT
OF LAID BICOXM AKD Ar.air.Ti.TrwE,
NORTH-WESTERN 1'aovixcta ASD Onm,

To

Titr CHIEP SECRETARY TO GOVERNMENT,
NOETH-WtSTEHS PkOVINCES AXD OfBH.

Bo,

I *UA\I.* tlve honor to submit the Anoonl Report on the Cawnpore Farm fnr 1&95.95 and to say that the report liai Wen examined liy ih* Africottwa] CbemUt to Uu- Government of India.

t. ThcIarmwM throughout the yew under the immediate charge of Mr. P. V. Subliah, Principal of tbe Agricultural School at Cawupore, and the greater part of tbe report i* bawd on the notes kept and furnished by him.

The y«ay under report was characterised hy deficiency of rainfall, which, though not very keenly felt at tbe Farm on account of facility* of cana! irrigti inn, r-uuted same damage to sugarcane, a crop which oeeupi« • very prominent plaw in tlie programme of orpwimenU under trial. In the kharif the field of maiio wat my good- The rabi crops on uaWfttd lands gave a very poor outturn, 1,ut the yield of wheat on irrigated areas under high oultiv»Uon wat much heavier than usual, Tbe different import.-d varieties of cotton gave a remarkably nigh outturn at compared aritfa Ifct past year*, and an interesting fact discovered during the year under report in the matter of cotton cultivation wai that several varieties under trial at tbe Farm were capable of yielding successive outturn! of fibre and *oed if the planU were, iniicad of lieing sat down at the completion of • In- Tint picking, allowed to «Undin the field. Kxprimenta will be continued with a view to determining Uie economy of thii method of cultivating cotton.

3 The Agricultural < 'In-mitt to the Government of India made a abort stay at tbe Arm during U» eane-cruihiag aaaaon, to analyse tbe juice and suprrviw the manufacture of *fnr.* As interesting note in which be baadtseutaed tbe rwultn of the sugarcane Mftrimen** and art forth tbe eoncltuions arrived at, formi an appendix to the report. Witk regard to the Paunda cattn which are Dot ordinarily used EM the production of sugar in th«e provinces, Uu eiperimetrta made daring tbe year under report ba«« contrmri the results obtained last year, namely that gowl *gmr* could sr»e-cea«fully 1* produced from the Paunda canee, a fact worthy of the notice of native • oltrnti rt,

4. The expenmtuU with fodder crops have proved that ;«ar and *guar* are *n»\-* l«tf»»dder.yUUmgrt»r*Md*wcaf*U" or PTM1^ ^"w «»«* cuttings in a year, aUo that they oould sucowfuD/ ** *t*0"* "iti> *** ^ of wtincial irnemiion for f.idder purpowj* »o the hot weather, when green fodder is generally tcarce. Canadian oats have again baw found to yield a very high outturn of »traw, and coiw^umtly to be especially wiUhle for culUvalion in winUrfor foddw.

6. Tbe various systems ol conserving cattle manure now under trial at the Farm are, Ukely to lead in tun* U> HUM r»uJU of economical value.

0. Tlu mriag of «inlk worm oUftbfd from A « u h*i •ftin pnnd a failure. It appears that (her coaot »Uad tb* bet climate of Ckvnpoi*.

7. Tb* new Afab rtallwa rmiraJ from tbe Ciril V«Uriawy IVputmrut bt» kept ver rcoodbmttbtburaibMtUMTMr. Tbm ia raougb *6aami* f*r ku unricM. but: tb* mAna ntwtfKi u« not grocnllf cf • good Lratliay cbM. On!/one m»tr wnrtd bj Km bu fMltd to ftr, wl tb,. Supnislradrat of U* Civil Veterinwy Dvputnwsl «M fuJljr *wttk&td* witb tbe tjiialitj of b«r fad oa Uw <xa*ion of ba but rint. It t% however ir, too wrl;]r«l *U>* form a dcfiaiW opbin witb ngw* to tb« iUUwa't work.

8. Tb« 1'hDoptt • miinpaat of tb« opcrmtioni *mi* tb« Fkrm bM, w far, U«o fully satisfactory.

1 t» r« tbt boowr to b».

Sir,

Your most obedient servant,

B. M. UADI,

Asst. Dir. in charge of the Dept. Land Records and A

N.-W. Provinces and Oudk,

REPORT

ON THE

CAWNPORE EXPERIMENTAL FARM

FOR THE

Kharif and Rabi Seasons, 1895-96.

I.—HISTORY OF THE FARM.

THE Government Farm, Cawnpore, is situated in village Ciolaia, about three miles south-west of the Cawnpore city. It is near the Rawatpur station of the Cawnpore-Achnera Railway, and its distance from the Cawnpore East Indian Railway Station is about four miles. The land occupied was originally rented from the zamindars of Gutaia in May 1881, and in that year the important manurial experiments still carried on in the "standard" and "English" plots, which will be described presently, were started by Mr. J. R. Reid. Within a short distance of the Farm premises a small workshop for making and repairing agricultural implements and a [illegible] were erected.

During the first years of management the area of the Farm underwent frequent changes, but of late it has not varied. The Farm proper, of which a map is attached, extends over [illegible]1·33 acres, excluding the land occupied by the canal distributary. It enjoys good facilities for irrigation, being served by a distributary from the Ganges Canal.

The soil of the Farm may be accepted as a fair sample of the light red loam which occurs over a large portion of the Ganges-Jumna Doab. It was chemically analysed some time before 1882 by Mr. S. A. Hill, B. S. C., Meteorological Reporter to the Government of the North-Western Provinces, and the analysis is given below :—

Constituents.		Composition per cent.
Combined water		2·04
Organic matter		0·16
Carbon dioxide		0·16
Ammonia		None.
Nitric pentoxide		0·11
Chlorine		Trace.
Sulphur trioxide		Do.
Phosphorus pentoxide		0·11
Silica and [illegible]		0·13
Alumina		4·20
Oxides of iron and manganese		5·59
Lime		0·90
Magnesia		0·91
Potash		0·22
Soda		0·08
Clay decomposed by H_2SO_4	Alumina oxide	2·14
	Silica	3·27
Insoluble silicates		79·54

Dr. Voelcker, in his report on the "Improvement of Indian Agriculture," records the following opinion regarding the Farm :—

"In fact, I was much pleased with the Cawnpore Farm, and was not prepared to find in India anything [illegible] of what an experimental station should be."

Several fields had been found by experience to suffer from waterlogging when [illegible] rain fell within a limited period. The level of such fields was raised (where it was possible to do so) in 1894 by means of spreading earth dug out from uncultivated strips of land adjoining, in order to improve the drainage. Large quantities of earth taken from the canal distributary were spread for similar purpose on a plot (Field No. 9 on the map) which used to be under water in the greater part of the rainy season every [illegible].

GENERAL CHARACTER OF THE SEASON

During the rainy [illegible] be hardly sufficient for agricultural requirements, and the autumnal rains which were consequently looked forward with great anxiety failed alto[illegible]. Detrimental as this was to the progress of agriculture, [illegible] xperimental Farm, where the deficiency in the rain was almost made up by canal irrigation. Still the sugarcane crop, which requires a moist [illegible] suffered [illegible] in want of rain, and gave, [illegible] than it would have given in a season of better rainfall.

But for cotton the absence of rains in October and November and for wheat the absence of the rust-causing cloudy weather in February were very beneficial. The predominance of clear weather in the month of September gave sufficient time for a thorough tillage for the *rabi* crops, which were consequently sown earlier than usual.

Owing to clear weather and the early appearance of spring, the *rabi* crops ripened earlier during the year under report, and were harvested about a fortnight before the usual time.

The subjoined table shows the amount of rainfall during the year under report and the year preceding it :—

Month.	Actual				Normal.		Remarks.
	Rainfall.		Rainy days.		Rainfall.	Rainy days.	
	1894-95.	1895-96.	1894-95.	1895-96.			
April ...	—	—	—	—	·11	1	
May ...	0·22	—	2	—	·52	1	
June ...	7·88	1·54	10	5	3·11	4	
July ...	9·50	3·28	16	10	10·25	12	
August ...	13·02	7·54	7	12	10·06	12	
September ...	10·17	*5·02	6	5	4·93	7	* Of this 4·80 inches fell by the 3rd and the remaining ·22 inches fell on the 18th and 19th, as the rainy weather practically came to a close by the 3rd September.
October ...	10·12	—	3	—	1·23	2	
November ...	3·04	—	1	—	—	—	
December ...	0·29	0·02	—	1	·34	1	
January ...	2·16	—	2	—	·64	1	
February ...	0·32	—	3	—	·28	1	
March ...	0·20	—	—	—	·23	1	
Total ...	62·94	24·00	51	33	31·12	43	

II.—TESTS OF MANURES.

(a) *Permanent manure experiments with maize and wheat.*

These experiments are carried on on four sets of 13 plots each. One set is sown with maize and another with wheat year after year, and the remaining two with maize and wheat alternately. The first two sets of plots are called the "standard" series and the last two the "duplicate" or alternate series. The manures mentioned in the following four statements are applied to the thirteen plots of every one of the four sets, so that the effect of every one of the 13 manures is tested on four plots every year.

Kharif standard and duplicate series.

Between the 3rd of January and 3rd of July 1895 the plots of the kharif standard series were ploughed six times with the Watt's plough, and were watered once on the 27th June before sowing. The plots were sown on the 4th July with *Jaunpur* maize at the rate of 12 lb of seed per acre.

Six ploughings were given to the plots of the duplicate series from 3rd February to 3rd July 1895. Plots Nos. 4, 9, 10, 11, 12 and 13 of this series were watered on the 29th June before sowing. The rest were not watered, as there was a fall of rain. Maize was sown in these plots on the 4th July at the rate mentioned before, and from 24th to 31st July seedlings raised elsewhere at the farm were planted in blank places where seed had failed to germinate.

The respective outturns of the two series are shown in the following statements :—

Statement showing the outturn of the kharif standard series—maize.

Plot number.	Plot area.	Treatment with reference to manure per acre.	1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	1895-96.
			Outturn per acre in lb.														
K. 1	Each plot = 400 square yards.	Cowdung 100 [illegible] maunds	—	2,434 9,438	1,720 2,879	[illegible]	472 4,221	[illegible]	—	48 234	[illegible]	488 787	632 [illegible]	890 3,146	[illegible]	[illegible]	[illegible]
K. 2		[illegible]	—	1,738 [illegible]	1,044 3,734	[illegible]	[illegible] 3,321	[illegible]	—	137	[illegible] 7,187	180 171	[illegible]	605 2,964	[illegible]	[illegible]	[illegible]
K. 3		[illegible]	—	1,105 [illegible]	1,445 3,518	[illegible]	206 3,493	[illegible]	—	131	1,200 7,917	153 118	[illegible]	435 730	[illegible]	[illegible]	[illegible]
K. 4		[illegible]	—	1,453 7,150	1,073 3,165	1,250 3,707	337 3,107	[illegible]	—	24 109	895 7,817	310 304	641 2,710	103 1,306	[illegible]	[illegible]	[illegible]
K. 5		Grain / Straw	—	2,100 9,176	1,098 3,712	1,009 4,303	873 4,394	507 [illegible]	—	24 104	1,041 5,870	190 [illegible]	327 925	287 [illegible]	[illegible]	[illegible]	850 3,873
K. 6		Grain / Straw	—	—	1,282 3,783	1,200 4,232	320 [illegible]	847 [illegible]	—	—	1,246 [illegible]	[illegible]	1,053 3,924	[illegible] 2,008	[illegible]	[illegible]	1,024 8,277
K. 7		manure	—	—	1,708 3,488	1,248 [illegible]	[illegible] 3,780	[illegible]	—	—	1,827 8,193	[illegible]	472 4,235	1,005 1,784	[illegible]	[illegible]	2,314 [illegible]
K. 8		cowdung +	—	—	—	[illegible]	720 4,508	[illegible]	—	—	[illegible]	[illegible]	1,234 3,388	866 1,040	[illegible]	[illegible]	[illegible]
K. 9		[illegible]	1,488 —	—	—	[illegible]	461 [illegible]	[illegible]	—	—	[illegible]	[illegible]	456 3,445	237 4,422	[illegible]	[illegible]	[illegible]
K. 10		[illegible]	—	—	—	[illegible]	[illegible]	[illegible]	—	—	[illegible]	[illegible]	1,312 3,689	200 1,964	[illegible]	[illegible]	[illegible]
K. 11		[illegible] +	—	—	1,708 3,068	[illegible]	[illegible]	[illegible]	—	—	[illegible]	[illegible]	665 [illegible]	830 1,032	[illegible]	[illegible]	[illegible]
K. 12		manure + gypsum	—	—	1,495 3,895	1,363 3,773	[illegible]	[illegible]	—	—	[illegible]	[illegible]	[illegible]	738 1,251	[illegible]	[illegible]	2,232 7,278
K. 13		Grain / Straw	1,220 —	[illegible]	990 3,845	1,044 3,779	[illegible]	485 4,747	—	—	[illegible] 4,247	471 424	[illegible]	218 750	[illegible]	104 2,027	1,029 4,377

Statement showing the outturn of the kharif alternate series—maize.

Plot number.	Plot area.	Treatment with reference to manure per acre.		1891-92.	1892-93.	1893-94.	1894-95.	1895-96.	1896-97.	1897-98.	1898-99.	1899-00.	1900-01.	1901-02.	1902-03.	1903-04.	1904-05.	1905-06.
	Each plot = 433 square yards.	150 maunds ... lime [illegible]	Grain ...	—	1,865	1,077	1,508	620	665	—	262	1,841	1,113	950	952	877	[illegible]	1,110
			Straw ...	—	7,1[illegible]	5,108	7,406	3,605	3,272	—	306	7,310	7,938	3,872	5,021	4,4[illegible]	[illegible]	4,472
		[illegible] + gypsum 2	Grain ...	—	1,704	979	1,224	641	552	—	423	1,855	1,053	944	533	1,4[illegible]	[illegible]	1,180
			Straw ...	—	6,755	2,040	6,020	3,042	3,844	—	702	7,023	8,125	4,233	3,530	[illegible]	[illegible]	5,200
		[illegible] ...	Grain ...	—	2,020	1,170	1,260	605	665	—	121	1,273	625	662	860	1,342	[illegible]	1,004
			Straw ...	—	7,855	2,597	6,110	[illegible]42	6,001	—	411	6,900	6,240	2,479	[illegible]	6,926	4,223	2,020
		[illegible] cowdung ...	Grain ...	—	222	713	866	315	592	—	—	330	303	544	1,113	409	552	750
			Straw ...	—	3,665	3,329	4,008	3,371	3,461	—	181	6,088	2,148	3,751	3,290	9,270	4,707	2,904
		[illegible] ...	Grain ...	—	1,278	820	824	484	520	—	—	1,077	620	484	470	1,561	750	742
			Straw ...	—	7,052	2,523	4,760	2,620	5,007	—	145	6,651	5,346	2,178	2,902	7,744	4,828	2,807
		[illegible] bone super-	Grain ...	—	—	1,048	802	702	580	—	—	1,222	1,267	478	708	974	557	808
			Straw ...	—	—	2,837	4,420	3,519	3,168	—	200	1,779	8,143	2,105	4,077	5,062	6,563	2,882
		[illegible] bone-dust	Grain ...	—	—	300	1,002	308	580	—	—	1,240	1,254	1,250	604	1,331	1,080	1,140
			Straw ...	—	—	2,222	4,502	2,436	3,844	—	200	970	6,572	4,808	3,790	6,558	7,173	4,247
		[illegible] cowdung +	Grain ...	—	—	—	1,194	822	477	—	209	1,013	899	871	544	1,873	680	1,147
			Straw ...	—	—	—	2,648	3,802	4,250	—	671	6,792	7,272	3,614	4,629	10,032	7,100	8,442
		[illegible] ...	Grain ...	—	—	—	1,728	622	1,161	—	248	1,079	1,306	1,101	1,210	2,111	1,262	2,097
			Straw ...	—	—	—	7,065	[illegible]	2,028	—	702	7,346	3,744	2,002	6,862	12,044	7,064	3,023
		[illegible] ...	Grain ...	—	—	—	1,108	847	776	—	121	1,270	1,202	990	1,022	2,037	865	1,160
			Straw ...	—	—	—	3,707	4,133	4,230	—	244	8,222	8,276	3,140	1,470	8,760	3,602	2,941
		[illegible] dust 1½ maunds.	Grain ...	—	1,026	1,244	1,050	622	544	—	—	1,085	774	786	786	1,032	732	1,083
			Straw ...	—	7,383	3,040	4,018	5,541	4,622	—	242	7,524	2,604	3,036	2,050	7,373	6,463	4,621
		Sheep-dung 150 maunds + gypsum 2 maunds.	Grain ...	—	—	1,241	1,974	520	239	—	295	1,422	1,488	942	786	1,345	871	1,325
			Straw ...	—	—	3,031	4,769	2,321	4,490	—	341	10,477	4,730	2,214	4,271	7,207	6,490	3,824
		Unmanured ...	Grain ...	—	324	802	564	104	205	—	309	502	871	629	827	780	266	774
			Straw ...	—	5,024	2,049	3,542	364	3,430	—	664	4,409	5,394	2,178	4,753	6,462	3,403	2,178

Outturn per acre in lb.

It will he wen that during the year under report the tf4rec «heep-dung plots and the pntnlMt" jiloti have piven the 1 w*t outturn*; the cowdun? plot* come next;1hen oom« llw unmanured plot, and the saltpetre and a»hec plot* « which the germination m particularly poor come the lart.

An explanation for the *lower* outturn* given by taltpetre aim menu to lie in the fact that 3 maundi of thi* manure *upplr a mnch (mailer quantity of (itrogen to the wit u enmparad with the ibeep-dang, pondrctte mad oowilsng in the (jaantitie* ia which they are applied in thi* experiment. Thi* Cut ha* been determined by a chemical analytw of tbe cereral manuref.

mbi standard and duplicate terifjf.

Tbe following it a detail of U» cultivation of the *rain* ttand&rd and alternate acres :—

From the middle of June 1895 to the beginning of October 18»6 the plot* were ploughed three time* with the Watt'* plough and the land levelled with the *patela* aft<r each ploughing. Tbty wore aown on the Uth October with Muiaffarnagar wheat at the raU of 13! H> per acre. The plot* were watered throe time* between NovetBba 1S9& and February 1S9B.

The crop ws* hanreattd about the end of March 1890.

The following table* *Aaw* the outturn* of both the teriei:—

Statement showing the outturn of the rabi standard series—wheat.

Plot serial No.	Plot area.	Treatment with reference to manure per acre.	Outturn per acre in lb.														
	Each plot = 400 square yards.		1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	1895-96.

Statement showing the outturn of the rabi alternate series—wheat.

Plot area.	Treatment with reference to manure per acre.		1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	1895-96.
			Outturn per acre in lb.														
[illegible] yards.	Cowdung [illegible] maunds.	grain / straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Cowdung [illegible]	grain / straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Cowdung [illegible]	grain / straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Ashes of [illegible] cowdung	grain / straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Saltpetre 3 maunds	grain / straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Saltpetre 3 maunds + bone superphosphate 3 maunds.	grain / straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Sheep-dung 180 maunds + [illegible] maunds.	grain / straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Ashes of 180 maunds of [illegible] petre 3 maunds.	grain / straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Poudrette 180 maunds	grain / straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]-ung 180 maunds	grain / straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Saltpetre 3 maunds + [illegible] maunds.	grain / straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Sheep-dung 180 maunds [illegible] maunds.	grain / straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Unmanured	grain / straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Here also the best outturn was given by sheep-dung plots, the next best by cow-dung and poudrette. The lowest outturn was obtained from saltpetre and ashes.

As a rule, the outturns of the *rabi* alternate plots are higher than those of the *rabi* standard. The explanation to this lies in the varying length of time each of the four series has between two crops borne by it, *i.e.*, the crop of one year and that of the next. Thus :—

Kharif standard (maize after maize) has a fallow of about	... ...	9 months.
" alternate (maize after wheat)	... ...	3 "
Rabi standard (wheat after wheat)	... ...	6½ "
" alternate (wheat after maize)	... ...	12½ "

This year, however, the yield of the *rabi* duplicate plots was, contrary to past experience, lower than that of the *rabi* standard plot, owing to less uniform germination and the consequent smaller number of plants in the last-mentioned plots. This [illegible] alternate plots were maize [illegible] and [illegible] out into, large [illegible] first ploughing [illegible] did [illegible] ble [illegible] into powder [illegible] of sowing ; [illegible] in the [illegible] series, [illegible] of these plots [illegible] the time of [illegible] was [illegible]

The unusually high [illegible] at the Farm were, in a great measure, [illegible] *rabi* of 1895-96 [illegible] good for irrigated crops. The general opinion of *rabi* 1895-96 [illegible] true for unirrigated crops ; but the Farm crops being irrigated were better th[illegible]

(*f*) *Manurial experiment with potatoes.*

This was started in 1893 on two sets of five plots each. One set was grown with the white skinned country [illegible] "Madrasi" [illegible] the other with [illegible] hill variety from Naini T[illegible]

Details of cultivation [illegible] country variety :—

Tillage.—Ploughing began on the 8th of July. Two ploughings were done with the Watt's plough, subsoiling once, cultivating three times with the Planet J. R. Horse Hoe, and levelling the land with the *patela* [illegible] obtained was about 10 inches deep.

Manure.—Spread a few days [illegible]

Sowing.—Was done on 16th October in rows 1½ feet apart from row to row and about 8 to 9 inches apart in the row. Medium sized whole tubers 1,210lbs. per acre were planted. The seed was good and germination uniform.

Earthing up.—[illegible] November.

Irrigation.—Five times.

Digging out the tubers.—On [illegible] months.

The following statement gives the outturn of the country variety in 1895-96 and in the previous years :—

Statement showing the effect of certain manures on country potato.

Plot number.	Plot area.	Manure applied per acre.	Outturn per acre in lb. 1893-94.	1894-95.	1895-96.	Remarks.
36/1	Each plot = 720 sq. yards.	Farmyard manure, 200 maunds ...	10,179	4,105	17,874	Supplying about 100lb. of nitrogen.
36/2		Poudrette, 200 maunds ...	8,068	6,228	18,062	Supplying about 100lb. of nitrogen.
36/3		Castor-cake, 12 maunds ...	11,410	3,290	17,273	Supplying about 40lb. of nitrogen.
36/4		Bone superphosphate and saltpetre 4 maunds each.	11,300	2,495	14,807	Supplying about 30lb. of nitrogen.
36/5		Unmanured	7,136	1,718	13,080	

It will be observed tliat daring the year under report the outturns in all the plots were generally good. Ptajifttfts Rave the beat outturn and cwtor-calce nnd farm-yard manures have done nearly equally well. The high outturns on ail the plota and the outturn of 12,6801b, oa the untnanuml plot are chiefly due to the bare*fallowing of the plota for 8 month*, good tilth add aeed and uniform germination. The yields of the several ploU were aoM at under :—

Kmrmyurd manure plot for Rs. 26-11-6 or Bs. 182-2-3 per tore. Powlrrtt* plot for R*. *tS-b-S* or tU. 194-3-0 per acre. Caator-ctlrc plot for Re. 28-13-10 or Kc *ISi-t-t* per ten- Sapafpbaepatta and nitre plot for IU. Sl-H-ll or Us. 149-8-2 per acre. Unmanured plot for 11*. 1&-15-3 or It*. 129-3-3 per acre.

With a view to determine the outturn of country potatoes under high cultivation a Beit of *,0d k *qnaro yardi and in fair oondition was grown with potatoej. The manure applied wat poudrette at the rate of 890 maun *U* per acre. Tlio yield obtained wai 13,85ttb., ML, about £01 maunds per acre. Thd produce was told for H*. 1*1-4-0 which ii equivalent to a return of IU. 109 per acre.

Details of cultivation.—For the hill potatow :—

Tillage—Three |.lunghingt with the Watt's plough; cultivating four times witb tbe Plaxwt J. S. Howe Hoe. Tbe rwt as in the eottntry variety,

Manure—Was spread a day before sowing.

Sowing—Was done on the iSth and 20th November. Tuber* cut to peices obtaining two or more buds were planted at the rate of l,0Q21bt. per acre. Seed and germination were good. The ridge* were 2 f feet apart from centre to centre and tbe " seta " were planted a foot apart on the ridges.

Karthintj—On<<« betides the ridge* that were made before towing.

Irrigation-*fltf times.

*Diggins <** *** tvlxrt*—On the 15th April 189fl.

0WM*e* ami »Mj'«-rte«—Tbe germination wta good, the plants came up well and were promising till about the middle of February when the leaves began to dry and thii itate iocratted more and atore in §pite of watering. It was clearly due lo the drier and hotter weather of February and March thU year than u.ual. The tubers were alto attacked by white anu—to a greater extent on tbe cowdung and poulrotte plots than on tbe other*. Hut fur three two injuries the crop would have yielded a higher outturn than it did.

Tbe results of the experiment are tabulated in the statement below •,—

StaUmtnt Aoving Ih rtnJU of tiu txperiment with Kill potato*.*

Plot number.	Plot area.	Manure applied per acre.	Outturn per plot in lb.			Remarks.
			1893-94.	1894-95.	1895-96.	
20a 1	Each plot = 780 square yards.	Farmyard manure, 200 maunds ...	1,004	7,424	[illegible]	
		Poudrette, 200 maunds ...	2,532	8,332	[illegible]	
20a 3		Castor-cake, [illegible] maunds ...	3,036	8,000	3,207	
		Bone superphosphate 4 maunds and saltpetre 4 maunds.	2,881	7,018	3,810	
20a 5		Unmanured ...	1,081	8,402	3,177	

Th« plan of tbe manurkl nperiment with the two wietiaa of potatoet haa ttoc* htJB matrna.Hr tttmd by the Agricultural Chtmist to the Oonrnmnt of India and Is described fully !* bis noU (Appendix A).

(*f*) *MitnuruU trptrivunl vtitk indigo,*

Hut wai started io 1893-94.

The following table shows the results of the experiment :—

Statement showing the comparative effect of gypsum and other manures on indigo.

Plot number.	Plot area.	Manure applied per acre.	Outturn of green indigo stalks per acre. 1893.	1894.	1895.	Remarks.
			lb.	lb.	lb.	
273/1	Each plot = 1,210 square yards.	Cowdung, 150 maunds	13,186	2,214	11,420	
273/2		Gypsum, 3 maunds	10,456	1,004	2,400	
273/3		Bone-dust, 5 maunds	10,050	2,270	10,813	
273/4		Unmanured	7,250	2,304	8,224	

Experiment with gram and peas.

The subjoined table gives the results of this experiment :—

Statement showing the comparative effect of certain manures on gram and peas.

Plot number. Gram.	Peas.	Plot area.	Manure applied per acre.		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Remarks.
[illegible]	[illegible]	Each plot = 400 square yards.	[illegible] manure, 100 maunds	Grain / Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		Gypsum 3 maunds	Grain / Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		Ground kankar, [illegible] maunds ...	Grain / Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		Bone superphosphate, 3 maunds	Grain / Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		Unmanured	Grain / Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

(*c*) *Sugarcane manurial experiment.*

This was started in 1894-95 in accordance with instructions received from the Agricultural Chemist to the Government of India. The variety chosen for the experiment [illegible] the same plots were used during [illegible] as in the previous year.

Details of cultivation.—

[illegible] the 22nd [illegible] 5 ploughings were done in all [illegible] once with Watt's plough; cultivating once with [illegible] harrowing twice [illegible] the land was levelled twice with the patela.

[illegible] March by dropping the cuttings in [illegible] the native plough in the ordinary country way. The [illegible] part.

[illegible] Weeded twice, hoed twice, plants earthed up once.

Irrigation.—Ten waterings were given in all.

General.—The germination was irregular in (1) the superphosphate (2) the superphosphate and nitre and (3) the bone-dust plots. In all the plots except the first three plots of the series viz. V, V and V the growth of plants was very slow and especially so on the superphosphate plot. The failure of rains in September and October also checked the growth of plants somewhat and a borer caused some damage in September. The following statement gives the results of the experiment for 1894-95 and 1895-96 :—

Statement showing the result of manurial experiment with sugarcane.

Plot number.	Plot area.	Treatment with reference to manure per acre.	1894-95. Yield per acre of— Cane.	Juice.	Gur.	Percentage of— Juice to cane.	Gur to juice.	Gur to cane.	1895-96. Yield per acre of— Cane.	Juice.	Gur.	Percentage of— Juice to cane.	Gur to juice.	Gur to cane.	Weight of green tops.	Weight of dried leaves.
			lbs.	lbs.	lbs.				lbs.	lbs.	lbs.				lbs.	lbs.
[illegible]	Each plot = 1,210 square yards.	Unmanured ...	30,254	15,066	3,102	49·83	20·48	9·15	21,230	10,642	1,806	49·5	17·4	8·4	16,170	5,673
[illegible]		Cowdung 7 tons ...	36,414	19,156	3,124	52·61	16·30	8·57	15,868	7,177	1,213	45·5	16·02	8·26	15,823	4,882
[illegible]		Cowdung 14 tons ...	34,713	17,780	2,856	51·22	15·95	8·17	13,028	6,413	1,159	49·6	17·0	8·4	13,070	4,626
[illegible]		Bone superphosphate 2 cwts.	37,440	18,929	3,106	50·55	16·80	8·24	5,489	2,610	344	48·2	12·9	6·2	7,417	2,071
[illegible]		Saltpetre 2 cwts. ...	35,372	18,335	3,100	51·60	16·89	8·71	12,636	5,556	1,018	40·7	18·2	7·4	12,869	5,450
[illegible]		Bone superphosphate 2 cwts. + saltpetre 2 cwts.	30,032	15,082	2,656	49·23	17·61	8·80	10,180	4,328	779	42·8	17·8	7·6	9,612	3,808
[illegible]		Bone-dust, 5 cwts ...	47,576	24,078	3,484	52·40	13·06	7·32	11,055	5,054	858	45·7	16·9	7·7	9,638	3,747
[illegible]		Bone-dust 5 cwts + 2 cwts. saltpetre.	41,808	21,650	3,076	51·88	14·18	7·35	8,167	3,797	602	46·2	15·8	7·8	7,077	3,543
[illegible]		Unmanured ...	43,120	21,048	[illegible]	50·20	13·75	6·90	7,036	3,341	582	47·8	17·4	7·6	5,802	3,546

It will be observed that the outturns in 1894-95 were in all the plots much higher than in 1895-96. This was partly due to the fact that the plots were in better condition in the first year. The cane crop of 1894-95 had probably taken up a considerable quantity of plant-food from the soil and to [illegible] crop in the succeeding year with no more rest for the land than that of about 2 months, much heavier manuring than was provided in the experiment was necessary.

In both years the 14-ton plot has given a lower outturn than the 7-ton plot and the first unmanured plot; the bone-dust plot has done better than the bone-dust and saltpetre, and saltpetre alone has done better than saltpetre and superphosphate. This shows that the difference in the produce is not due to difference in manure but to other causes, chief of which is the want of uniformity in the condition of the land. This manurial experiment has therefore so far led to no definite conclusion as regards the effects of the several manures used.

It has, however, shown that the quantities used in this experiment are insufficient to produce appreciable effect on the yield. The plan of this experiment has been altered at the suggestion of the Agricultural Chemist to the Government of India. The details of the new plan are given fully in his note appended to this report (Appendix A). Another point worthy of notice is the unfortunately higher percentage of juice obtained in 1894-95 than in 1895-96. This was due partly to the canes having been in the former year longer, thinner and more juicy, and partly to the fact that some of the mills used during the year under report were not in such perfect working order as those used in 1894-95.

(f) *Permanent experiment with green manuring.*

Station A.

This experiment was started in 1893-94 and has for its object the determination of the manurial effect of—

(a) Ploughing in a leguminous crop.
(b) Growing a leguminous crop in alternation with wheat.
(c) Indigo refuse as manure.

The manures applied to plots Nos. 3, 4, 10, 11, 12 and 13 were adopted some years ago in accordance with the advice of Dr. Leather, the Agricultural Chemist to the Government of India.

The hemp on plot No. 7, the indigo on plot No. 8 and the urd on plot No. 10 were ploughed in on the 2nd September 1895. The hemp on plot 6 and the indigo on plot 9 were cut off the field on the 16th September 1895. The rape on plot 3 was sown on [illegible] August 1895, and ploughed [illegible] October 1895. The rainy weather practically closed on the 3rd September. Thus a great part of the rainfall was utilized by the green [illegible] crops that occupied the land in July and August, and the plots under them were [illegible] in September and at the time of sowing in October, much drier [illegible] exposed [illegible] to catch and hold the rain water. The result [illegible] the plot which carried a green manuring crop in the rainy season (with [illegible] rape) the tilth obtained for sowing was dry and full of clods [illegible] seed sown on 16th October did not germinate until a few days after they were watered on the 9th November. While plots [illegible] 3, 4, 5 and 11 germinated in about a week after sowing and thus the wheat crop on these plots had a clear start of about [illegible] over the plots which bore a green manuring crop in the kharif. Besides t[illegible] these latter plots had to be done in about a month's time while the former plots i.e. Nos. 1, 2, 3, 4, 5 and 11 had a period of 4 months for their tillage. The tilth of the plots under green crops was therefore more artificial and less weathered. The [illegible] to the action of the weather was strikingly [illegible] plot [illegible] which the ploughings done though equal in number to those done in other plots of the series, had to be completed in about a week (i.e. between the 8 and 15th October) and the seed-bed obtained was as fine, moist and deep as on the unmanured and other plots whose tillage extended over four months. But the wheat crop on the rape plot was strikingly pale and miserable from the beginning to the end for which there appears to have been no other cause than the want of weathering of the seed-bed.

With a view to know the quantity of organic matter that is ploughed in, the hemp, the indigo &c. were all cut and weighed before ploughing them in or removing them off the fields. Specimens of the plants ploughed in have been submitted to the Agricultural Chemist to the Government of India for analysis, so that we may know definitely how much nitrogen has been ploughed in, but the analyses have not been yet received and therefore simply the weights of stem and leaves of the several plots are noted below :—

Plot No. 6 Hemp removed	...	...	...	15,030 lbs per acre.
Do. No. 7 Do. ploughed in	...	...	...	14,883 lbs ditto.
Do. No. 8 Indigo ditto	...	...	...	3,021 lbs ditto.
Do. No. 9 Do. removed	...	...	...	3,880 lbs ditto.
Do. No. 10 Urd ploughed in	...	...	...	15,473 lbs ditto.
Do. No. 3 Rape ditto	...	...	...	2,323 lbs ditto.

The hemp and urd crops were good but the indigo on the two plots was bad and had been poor in the previous 2 years also, for which no exact explanation is known.

In some places there is a belief current amongst cultivators that indigo cannot be successfully grown on the same land year after year unless the land is rich. Perhaps this may be the case with these plots. The very low outturn of rape is due to the fact that it is a rabi crop and has been experimentally grown as a *kharif* crop, but without success so far. The following statement gives the results of the crops in the year under report and the previous years :—

STATEMENT.—*Showing the result of experiments to determine the effect of "green manuring" on wheat.*

Manure applied per acre.		Outturn per acre in lb.
Old indigo refuse, 120 maunds, ploughed in	Grain	[illegible]
	Straw	[illegible]
[illegible]	Grain	[illegible]
	Straw	[illegible]
Rape to be ploughed in	Grain	[illegible]
	Straw	[illegible]
[illegible]	Grain	[illegible]
	Straw	[illegible]
[illegible]	Grain	[illegible]
	Straw	[illegible]
[illegible]	Grain	[illegible]
	Straw	[illegible]
Hemp and wheat alternately	Grain	[illegible]
	Straw	[illegible]
[illegible]	Grain	[illegible]
	Straw	[illegible]
[illegible] indigo ploughed in	Grain	[illegible]
	Straw	[illegible]
[illegible]	Grain	[illegible]
	Straw	[illegible]
[illegible]	Grain	[illegible]
	Straw	[illegible]
[illegible]	Grain	[illegible]
	Straw	[illegible]
Gram, hemp ploughed in and gypsum, 6 maunds	Grain	[illegible]
	Straw	[illegible]
Lucerne and wheat alternately	Grain	[illegible]
	Straw	[illegible]
[illegible]	Grain	[illegible]
	Straw	[illegible]

As usual the [illegible] indigo [illegible] done the best. The high [illegible] of the unmanured plot [illegible] plots [illegible] already explained. [illegible] the former [illegible] enough [illegible] to germinate without the help of artificial irrigation and [illegible] a start [illegible] crop of [illegible] fortnight over the plots that [illegible] a better crop. [illegible] indigo [illegible] outturn of wheat than the hemp and [illegible] plots [illegible] that the [illegible] crop [illegible]. The low [illegible] of the [illegible] plot has been already explained.

Temporary green

Series II.

An experiment on another set of four plots was started [illegible] to serve as a duplicate to the [illegible] series. The weights of plants ploughed in this season are as given below:—

Hemp ploughed in … … … … …	3,780lbs per acre.
Urd ditto … … … … …	13,300lbs do.
Khurti (Dolichos biflorus) … … … …	8,201lbs do.

The out-turns of wheat obtained are given in the following statement. The plots of this series also needed artificial irrigation to complete the wheat germination :—

Statement showing the result of temporary green manuring series—crop wheat.

Plot number.	Plot area.	Manure applied.		Outturn per acre in lbs. 1903-04.	1904-05.	1905-06.	Remarks.
27a/1	730	Green hemp ploughed in … …	Grain …	837	264	972	
			Straw …	2,147	632	1,794	
27a/2	780	Green khurti ploughed in … …	Grain …	828	200	1,059	
			Straw …	1,943	806	2,117	
27a/3	950	Green urd ploughed in … …	Grain …	720	270	791	
			Straw …	1,826	1,124	1,918	
27a/4	960	Unmanured … … …	Grain …	341	414	1,139	
			Straw …	1,360	1,050	2,153	

IV.—METHODS OF CULTIVATION.

([illegible] early and [illegible] sowing of maize.

This experiment was started in 1897.

The "early sown" plot was sown on [illegible] and harvested on the [illegible] August; the "late sown" plot [illegible] and harvested [illegible] October. The following statement gives the results of the experiment during the year under report and the previous years :—

Plot number.	Plot area.	Quantity of manure applied.	Description of sowing.		Outturn per acre in lb. 1897-98.	1898-99.	1899-00.	1900-01.	1901-02.	1902-03.	1903-04.	1904-05.	1905-06.
Field No. 25. 25a	Each plot = 1,833 square yards.	Farm-yard manure 200 maunds per acre.	Early sown	Grain	794	1,168	2,002	300	1,942	1,074	1,825	212	513
				Stalk	3,711	3,467	7,000	7,000	3,686	7,734	4,742	4,878	3,008
25b			Late sown	Grain	824	1,080	1,552	463	1,500	2,098	1,201	270	1,053
				Stalk	4,004	3,362	3,640	3,124	3,070	6,314	3,320	4,540	2,681

Tii- " lute sown "],],.! gaft,M in 189*, letter retsihs t!un tbe "early town" plot, ooutrary to guncral ezparMac*.

(/i)_/;., [illegible] *in early and taU sowing of cotton.*

The axpttUMDt «» aUrtett in 1391.

Tlw "«Hy sown " j»l«u were »own on tlio 1 1th June irnl tbe " late »wn " plota on the (tut July. The *rvwlta* are Ululated in tho Mibjoinal rtutement which will •how tl»t IP tite jxwt year five out of the tmn variatia* gave biglier outturna by *wrlitr wowiog* and Uwt the ouLtunu ha»e b«n ffeonultjf good owing to a favorable [illegible] I for COtUpB :—•

[illegible] showing (Afl rtsull of tarty and tale mnriny uf* ***eaU*** [illegible]

Plot	Area	Treatment	VwWtk*.		1891-92 Fibre	Seed	UU-tt. Fibre	Seed	1893-94 Fibre	Seed	UBMt, Fibre	Seed	UM4ML Fibre	Seed
A.C. I	2	*	Varadhi	Early	tM	[illegible]	[illegible]	223	H	n	33	[illegible]	UC	404
				Late	nl	102	[illegible]	145	118	128	[illegible]	[illegible]	—	257
a			Dani	i Mr	115	291	[illegible]	1W	u	•	27	[illegible]	M	MB
				Late	[illegible]	[illegible]	[illegible]	108	M		[illegible]	27	H	Its
	1		Dharwari	Early	M	UT	U1	itn	[illegible]	[illegible]	17	[illegible]	Mr	«9
				Late	[illegible]	uo	IK	[illegible]	3T	ISO	[illegible]	[illegible]	M	.'J7
		i	Broach	VK.flr	[illegible]	41T	1U	MS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	MS
				Late	[illegible]	n	[illegible]	145	[illegible]	[illegible]	[illegible]	17	[illegible]	m
	1		Louisiana	Early	171	[illegible]	[illegible]	MO	[illegible]	ISO	31	[illegible]	[illegible]	1*4
				Late	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Mi
		8	Jwt	Early	[illegible]	I11	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	M
				Late	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	M
			Country	Early	[illegible]	[illegible]	[illegible]	[illegible]	tu	[illegible]	[illegible]	[illegible]	IM	MI
				Late	[illegible]	[illegible]	[illegible]	m	74	1*0	[illegible]	N	IM	[illegible]

(c) [illegible] ***cinwni with murtil <-rv}».***

ThU «iirrimcol wu itortad four yean ago with tbe object of determining.—

(i) Uw comparatin outturn* uf certain kharif en>pi in toroe of Lbe more CODUDOQ •aixtttna in wlucfa Utow croj* an gvtwnlljr grows bjr tlw ordinary culU-[illegible]

(4) which of tbe»* common mixtartt u tbe mmt urofiuUe.

Tlw f[illegible] ,ialcnwnt (p»« tbe rwilU of UM experimeot during the year under tnportaod il[illegible]

Statement showing the result of experiment with mixed crops.

Plot number.	Plot area.	Crop		Quantity of seed sown per plot in lb.	[illegible] acre in lb.								Cost of cultivation including seed, labour, rent, &c., per acre.	Value of out-turn.	Net profit or loss.	Remarks.
					[illegible]	[illegible]	[illegible]	[illegible]	1902-03.	1903-04.	1904-05.	1905-06.				
				No.									Rs. a. p.	Rs. a. p.	Rs. a. p.	
M.C.1	1	[illegible]	Grain Stalk	1	— —	— —	— —	[illegible]	137 346	1,180 2,200	808 2,452	125 450	20 10 0	18 14 0	−1 12 0	
		[illegible]	Fibre Seed	2	— —	— —	— —	[illegible]	1 12	1 8	12 21	22 52				
		[illegible]	Grain	1	—	—	—	[illegible]	—	—	—	2				
		[illegible]	Grain Stalk	4	— —	— —	— —	[illegible]	21 209	21 215	48 182	86 224				
M.C.2	2	[illegible]	Grain Stalk	1	— —	27 —	27 —	[illegible]	271 1,100	756 2,302	— 1,194	101 477	23 14 0	27 8 0	+1 10 0	
		[illegible]	Grain Stalk	2	— —	[illegible]	[illegible] 309	[illegible]	124 4,007	299 2,404	— —	330 1,000				
M.C.3	3	[illegible]	Grain Stalk	1	[illegible]	[illegible]	247 —	[illegible]	1,424 3,400	530 3,210	329 1,541	155 405	24 0 0	42 12 0	+18 12 0	
		[illegible]	Grain Stalk	2	[illegible]	[illegible]	[illegible]	[illegible]	360 8,208	349 3,082	32 2,215	734 4,406				
M.C.4	4	[illegible]	Seed	1	—	—	—	452	387	233	—	84	23 1 0	24 2 0	+1 1 0	
		[illegible]	Fibre Seed	2	— —	— —	— —	30 60	1 2	2 3	7 11	20 55				
		[illegible]	Grain	1	—	—	—	32	—	—	—	4				
		[illegible]	Grain Stalk	1	— —	— —	— —	81 405	7 16	23 225	69 153	154 1,408				

(d) Experiment with old and new indigo seed.

This was started in 1893, at the request of Mr. Whitehart, Secretary, Upper India Chamber of Commerce, with the object of determining how long indigo seed can be kept without undergoing deterioration in its vitality and fitness for sowing.

The following table shows the outturn :—

Statement showing the results of experiment with old and new indigo seed.

Plot number.	Serial number of plot.	Plot area.	Detail of seed.		Outturn per acre in lb. 1893-94.	1894-95.	1895-96.
[illegible]	1	Each plot = 605 square yards.	Indigo seed 4 months old	Stalk	8,843	10,904	10,712
				Seed	120	115	—
[illegible]	2		Ditto 1 year and 4 months old	Stalk	9,719	11,122	11,732
				Seed	178	111	—
[illegible]	3		Ditto 2 years and 4 months old	Stalk	6,903	8,048	8,202
				Seed	137	99	—
[illegible]	4		Ditto 3 years and 4 months old	Stalk	6,903	6,808	8,448
				Seed	152	98	—
[illegible]	5		Ditto 4 years and 4 months old	Stalk	5,222	3,008	3,504
				Seed	142	18	—

The results of the year under report and those of previous years show that "4 months old" and "1 year and 4 months old" seed have given nearly equally good outturns of stalk; that "2 years and 4 months old" and "3 years and 4 months old" seed have undergone appreciable deterioration; while that which was kept for a year more became much less valuable for sowing. Mr. Whitehart's experiments elsewhere are said to have yielded similar results. The experiment has been closed before taking a crop of seed from the stubbles, as it was no longer considered necessary and the land was required for other purposes.

(e) Experiment with lucerne.

This was started in 1893-94 with the object of determining the relative merits of sowing lucerne broadcast, in furrows and on ridges.

The seed was sown at the rate of 20 lb. per acre but insufficiently, the blanks had to be filled in twice. From the time of sowing on the 30th September 1894 up to 15th June the plots received eleven waterings in all. The crop is still standing and will be continued as long as possible, but the weeds, especially on the plot sown broadcast, are putting down the crop though this plot was worked for weeding, with hand-labour, from the time of sowing up to 15th June.

Statement A below gives the results of the experiment for the past three years and Statement B shows more detailed information for the three plots, in 1895-96 :—

Statement showing the results of the experiment with "lucerne."

STATEMENT A.

Plot number.	Plot area.	Manure applied.	Treatment.	Outturn per acre in lb. 1893-94.	1894-95.	1895-96.	Remarks.
A.	Area = 430 square yards.	Farmyard manure, 200 maunds per acre.	Sown on ridges	1,769	9,123	19,372	
B.			Sown in furrows	771	7,798	16,828	
C.			Sown broadcast	371	6,108	12,068	

Statement showing the different [illegible] of [illegible] lucerne.

STATEMENT B.

No. of cutting.	Date of cutting.	Period of growth in days.	Green fodder per acre [illegible]	[illegible]	[illegible]	Remarks.
[illegible]	[illegible]	[illegible]	[illegible]	400	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,440	
[illegible]	[illegible] April [illegible]	[illegible]	2,705	[illegible]	[illegible]	
[illegible]	2nd May 1896	[illegible]	2,396	[illegible]	1,779	
[illegible]	[illegible]	[illegible]	1,488	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
		350	13,372	14,276	13,088	

Transplanting wheat.

Two years ago this experiment was tried on a small scale on the demonstration plots of the students of the Agricultural School for filling up blank spaces in the crop. In the year under report also and for the same purpose wheat seedlings about [illegible] days old were pulled out from the thickly grown parts of [illegible] fields and planted in blank spaces in the crops with generally very [illegible] moister or richer field they took root more readily. [illegible] fast shorter than the plant produced by seed and bore generally longer ears filled with more grain. These are points well known to cultivators regarding transplanted paddy, maize, juar, &c. In the current year a plot has been allotted for determining more systematically the outturns and other merits of transplanting wheat as compared with sowing [illegible].

V.—TRIAL OF IMPLEMENTS.

(a) Permanent experiment with deep and shallow ploughing.

This was started in 1892. Its object is to determine the effects of deep and shallow ploughing on [illegible]. There are three plots one of which is ploughed four times [illegible] inches deep, the second four times five inches deep with the Watt's plough, and the third eight times four inches deep with the country plough.

The soil of the plot ploughed nine inches deep with the improved plough lost a good deal of [illegible] ture of the soil till near the time of sowing and the same [illegible] took place, to a less extent, on the plot No. [illegible] ploughed five inches deep.

Owing to deficient rainfall during the year the result was that as regards the moisture of the seed-bed and consequently the germination, plot No. 3 ploughed with the native plough was the best, that ploughed five inches deep with the improved plough was next best and the plot ploughed nine inches deep was the worst. This was anticipated, but could not be helped, as the experiment was a permanent one and the details of ploughing laid down long ago had to be literally carried out.

The subjoined statement gives the results of the experiment, showing that in the year under report the plot ploughed with the native plough gave better outturn than the other two plots. But the advantages of the improved plough do not lie so much in increased outturn [illegible] in the greater economy, speed and efficiency with w[illegible] [illegible]ly for sowing.

The averages of the last [illegible] 12 years are the reverse of the last year's results. It may be remarked here that these three plots did not receive any manure :—

Statement showing the results of the experiment with deep and shallow ploughing.

Plot number.	Plot area.	Treatment.		1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	Average of outturn 12 years.	1895-96.
				Outturn per acre in lb.															
P1.	Each plot = 2,420 square yards.	Ploughed 9 inches deep with [illegible] plough.	Grain ...	...	1,026	1,220	721	258	537	...	994	920	1,000	601	1,333	1,078	265	822·06	1,180
			Straw ...	...	1,030	1,758	1,113	1,178	852	...	1,304	1,710	1,823	1,210	2,787	2,398	808	1,002·75	2,009
P2.		[illegible] with [illegible] plough.	Grain ...	...	775	679	850	210	408	...	822	624	807	678	1,427	1,072	128	729·50	1,250
			Straw ...	...	1,306	1,374	1,274	1,049	694	...	1,040	1,332	1,865	1,339	2,385	2,221	464	1,453·32	1,949
P3.		Ploughed 3 inches deep with native plough.	Grain ...	...	586	402	572	274	403	...	742	661	678	372	1,223	1,005	183	615·82	1,434
			Straw ...	...	940	900	908	1,113	281	...	1,500	1,062	1,258	1,198	2,738	2,484	456	1,209·91	2,077

Implements.

The following implements were tried at the Farm during the year under report.

I.—THE WOODEN COUNTRY SEED-DRILL.

In the Central Provinces, Berar, and a few of the [illegible] districts of Madras a cheap and simple form of seed-drill is in common use. At the instance of Mr. [illegible] two such were obtained from the Central Provinces, one suitable for sowing kharif crops and the other for rabi crops. With the latter, one-half of a field in fair condition and which had been lying fallow for 7 months was sown with wheat and on the other half the seed was dropped in the furrows made by the native plough in the ordinary way. No manure was applied to the crop and no watering was done. The seed-drill is provided with three tines.

The furrow made by the central tine was about an inch deeper than the furrows made by the two lateral ones and the [illegible] as it was found that the [illegible] choked the [illegible] the two lateral tines and frequent blanks were left in the field. Probably want of experience in working with the drill may be the cause of [illegible] in places where the drill is in use the labourers employed to drop the seed in the hopper are men who have special practice. It is hoped, however, that these difficulties will be got over, in the current year, by the substitution of wider [illegible] for the lateral tines.

The following statement gives the results of this experiment. The difference in the outturns of grain in favour of the ordinary sowing would certainly have been more than made up if the blanks referred to had not occurred in the drill-sowing:—

Statement showing the different methods of sowing wheat.

Plot number.	Plot area.	Treatment.	Outturn per acre.		Remarks.
			Grain.	Straw.	
			lb.	lb.	
[illegible]	[illegible]	Sown with the drill	[illegible]	[illegible]	
[illegible]	[illegible]	Sown in the ordinary way ...	[illegible]	[illegible]	

One great advantage claimed for sowing in drills is the possibility of bullock-hoeing and the greater economy and efficiency with which the crop can be kept free of weeds and the soil [illegible] between the [illegible]. In the current year attempts will be made to determine the [illegible] outturn [illegible] of the drill [illegible] bullock-hoeing [illegible] of the bullock [illegible] now at the Farm or with one specially made to suit the drill, [illegible] the [illegible] where the drill [illegible].

11 —Tma P U M T J, R. HoaainoK.

Tliim ha* now become a wmmou impkmnt at the Farm and w raaik work* by a pair or nalinrn md bullocks. After the field b*l bean broken to tb« required deji- by an improve4 (.lou^h, tin* implvmesl waa Urjf!v uml in the year under report and wit; excellent results, r iut>««{ut>ntlr patvefamsg tbo ami and cleaning weeds for wheat, potato**, entton, nigarcane, fee , and for boaoff «rop* aoaru in !«*•• twa '"** or rtlwr apart. Ordinary fann lainumr* eaefly adjtut it for hoeing crept drill in varying width* and fuxl u> diffi'-nlty in working il saneraily.

The implement is li:ht and ttrong and w aniUhW ia India f>r atool B« S3 It can work 1| to ej acm a day aoeonJiAf to th« power of eattlr, tbe condition of th* »oil and th* seal of the dri*«r.

Ill .-HaMOW.

A aiapk and ucfal it*en[(»o of harrow that baa bean in twa al th*Saidfat farm for many ymr* WH m.de at It* Vun workabop taat year aod baa brni ir»« full trial with *aU.foiory naolu. It h« baoona now OM ttf tba common implements in ua» at tb« farm. It owU R«. 1& and can be enpplwd bum tbe Fans workshop. It goes over 1 to 41 acne in a day according to tbe powrt of tbe rnttle \mA and tbe cooditioo of th« auiL It can be worked l.y a pair of audium aiacd bnlloeba-

IY<— HovABtt'* Pwtr Pu>' D2.

Tbi*. wUo fittrd witU a ttnlJ. Share made at the Para, baa bam fowl »«O' tuefttt imfUnirni for d«vpir tilkay*. It go«* down to a drptb of about * inclw, •** whan the awl ia baid a* in tbe wat of a mJ» atabbla in A; or May or *l«-o «nl ing is i for aasaraaiw lt-.-„ it i* worked with two patn, but in ordinary caaei with a single of good sized cattle.

VARIETIES OF CROPS INCLUDING KOnDFRU

(a). Experiment with foreign varieties of cotton.

Thia was started in 1888 with the object of determining which, if any, of the foreign cottons are suited for cultivation in these provinces. Originally the experiment bafan with lU varieties, but in 1893 four were »(„!M^ j , , trial on aw«n! of low yield or of .fwior quality.

TV following ia a detail of npmtioaa **rri«d oo in Uw , experiment :—

Tillage.—.;!•«! tanc« with KM Watt's plough, ami hammed t*

Manuring.—Poudrette at the rate of J«att»d# per acre waa tymd on the plots just before sowing.

Sowing.—Tint wa» done on tie »rd Jane wilb twefull/ aalaetm) »ml. straight lute* w«n> fiiat marked on the plota 3 fat aaw and similar lines were nurkad oroatwaw * faet apart. At ibj points of intersection »o or ' three arad* war* dil.-lin] hy kbamren in mail bulat nWr * h hand-hoes and then covered n«tr with earth. Tbna tbe dibtJis; waa d«M on oaraera of rectangles each 3 hatlqrtfaaV

?1>—iaa.-Wben the pl.at. were about a amtb oW, an «M bajf 4 fawb plot the •ap*raW«a aod weaker pleau wer» palUd owl, laavtay en* plan: in a bela and two plant* «a tbe otbtr half. Tbw UD half of each |J •*• •il«r wa# onlf OM plant for 0 «}aai« U n»l. t, th. other naif i |iaau w«re alkm«l for amr/ < *tuar* faet. Tba famgn ruvtn pat farib a «nmbar of side branches and this habit of growth is specially larkad in theaa. whik the country varieties grow tall and erect with fewer side branches. The above space waeaUvwed to gin each pU«t faUmp-lor lateral dtialopaaMt and it appears that - MbtUer toalWw oa<|Mre feet for on* than for two pU

Weeding and Hoeing.<;.—Tba arop aw weeded «Wi nasnml kl» hi growth and •ce bafara aeanag. and we* Ulli.ir. hoad tbnee ..U> Caww* J K Ue«Ht4M>

irr^u(.uW.-.Tbi> waa d«M eaee U aaftaa lbe Ud for Uig* and fear '» dwu>» » * • • » • * • the arep on the following dates — MUJ No?anib Itod Daaraabar, 4Ab Aftil aaJ I W I Ma/.

*DiMu*t**>* <w.—In September the foivi<ni varieties alone and not the Country varietic* were attacked l.y an insect wbiuh wa* identified by the Superintendent, In >*m,* to be r *tic {weevil)* Iwlong-to an undetcribed *tf* neb was previously sent to the Mawiim •* attm-Littir cotton in Lalmrc in 1S9S. To get rid of tbe«e inaecU^riuklin^ ,<(tobaaa * -lution, *tslne** and lime-water were all tried without suit-.^. Kvuntiislly tlie worm* were nicked one by one by tbe band and killed. The crop bad no trouble with this insect afterward*.

ag.~Tbe seuon of picking U»^an in U» middle of October and closed in tin- middle (if January En lie latter tnoitlb' plants again put f-.rfh fre>b oho.it •, fnnnc] rnw leave*, Dowun and bolli. The gftlliering of this fecund crop began in tli« beginning of May and doted tllogetha ly the mtitdlt'" of June.

Gtntrnl.—A* a ro.ult, of lh» m«n»oon rain*the jikntsaguin put forth a luxuriant, rather r.mk, growth and arc now bearing flWen and tclk

Tln< following UWAIIQWS the outturn of cotton in ihe pnviotu yean and in 6, together witli tlie yield of the tecond crop gathered in the hot weather of 1M6^-

• utlurn oftliffm! U'rrujn totton.*

Plot number.	Plot area.	Names of cotton.		1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	1895-96.	Second crop in 1896.	Remarks.
lit,	Each plot = 240 square yards.	Upland Georgian	Fibre ...	118	160	102	54	86	34	—	—	—	
•			Seed ...	352	365	228	131	171	102	—	—	—	
• «		Tree cotton ...	Fibre ...	111	146	113	82	100	21	23	209	141	
			Seed ...	273	334	251	191	201	71	41	629	285	
[illegible]		Louisiana ...	Fibre ...	97	134	120	50	102	85	25	210	229	
			Seed ...	262	437	349	128	223	77	29	718	469	
[illegible]		Cave Hill ...	Fibre ...	100	134	91	102	96	86	—	—	—	
			Seed ...	242	308	137	186	217	157	—	—	—	
[illegible]		Hybrid ...	Fibre ...	81	163	109	52	103	28	27	289	192	
			Seed ...	207	445	259	138	298	83	57	773	397	
[illegible]		Sea Island ...	Fibre ...	97	104	91	54	182	32	28	320	160	
			Seed ...	235	314	211	130	363	70	63	883	365	
41B.		Egyptian ...	Fibre ...	97	134	80	45	115	12	23	314	114	
			Seed ...	221	434	194	102	309	60	70	869	322	
		Hinganghat ...	Fibre ...	111	163	103	64	159	30	23	237	113	
			Seed ...	293	457	251	158	300	60	41	640	252	
		S. B. Meary ...	Fibre ...	24	184	60	29	72	33	—	—	—	
			Seed ...	48	320	190	64	134	59	—	—	—	
		Shine's early prolific	Fibre ...	24	140	40	18	91	23	—	—	—	
			Seed ...	48	290	100	43	184	71	—	—	—	
[illegible]		Jones's improved	Fibre ...	24	180	60	20	41	66	—	—	—	
			Seed ...	48	360	120	50	98	97	—	—	—	

ooUuru • the, lucti outturtts art- ir», wad to what filcnt racb of tbe M . tor*, nonu-ly, *tbt I* wnn.th* *I* wfflcitot room for ttie fall , ll» «a- •>*, *to.,* owiiUd in UM produ'ti'in of such * ar* j».<i- ' furtlirr •x|«riment and oUtrraliitn m I.....ir> i.-f..r.- y dcfiaiU oj<iiii-m can be furmed and tlte rabjeet irill be studied wttb *p«ctal in:

lk Kk atdAmum • o

Tbe cspertMant WM »Urt«d ia

The cottons [illegible], but they were not bullock-hoed as the seed was sown broadcast.

The following [illegible] —

Statement showing outturns of Khandesh and Assam varieties of cotton.

Plot number.	Plot area.	Manure applied.	Varieties of cotton.		Outturn per acre in lb. 1894-95	1895-96 ([illegible])	Second crop in 1896.	Remarks.
[illegible]	Each plot = 200 square yards	Poudrette 200 maunds per acre.	Jari (Khandesh)	Fibre	17	223	133	
				Seed	34	616	279	
[illegible]		Ditto	Bani do.	Fibre	10	118	97	
				Seed	24	394	299	
[illegible]		Ditto	Jaintiya (Assam)	Fibre	6	220	207	
				Seed	13	430	344	
[illegible]		Ditto	Garo-Hill do.	Fibre	13	220	108	
				Seed	28	413	187	

(c) Experiment with Canadian Oats.

[illegible] these [illegible] of tillers, but followed by poor ear-heads of grain. [illegible] more than wheat and about 20 days [illegible] may [illegible] grain proper[illegible].

[illegible] but owing to [illegible] germi-[illegible].

The germination took place [illegible] plots a few days after [illegible] tion on the 10th Nove[illegible] of hot-weather a better outturn [illegible] obtained.

[illegible] following table shows [illegible] results of [illegible] experiment :—

Statement showing the [illegible] of Canadian [illegible].

Plot number.	Plot area.	Variety of Oats.		Outturn per acre in lb. 1890-91	1891-92	1892-93	1893-94	[illegible]	[illegible]	[illegible]	Remarks.
[illegible]	Each plot [illegible] square yards	Prize Cluster	Grain,	520	240	344	176	[illegible]	296	[illegible]	
			Straw,	2,142	1,129	10,299	3,450	3,000	4,408		
		Canadian Triumph.	Grain,	792	[illegible]	316	140	71	[illegible]		
			Straw,	2,547	[illegible]	3,079	3,536	2,017	4,230		
[illegible]		Excelsior	Grain,	[illegible]	128	300	244	184	289	[illegible]	
			Straw,	[illegible]	942	8,731	13,080	3,806	3,729	[illegible]	
		Welcome	Grain,	716	240	436	200	71	[illegible]	[illegible]	
			Straw,	[illegible]	[illegible]	[illegible]	[illegible]	2,800	[illegible]	173	
[illegible]		Bonanza	Grain,	787	[illegible]	[illegible]	[illegible]	140	392		
			Straw,	[illegible]	918	10,276	[illegible]	[illegible]	4,221		
		White Egyptian.	Grain,	947	[illegible]	[illegible]	192	[illegible]	[illegible]	137	
			Straw,	2,609	996	7,110	[illegible]	[illegible]	[illegible]	[illegible]	

(d) Experiment with American wheat.

The Political Agent of Bundelkhand sent a variety of wheat which he saw in 1894-95 [illegible] the garden of a Maharaja [illegible] free from [illegible], while the neighbouring fields were attack[illegible] it was an American variety and he took [illegible] measur-ing 1,21[illegible] into two [illegible] was sown [illegible] variety of wheat. The [illegible] containing saltpetre) and received no other [illegible].

The seed germinated well and grew into vigorous plants looking more like barley [illegible] wheat and the ears also were more like those of barley. The plants of this variety wer* generally akrnt ft foot Ujghtf, tlum those .-f tlie Vtizaffarnftgur variety growing «tde by tide and U>ok about 10 dayB more to mature. The htffe r variety rjn (be other half of the *ame field and on nnu other Sekb of the Farm had ruat, while the American variety WM perfectly fr«. The came Wat the ease on another field where UM variety tnu jrn>wn. Tbo teaion of the year, wa* not, howovt-r, favorable for n«t and it remain* t» b« wen if this varirty will be ruit-jtnwf in a trOTM year al*o.

TIIP pmin of the American variety is l.anl, •emi-tranii«rent, nddiih and long, than th- ordinary country wheat, The grain prgdaoad iit the farm was larger and m..r.- plomp tlwn that NMped hon th- 1'nliliial Agent. Thi» variety ii offered by ti* di-al.*m in Cawnjwrc at a little higher]im- tlian the ordinary wheat.

Tlie reattlU of the exftcrinK'nl are tatjulat<il in the fnlliiwiim ihitumit :—

Statement showing the results of the experiment wi'A A mtrif,m > wheat.

Plot number.	PM M	Name uf iirlflr.	OnHuro pn-wi*		Remarks.
			3	I	
				ft.	
	lack plot 004 square yards l 1	A • (!. in wheat	M*	Mn	
		Muzaffarnagar wheat	MM	[illegible]	

(r) *Exjxrinu-nt with varietit* of m\pareane.*

Thi» WM «Urted in 16»» bat in the ye»r under report the qaurtuka of manure, the ro.t!wd of ptantinjf, fa»., wert greatly changed. The vmrwtiei growu in tbe year were;—

The "Madrani" ;ionda,—T!i« ii the variety grown vory largely near Cawnpor« and I.nek now for chewing ad pnpuWly IWUCVAI to U> unfit for making *"gur"* from. It grows 8 to 10 feet h:^!t tad more anil caoea wnghing abmt 3 It» each are commonly met with in the Canti|mre ami Luckiiow nwkirt«.

Tl.i "gur" made from it waa *)?HA* in retpect of grain and hwdnew and WM, for all jirtctical jmrpotei, aa good ft* the "</ttr"ti *matna.* It wld at 10} *la* 11} seers a rupee,

The *Poonn* pkunda.—Th» waa ip»cially otitained from Toona for trial at the Farm. It hat a llraw-eolorad ikin an<l n a *uoft* variety, breaking«uj|y. It ^rotrttaller than the Madran and ii euually thick, but at the farm ila canea felt down very much not* by their own weight than by wind. Iu aoftncaa, want of •tanking power, the quality of breaking rmlik. t!i • Uadency I «» « to«rack or cleave and iu requiring very frequent and regular irrigatinn wan the bad point* that were iioli<-«d in this v*rifty during iu growth at the Farm. Iu un« ff."«l ijualuy WM the luxuriance with whkh it grew. The " ffw " w»> slightly B»ra raddiah in colour, mfri-r in cooaiatency and poorer in grain Uun tha- of the EadatL Tito *"yitr"* watwld at Ii to J] *ue?n* * rup««.

J),, Sahdranpur variety.—Thi» it al«j a jmunda and ii pMwn for ehewiag. h i* the common variety of jwunda in Sahanopurand the adjoining dictricU. It it abet. Ur and Unnrwr and na> »horter iatemodta than th« MadraiL It u a aoft rarirty haimg green akin gwwrally getting a gotden tinge when ri|*. It breakt very readily. Ttw"ir«r" made from il w»» ir*"l io gr«m and hard, but more rtddith in rulour than thai «f thr MaJra.i and auld at »i-'ut II «w« ft rupee.

Dikchan.—Tbit nntty ii grown for cniihinj,. ami not for chewing generally. 11 is considered out o(the Ui varieties f U«»* pwrin««, btinjr genrrutly ;MW« with more manure and bttUr cultivation and ii uiorr common nrar Sliuhjahjupur. It gate ll* i rest "gur"' of all UM fin rariettM In nM]w;t of colour, • consistency • and grain, wnkh wa*tolJ a< 13 to Ifi Mnini|«t.

"Dhaul".—TV can** of tin* variety are generally thin and tall «od arc ea»ilr Uid by niwfe, *»|*c»l!y on nch or weU-ounurtd landa. They are hard and itrawcoloured. Thi* variety \ i#M*l " </n,- " of good toloar and mntittmfty, but WfM what |>->rrr in -n.n than that.»(UK- Madnui and the Sahanuipvr varwUM. TV gur sold •l I Ml to 11) mi a ropM.

Mat •w.—Wu not grown M *oat* of tbt TWWUM, but only on the *9* mannrii plots. IU «w* haw •iwrU-r inlotrwd** than tfeta of UM *Diktkan* « the *Dhaul* " asd *an* mam^otourad. lu *gur* «u tU brrt of at) the fit* WMUM in flftloMr, haidiiM and gram awl wit aa| at 10| la 11 Hvn a Dprt

Details of cultivation.—

IWd ge.—Ploughing *t* W'»n on tht t»th of Jaaumrj 1995 am) in all* ploughing* were • dor* with the Watt's plough, two, Mb^gifey, wtlh UM aa»», *on* flashing* with tlw natin plongh awl harrowing 0 *Umr**.

Ma I hM 11 M H ,.nd tkrre hundred naaada «f pnodnl U Tor tht t«r*r paan- du naowty. Poon., Madmi and S^li^inpuri. and 1,000 martad* far tlw olhiT (we varieties— Dilwbaa and DhuiL TV «t« 300 maunds would h»e injt»«J U>e Wur \ij proda.inj; rank gmwth.

Planting. -W « dan* MtUn.hr.ud furrow system. Tb# fum>w, for the *Dhaul* and *Dikchan* were 1½ feet apart from centre to centre and for the paundas 2½ feet apart.

Tba o w n n p i *mm torn* roooa n r m m wrr* pb< ... the *Dhaul* and the *Dikchan* on the 28th; and J UM *ilo* ... on 11th March 1895.

*ri Irrigation.—Eighteen waterings were (jiti-n t> the foou and tht hwtsfwi a&d 15 to tlw JbUdnu, Dhm) aad thketmn.

After cultivation—Honng t«rk»aad «rt«diaf twioa. Eartliio^ thrra for the Poona and oww lor tb* *othn* mirti M j tht two mn ^rthiap for the Poona were necessary for r«'H»«mf«oaain|.ap r ..Kt«th«|4wU. Th.fciBeooe.fwdl it* rmri* ties. Tying twice for UM P09M a&d ooct for tht remaining varieties.

Diseases and Injuries. -All tht varirtin made very good progress till the begin- «iog of SrptnuWT wbta pmhapa owiog to UM abanw* of raia« tbt IMTM began to dry and a irrut, » M , Bwralljr on tb. Fano mod tD c.ltiralon oaU »«,od, (bow) boring down the stem from above till it came to a hard B«U froa. whtb it {MM! out by boring through the sides. The grub was identified 1 at tbt Isdimi) MOM: , Calcutta, to be a *Lepidopterous larva.* Tobacco solution — lrMdl«f,tk..o l « wwi TI-.l attack was popularly believed to be due to the deficiency of rainfall and its practical absence, after the third of September. The loss caused by the grub may be put at not less than 15 per cent.

... month of October and afterwards the fltttto got o*«r litr 4MWM to a mwibraiat »unL

C+r ing.—W J -doDaf M «iWl*lhtot«»i:tl, February partly; the remaining part the crop was cut towards the close of March and the beginning of April. The following statement gives the result of the experiment :—

Statement showing the results of the experiment with five varieties of sugarcane.

Plot No.	Plot area.	Manure	Variety	1894-95. Outturn per acre. [illegible]	1894-95. Outturn per acre. [illegible]	1894-95. Outturn per acre. [illegible]	1894-95. Percentage of [illegible]	1894-95. Percentage of [illegible]	1894-95. Percentage of [illegible]	1895-96. Outturn per acre. [illegible]	1895-96. Outturn per acre. [illegible]	1895-96. Outturn per acre. Weight of gur.	1895-96. Percentage of Juice to cane.	1895-96. Percentage of Gur to juice.	1895-96. Percentage of Gur to cane.	Weight of green tops.	Weight of dry leaves.	Remarks.
				lb.	lb.	lb.				lb.	[illegible]	lb.				lb.	lb.	
25.	Each plot = 1,210 square yards.	Poudrette 1,500	[illegible]	...	[illegible]	...	...	[illegible]	...	52,008	[illegible]	[illegible]	62·8	15·8	9·8	12,252	6,430	
23.		Ditto	[illegible]	...	[illegible]	...	...	[illegible]	[illegible]	45,450	[illegible]	[illegible]	64·18	16·9	10·8	14,104	6,588	
13.		Ditto	Saharanpuri paunda	...	[illegible]	...	[illegible]	[illegible]	[illegible]	50,555	[illegible]	[illegible]	50·6	16·7	9·4	11,250	8,100	
43.		1,000 maunds per [illegible]	Dikchan or Kalara	10,380	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	50,814	[illegible]	[illegible]	54·8	13·5	7·4	14,001	10,740	
63.		Ditto	[illegible]	10,117	[illegible]	[illegible]	[illegible]	...	...	40,837	[illegible]	[illegible]	51·9	15·13	7·8	13,702	9,621	
...			[illegible]	38,509	[illegible]	3,071	[illegible]·06	15·02	[illegible]	12,004	[illegible]	948	45·6	17·31	7·80	11,132	4,228	The figures denote the average of the figures for the nine plots of the same trial experiment with sugarcane described before.

The Poona variety has given the highest outturn of *gur* equal to almost 42 maunds per acre; next comes the Madrai with an outturn of almost [illegible] maunds per acre; and the Saharanpuri comes the last with a comparatively low outturn of 30 maunds an acre. This lower outturn is due to [illegible] condition of the [illegible] cane [illegible] from Saharanpur and the [illegible] of the cutting planted. It was also due to the greater damage which rats did to this variety than to the rest.

The [illegible] portion of the crop (cut in March) [illegible] of [illegible] dried up and injured canes and gave a smaller proportion of juice and a correspondingly smaller weight of *gur*, the latter being inferior to that obtained from the first cutting.

If approximate money values be put on the quantity of *gur* obtained per acre the results will stand in the following order:—

Name of variety.	Outturn of *gur* per acre in lb.	Approximate value of the average outturn of *gur*.	Remarks.
	lb.	Rs. a. p.	
Madrai	4,944	224 11 7	@ 22 lb a Rupee.
Poona	5,130	205 7 0	@ 25 lb do.
Dhaul	3,208	142 3 4	@ 21·5 lb do.
Dikchan	3,772	134 11 5	@ 28 lb do.
Saharanpuri	2,909	116 12 8	@ 24 lb do.

Percentage of juice to cane.—This de[illegible] and the thickness and length which the canes attain. [illegible] of a given number of canes, the gross [illegible] percentage of juice they have been found to yield even when the variety is the same. Again in the case of two canes of equal weight one longer and thinner than the other, the latter cane appears to give a higher percentage of juice. The canes of the crop cut in February belonging to the [illegible] plot [illegible] and to the five varieties, were regularly counted and weighed [illegible] and of the juice extracted were recorded. These figures, together with [illegible] minor experiments, are tabulated in the following statement to illustrate the point under reference:—

Varieties.	Number of canes.	Weight of canes in lb.	Weight of juice expressed in lb.	The average weight of a cane in lb.	Percentage of juice in cane.	
Mature Plot No. 1 ...	8,021	3,064¼	1,609	·25	51·7	
Do. do. 2 ...	8,002	1,370	775	·19	69·0	
Do. do. 3 ...	9,740	14,231	604	·17	42·7	
Do. do. 4 ...	3,130	340	237	·09	44·9	
Do. do. 5 ...	7,033	1,997¼	652	·19	47·0	
Do. do. 6 ...	8,380	1,235	584	·14	46·2	
Do. do. 7 ...	9,340	1,720	870	·19	47·9	
Do. do. 8 ...	9,000	1,207	413	·14	49·2	
Do. do. 9 ...	7,700	1,088	632	·14	45·8	
Poona ...	5,003	5,003	3,411	1·07	64·8	
Madrai ...	4,003	4,437	2,850	1·06	64·14	
Saharanpuri ...	8,840	8,845¼	3,720	·26	47·2	
Dikchan ...	12,000	4,014	2,375	·37	53·9	
Dhaul ...	14,000	3,022	1,999	·27	67·23	
Madrai ...	41	182	135	2·76	62·6	
Do. ...	73	200	841	2·53	70·5	Good canes.
Poona ...	84	200	141	2·38	70·5	Do.
Do. ...	140	200	133	1·42	70·5	Do.
Red cane (Lal Panada) ...	160	212½	240	1·90	60·0	Inferior canes.
					77·9	Thicker and shorter canes.

Gur-making.—Pans of the shallow pattern were used for boiling down the juice, which was, as a rule, strained through a cloth while pouring into the pans. To assist in removing the scum an infusion of bhendi [illegible] mucilaginous substance—and milk diluted with water in the proportion of 1 to 3 were found useful. The bhendi was soaked in water for 24 hours and then rubbed in it with the hand. The infusion was then strained through a cloth and kept in corked bottles for use when needed. It was made once in four or five days. When the scum that comes off naturally was removed, the mucilaginous infusion was poured twice at an interval of a few minutes, about an ounce each time. After this the diluted milk was poured twice at an interval of a few minutes, about two ounces each time.

The *gur* made was as good as the canes would admit of. The colour of the *gur* depended to a certain extent upon the colour of the canes used: the red canes giving redder *gur*. The canes of yellowish or straw colour gave the best of the neatest appearance and the *gur* obtained from green coloured canes was the most inferior. Dr. Leather found by a comparison of analyses of the juices and *gurs* of the several varieties that the proportion of glucose to cane-sugar in the *gur* was higher than in the juice it was made from; and that this increase was due to the inversion of a part of the cane-sugar in the juice (i.e., the conversion of cane-sugar into glucose) during the process of boiling. With a view to prevent this inversion he tried a few experiments by adding "milk of lime" in varying quantities to the juice, to neutralise its natural acidity. The details and results of these experiments are given in his report (Appendix B).

The *gur* made by adding "milk of lime" strikingly improved in their grain or sugary appearance, but they became darker in colour. Thus the addition of lime raised the value of the *gur* from a sugar-refiner's point of view, but lowered it in the eyes of the ordinary purchaser, who looks as much to the neat appearance as to crystals.

(*f*), *Gujrat Bajra*.

The seed was obtained from Bombay at the suggestion of Dr. Leather. It was grown in rotation with the indigenous variety of these provinces, two acres of each plot being 400 square yards. The outturns obtained are given below:—

Name of varieties.	Plot No. 1.		Plot No. 2.		Remarks.
	Grain per acre.	Straw per acre.	Grain per acre.	Straw per acre.	
	lb.	lb.	lb.	lb.	
Gujrati — — —		14,073		12,044	
The country variety of these provinces —	1,488	10,132		10,833	

The plants of the Gujrat variety grew taller, tillered more freely and put forth longer and thicker ear-heads with larger grain than the country variety. The former also took about 10 days more to mature which will be a disadvantage when, as is often the case, it is intended to grow a *rabi* crop after removing the bajra. But for growing in mixture with arhar the Gujrati bajra is, in every way, better than the country bajra.

(*g*) *Fodder crops*.

In the year under report juar, maize, guar &c., were grown for fodder and gave good results. The year's experience in this respect shows that abundant green fodder can be easily produced for cattle in any part of the year. It also shows the excellence of juar and guar as fodder crops and their capability of yielding 3 or more cuttings where irrigation is available. If sown after the setting in of the monsoon, two or three ploughings to prepare the land and about 30 to 40 lbs. of juar seed per acre are all that is necessary. If sown before the monsoon, artificial irrigation to soften the land for sowing and during the growth of the crop is necessary.

The following statement gives the weights of green fodder from the cuttings of the several fodder crops. To make the statement complete the crops grown on the green manuring plots have also been included in it:—

Statement showing the outturns [illegible] from [illegible] Lucerne.

	1st cutting.			2nd cutting.			3rd cutting.			Total number of days of growth.	[illegible]	Remarks.
	Date of cutting.	Period of growth in days.	[illegible]	[illegible]	Period of growth in days.	Weight of green [illegible] acre.	[illegible] cutting.	Period of growth in days.	[illegible]			
(alone).												
[illegible] vulgare).												
— —	26th May '95.	43	17,300	[illegible] '95.	23	[illegible]	[illegible] '95.	13	[illegible]	117	43,279	
— —	25th ditto	52	16,081	[illegible]	48	[illegible]	[illegible]	17	[illegible]	117	42,003	
— —	17th ditto	28	19,023	—	—	—	—	—	—	28	19,035	
— —	1st June '95.	53	[illegible]	—	—	—	—	—	—	53	18,120	
— —	2nd ditto	55	[illegible]	—	—	—	—	—	—	55	21,733	
Vigna catiang).												
— —	21st May '95.	45	[illegible]	[illegible]	62	15,403	—	—	—	110	[illegible]	
— —	22nd July '95.	81	[illegible]	—	—	—	—	—	—	81	[illegible]	
— —	Ditto	81	[illegible]	—	—	—	—	—	—	81	[illegible]	
— —	Ditto	81	[illegible]	—	—	—	—	—	—	81	[illegible]	
[illegible] paradoxicus).												
— —	5th June '95.	53	[illegible]	—	—	—	—	—	—	53	[illegible]	
[illegible] Braliatus).												
— —	5th Sept. '95.	66	10,452	—	—	—	—	—	—	66	[illegible]	
— —	2nd ditto	73	13,373	—	—	—	—	—	—	[illegible]	[illegible]	
— —	21st Jany. '96.	113	9,436	—	—	—	—	—	—	[illegible]	[illegible],436	

VII.—DISTRIBUTION OF IMPLEMENTS.

THE subjoined table shows the distribution of agricultural implements. There was a remarkable increase in the number of ploughs, chaff-cutters and kibblers distributed during the year. It was due chiefly to the efforts of the representatives of the Department in bringing the improved implements into prominence at the Agricultural Shows. Among the ploughs the one that had the largest sale was the "Improved Baldeo Plough" invented by the Farm mistri.

A new flour mill worked by hand power was invented by Baldeo in the year under report and its working was shown to His Honor the Lieutenant-Governor on the occasion of his visit to the Farm in the month of January 1896. Under His Honor's orders a mill was sent to each of the Central Jails at Agra, Allahabad and Benares where they were tried. The result of trial has shown that there are [redacted] slight defects in the mill which the inventor is now trying to remove.

Statement showing the distribution of implements during the year ending 31st March 1896.

Name.	UN4(, M.I.	UN4(, TrW.	UN4(, 11 in.	UN4(, Total.	im.wi. Sold.	im.wi. Tri.1.	im.wi. Htr..	im.wi. Total.
					W	(*>	(4	
Ploughs	ut	17	IS	101	132	so	27	n)
Clabl) p**p>	14	4	S	SI	14	4	4	[illegible]
H*1«lr> Wi'.tt	1	...	...	1	1	...	...	i
B*ii*« Dear Mill	...	...	...	...	1	...	...	3
Horse Hoe	...	...	...	...	1	...	...	i
M. Hunt's Kibbler	a	[illegible]	...	8	n	1	...	n
K*b«i KIMbn ...	4	...	...	4	t	...	...	i
CMF-roitrr.	4	1	...	[illegible]	10	1	...	
Sugar-pan	1	m	...	1	...	...	1	
Harrow	...	...	...	...	1	...	...	
Krtl Tttm	...	...	...	...	1	...	...	
Dredgers	...	...	a	[illegible]	...	t	[illegible]	
»rta 4 boriitf U»b	...	4	...	4	...	l	1	7
T*al	-	-	...	...	...	...	-	...

VIII.—DISTRIBUTION OF SEED.

THE following statement shows the distribution of seed during the year under report and the corresponding year from the ... attached to the Farm.

Statement showing distribution of seed.

Name of seed.	Quantity distributed. UHM,	Quantity distributed. U M
	lb.	lb.
Wheat	12,008	MM
Cape oats	7.MD	11,953
Maize	40	14
Sorghum	M	M
Egyptian clover	n	
Guinea grass	10	I
Onions	...	4
Lucerne		47
Paddy	...	525
Castor	...	82
Una (akita)	...	20

There was a marked decrease in "wheat" owing to a diminished demand for it and partly to the fact that the figures of 1894-95 include an item of 16 maunds distributed through the Secretary, Agricultural Show, Jaunpur, among the cultivators of that district. No such distribution could be made in Jaunpur during the year under report in which there was no show in that district.

IX.—SERICULTURE.

The experiments in this branch have led to the conclusion, without doubt, that it is almost impossible to rear silk worms in the hot climate of these provinces.

It was reported last. « N (that a fra»h aupply of lire cocoons tiul U-n b dented from J U n , tb* eapply »» woeiwd n A % » at 1894 . »l «-o»Uin*d 100 cocoa*. Tbe worse prodaotd otly A. yelee till t.«tod or hfcnury 189ft. Tbe fir* cjct was K fairly Mcm»»fot (vo*. UM MMOI m ft wry poor otw and UM thinl «i * total Uilunr owtatf to U* d*»tk ot »U UM wonM dat to aflcoU of lugb temperature.

In now of to* abow it t* BOW istaodtd togir* «p the experiment.

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full served. Results of ttMtttCiotftrr, WM npW«l by fttwlbrr •UlltOD, - Utorft," wporUJ by U* < T«uriM<7 IS*nmeiit in bt a toon nccwrfol fukl-g^ut.

The *atw* •Utlinn amwl 37 DMIM donaff tbtryMr.of which 1 bM n br I ODO » raportcd to be in N i m l l l i A b»n> hem raKMMy MTwiig «t» sot y«t ktviwn in *» M M ,

TV t*,» brood mam kepi at ibe Farm wm told off, M thty bad paawd **># •«•

XI -CATTLE AND CATTLE BREDINO.

Tb» Koet trait tnaiatehwl at lbs F»nn Wi«nd i7 towi do nap tb* jwtf under rtport, of wbieh 18 bate ealvad and eWnn in r*f«rt«d tn U in calf. Fi» c**«» proved •ftMDOMafd and th« KtalU of tb* oonrisff ta IS e»—• art not known. Tb* calr*J*» fftr obuwd an la »vrrv rr.j*rt l*U*r tban eftlvwt of th* pom looml brndl city

Tbs com UMI <MM (or cormng w»re, M in iKr put r*ar. uwetly *fro** ta# Farm. of Cawapon and U* nltay** In UM B*«blw«rbood of UM

Hilary //*«j. in UM Vrtennirj ll«|«l»l.

Tb* •nVjoiwt tobt* «bowi ib* d*taU of wprk attached to UM Farm dariaf Ut* y«ar ander r*p

Tb* nomber of pattMU trfttUd KM *bon* W *to 1*1: 0» nam!«r ««nd w» 70 against « in ibe |«it y«r. The ramlla »r* Moow»ft»f tad * mid b«m bar* «t ill U*t#* bad it Urn pgambU f>vr UM «t<itn in cbir«« of UM bo*) ., «oalinu«II/ «' t!>* hospital, wbwb be eonld a*t do, at b* had to b# a«mi fr^awHly to pwrabaw ball* fr various cattle distr U utd al*> tn Babntob in extinction with UM iMrtbroak *t*t* cattle-disease in that district in the past cold weather.

Disease.	Number of patients treated.	Number of patients cured.	»*«aw	Number of patients found to be incurable.	Remarks.
Ulcer	•	t	—	—	
Dislocation	[illegible]	[illegible]	—	—	
Strangles	1	1	—	—	
Boils	4	[illegible]	—	—	
Catarrh	1	1	—	—	
Tympanitis	4	[illegible]	—	—	
Abscess	2	2	—	—	
Fever	[illegible]	[illegible]	1	—	
Diarrhoea	[illegible]	[illegible]	—	—	
Lameness	[illegible]	[illegible]	—	—	
Swelling of the legs and body	[illegible]	[illegible]	—	—	
Mange	1	1	—	—	
Rheumatism	[illegible]	[illegible]	—	—	
Fracture	[illegible]	[illegible]	—	—	
Inflammation in the neck	[illegible]	[illegible]	—	1	
Colic	[illegible]	[illegible]	—		
Throat-disease	1	1	—	—	
Nephritis	[illegible]	[illegible]	—	—	
Disorder of kidneys	[illegible]	[illegible]	—	—	
Constipation	1	[illegible]	—	—	
Distemper	1	1	—	—	
Total	n	76	1	>	

(c) Miscellaneous.

Different systems of housing cattle.—The object kept in vi^ in these trials is two-fold, viz., (1) to determine the quantity of manure obtainable in a year from a pair of worling cattle, and (2) to utilise the nrinc, which contain, more nitrogen than dung, moat of which i* wasted in the ordinary practice of the cultivators. With these objects two systems of housing have been under trial feu the last t wo years : Shed A, in which the tiling dropped during the night is spread and covered with litter at 5ib a pair every morning and tbe dung ami the litter arc removed together at the end of tbe month; Sbcd 11, from which tbe dnng is removed every morning but which al» receives tb# same quantity of titter as Shed A, for absorbing the u rioe. The manure of the Shed A removed at the end of the month, (8) the dung removed daily from the Shed B and S) the litter soaked with the nriat removed at tbe cud of the month, are thrown into separate pits thatched over with *riiappat*. The foods used, the litter supplied, the manure* removed daily and monthly are all weighwl and the weight* carefully recorded. At the end of a year or other period according to need and convenience, the content* of the pit* we removed and weighed before carting to the Gelds.

Bcskle* these two abeds A and B, tbe trial of two mow methods ha. been com- nenoed during the year nnder report, n:, the boi system and the utUuung of urine without any litUr.

As U» box srsUm is being tried now for tbe first time at the Fnrro, it bat so far d*D« well and i* well known to be a most eJfcdeut method of utilizing the whole of the urine aa manure. It is deccribed here in detail. A pit 3½ feet deep, 7 feet broad and 10 feet loog was dug. TUe bottom of tbe pit wa* plastered with eby, sprinkled over witbasbis and a tbin layer of straw ipwad tb<r»n. In front tbert is the manger for the fodder. Every morning when the cattle were removed from the boi, a man distribatrd the dung evenly on the ground underneath tbe old litter ami spread in addition &a of chaffed imgsrcan* leaves. The boi thus continued clean and free from smell ami tl» pair of bullock* that have hwn tied iiftt for thr last IB months nearly have been doing well without any tract of injury either to their hoofs or b their prtn-nl bsallk. The pit pot *IvV* in ab^t 8 month* and the manure in it was dag out in May and immediately after weighing cartod to the field, direct About l.DiOtt at the turf** was fmh anJ the r«st 5,*&5tt> «« * porfeatly fermented rich looking soft mass.

While dijfring out the manure ammonia smelt strongly and toe temperature n^ £, *wtface* wa* »b«nit U0 u> 130 degree* Kahrenlwt and at the bottom shout W decrees]t i, erroneously arj{«l by son* native cultivators that the quantity of litter required i* too much to adi» it of the t "« •*•*"» l*"»K *vlopltd* by Owmi. Bnl experience at the Kann h** shown that. euttiwUr who grows sugarcane can easily get over tbe d.awtJty, as an act* of sngaroine dives more leave, taan an required for littering a pair of catll. throughout tb. *yW,* using Sib a day.

The shed without litter.-D* 4*™<* oE «««risJ Ior ****« " !! tter will '* * difficulty with, *t,* good many cultivator., even supposing they p* to rerognw the importance of uni* a* manure ar<l th# ..eertwty of litUring th«roattle abed* for absorbing it. Hence the Ui»l of Ibis method IIM. The floor of the Aed U made even by beating it well and given . p-nl> slope. At the border of the slope is a small drain an earthen vessel placed in a small hole lined with ... not eooked by the dug in the ground adjoining ... earth flows down into the drain, and from tbe drain into tb* earthen vessel.

Every morning the dunir of the shfd b removed, the uneven par; levelled, and ^ ... over the wet parts. ~The dung, ... earth scraped and fresh dry earth sprinkled over the wet parts. ... any urine that may be in the vessel are all, after being weighed daily, thrown in a pit, which also has thatched roof over it like the other pits.

Till the beginning of the rainy weather in June the shed was easily kept perfectly clean. During the rains the floor requires more scraping and more sprinkling of earth. In this method the only trouble i* that the cultivator mnst bats a heap of earth neat the shed for use in the mornings and in a roofed plat* for use in tb* rainy wealbei.

The quantity of manure obtainable from a *pair of working cattle in a year* from the several methods that are under trial are given below:—

		lb.
Shed A.—Dung, litter and urine removed at the end of the month	...	7,824
Shed B.—Dung removed every morning (the weight of dung alone)	...	7,328
Weight of litter	...	2,371
Weight of both litter and dung of shed B	...	9,699
Pit-made weight of manure	...	10,547
The earth-sprinkled—weight of manure	...	13,222

The litter of the shed B stored separately underwent little or no fermentation and the dung of the earth sprinkling shed had not properly fermented at the time of weighing as it was an accumulation of only five months. The earth was mixed with it.

The farmyard manure of Shed A and the dung of Shed B have been twice or thrice analysed by Dr. Leather. The results of his analyses conducted in connection with manuring the sugarcane crops of this year are given below:—

		Percentage of nitrogen.
1.	Farmyard manure of shed A ...	·58
2.	Dung of shed B ...	·62
3.	Standard of English Farmyard manure ...	·65
4.	Poudrette of Cawnpore Municipality, 12 months old ...	·47
5.	Ditto ditto 6 months ...	·53

CAWNPORE, The 14th October 1896.

SAIYID MUHAMMAD HADI, M.R.A.C., M.R.A.S.,
Assistant Director,
Land Records and Agriculture.

APPENDIX A.

Extract from the inspection note by Dr J. W. Leather, Agricultural Chemist to the Government of India, on the Cawnpore Farm.

3. In the case of the varieties of cotton, I think it would be a great advantage if new seed could be procured for all the varieties, as the past history of many seems to be doubtful. It may not be possible to get new seed of all the varieties at once, but this might be done in the case of the Indian varieties. In the case of the Americans, I would suggest that the United States Department of Agriculture should be asked to send seed of half a dozen of their best varieties.

4. In the case of the sugarcane experiments, I have suggested to Mr. Subbiah the following procedure :—

(a) *The manure series.*—One variety of sugarcane (the Madras pounda) will be manured on 10 plots as follows :—

(1) Cattle-dung @ 125 lb nitrogen per acre.
(2) Cattle-dung @ 250 lb ditto.
(3) Ditto @ 500 lb ditto.
(4) Poudrette @ 125 lb ditto.
(5) Ditto @ 250 lb ditto.
(6) Castor-cake @ 250 lb ditto.
(7) Ditto @ 500 lb ditto.
(8) Saltpetre @ 125, bone-dust @ 125 = 250 lb nitrogen per acre.
(9) Ditto @ 125, [illegible] @ 125 = 250 lb nitrogen per acre.
(10) No manure.

These plots will be in fields 27, 28, 29 in one year and in Nos. 29 and 30 in the alternate year.

(b) *The varieties of sugarcane.*—The several varieties of sugarcane will be manured with poudrette, but in each case the cane will be grown on two plots, one of which will receive 250 lb of nitrogen per acre and the other 500 lb. These plots will be in fields Nos. 5, 3, 3, 4, 5, 6 and 12 and 13, 11, 10, all at the west side of the Farm, in one year, whilst in the alternate year they will be in fields Nos. 1, 2, 3, 4, 5, 6 at the east side of the Farm.

I have withdrawn my objection to the plots at the west side of the Farm. Mr. Subbiah seems satisfied that there will be no risk of waterlogging.

I have also discussed with Mr. Subbiah the question as to whether these sugarcane plots should lie fallow in the alternate year or whether other crops should be grown on the land. He points out that the cultivators about Cawnpore usually take an interim crop, and I am inclined to think that such a procedure may have some advantages. The amount of manure which will be applied to some of the plots will be much in excess of what the sugarcane crop will actually take out in any one year, and if an intermediate crop be grown without any *further addition of manure*, the manure "residue" unused by the sugarcane will be more or less utilised, and the land will be thus reduced again to a more uniform condition of richness in plant-food before the following crop of sugarcane. Mr. Subbiah's suggestion is to grow potatoes in the early cold weather, and I think it might for the present be acted upon. One cannot of course at present say whether it is the most desirable choice; experience only will decide this. The weights of these crops will of course be recorded. Thus in these experiments with sugarcane two principal objects will be kept in view, the one is to determine what sorts of sugarcane are the best, as judged by the weight of crop, proportion of juice expressed and the quality of the latter; the second is to determine the most economical manuring for the crop.

Regarding the analyses which I have made of this year's sugarcanes, I shall forward a separate report. I have asked Mr. Subbiah to kindly send me a copy of the weights of cane from the different plots when they are known.

5. *The potato experiments.*—These experiments may usefully be [illegible]ed, and the two varieties which are now grown at the Farm be manured as follows:—

(1) No manure.
(2) Poudrette @ 200 lb nitrogen per acre.
(3) Ditto @ 100 lb ditto.
(4) Cattle-dung @ 200 lb ditto.
(5) Ditto @ 100 lb ditto.
(6) Castor-cake @ 200 lb ditto.
(7) Ditto @ 100 lb ditto.
(8) Saltpetre @ 50, bone-meal @ 50 = 100 lb nitrogen per acre.
(9) Ditto @ 50, superphosphate @ 50 ditto.
(10) No manure.

These plots will be in fields Nos. 24, 25, 26a and 26b, each plot to be $\frac{1}{10}$ acre. In this case also, since the manuring [illegible] fairly heavy, an intermediate crop of maize (unmanured) might be taken in the kharif.

[illegible]t these manures in the different experiments may be applied in the [illegible] will be necessary that they should be analysed before they are [illegible] would ask that samples may be submitted to me at about the following dates:—

Manures for sugarcane, February 1st.
Manures for [illegible], April 15th.
Manures for wheat, August 15th.

APPENDIX B.

Note by Dr. J. W. Leather, Agricultural Chemist to the Government of India, on the composition of sugarcane and raw sugar made at the Cawnpore Farm during 1895.

1. The experiments on the growth of sugarcane which are being carried out at Cawnpore, Dumraon and Bo[illegible] have [illegible] objects in view. The one is to determine what quantity of manure can be most economically employed, and for this purpose different amounts of various manures are applied. The second is the comparative growth of different varieties of cane. The annual results of these experiments are published in the Reports of the several farms named and will not be referred to here.

2. In conjunction with these experiments I have this year, as last year, made a number of analyses and experiments with the object of determining several other points which are of importance. These may be summarised as follows:—

(1) The amounts of cane-sugar and of glucose in the juice.
(2) The amounts of cane-sugar and of glucose in the raw sugar obtained.
(3) The amount of "inversion" which occurs during the boiling process.
(4) The quality of the sugar prepared in the centrifugal machine.
(5) The loss of sugar which occurs during the boiling process.
(6) The total amount of sugar in the cane.
(7) The amount of juice and consequently of sugar which remains unexpressed from the cane.
(8) The amounts of nitrogen and of phosphoric acid in the sugarcane crop.

3. *The amounts of cane-sugar and of glucose in the juice.*—The cane-sugar and glucose were determined in the juice of six varieties of cane grown at Dumraon, in 6 varieties at Cawnpore and in three at Poona. The varieties grown at Dumraon were all manured equally with town sweepings and castor-cake. At Cawnpore five of the varieties were manured with about 1,000 maunds of poudrette, but the sixth ("matna") was grown on nine plots with different manures, containing very varying amounts of nitrogen or phosphoric acid, these being however, so far as the nitrogen is concerned, very much smaller than in any of the other experiments and they are in all probability too small to produce a really heavy crop.

At Poona the three varieties were all manured with poudrette, containing 500 lb of nitrogen per acre.

It is desirable to consider three points in connection with the results of the analyses of the juice of these varieties.

(1) The comparative quality of the juice of different varieties grown at the same place.

(2) The comparative quality of the juice of the same variety grown at different places.

(3) The comparative quality of the juice of the same variety grown with very different amounts of manure.

(1) The amounts of cane-sugar and of glucose in varieties grown at the same place. In the two statements No. 1 and 2 are set out the amounts of cane-sugar and of glucose found in the juice of six varieties of cane grown at Cawnpore and Dumraon.

and Hanneh's polariscope, the gluc[illegible]

STATEMENT No. 1.—*Six varieties grown at Cawnpore.*

Manure.	[illegible] Poudrette, 80,000lb.	Pliketa [illegible] 80,000lb.	Saharanpuri Poudrette, 80,000lb.	[illegible] Poudrette, 80,000lb.	Madrasi Poudrette, 80,000lb.	[illegible]
	%	%	%	%	%	%
Cane-sugar ...	12·74	[illegible]·08	10·09	14·18	13·90	10·30
Glucose ...	1·1[illegible]	[illegible]	·98	1·77	[illegible]	·40

STATEMENT No. 2.—*Six varieties grown at Dumraon manured with 8,200lb of city sweepings and 6,560lb [illegible] per acre.*

	Mungo.	Daal.	[illegible]	Nam[illegible]	Samsara.	Bhuri.
	%	%	%	%	%	%
Cane-sugar	9·53	11·55	13·70	11·10	13·51	[illegible]
Glucose	1·06	·99	·[illegible]	[illegible]	[illegible]·18	·47

These analyses show at a glance how considerable are the variations in the proportion of cane-sugar and of glucose in the juice of different varieties of sugarcane. One of them contains only about 9·5 per cent. of cane-sugar, whilst the juice of [illegible] variety [illegible] grown at Poona (to which reference will be made below) contains nearly 18·6 per cent. of cane-sugar.

The glucose will be referred to more particularly in another part of this note, but it may be here noted that it also varies very greatly indeed. [illegible] varieties contain only about 6 per cent, whilst the juice of another contains nearly [illegible] per cent. Now, bearing in mind that the cost of cultivation, of crushing and of boiling down the juice of different varieties may be taken as being equal in any particular locality, it will be at once apparent that if the sorts of cane which produce poor juice could be replaced by those producing rich juice, an enormous benefit would be conferred on the cultivators. The juice of the Poona variety is probably not quite so rich as some of the sorts grown in the Mauritius, but it is not much below their best; and it seems not unlikely that there are in more than one part of India varieties of cane which with little improvement, could become equal to any in the world.

Moreover, as will be seen presently (paragraph 6), the evidence which is at hand tends to show that improvement of varieties to [illegible] is accompanied by a lessening of its quality; and it would seem that a search after the best varieties which [illegible] in one part or other province is perhaps the most important matter to be taken up in endeavouring to improve the sugar-producing power of that province.

5. *The juice of the same variety grown at different places.*—[illegible] at hand [illegible] to two [illegible]

The first is that of some cane which was sent from the Mauritius to the Director of Land Records and Agriculture, Bombay, two years ago. Two varieties were sent, one a white and the other a red variety. They were cultivated in 1894-95 and again in 1895-96 at Manjri (Poona) with very liberal amounts of manure. They were said to be varieties which produce juice containing some 18 per cent. of sugar. Whilst they grew [illegible]y at Poona the juice has in neither year contained anything approaching the above. Several analyses of the red variety showed only about 10 per cent of cane-sugar 2·0 per cent of glucose, whilst that of the white variety contained about 12 per cent. of cane-sugar and 1·4 of glucose. The second case is that of the variety grown around Poona and which contains about [illegible] per cent. of cane-sugar and from 1·0 to 1·5 per cent. of glucose. This variety was sent to both Cawnpore and Dumraon last year, and, as shown in statements Nos. 1 and 2, it there contained considerably less, namely, [illegible] than 18 per cent. of [illegible].

The evidence at hand therefore goes to show that sugarcane may suffer materially in quality by transference to long distances, which entails a change of climate. It [illegible] varieties, after several years of acclimatization, will recover [illegible] original qualities; but the process is an expensive one, and if good varieties already exist in a province, it would probably be better to identify these and extend their cultivation, than to transfer varieties from long distan[ces].

3. *The juice of the same variety grown with different manures and with different amounts of manure.*—At Poona one variety has been grown with a variety of manure. The list includes poudrette, cattle [illegible] various oil-seed cakes, bones, superphosphates and saltpetre. In 1894-95 the amount of nitrogen applied per acre varied from 200lb to nearly 1,000lb, whilst the phosphoric acid varied from 140 to 2,700lb.*

In neither year was there any relation observable between the quality of the juice [illegible] the amounts of manure applied. In 1894-95 the proportion of cane-sugar (*vide* Agricultural Ledger, Medical and Chemical series No. 1, page 3) varied, but it is probable that the variation was due to causes quite apart from the manuring. The analyses of the juice from these several plots for 1895-96 are set out in statement No. 3, and it becomes evident that in the case of this series of plots which received varying amounts of different manures, that the quantity of the juice is maintained almost uniformly throughout :—

STATEMENT No. 3.—*Composition of the juice from plots at Poona.*

	Poudrette N. 1,000lb, P_2O_5 1,500lb.	Poudrette N. 500, P_2O_5 [illegible]lb.	Cattle dung N. 500, P_2O_5 [illegible]lb.	Prepared manure N. 500, P_2O_5 [illegible]lb.	Safflower cake N. 500, P_2O_5 [illegible]lb.	Cotton seed cake N. 500, P_2O_5 [illegible]lb.	Safflower and earth nut cake N. 500, P_2O_5 [illegible]lb.	[illegible] cake N. 500, P_2O_5 [illegible]lb.	[illegible] cake N. 500, P_2O_5 [illegible]lb.	Karanj cake N. 500, P_2O_5 [illegible]lb.	Fish manure N. 500, P_2O_5 [illegible]lb.	Bone meal N. [illegible], P_2O_5 [illegible]lb.	Poon, superphosphate N. [illegible], P_2O_5 [illegible]lb.	Bone meal and saltpetre N. 500, P_2O_5 [illegible]lb.	Bone superphosphate and saltpetre N. [illegible], P_2O_5 [illegible]lb.
Cane-sugar ...	15·16	15·21	14·20	[illegible]	16·09	15·58	16·02	14·28	15·02	15·00	11·06	16·31	17·30	13·72	16·52
Glucose ...	1·27	1·47	1·24	1·22	1·35	1·77	1·30	1·67	1·28	1·72	1·32	·93	1·10	1·54	1·91

At Cawnpore likewise the series of plots on which different quantities of manure were applied lead to a like conclusion. Statement No. 4 exhibits the amounts of manure applied and the quality of [illegible] obtained; and [illegible] again the proportions of cane-sugar and of glucose remain constant, while the amounts of manure not only varied considerably, but were very much smaller than in the case of the Poona plots.

* In 1895-96 the amount of nitrogen applied varied from 18lb to 1,000lb, the phosphoric acid from [illegible] to 750lb.

STATEMENT No. 4.—*CmfotUitn vftktjuictoftkt "mttna" varitlt* grown on plot* *at* Cam MM.

Manures per acre.	No manure.	Cattle dung 7 tons N = 94 lb.	Cattle dung 14 tons N = 188 lb.	Bone superphosphate 4 cwts, N = 17 lb.	Saltpetre (crude) 2 cwts, N = 14 lb.	Superphosphate 4 cwts, saltpetre 2 cwts, N = 11 lb.	Bone-meal 5 cwts, N = 21 lb.	Bone-meal 5 cwts, saltpetre 2 cwts, N = 33 lb.	Compound.
	%	%	%	%	%	%	%	%	%
Cane sugar ...	11·67	16·00	17·04	17·08	16·74	15·14	15·03	16·58	16·03
Glucose ...	·27	·50	·37	·31	·31	·51	·44	10	·32

Tbu* it appear* etidest tbat tiir ijuality of ihr juice of any particular variety w not *maUnaltj* affected by ttie amount or de*criptioii uf manure appliad. I tay • *>tlf,* btcauM 1 ahuuld not wi»b to imply that manuring can have *no* influenct.

On the cootrary, aod quite apart front the queition of tbc antuunt of cane grown per am or of other [ii\i|*rtiea of aagareanc to he liiaunesod later, which ia altopoil,.r rtittind from tbe point nndar diacuwwn, I believe tbat tht *fwmUtf <>(* (he juice of may be improved by good cultivation aod liberal manuring. I hare •eta > hi Debar whir.-b bad loat all tbe usual appearance of tbe arop and which I thought •ae reada; a condition brought about, I do not doubt, by the tcanty manuring •pplu-d, Hut 1 think kVa evidence above pet out goes to abow that the improvement in the quality of tbe juice of a cane will at llw l**t be a ilow proevw. It alw> Mem* evident tbat we may place fair reliance on tbe information offl •'-alftttcutii *S*».* I and £ in which the quality uf the juice of different nriatiai tru TthiUtwi. U oan lianliy b> iuggcctedj for intUnw, tli»tlfi,j- «re aeckbrntalili aajr *av , it mu.l r»tiirr Id . <at the compontion of tfattf JMftHat there - v ith Dm ezeeption of tbe "Pogna variety" they wen not I rought from long duUocet ID the farm* in <|U««tiuo, but belut ..• nepoctivt prorinoea, and we may, I think, tafely conclude that, for namj tbe i than of (he North-Wettcrn » attd the tuuitg

»ad i . !!• • i'j{»l are poor and may etiily b* rcjtUceJ by better omi air atUwl.

Tit cewpouttei tm tftir ("fir " or "g»! ") tUmimmi.

the raw kugare, it will be well to find *et out ^ >r. So far ** tbe eultiralor'f p«l*i ned It m liter* cro"> oUitii iiiui-U nolaiHe. she MOID value a« cue^ugkr, In tbe l»ua>, bow- •rer. bu) er* u«ke a difference between ***f*r"* whwb u nice and firm and a (tood aolowr aitd cr> »Ul and *"gur"* of Ud colour and aof UWM. Tbo Bnttya who ither wfiniug *or* iwiwitneat-making or fir the lil of *gmr,* btn to ware. botut large uuafttitir* aud dn mau ia yery apt tu aU *adron. Tlwhi^her t acow, Uto gfwater will be ilw l«»(«,,) thu. .juiu- apart boa the wmpuitite value i.f raw iiigan to tbe larjre rcfiuer, tU bat]<• tui-m n all *Imrgm* tugt f •till grraUr moment. K*•!

nut «o ii(ual > v*ulli*it irtioa f gl«COM in the raw •ugar '• the amount j.rwent in liie jniec, n i» anxiuai wl rmrd dunng tbe U>tliu/-tluws prpceea. Aim

The amount of acidity* in those cane juices which were examined varied somewhat as will be seen from the accompanying statements, though it is in all cases very small. It is due to the presence of several different organic acids, and while the juice is being boiled down this acidity causes the inversion of a certain quantity of cane-sugar. This inversion may, at least in part, be prevented. I mentioned in my note on this subject last year that a little alkali (potash) was added to the juice at Cawnpore before boiling down.

This year I carried out several experiments with lime instead of potash. The latter has the disadvantage that it is itself a means of preventing cane-sugar from crystallizing, whilst lime in the small quantity used does no harm. The extent to which it prevented "inversion" will be seen presently. In order to determine the extent of inversion, it is necessary to compare the relative qualities of glucose in the juice and in the "*gur*" obtained, and the following statements Nos. 5, 6, 7, 8, are drawn up with this object. In each is set out first the percentage composition of the juice and of the *gur* respectively, and then in order to show at a glance the relative amount of the glucose in the juice and in the *gur*, its proportion per 100 parts of total sugar is printed in thick type. It will be seen that the proportion of glucose in the juice varies very greatly from about 2 parts for 100 of total sugar in the matna variety to no less than 17 in the dikchan variety (statements Nos. 6 and 7). In the *gurs*, there is on the whole much more uniformity, it is in the majority of cases about 10 to 14 parts per 100 of total sugar, though exceptions occur such as the dikchan *gur* which contained 22 of glucose per 100 of total sugar :—

STATEMENT No. 5—*Composition of juice and gur from six varieties grown at Dumraon, 1895-96.*

	Mungo.	Khari.	Red Bombay.	Poona.	Samsara.	Bhurli.
	%	%	%	%	%	%
Juice—						
Cane-sugar	9·55	11·55	13·70	12·99	13·91	13·01
Glucose	1·06	·99	·95	1·15	1·18	·57
Total sugar ...	10·62	12·54	14·65	14·15	15·09	13·58
Ratio: 100 parts of total sugar contain of glucose.	**10·0**	**7·9**	**6·5**	**8·2**	**7·8**	**4·2**
Gur—						
Cane-sugar	71·85	68·07	73·99	69·20	70·62	77·46
Glucose	11·37	9·39	9·81	10·31	10·79	5·27
Total sugar ...	83·22	77·46	83·80	79·51	81·39	82·73
Ratio: 100 parts of total sugar contain of glucose.	**13·7**	**12·1**	**11·8**	**12·9**	**11·9**	**6·3**

STATEMENT No. 6.—*Composition of juice and gur from six varieties grown at Cawnpore, 1895-96.*

	Dhaul.	Dikchan.	Saharanpuri.	Poona.	Madrasi.	Matna.
	%	%	%	%	%	%
Juice acidity	·055	·040	·066	·028	·049	·074
Cane-sugar	12·74	9·08	11·03	12·48	13·90	16·36
Glucose	1·25	1·56	·98	1·77	1·53	·37
Total sugar ...	13·99	11·04	12·07	14·25	15·43	16·73
Ratio: 100 parts of total sugar contain of glucose.	**8·9**	**16·93**	**5·8**	**12·4**	**10·6**	**2·2**
Gur.						
Cane-sugar	68·67	62·99	70·92	69·72	69·06	71·73
Glucose	11·95	17·99	9·94	13·30	12·82	10·43
Total sugar ...	80·62	80·98	80·86	83·02	81·88	82·16
Ratio: 100 parts of total sugar contain of glucose.	**14·2**	**22·2**	**12·3**	**10·6**	**15·6**	**12·6**

* The acidity was determined by neutralising the juice with standard alkali, litmus paper being used as the indicator. The juice is too strongly coloured to allow of any indicator being used in the liquid and clearing agents are inadmissible. Cochineal gave too high results and phenolphthalein is inadmissible since the juice contains carbonic acid. The figures represent parts of K_2O required to neutralise the acidity of 100 parts of juice. Since the acidity is due to a variety of acids, this mode of expressing the results is preferable.

STATEMENT No. 7.—Composition of juice and gur of the viatna variety grown at Coimbatore with different manures. 1.V.:,.:H;

MID art ptr m .	£ i R	1 If I |1	h	t h jl	M g l t	p II1	1 c	Ii i i. P	1 A
JMML	%	X	%	X	X	X	X	X	X
Cane-sugar ... OIMHM	IG07	[illegible] •M>	[illegible] •87	[illegible]	[illegible] 81	If-M 11	[illegible] u	16H ID	10a -u
Tm»l Mfu	U -'»	1740	J7 4J	J7'an	i r m	i:. ..^	16*7	16-87	1'135
Bttio lOOparUcf loUJ »OfJf CO9-Hua tJ glucose.	34	26	21	in	1*	33	38	17	1 j
ri»i«(>r 0<MOM	7* 61 MM	n-m	7171	N N ifw	[illegible]	.•.»M ma	7*74 io-i«	71 hi	? • »
Total nf*r	ntt	[illegible]	HI'l!'	[illegible]	SMI	[illegible]	•MB	H n	B11.1
Ratio 100 p«rU of lOUl H''B«t «•• t»a of llnrow	105	ire	lit	137	12 8	16-7	12J!	in	90

STATEMENT No. 8—Composition of juice and gur from A< Poona sugarcane grown at Poona with different manures.

		ii					l*								
Juice • '• ? Cane-sugar Glucose	[illegible]	•i·	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	•001
Total sugar	IT1	irw	17 M	17 »	ira	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	·…·	In-*:	[illegible]
Ratio: 100 parts of total sugar contain of glucose	748	S3	78	69	88	[illegible]	75	[illegible]	[illegible]	[illegible]	8 69	4 9J	[illegible]	[illegible]	[illegible]
Gur. Cane-sugar Glucose	[illegible]	[illegible]	[illegible]	7»1P	[illegible]	[illegible]	[illegible]	ts-ui	[illegible]	[illegible]	rra ii H	73 IT	[illegible]	7: H	[illegible]
Total sugar	[illegible]	[illegible]	[illegible]	[illegible]	M I	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	M t:.	• :!	[illegible]	[illegible]
Ratio: 100 parts of tet»t sugar contain of glucose	111	131	[illegible]	ISA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	437	182	[illegible]	[illegible]

There is, however, considerable variation in the amount of glucose formed during boiling down. The juice of U» uutns variety it C«wDpor« cunUuiwd *»n]y about two parts of gliioow jvrr 1W of *uffu. wbcnM tti^r p.nt»iii«J more than U oo *n »v.-r-, mtM NUQ|>IM (»1«triufut 7), 10 i«rU bmnff thui I formed during the boiling process. QD UM oU**r h»«I, th« Ihurli tfcnfty «l Domtmon U.i i j*rt» in the juice in<! only 0 in tht *gur*, thtiwiaff a v*n iiislil uaount of itivrmon, *then* Meow to U no cWr rcUtiun Utvetn tie tomunt of «cvlitjf wd tu« »mounl o(inveffwn

8. It is pMibk (•»] jwrlajt pnrtn-mMr), bnwever. to pnvent in • ^wat OMunrt tl«» gincoM fonnath.D A* »liwlv iwiir«(«], ripcnm.-nU with ij.ti. klinv wm nude «t Cairnjioi* »od I\xms to twt how far IUCOM* migltl be »tUin«l in tht* mitiBw MK! I mint b«M tlt*nk Mr. McGl•!*!), F.C 8 , of the CAwnpnn Su-jr Work*, Lift ..., for tiw inUTHt be took in the matter. In ortlcr to oliUin UM bot mulli it «u 4MI»U« to add U nach IIOM io Uw juie« bvfon tailing w would tMrl/ but not quiU stulnJuw all tb» »oOitr,

If an excess of lime be employed the resulting *gur* is black and would command no price in the bazárs, although as will be seen below, its quality is really not lower than that of ordinary *gur*. To do this, the lime was added in the form of "milk of lime," (*i. e.*, quicklime and water made into a thin cream and separated from all lumps, stones, &c.) to a definite proportion of the juice for each pan operated upon, until that portion was quite neutral or very slightly alkaline. The remaining portion of juice was then mixed with the neutral portion and the whole thus became slightly acid. Thus for example if it was desired to neutralise ⅞ths of the acidity, ⅞ths of the juice which was intended for one pan was separately neutralised with the milk of lime and then the remaining ⅛th was added, by which means a juice was prepared containing only ⅛th of the original amount of free acid; or again if it was desired to neutralise $\frac{11}{12}$ths of the acidity, $\frac{11}{12}$ths of the juice intended for the one boiling was neutralized and then the remaining $\frac{1}{12}$th of the juice was mixed with the neutral portion and a juice was obtained containing approximately only $\frac{1}{12}$th of the original acidity. The process is [illegible] simple, and [illegible] litmus paper must be employed to determine when sufficient lime has been added (it is added by the spoonful), I believe that cultivators might [illegible] little practice to perform the operation perfectly well, assuming of course that [illegible] be worth their while to go to the trouble to do so.

They all know how many "ghurras" of juice go to a panful, and hence there is no difficulty in their measuring off the right amount for neutralizing. The results of the experiments are set out in statement 9. It will be seen that in all cases the proportion of glucose formed during the boiling process was very muc[illegible] fter the addition of lime. In two cases, where only $\frac{1}{12}$th and $\frac{1}{16}$th respectively of [illegible] left unneutralized there was practically no inversion, also when a slight [illegible] was employed and all the acid neutralized, there was no increase in t[illegible] glucose. In the majority of cases there was some inversion, but much [illegible] n when no lime was added. In the case of the juice of the Matua variety at Cawnpore, the juice was all used up before I knew how much lime might safely be added.

When ⅞ths of the acidity was neutralized the inversion was still considerable, but it may fairly be assumed that if about [illegible] of the acidity had been neutralized there would have been very little inversion.

Statement No. 9.—*Showing the effect of neutralizing juice with lime before boiling.*

	Cawnpore experiments. Matua variety.						Saharanpur variety.			Madras variety.		Poona experiments. Plot 7.		Plot 8.	
Juice— Cane-sugar ...	16·74		16·58		16·03		15·69			14·10		15·95		15·03	
" Glucose ...	·31		·29		·32		·98			1·25		1·53		1·72	
Total sugar ...	17·05		16·87		16·35		16·67			15·42		17·48		16·75	
Ratio: 100 parts of total sugar contain of glucose	1·8		1·7		1·9		5·8			8·7		8·69		10·2	
Amount of acidity neutralized.	No lime.	[illegible]	No lime.	Alkaline.	No lime.	[illegible]	No lime.	[illegible]	[illegible]	No lime.	[illegible]	No lime.	[illegible]	No lime.	[illegible]
Gur.															
Cane-sugar ...	72·54	74·30	71·65	75·76	72·60	72·94	70·02	75·80	79·42	69·06	77·41	75·95	79·69	73·67	79·00
Glucose ...	10·07	·066	9·21	1·62	7·33	5·31	9·94	5·55	5·06	12·93	7·67	11·90	9·00	12·47	9·60
Total sugar ...	82·61	81·03	81·76	77·38	81·13	78·25	80·86	84·15	82·21	81·69	84·08	87·65	88·69	86·14	87·60
Ratio: 100 parts of total sugar contain of glucose.	12·2	0·16	12·1	2·09	9·0	6·70	12·3	6·36	6·08	15·6	8·9	13·5	10·1	14·4	1·09

Thus generally [illegible] ployed, a juice containing a low percentage of glucose may be valued much higher than one containing a high percentage, although, without the addition of lime or some other neutralising agent, this advantage is not necessarily maintained.

The matna r ^ t y contained a very low proportion of glace* in the jui W»« w« ;ex»pt.nir «rt*r addition of lime) of DO value ; for the *jar* nbUiood from this «w contain*! a fairly high proportion {.bout 12 per wnt., *vid«* ttabment Vo. 7) under Ordinary circa ran tan en,

Mr. McGl .•ban inform* me that the Mm pie of *yur* which wat ? M M * *(vidt* a(atement) wu better than average "pulri "or ttrained rib coiling about EU. 5-5 p<r mat'nil. *

9. Th rtfininy of jagptry* fcv *the hand centrifugal machine.*

Quit* apart from any mark,t wfaieh may win for raw aug.r required by large t*6nen« there appear, to be a conyd.nl.la demand for awni-M-fined Mg,r by ,,,,. refiners *n.* To the poorer da*, of nfento, mob**, or a *jur* containing a high proportuaoichHw.i. jurt «B,wda find a. ordJnarr ffMr. The feeding value of the two may be Mid to be identical.

On the other hand, the refiner wanti ai littlo molaww (gluoo^) „ po-juu m.. lea, it, amou^thM^ trouble will fa ha« in hi. manufacto™. It f o C therefore that if, isatead of *f*r* being awt to refioen, eemi-reSned augar be *went* «,d tbe molaaeee reUioed by tbe grower, a diiti&ot economy will be effected.

Tfcbktoagieaty tb# tuteof thing* wtU I *tmai* around B^hea. The V in*t«id of being boiled .Iowa hard to the form of *yur,* ii largely oonrorted into a lemT liquid jaggery from wbiob, by the aid or Me#*». Tbomaon and Mylne'a hand oeotri! fogal. mort of tbe moitmee uaeparaUd from tbe tugar crytUl and retained for loeat consumption. whiltt tbe eemi-nfioed mgar it aold. I have Ui thank Mr. *MAathr* showing I n» eomeof UMM maohinee at work and for tome valuable information on the subject. D»nUle« the proportion of eugarcrytUl obtained will rary and depend on the i awl of joim and oa the method of boiling employed. But from what 1 could Urn the semi-pun* ««ar obtained amount, to about one-half of the »jaggery operated upon* the other rhalfooiifiiling of a liquid moUat«>, wbuh, on boiling down furnuacfor which 1l» parnetly good for human ooMtimption.

Tbe market valca* of the different materiata were aa fdlowa at the time of my ifiait i Ordinary *ffmr* 12 .err. tbe moee , *emi-refin«d wgar 0 «,,,,. *g»it* m d o friJm ^ laeaa. |« teem. Tho* a maund of ordinary *>j<w* would have .old for fl(. 8·5,0) *wUUt* lf ' Uteaamequaotity of juice had been ooanrtal into jaggery and refined in the OtothfoM] Uww would be obtained *tQ* m r > of wtgar worth *R*.* W4» and 20 tMr. of 2nd a w * r fi>r or value KJ. 1-9-0. ' '

TU profit would not be quiU M large H UMM figure. imlic.Ui, beeauM of the wet of boiling the aolaewe dowa again, but. the above example will ibow that it may * raadily pay a cultivator to convert a part of hii juioe into jaggery and p—- semi-refined mgar from it, inelead of eelling it all at *>jur.*

The following aaatywa of aunplee of Mmi^tfintd tugar will illu.t rate their oompoaitMB. There ii in adJitMn, oneaualy«i« *at* a sample of *-jar mmdt* from lite molasses.

Statement No. lit.

	Sugar obtained by the centrifugal.	Gur from the molasses of the same.	Sugar obtained by the centrifugal.	Sugar a refined by wet wood.
Cane-sugar	[illegible]	[illegible]	[illegible]	[illegible]
Glucose	[illegible]	[illegible]	[illegible]	[illegible]
Ash	ii	[illegible]	[illegible]	—
Total sugar	[illegible]	[illegible]	[illegible]	[illegible]
Ratio 100 pi.-i of |aW iu,« contain of glucose	[illegible]	IM	[illegible]	[illegible]

It will be M that Ik* *gmr* ntucb we* prepatwl from tbe molasses was of not at all rtry peer quality, wdead it wa» neariy »jrood «• eomtof the gura which were prepared fiww jutcr direct at tbe farm*.

* I apply the term "jaggery" to the semi-solid mass •Wat « prepared by staying the boiling process at an earlier stage than is the case when "gur" is prepared.

10. *The loss of sugar which occurs during the boiling-down process.*— The loss of cane-sugar caused by inversion has already been dealt with. There is, however, another source of loss during the boiling process which I have attempted to estimate. Assuming that we have determined by analysis the percentage amount of sugar in any particular quantity of juice and that we know the weight of the juice; and, secondly, if we similarly determine the percentage amount of sugar in the gur obtained and that we likewise know its weight, the weight of sugar in the juice employed and in the gur obtained may be readily calculated. If no loss (excepting inversion, which is not a loss in the sense in which the word is applied in this paragraph, for if cane-sugar becomes inverted it forms glucose) occurred, the total amount of sugar found in the *gur* should be equal to the total sugar in the juice.

In making such a calculation, however, it becomes necessary to bear in mind what the errors of experiment may be. In the analysis of the juice the error may be 1 per cent. of total sugar, in the analysis of the *gur* it may amount to [illegible] per cent. of total sugar. [illegible] of juice [illegible]. For the former a sample was taken from the juice at each mill which was [illegible] of cane, the bottle was filled (at Poona) from the big [illegible] which contained the juice for one boiling in the hour [illegible] each sample represented about [illegible] of juice. [illegible] variation, were frequently found between the composition of the juice of [illegible] per cent. of total sugar, though [illegible] cent. of total [illegible] between two samples would be equivalent to [illegible]. We may, however, fairly assume that the mean of the two analyses would really represent the average composition of the juice of a plot of cane, [illegible] the error would not be greater than 2·5 per cent. of the total sugar.

In the [illegible] of cases, however, the difference between the composition of two samples of juice from [illegible] plot of [illegible] this figure. In the case of the *gur* the sample could be very perfectly obtained.* A long iron instrument semi-circular form like the one employed for sampling cheese, though much longer, was driven into the blocks of *gur* and on withdrawing it, a circular slice of *gur*, the whole length of the cut, adhered to the instrument. A portion from the centre of this slice was taken from each block (or from one-half of the blocks if the number be large), and these portions on being mixed together give a very perfect average sample of the *gur* of the whole plot. It may be mentioned here that although *gur* is quite solid in the ordinary sense, still the molasses do pass gradually downwards, and a piece chipped from the top of a block might contain less glucose than a piece taken from the bottom. The advantage of obtaining the sample from the very centre will thus be apparent. Only one sample of *gur* was analysed from any one plot, but the error of sampling when done in the manner above described cannot be supposed to be anything appreciable. In the accompanying statement No. 11, the weight of juice, the percentage of total sugar and the calculated weight of total sugar in the juice is placed in the upper portion; in the middle portion is stated the weight of *gur* obtained, the percentage of total sugar in the *gur* and the calculated weight of total sugar in it. Finally we have the difference between the weight of sugar in the juice and in the *gur*, representing loss, and the percentage of loss. This has been calculated for four plots at Cawnpore and for three plots at Poona; in addition to which there is the result of a careful experiment on one pan of juice made at Poona. It will be seen that usually the loss amounts to more than 10 per cent. of the sugar; the figures obtained from the Cawnpore experiments agreeing closely with those at Poona. There are two reasons for this loss, the one being due to juice which is unavoidably carried off with the scum, whilst the second one is due to sugar which adheres to the cloth lining of the mould into which the *gur*, whilst still warm and soft, is put.

STITUCEKTNO. 11—*Showing ton vrhieh ocev.rn when boding down juice.*

		Cawnpore experiments.				Poona experiments.			
		Mairua variety.	Poona variety.	Madrasi variety.	Sahâranpuri variety.	Plot 18.	Plot 19.	Plot 20.	Plot 21 (boiling).
Juice ...	lb	1,807	3,432	2,833	1,936	11,400	13,284	12,833	900
Total sugar per cent.	...	16·24	14·25	15·45	16·67	17·2	16·75	17·17	16·14
" "	lb	293	489	437	320	1,958	2,224	2,203	145·2
Gur ...	lb	316	234	450	332	1,322	2,338	2,210	131
Total sugar per cent.	...	82·06	83·62	81·86	80·36	85·1	80·63	87·52	87·26
" "	lb	256	446	376	284	1,683	2,008	1,943	131·7
Loss ...	lb	37	43	61	36	275	216	260	13·5
" per cent. ...	...	12·7	10·4	13·9	11·2	13·95	9·70	11·80	9·3

The experiment on one pan of juice a I Poona wat made to determine how much sugar • i* carried off by the icum. InUu*ca« the total loaf amounted to 93 per «nt. It wae intended to collect all the team, wrigh it and atulyw it. But It n difficult to do thu, aa the " drainer " with which the ecum it itparated it paaaed from ti* pan to Uw weel in which ihe acum it put, aonu dript on the ground, ami again the «g»r Imlcr ha* to (five U» drainer each time a violent nhake to detach tome of the ecu in, Md it thu* happeni that all Uw ecum wa« not actually collected. In the vxprimraU under DOticaUweram weighed 1*11. It contained £7'i5 per cent, of *tugtr,* and tliii amount* w flOIbof Mgar. Of the 03 percent, of I »«t 4' 6 per cent- wu thut accounted for. Hut wnc* *om* part of Uw acum wu i«t the amount of augur in the «cum may be mfcly larointd to be greater than iht*; probably MI j«r *oral,* of UK IUM would •wre »u. uratcty repraeal it, The remainder mutt be amimed to he attached to the cloth. Now, although -b H i» tbut »een that a !«e of more than 10 per cent of U» •ttgmr in the juioe i> wtaincd, it happen* that that portico which goc« with Uw scum u taefully employed. At Cawnpore the *cum waa fed to cattle : at Poona an amiarrange-ment'. «xi*U with Uw nan who »uppH« all the rope* that be •hall b»vo the ecum as payment. He takaa it and prcjarae *ffur* from it, and concidrring tint it oontains such a bijfb paneatage of lUjrar, it will be cvulrut that altliocgh tlie preparation of sugar from i: will vntail HHIK iittle troable, *ttll it cut L* pt^Hubly done. 1t is a matter' of eatiafactiaa to find lh»t Utia sugar w not watted, and afford* another example of how vcnomteal Uw cultivator M, whrn by mean* of |«tin)ce he can be *to.*

11. *Tht total amount of *ugar in the can-* —

\. is u. I ktMwn, Uw amount of eugar which actually exwta in Uw cane it far greater thanibat whuh uaprveaad by any mill. It appeared nereitbelav of interest U> make aome deWrminattoo* of Uw total «qgar in diJTereot aorta of cane, partly bMejueioeadatermiiMUoii* have nut been prcviou»ly made M far n thr trriur it aware) for Indian •au'», bat more pAiticuUrly beoauae frum Jifforvnt aurta of cut tery ujjereol amoonU of juice are eipM**!, «»d Uu* independently or the exact dteorip. twn of will empwyd- I*»[1] J«" •» •**"»P[l] *" """^ *• *l»»mi«» **• toUl aogar in Uw owe and at» (aim* we can oakwlate ih« amount in Uw juice expteaied) Uie sugar tn Uw retoa* »•»«*; lite mm of the two latter would form a check on Lbt correctness i of Uw former. It ba* been fonnd impuoable, for »ev«nil reawnt, to deter-mine Uw aufKT tn Uw croabed ea»e directly with any dvgtea of rt** tueea, aad reliance musA be placed oa the «VUrmi»atii>n« of Uw toUl mgar in Uw cane aad taUw joiee, *• will be at**, Jwterer. lli«« are pwbably very aear the truth and earna inier«MiB« iwUta an ofeuuied. It will U well in Uw firtt plaoe toexpuii U» procea* Mpw/edforUwpttrpee*. A ea«mwnt pUnlrt*m may be mid to <xnmt of Uw prineipal parta, Uwove ta jniee aad Uw«Uwr » " <m(te Hbw," *bich ooouaU pi IBCIpally ef eeHuluae •ad oUwr iBMtnbw carUhydratra, Th" former, the juioe, it a wiiery lioutd, whiltt UM «wl» fibre • praetically intolnbte *a* cold waUr. If Uirnfore Uw eUm (after bang been atuiably e»t up M U to admit Wfuwr to pa» among the Sim) be treated with water,

the latter will with iwijr the juice entirely, baring tbe erode fibrt behind and the Utter nwy be dried and weighed, la the analyse of cMUe-foddere ebemiit* b»« nnially found it mot* exact to empliy bit water in withiny the jute* or foMite portion from the erode fibre. In tbe ease of augntM* 1 bars employed (for the pur-jwai uniUr ditctwfWw, namely, tbrcmimali'o of the jtiwe and eagarl only cold nM ; for our object ta to enpante only tbote m*t ten from the erude fibra which are dwwlwd » tbe juice, i. e\, in a cold watery fluid. If, tben.w<>thae*epetate tbe erode film and weifcb it, the other portion U eontidered to be juice. Ilaring deUrmioed the proportion of iatet, we can from iU anaiyus oalcotate the amount of *ui^ar or any other of it* coasliuents whi.li tre prewnt from tbe parentage of jin * fo«nd hi any oaae. Thus if we found 10 per cent, of erode fibre in a eane, the different* or P0 per teat, would be juice; and if that juice contained I & per ornt. of sugar, the proportion of sugar in tbe caoe wouldU (OOxls^lUO) la-sper cent. A« a cbrtk on thw method we bave ottwr evi-dence. A eoeonlent ttem if dried at a temperature not exceeding UM boiling point of water, will lota it* water entirely, and wa nave remaining what» commonly termed by eberoi.tt tl.e " dry matter." Now it will be erideat that tbit dry matter contain* tbe erode fibre *nd the logar and other *>tU instance* whicb rxift in tbe juice. If therefore to the erode fibre we add tbe amount of lugar, mineral matter and slbomtnoid) f>und ia the juice, the MUD thoald equal approximately the amount of " dry matter." In tbe cate of mgareane juiee, the gMater part of the solid matter* dtaaolnd in it tvnstot of tagar; the amount of mineral matter* and alt'iuninoitt* an very tmall, ae will be eeen when axammfag UM (UtemenU. In the example above quoted the dry matter thould * a liule more than the erode fibrt 4- the eager, or rather nor* thin S3 5 per tani. Thui a ohx* ia placed <m the determination, of the l-Ul »ugar in the «aM which, would ihow what error* might exut in UM proceai of auaUii*. The weak patal in tbe tnrthod tin in tbe fact that only .null uuanttliee of eane (about C to 3 ox. tu, from 3 or * canmi oould be operated upon, and although average naad case* were choera for UM parpoat, (till tbe temple thne obtabed » mtteh more open to doubt Una the *an>plat of juice. The method ia aot psppoeed b> be quite aecurate, bat the malts obtained an inffioient for the pnrpnee. Tbe acrompanytng atatenMmt No. If will now be readily ttnderttood. All the figure* repreeent parts |<er 100 parti of fmh ««garcaac. tn ilw fint two Golnmita of the atatemeat are the remits obtained by UM ttalraif of ampin of cane from two parta at Pooua, both or whi. h *m of the ease variety and UM mult will indksta that tbe m«Uwd employed may I* relied upon Ia the other five eolnmn* are tbereeulU of the analytt* of 6»e varietinof caae growDat Cawnpof*-ID the upper part of the italctamt i* eihilii*-! the proportion of water and of dry matter in each tort of cane. The ercood eretion oftbe lUtcowntt bewe the prof eretion of erud* fibre and of juice, la the third eretion are fuund UM proportion* of eraie fibre and of »ugaT, a>h and •lbuB>inc>id» which vkiiUd in tbe juice, itxl UM MUD of UMM may be conparcd witb the dry matter. Ia two ca» tbe total of UM determined cwoati-tasats ia aomewbat too high and in - third it • a Lltle tow, in UM other four «a*ee the remits Mtaode apftraxiauWly viUt UM d I y null'r. It will be aeea that the pro-portion ol erode film vaha* very WBMdemUy. Boat* wWUeacoataiBiag nearly lwKea» much u *uiUrn.* *The* pfr««nUg« »f juice, on UM ulhrr b*oJ, varira fm« 84 prrceot i» about tl per ccat. The percaatag* of total togar rarwa fr^m 10 per em I. l« mow than 10 per teat. It may U uwnn ncJ htre that Ue Leat caa« pr»i«c«d »U'-*1 doe* not contain more tUan IS par oant. «T ngar, and «onM<|oeatly it may be a».»it<J that wr have ta the variety grown at Pooe* a caae whith is nearly aqutl to any in UM world. It naoJaiaa, naomonr, a low proporUia of crade fibre, a quaLty whirb, ae will appear from tbr o>nUiera4mM duwkved m the o*»t paragraph, M of aome moment. Of tbe varietMa g m n in u.« North-Wettern Profiaee*. UM Sahlraanjri eaataias about *la* per oawt. el a*gar, wbcb W high ; but the proportion of crude fibre is higher tbao is tbe Po<na>o>aa, The ttnaty "uuloa" oool.it- a fairly bi«h proportion of M«*r, bat it also eoaUins a vary high proportwtt of erode fibr*. TU timt «s d.kcJun and dhaul rank far Utow, (vr *timy* aoavtaia ww propMUvaa of i«gw aad h>gh proportions of crude fibre.

STATEJIWT NO. 12— *The eompcmtion of tugarca*

	ft*»am«nfc		Cairapon ri jw ri m«• u.				
	Mot!	l'.t ll	DawaL	lHek-chut.	Uatn.	pnl	KtaVaal
Dry aitwr	it .1	Mi 7G-S1	• M I 76ns	mg 9074	KHM ;.. (l	a»M 74-06	[illegible]
Cni, flbrt Jult»	M I	"6*	ii;: m •	ii no	l4« ss-io	10 Si KM;..	H»00 Bfrog
CTWU An Total • ! « AllmmuMidl in Met	1611	10 11 •at	(MB • «	11 00 Hl3h IS • i	U*l 1 1 -T 10	10,14 • w •so	n ...),y >i 14 «
	[illegible]	[illegible]	•HI	tl til	aM4	MM	MM

11. *The amount of* ;iww o»d con*«7U«»% o/ »i»gnr tc*irA *remain** «>,/j-. pressed from the cane.— Muring driarmined the amount of juice ntri from lint th« amount of sugar w•"•" iliffrtwtotaoiconliiiwrf, w«0»v now «nnfi»n> fhu informmtion with th* amount of jnit* and Mgw «p*w». In the -tUtem^Dt No.]3 w net oat for the Mtne mM awnplwof m w u w«e referwd to in Uic fowgomg i»«^raph tlte t•((a juice in t iceanr, U» proportion wt.rwted by ih# mflli, and the diffen?ne« or that remain in - In UM rcfu»f c»oc ; thtii nmilarlj the total miffnr in the cane, the ammint exprvniod in the juice and Uavt jhirt remaimnffin the cmohed eane; finally ir> ttip iliirl Motion of tba statement the relative proportions ,,, cnllJ,, filiw " ^ i aico in 10ft V*ati** <f eru»h«I C*DO. A glarx» at tbo fiirurw in ih* fir#t P««U(MI of tbe rt*lonH!iit ahotrc (Jiat whilut Ibere u no »ery great Jiffvren*.« in tli proportion of jui«* wiiit-h Hie vnriptiw! oontain, lhe amounU «ptwa»*l vary •nortnou«ly; from tlw cane at Poona more than 70 out of ttl |*r cent of juiee tu obtained, wliil«t fr..m the matn* Turirtr at Carnip-ire only •Utt* 45 out of 85 per cent wa* reatin-d. The o0i«- rar ipv M intertnediata po*it;-n At tint «iebl it woaid Uw»|«-el«U that tbe ailli were at fault und that ilw high proportion of juiee *txpntmi* at Poow indiratca that tin* mi!* emp]«y! tht-re wcr» beiltr than tlm«e employed at Cawnpore. So far a* Uiii point i« caneerned, I Ulure tfcal tie tnUU «nj>lojrBd at Cawnpow *m in *evwal ca^, (8 ,tl.IN a used l«d one! ami ptiwubl/ Utter milt* would lia« expreiaod rallier m»ro. But thin will ool in any caao arcount for the gwart dtfleremw which MM found. From the Pooi.a variety *{grown* at Cawnpor*) 86 jier «nt. wat expmawd, whi^h «• dintirtctJv *lem* tian irltat WM «U*in«d fr<»m UJI» «rietj at Poona, Bot a comj-ariton or thv mrnlU of rni»f]jng tbe acreral varietiea at CaWDpore abowa that wlnirt 04 ooi of 90 per cent, of juice wa. obtain*! from tbe Madras rwSHr, »nly 45 out of 86 percent, wa* got from the matna, and thii owler perftcttj aimilar cooditiniti ai rogarli miili. If, however, inatead of making wmpan*Mi» *»f* the atnounU of juiae, the cmJ« 6liro and Ui» j.art it playi t« to eoBiidered, an explanation offer* or fcnelf. Aa anon aa (lie oane it brokoti and wliiU still a tbe mill, the crude 6bh» may b* 1iltM»d aimpljr to a *tpoagt.* Tht cell* which cneloM tht joiw i" ^** ""p**' cttl<> mrp l*»lf«> «nd there i« nothing to prevt-nt the jnet fron Ua«»g *•>• <«».«w»ptia|r <i« p*»y»e«l property ofadhen'oo. Tlit» !• wiot) baia« the ««*, >k* «"«»nl »f J oi « wlli <* will remain with anjr refnar cane u it Uam UM mill, *fl •I'p'n'l pnnd|»lly on the amount of ipongr materUl, in other «orfl,»ita*eTKA/tt«pr»etlt, Tbo lower portion of the Hatemenl eihihitothi. wry okwrty, f<* th« refnw ca« of all Ue Bw varwtie. at Cawnj^re c-nwi,tod of 2& to 17 par «»»t. ot crod* flbte ami "» to 7» per tent, of joke, abow.ng tUt tlw milli faaU workatt »«/uniformly indeed in eac i case.

S-rmmwr No. 13 —Amount of j *ict and ntgar r*maining in ">* *«sked cane

	[illegible] cane.		Cawnpore experiment.				
	Plot 2.	Plot 11.	Dhaul.	Dikchan.	Matna.	Saharanpuri.	Madrasi.
Juice in cane ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
„ expressed ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
„ ta rrfw*c»M ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
To(*t .tic*' in MM ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ditto, juice expressed,	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Dilta i»fw<use ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Composition of refuse cane crude	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Juice ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	100·0	100·0	100·0	100·0	100·0	100·0	100·0

At Pontw tW refn«e cane nu»t have been un>itt*tttanab)y better ont*h+l for the refute cane coatitted of 30 par *nsttt.* of erode film and TO per cent, of juice. It that Iwimw apparent tint the proportion of crude fibre in any cane it a my important factor, ftnr *i** may be tUtrd at approximately correct that the amontr of juice remaining in th« entthed MM vmhet directly with the proportion of crude fibre in the caw. The main* variety contain* about 15 par wnt. of crude fibre and held 40 per oent. of juice within itf IUUUMB when truabrd; the Pooea variety (crutbed with an entirely different mill at Pcx>na> containad 8 per cent, of crude fibre and retained £<> per «"'• of jam. It will ihui becoei* apparent why it it that although ibo malna variety contlinoJ S6 per rent, of • juioe containing nearly 17 per cent, of uigar, it U but a very pour tiane fir rntnluni; pqrpaeea. Of the 14 per cent, of tugmr in tbe oanr only a L;tle more than half wa« expe«ca«d, wbetaaa in tbe case of the Sa.!iir*n|>uri and Madtati varietiee]rd* of the eugar they cootainnt m expreM«d, and from the Puon* variety (grown at foona] th> proportion nrueeto |tha. It maybt taid tnenforethal it ii !'»!• goodgrowittg acane with v«r> rich juice if tbe prnportbn of erode fibre i* likowito bitfli; a low proportion of t rude fibre ia indeed of grraUr unportanee than the {*»••»-•ion of a good null.

14. *The amo•int of nitrogen awl jAotpkorie add* ta tit *tuffanonr eroy* — La«t year an appro&im«te etttoute of the amount of nitrogen and of pbot}>Oori« acid in tbe lugmrcant ;Mp wu made, but it a|i)*anrd to h» worth wbit« to mak« awunte dVtermiwiiont of tbeae two coMtiUwoU, Tor Una crop M oooaidered guii-rtlly to be a very exlianating one. Stroj.U wtra tberefote. taken of the tagarainc. of the p e n tram and tops of the cane which are not paated through the mill, and of the dry U*Tve, which are stripped oil the ouw when it i» harveated. Tbe wotgbti of three were also recorded, and from thttand the pttsenlag* (uund by cbtmkal aaalyew, tbe weight «[nitrogra and pboepbonc acid Okay be rtadity cakub>t«d. Tbe accuwpatiy ing •Ulomcnt Nu. \i eshiUt* the rtnlu for two varWtte> grown at Uumraon and two .it C^irnport. The largi^tamout jya waa takes -up by the "Madrasi" crop at Cawnpo•ic and thi' ut^•.-•t anotiat of |JJ-phoric acid by tlw mat ta crop. Tb* ii,,.ount of nitro•','•"> in tl»; Matlran OTOf ie iadred far higher than in tbe other*; too propurtiuu *ot* Mtn>g«n in Uie •event j art* of tbe |'lant ta high and to alto m tbe rrla-ttvo weight of green and dry Uavee. In none of tbt four c*ea» were tbe oropt to heavy a* at Poout. Tbe crop of tbe Poana vanity at Dauraun wat only aU>ul half a* heavy a* a good ono at Pogna, and the atsoante of nitrogen and pboapborw attl in a good crop of oane at Poana ouy he aaiJ to approximate lo at leu* lOOft per acre aaek

STATEMENT No. 14.—*The amount of nitrogen ... sugarcane crop.*

	Dumraon experiments.				Cawnpore experiments.			
	Poona variety.		Red Bombay variety.		Madrasi variety.		Matna variety.	
	Nitrogen.	Phosphoric acid.	Nitrogen.	Phosphoric acid.	Nitrogen.	Phosphoric acid.	Nitrogen.	Phosphoric acid.
	%	%	%	%	%	%	%	%
In fresh cane,	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
In green tops and leaves,	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
In dry leaves,	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

STATEMENT No. [illegible].—*The amount of nitrogen and phosphoric acid in the sugar-cane crop.*

	Drain experiments.				Compost experiments.			
	Poona variety.		Red Bombay [illegible]		[illegible] variety.		Matna variety.	
	Nitrogen.	Phosphoric acid.	Nitrogen.	Phosphoric acid.	Nitrogen.	Phosphoric acid.	Nitrogen.	Phosphoric acid.
	lb.		lb.		lb.			
Weight of fresh crop ...	46,000		[illegible]		[illegible]		[illegible]	
Of dry [illegible] ...	[illegible]		[illegible]		[illegible]		[illegible]	
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
In cane ...	[illegible]	[illegible]	13·4	[illegible]	[illegible]	[illegible]	1·0	[illegible]
In cane tops ...	[illegible]	[illegible]	[illegible]	101	[illegible]	[illegible]	[illegible]	[illegible]
In dry leaves ...	[illegible]	10·1		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	411	[illegible]	[illegible]	[illegible]	[illegible]

Conclusion.

16. We may now summarise briefly the results obtained up to the present on the subject of sugarcane.

(1) It is evident that the juice of different varieties of cane contain very different proportions of sugar: further, that the proportion of sugar is not materially affected in any one year by any description of manure or its amount. This proportion of sugar in a [illegible] may be altered [illegible] by a change of climate.

(2) The proportion of glucose in the juice of different varieties varies considerably. This proportion is increased, in some cases largely, during the boiling process; but that this increase may be prevented in a great measure by the addition of lime. It is probable that cultivators could easily be taught to "lime" their juice if there were any [illegible] for it.

(3) That during the boiling-down process there is a loss of about 10 per cent of the sugar which is in the juice operated upon, most of which is skimmed away in the scum. This sugar need not, however, be lost in the economic sense.

It may be fed to cattle or (as at Poona) some at least of the sugar in it may be rec[illegible]

(4) The amount of juice, and consequently of sugar which remains unexpressed from the cane depends on the proportion of crude fibre in the cane. Therefore it is desirable to grow varieties of cane containing a low proportion of crude fibre. The [illegible] of sugar remaining in the crushed [illegible] may be as much as nearly one-half of that in the juice, or it may fall to as low a proportion as [illegible]th

(6) The amount of nitrogen and of phosphoric acid taken up by the sugarcane crop will vary from [illegible] in such heavy crops as those grown at Poona.


MAP
GOVERNMENT
FARM,
EXPLANATIONS

REPORT

ON THE

Cafonporc 6*penmcntal Farm

TOR TUB

Kharif and Eabi Seasons, 1896-97,

(/ l.AUABAD:

North-Western rrorineti and Ottdh Oowrawnf fmi,

1898.

No. 143.

DEPARTMENT OF LAND RECORDS AND AGRICULTURE.
N.-W. P. AND OUDH.

Dated, Cawnpore, the 8th January 1898.

FROM

J. S. MESTON, Esq., C. S.,

DIRECTOR OF LAND RECORDS AND AGRICULTURE,

NORTH-WESTERN PROVINCES AND OUDH.

To

THE CHIEF SECRETARY TO GOVERNMENT,

NORTH-WESTERN PROVINCES AND OUDH.

SIR,

I HAVE the honour to submit a report on the working of the Cawnpore Experimental Farm for the Agricultural year 1896-97.

The report is written by the Assistant Director, Saiyid Muhammad Hadi, M. R.A.C, who has generally supervised and directed the experiments throughout the year. Before being printed the report was forwarded to the Agricultural Chemist to the Government of India, in accordance with whose criticisms certain modifications in the statement of results have been introduced. The Farm has been under the executive charge of Mr. P. V. Subbiah, Principal of the Agricultural School, the special appointment of Farm Superintendent having been abolished from 1st May 1897.

2. The Farm lands are efficiently protected from drought by a canal distributary which passes through them, and the exceptional severity of the year made comparatively little impression on their fertility.

3. Manurial experiments have been carried on on a somewhat intensive scale, both after the fashion accessible to the ordinary cultivator and otherwise. The value of highly nitrogenous manures for maize and wheat has been demonstrated; and on the whole castor-cake, alone or in combination with saltpetre and bone dust, seems to have given the best results, though there is very little to choose between it and the results of cowdung. The comparative merits of different manures applied to potatoes, maize, wheat and gram have not yet been determined, and the experiments must be carried on for several years more. Similar trials with sugarcane have been begun, and experiments to give results on what has already been done elsewhere. Green manuring for wheat, by ploughing in a preceding crop of hemp, urd or other leguminous plant forms one of the most scientifically interesting set of experiments at the Farm. Alongside the plots devoted to it are plots on which leguminous crops are grown in alternation with wheat and not ploughed in.

From a comparison of the results it may be hoped that in time we shall be able to prove definitely whether the process of green manuring in any form can or cannot be profitably adopted by the cultivator.

4. A few tests of comparative methods of working have also been made. This most useful field of investigation is necessarily restricted at the Farm, as comparative methods must be judged by their applicability to different localities. The Farm experiments have established that cotton should be sown early and not after the break of the monsoon: they also tend to show that plants sown before the first fall of rain give better and lighter stalks than if sown after the rains open. Both conditions should be qualified by the fact that early sowing and cotton will require irrigation to ensure safety. The experiments with mixed crops (pages 13 and 14 of the Report) go to show that arhar and juar grown together pay

btu*r thin certain other eomtnnationi; bttl the figure* are iocoaclaiivr. Trtat-plauUtion of wbmi ha* been cooductoj wtlb *mteemt,* bat tbc pncticsJ financial v»lu# of tbe operation mnaiM to be total.

6. No *vw.%mpUm**U* bar* be*n tmd during tb* year. English plough* ham HDiMIbtta worked ftgftiMttlwooaiitfjr plough«ad «•*« *bown tb«r Mperiority: bat tb. diffmne. in raulu b«v» MI btm wry a»t«rwl in tb* U*t two nbi MMOU-Tb* gmtar Mntion of ihe wi) MCB»J| by dt»p ploogbiog ww *toon* Y*1U*W« in w«t ytsn than in dry *oum.*

6. I i«tU« of tuple crop* have dwrwdly nodnd tnucb .ttentiou. Colloo and Mgmxam* w*r* tbe inbjecl or intemtiag ud cxbanttin «xfwfia>ebi. A number of Awerir*.n aod Indian eottoiw wan gre* fint timiid* by nd* under similar conditions. The local Cawnpore variety ud tbr JljdraUI twiety did better than any of ih* fcwhu k«. ik. i: ^ 6om bM Mill *u* bo de*rml»*d by txptrta, UKI Uw hM. is thrir [mat form a» loo Mw ta joMify any gnml cowJuMon*. Bmral vsrhtw* wtn alluwf to r-oain in tb* ground for two yean j tbe crop tbey ytrlded in tbe mood y«w w*» •omewbat more luxuriant (b*0 »t *t^U inA* picking*, Lot tbe fltir* ww iwiiff^root. EiperimenU wiOi sngarouw aad tb* treatment of yur eontiuu* t> vi«M ralu*W« f«il^ wfcicb ar-, bowmr, a*y*4 in a highly t«rbsk*l tog* and atu* U -obu t» further investigation.

7. The report (in*, tuwtnU fit doMt drUiU of tbt iapkmtsto ud MM) « which wm dktrtboted (row tb* godowa* .u* U»l to tb* F«m. A brl*f not* U >IM |ir*n of »b*t nt don* in wp^lng balk to tb* poUic. Tt«* btmncjM* of oar working a» frvwiof »v«7 y*v in inportiM* ; >nU I *waMm* tUt tbty tn*ril lb» brt •tlttbon w* c«o gii« tb«n. Ta pqt good oku Md witbis tb* Mob of tb* cotivator *.«J to L.tp him i,, improYing ib. MnIn of ntIlt b. breed are two of the most important objects of this department. They U». di«»t ud pr*ti<»l bearing on the Wf.»orU* gantry, ud go ftr to briDg U» dqwtewil into •y.p.tkw relations with the people.

8. In paragraph 9 of the report a reference is again made to the failure of silk-worm experiments some years ago. Interesting results, and some measure of success, have been obtained outside the department by Raja Rampal Sinh of Kala Kankar; and an early opportunity will be taken (with his consent) of studying his methods.

9. The general management of the Farm during the year has, I consider, been very creditable to Mr. Subbiah, who has his heart in the work.

I have the honour to be,

Sir,

Your most obedient servant,

J. S. MESTON,

Director.

The maize is sown three months after the removal of the wheat crop and harvested in September, and the land then kept fallow for nearly thirteen months until it can be sown again with wheat. This treatment goes on alternately in one of the two sets of plots in the "duplicate series." The manure applied to one plot of the "standard series" is also applied to the corresponding plot of the "duplicate series" in case of maize as well as wheat.

The kharif standard and duplicate series.

The cultivation of the ground consisted in ploughing the fields once with [illegible] plough, cultivating them twice with the Planet Jr. horse hoe, rolling the land with a small stone roller and levelling it three times with the *patela* (wooden flat beam). The fields were irrigated with canal water about a week before sowing and were sown with Jaunpur maize on the [illegible] of July at the rate of 30 lbs. of seed per acre. The weather being dry it was found necessary to artificially irrigate the fields which was done between the [illegible] and [illegible] July. The crop was weeded and earthed up about the 20th of July. The plants in some of the fields in high manurial condition, *e.g.*, the cowdung and sheep-dung plots, were knocked down in a more or less degree by the high westerly wind which prevailed in the middle of July, but the immediate earthing up enabled them to recover their vigour and to resist further damage from the wind. The crop was harvested towards the end of the first week of September. The following statements show the respective out turn of the two series:—

NO. I.

[illegible]—maize.

Plot number.	Plot area.	Treatment with manure per acre.		Outturn per acre in pounds. Average produce of four years, [illegible] to 1886-87.	Average for four years 1889-90 to [illegible]	[illegible]	[illegible]	1895-96.	1896-97.
K. 3	[illegible]	Cow-dung, 150 maunds	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
K. 1		Cow-dung, 150 maunds + bone-dust, 4½ maunds.	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
K. 2		Cow-dung, 150 maunds + gypsum, 2 maunds.	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
K. 10		Sheep-dung, 150 maunds	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
K. 7		Sheep-dung, 150 maunds + bone dust, 4½ maunds.	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
K. 12		Sheep-dung, 150 maunds + gypsum, 2 maunds.	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
K. 9		Poudrette, 150 maunds	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
K. 5		Saltpetre, 2 maunds	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
K. 11		Saltpetre, 2 maunds + bone-dust, 4½ maunds.	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
K. 6		Saltpetre, 2 maunds + superphosphate, 2 maunds.	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
K. 4		Ashes of cowdung, 150 maunds.	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
K. 8		Ashes of cowdung, 150 maunds + saltpetre, 2 maunds.	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
K. [illegible]		No manure	Grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Straw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NOTE.—In 1887-88 and 1888-89 the crop of maize was destroyed by rain and no produce was obtained, hence no outturns for these years [illegible] in this statement. For individual outturns of the [illegible] for which averages [illegible]

REPORT

ON THE

CAWNPORE EXPERIMENTAL FARM

FOR THE

Kharif and Rabi Seasons, 1893-97.

I.-HISTORY OF THE FARM.

THE Government Farm, Cawnpore, is situated in the village of Gutaiya about three miles south-west of the Cawnpore city. It is near the Kalyanpur Station of the Cawnpore-Achnera Railway, and its distance from the Cawnpore East Indian Railway station is about four miles. The land occupied was originally rented from the zamindars of Gutaiya in May 1881, and in that year the important manurial experiments still carried on in the "standard" and "duplicate" series, which will be described presently, were started by Mr. J. B. Fuller. Within a short distance of the Farm premises a small workshop for making and repairing agricultural implements and a seed store were erected subsequently.

During the first years of management the area of the Farm underwent frequent changes, but of late it has not varied. The Farm proper, of which a map is attached, extends over 51·33 acres excluding the land covered by the canal distributary. It enjoys special facilities for irrigation, being traversed by a distributary from the Ganges Canal.

The soil of the Farm may be accepted as a fair sample of the light reddish loam which occurs over a large portion of the Ganges-Jumna Doab. It was chemically analysed some time before 1882 by Mr. S. A. Hill, B. Sc., Meteorological Reporter to the Government of the North-Western Provinces, and the analysis is given below:—

Constituents.	Composition per cent.
Combined water ...	2·04
Organic matter ...	0·16
Carbon dioxide ...	0·10
Ammonia ...	None.
Nitric pentoxide ...	0·11
Chlorine ...	Trace.
Sulphur trioxide ...	Do.
Phosphorus pentoxide ...	0·21
Silica and tungstic acids ...	0·13
Alumina ...	4·29
Oxides of iron and manganese ...	5·33
Lime ...	0·90
Magnesia ...	0·34
Potash ...	0·32
Soda ...	0·08
Clay decomposed by H_2SO_4 { Alumina and oxide of iron ...	2·34
Clay decomposed by H_2SO_4 { Silica ...	3·37
Insoluble sand, &c. ...	79·66

Dr. Voelcker in his report on the "Improvement of Indian Agriculture," records the following opinion regarding the Farm:—

"In fact, I was much pleased with the Cawnpore Farm, and I did not find in India any thing which so nearly came up to my idea of what an experimental station should be."

S«mlfltldi had ——, _, ——mmr^f __ much rain fell within a limited period. T!» Urd of «JiDetd«,*i^pJol< Noa. 4,5,9-10, uxl 11 of tht "kli»rtr **tj*rd *ri« " and ploto 1, 2 mwl 3, all of tht "Uupli«W • erioi" wai raJatd in 1894 by aaaas af tpnadiaf awth dag oat froat aocuitivmtod Uripa of land adjoining, in oritr to iaprova llit Ununag*. Lafgt no*ntitia» of i«'L Ukaa from Un canal dwtribatary warn •pratd for liaiUr porpoot on a plot (fit No, 9 on tba tn*p) which urnl to U «adtr water ia tho greater part of tba rainy

11-GEHEEAL CHARACTER 07 THE S1A80V.

TOE year under nport ww oat of neogalaad agrkaJtanl atareity. E*«1 in • law, of UM wtatrra diatri khutf crop f*U«l |*s«nUr. »n-l itw r»W ajNaM ia uairrtgalml tncU t» poor. Ia O»wapot« tbt toutniaf«tl dwinff tl,e yaar nodn rrp-.n atwmntrd to* I77/8 inehaa whieh «at ratuidtrbblr behVinar aonui, KJ., 31)3. Tb»»nina practkaUy caatad aboot tba atkUU of Aagaot, aad ytmtij Uw crops b UM Drighbovrhood of UM Faim, a«c«pt thaw whkn ooakl faaJly tmgated, wan itrioaaty daamgaj or aMirol, loaL Tbt winter rains prond, baavftaial to tht Maadiag crop bat «m taOTSctoat to m*i«___, benefit tht ttnirhgalnl ana*. OB irrtgatad LUKU tbt osttara of nbf waa aaoraally heavy but oa murrtgai«I lamia U ww ootiaidctabl; poor. Tba droofhl ww not, however, so keenly Ml at tba Pana bosom osna) waur ww araiUbk lor tmgalioo whan waat«); aod OB tbia MCMUI th« yield both of tbt kbafff aad tht i»bf crop* ww good to gtatraL Tbt followtsg «ut«otet aLov» tho aawaat of niafall during tht *jmr* «adcr report and Uw praeadiag y«ar :—

Month.	Actual. Rainfall. 1895-96.	1896-97.	Rainy days. 1896-96.	UM-tr.	Normal. lu.-.f*:	I-tTO^	Remarks.
Aftti itn -	aao	—	—	—	•11	1	
Hay	M		—	i	•a	1	
JMM a -	Ha	WO <	(	M	MI		
j-ir .	MI	t:.<	•»	n	J :	d	
an ,.		MI	11	IT	10,*		
r n i .	• «		»	1	*»		
OtMaw • —	MM	—	—	—	I'M		
M. ..li ,	—		—	1	m	-	
December		f»	1	t	•u	i	
Jtaawrtan	—	It*	m	t	...	i	
»*«I -	tm	—	-	-		t	
- • -	—	m	>•	MI	•m	i	
Total	MM				IIU	«	

III—TRIAL OP MAHURE8.

(a) Permanent manure experiments with

THESE are the oldest experiments xp u gotag aa at Uw farm, having bam it initiated by Mi. K«ll in 1881. Tb«y at* <*rrWd on la fouracrk* of ibirtwa plots each. In the K pi ,«,, aitarbMl), ralbeiivaly «aIUd tht « kharf f Mandaid series," maize is grown year after y Mr. HtmiWI.T tha It plots, called the "rabi standard series", are cropped I ntrjr T«lM with wheat. In tbt other two wav* *«» AJ • •** AH, whi-h at* «IU tht"<iapiia«*"(or-aJi«nartt-awia«taMia»itgwwo J*r-aateljr with w!u»i, iU *bjaal btiag patty to *wfy (ho ia*Ua oftho standard •crkwr aad partly to d< Wrtaioe tht atoaoaiy of growing DM!« is rotattaa *mill* wbaal›

Statement showing the outturn … alternate series—… ice.

Each plot = 400 square yards.

Plot number.	Plot area.	Treatment … manure		Average outturn for four years, 1883-84 to 1886-87.	Average outturn for four years, 1889-90 to 1892-93.	1893-94.	[illegible]	1895-96.	1896-97.
6		[illegible]	Grain / Straw	1,806 / 4,531	802 / 4,552	1,543 / 6,935	302 / 4,223	[illegible]	1,138 / 9,979
7		300 maunds … maunds.		1,000	1,096 / 6,204	877 / 4,546	[illegible]	[illegible]	1,205 / 9,733
8		180 maunds + … soda.			371 / 6,402			[illegible]	1,218 / 10,848
[illegible]		180 maunds			1,201 / 5,330			[illegible]	[illegible] / 10,759
[illegible]		[illegible]			1,115 / 8,400			[illegible]	[illegible]
[illegible]		[illegible]			1,142 / 6,424			[illegible]	[illegible]
2		… maunds			1,406 / 6,479	12,111 / 12,0[illegible]		[illegible]	[illegible]
4		maunds			634 / 4,374			[illegible]	[illegible]
5		maunds + b … soda.						[illegible]	[illegible]
11		maunds + b … 2 cwts.				3,323		[illegible]	[illegible]
9		… working.			893 / 8,270		833 / 4,757	[illegible]	[illegible]
3		[illegible]	Grain / Straw	1,042 / 5,224	1,673 / 10,021		626 / 7,109	[illegible]	[illegible]
12		[illegible]	Grain / Straw	317 / 8,020	780 / 6,003		226 / 8,409	[illegible]	[illegible]

N.B.—… preceding statement, … report … ith sheep-du… manured with … marked beneficial effect of … manures containing less quanti…

The rabi standard and duplicate series.

… tillage operations carried on in plots of the two series are described below:— … ploughings were done, one with the Howard's pony plough and three … tt's plough. The land was then cultivated with the Planet, J. R., horse-hoe … nd once stirred about seven inches deep by working two Watt's ploughs … the other in the same furrow, the mould boards having been previously … The dry grass was then picked out. The plots were levelled with the … ight times altogether and harrowed once. The several manures were applied … October and specially selected wheat seed, of the white Muzaffarnagar … the 15th Oc… the rate of 120 lbs. per acre, the soil having … sowing. About the end of November the … plants grew too close. Where the germina… … filled up by putting in the superfluous … Two waterings were given during the … nd the other on the 18th and 19th of … the end of March. The results of these … following statements:—

… nded and … m indiff… ved fro… owth, w… The c… are tab… so thickly …

No. III.

Stafnw** (tawing (Aa outturn o/ (A< ra&I #tana*<rrrf series—

Plot	Pin am	Treatment with reference to manure per atfa.	Outturn por tern in jiounJ					
			Arcmt' out' flre Jf«t»,]S*3-*4 to 18.17-68.	Afar>«* outttim tor firel WI, 1WWV.UO 1801.39.	IS93-L'*		tM»M	168COT
H. s			1,(74	1,591	i,«n	IJDM	t7M	MM
to i		Co* OBnff, iw maminit fftw ^	L477		»,W3	Lilt	UM	
ft. 4		t'uw duns, I*" nt*in.|i 4- . tjnun ...			1,700	1.113	1910	M;I
ft m		!»w dart, 4t ma 1 ftra* ...		3.t4S	Moa			i M
		Cfl"-J«ti«, I*1 »aiiH>« + 1 O«lI« ...			1439		1,904	1.U8
a •		rrpMK littul> «• .»	t.U'i		3.133	1.440	G.7S4	4,974
	t	1 fin a .			3.01B	I-J-'S	3.001	S.U7S
ti *		SWj> dan», I«I -»a»M "*t»iw- ...		3.431	S.7T9	1.S3S	tt.003	6,131
•- A		S»Mp a,ne. 1H0 *M»U + t 0r^« ...			1M>		.!.;• N	3.10T
D a JiL		Uv«...la^.4| *•»•••• ' -		-	1.M0		i.i- >•;	1,111
		n.iwli + f Oraia ..				. 1.W.I	3.1 Ifi	•j IM
		;«,ai. I W K I I r»» ..	3.171		*.;«»	IJHI	4one	4.B74
	|		UH		1,KS		t,Blil	(JW1»
M. -		, rTM '«TMUB»I «*"»........a. •« ^f"'*1*Sirm* «.	HIM		4,704	;.•!•:»	G.97S	4,4(iT
«• 1			1.TS7	1.41?	LJM	1411	I.«H	1.H&1
fa	^r		OS]	1770	I.MI	1.130	: in	•MM
It |		S»:n»trr, 1 aiK«4t 4- baa*-1 Ormln _	1JBOO			1.004	1,003	I.-'W
fm		.1 „•, •(M k • 8tf»w „	1.U1	M '-	rvsc	I.Vil	4,MI	
* 9	1	-<». 1 »a«<I» • U«-(<I«i« ...	1.3S0				s,4sa	L'.'.'.i-l
tf K		«V^.«pbai-.I—•* t*I«- _	M 1	SAM	i.tu	Mi*	•.340	
		AatJT %r «w^«f ISOjOn»i» ...	Mt		1.411	730	J.S01	
taf.		•tihdi ...			S.004	1.3.-J	1.M1	
». 11		. ,tt I*o naawla of mm- < Dnia	IJWt	1 441	t.O44	MI	1J1M	ii«
		danf-f Bkltu>ln,3 naauii I Sin>« »	MM	!,<a*	S.7C3	1.741	a,i>>-i	MM
MI			nt		1.14S	4M	1V.-T	LJM
		DnmMand „ ™ IBua-		3.W7	1,181	UM	4.J71	MM

«Jb4r—drt wiU lad la la* >»••** •* (b» Fant far ittUl-Mtha ioJinJu.1 aaltmra* tat tt« y«i»o(»bitb Ita mranfaa hai* haw |.»•n In ruluan* i .-,•: • ttoH

No. IV.

WkJ fA« <m/(um o/ (Ae rail altermtt mnw—wktat

J	Plot area.	fjMJ|	Oattnn J«T «n in pwnda.					
			ATCTHC* "f-lum 1ST tw M 1) IUtT-	An*ay*nat-larn tor IIn man, I*o*. M» ML	IMM<	!	HM>M	1WG.97.
		, „ . Grao ...			MM			
4		CW*«M."»°»«»d« ~tIna> ...		s.ut				
		1^-j.a. IM BBtaa4< »		T.IM				
		1 i I«il II ••>•« —1 HIM* _		t,in			MM	
t		r—TJ.M IBO aM«b + j*a*					till 1111	xn*
«						IJM		
		M«a>4«*(.I»a •>*«•<!.						
.		AM*4IK,1WMMN1I4 . >> an ...			MM			
		V.— 4«*t. 4) t».*!••!•						urn
		*i • • J.—• Iftai ^•fcja 4. i •'•						
		IvflBaVJ|* \^ «n^ , a>- iv^* T						
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		a W ^» * * m mm. ^|. *,•						
u		J——. aUifeatM 4 aHMii.Ir t Mr%m M*		UM				
ii a§								

Here again, as in the case of the kharif standard and duplicate series, the effect of highly nitrogenous manures, especially saltpetre, sheep-dung and poudrette bears out the best results in the two sets of plots; cow-dung and [illegible] with other manures also produced (and outturns as in former years), [illegible] the conditions that nitrogen is the most valuable ingredient in manures needed for wheat.

(b) Manurial experiment with potatoes.

This was started in 1893, but under the directions of Dr. Leather it has been during the year under report, so materially modified [illegible] of manures that the experiment in its present form [illegible] is practically new. The experiment was tried, as in the previous year, on two sets of plots, one grown with the white variety known as [illegible] or the Madrasi and the other with the hill variety (or Naini Tal).

Details of cultivation of country potatoes.

Tillage.—Ploughed twice, [illegible] with the [illegible], borat-hoe four times and levelling [illegible].

Sowing.—Applying the manures, when tubers were planted from the 25th to 27th of October at the rate of [illegible] per acre.

Weeding.—Twice, and earthing up [illegible] times.

Irrigation.—Four times.

Harvesting.—12th to 14th February.

The following statement gives the results of the country variety for the year under report:—

Statement showing the effects of different manures on country potatoes.

Plot number.	Plot area.	Manure applied per acre.	Actual quantity of manure applied per acre.	Outturn per acre in lbs. for 1896-97.	Remarks.
			In lbs.	lbs.	
[illegible]	Each plot—484 square yards.	Unmanured	—	9,630	
[illegible]		Poudrette at 200 lbs. nitrogen per acre	62,500	7,720	
[illegible]		Do. at 100 lbs. ditto	31,250	3,700	
[illegible]		Cow-dung at 200 lbs. ditto	45,400	3,730	
[illegible]		Do. at 100 lbs. ditto	22,730	3,200	
[illegible]		Castor cake at 200 lbs. nitrogen per acre	2,824	4,740	
[illegible]		Ditto at 100 lbs. ditto	1,412	6,430	
[illegible]		Saltpetre at 50 lbs. nitrogen per acre *plus* bone-meal at 50 lbs. nitrogen per acre	631 2,001	7,360	
[illegible]		Saltpetre at 50 lbs. nitrogen per acre and bone superphosphate at 50 lbs. nitrogen per acre	631 8,103	4,780	
[illegible]		Unmanured	—	4,060	

It is too early to attempt at drawing any conclusion just now, this being the [illegible] of the experiment; and apparently the plots though adjacent to each other differ in point of natural fertility as is evident from the fact that one unmanured plot gave a very much higher outturn than the other. It is, however, clear that where greater quantities of nitrogen had been used in the shape of cow-dung or poudrette the yield has been comparatively high. In the case of castor cake, the manure was put in the lines in which the tubers were planted, and it appeared subsequently on the 200 lbs. nitrogen plot, viz. $\frac{24}{6}$, that the germination was very uneven. When dug out and examined the seed tubers were found to have rotted probably owing to the "over-heating" nature of the highly nitrogenous castor cake. Possibly with reference to the quantities that have been prescribed, spreading the cake on the whole surface, instead of using it only in the seed furrows, may prevent such an action on the seed.

Details of cultivation for the Naini Tal potatoes.

The plots were ploughed twice, cultivated four times with the Planet, J. R., horse-hoe, twb>ailrd three times and levelled with the ptlela fiv ttniM. The manures were applied and "cut tubers" or "sets" planted between the 15th and 16th of November, the weight of tubers used for seed being 1,19[illegible]. Weeding was done twice and the plants were earthed up also twice. Six waterings were given in all.

The outturn of the plots under experiment are tabulated in the statement given below.

Statement showing the effect of certain manures on the Hill potato.

Plot number.	Plot area.	Treatment.		Actual quantity of manure applied per acre in lbs.	Outturn per acre in lbs. (1896-97).	Remarks.
[illegible]	Each plot—[illegible] square yards.	Unmanured	...	—	13,550	
		Poudrette [illegible] per acre	...	67,500	15,000	
		[illegible]	ditto	31,250	13,250	
		[illegible]	ditto	45,450	15,410	
		[illegible] @ 100 [illegible]	ditto	22,730	13,540	
		[illegible]	ditto	2,824	6,100	
		Ditto @ 10 [illegible]	ditto	1,412	9,070	
		[illegible] } Bone meal @ 30[illegible] }	ditto	631 / 2,601	[illegible]	
		[illegible]	...	631 / 3,165	9,850	
		Unmanured	...	—	9,000	

The results are not according to expectation, and the differences in the outturn of the plots treated with the same manure but in different quantities are obviously due not to the [illegible] of the manure, but apparently to want of uniformity in the quality of the soil, as is indicated by the fact that one unmanured plot gave very much higher outturn than the other. Next year will, it is hoped, give better results.

(r) Manured experiment for indigo.

This was started in 18[illegible], having for its object the determination of the effects of [illegible] compared with cow-dung on the yield of indigo. An unmanured plot was included in the experiment.

The following statement gives the outturn, &c., of each plot:—

Statement showing comparative effect of gypsum and other manures on indigo.

Plot number.	Plot area.	Manure applied per acre.		Outturn of [illegible] per acre.				
				[illegible]	1894.	1895.	1896.	1897.
				lb.	lb.	lb.	lb.	lb.
[illegible]	Each plot—1,210 square yards.	Cow-dung, 180 maunds	...	[illegible]	[illegible]	[illegible]	11,250	9,242
[illegible]		Gypsum, 3 maunds	...	[illegible]	3,604	9,400	13,516	8,764
[illegible]		Bone dust, 5 maunds	...	10,020	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		Unmanured	...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

It will be observed that the results for the four years been so varying that no definite conclusions can be drawn with regard to the comparative effects of cow-dung, gypsum and bone-dust in the quantities in which they are prescribed. Taking into consideration, however, the average outturn of the last four years, it appears that bone-dim *hu* given •lightly hethr reault than <•<>w-Jimp and that gTpasm bu INCH interior to both in effect.

TIH diflttftooca are, however, nut eo aulfrul u to warrant sity practi-al iufatwwe.

(d) £xj#r\vmt cm immuring jpram a*<* *yea*.*

Tbe object of tbaa» MperitDMU u to deirrauiw tbe relative manorial nine of (a) gypuwi (&) ground JUiniar (and* carbonx e of lime), (c farm-van! manure, and (4 bosc *op«i»liu»|dwte on tbe jkld ortbe two Irpunjinou* i-rtiju. Thrtv i» aJ«o ao unmanured plot in • •%» h experime til to oompar* tbe mwlt* with.

TV outturn of tU diSenat |>lou osder tltit cxptriiueut u «l»o*n in lite following staMMBlx-

StaUmeiU akovint tht e&mparatir *jfect of certain manures on gram and peas.*

Plot number: Gram	Plot number: Peas	Plot area	Manure applied per acre		Outturn per acre of gram in lbs.: 1893-94	1894-95	1895-96	1896-97	Outturn per acre of peas in lbs.: 1894-95	1895-96	1896-97	Average outturn of gram for four years	Average outturn of peas for three years
[illegible]	[illegible]	Each plot = [illegible] square yards	Farm-yard manure, 200 maunds	Grain	1,543	334	1,119	390	580	273	454	917	473
				Straw	1,090	445	678	390	1,762	810	1,012	633	1,533
[illegible]	[illegible]		Gypsum, 3 maunds	Grain	1,730	324	1,313	620	260	303	347	1,048	276
				Straw	1,470	309	387	509	411	212	262	627	318
[illegible]	[illegible]		Ground kankar, 2½ maunds	Grain	1,183	39	1,160	314	337	261	300	710	303
				Straw	1,031	137	1,204	658	623	560	944	740	953
[illegible]	[illegible]		Bone superphosphate, 3 maunds	Grain	1,128	61	780	431	215	430	674	535	476
				Straw	329	183	320	494	430	805	1,816	629	148
[illegible]	[illegible]		Unmanured	Grain	835	21	726	408	184	315	351	502	330
				Straw	595	65	641	644	324	641	556	[illegible]	617

Cosaidrring ike anragt outturn of aaon plot in tbe !«•> c ij. rim.-uU no definite cqartnaioaa *tan,* ao far, bt draws. The effect of grp*ui&. tbovfb wry marked oo the yield *(gnat,* baa proved anything bol aMtafantofy is lite ca«t of poa«. Farm-yard manure baa doae fairly well in both ojaaa. Tbe experimeata moat ba aooUotwd •till further in ordn 10 obtain definite nanltt.

(e) Mmurial expirimntrU wiUk ntggrmmt,

TUe WM atartad in IWI-W, bt>t the askant of tbt oxptriamt bat ban fr**lr alreml ditriaf. tbe *ytr* under report, udaT laatraotbaa from tbe A(rWntt«r»l Cbnniat to tbr Qomntwni »f Ibdia. Tba rarietj npvrimealad *iih i< now tb» pounds eao« known a* • Uattran " taetaad of Ike « U / M triad in the pre> >w rear*- The quantities of *mumrm* hatre bceo much intnaaed ao aa to bring tbem up to lW atandard in aae a toon* the ealtivator* laat gtvw tbe M*lrval variety nmr larger town*, HKb a Cawnpore and Lucknow, a&d to eoppiy tbr fWater deawad ftf this variety Tor plant *f* «J ia th* tail. Taa utaaiai aobaajm *of* manuri; ng is similar to >** one following i«ti at the rooaa Kiparunaatal Kara, ami will tliua admit uf tbc M«ll« obtaining i<at)attbea» I ew farms baiag Mmpand wita «aah oiaar- As explained uord <> Mr. LaMbar[1]* note pabtiahed M aa appaodix to law Uat raar*a rvpon, tb» aufaniav* will be followed by a «rop of foaniry potatoee and rbat lit* auuiataa appjtnl an[1] J»t»dad la t«nt-Ct l»o cropi». *., i«gar>-sae and paiatuea.

Two Mtpanu «H* of I'ni<Ja ban baaa ptvrtded for tbia eiprriaeat *U>* bear aoftfvaaa la alta*»te *jmr*. one afi*r aaoli other.

Dat<aUe <>/ rw • I cultivation.

" P"[1]** **** ptovK^Jn I have tlai w, wbcoibd Iwwr, u»aeb«plauga>d oo<» and culti- e with c . R., bor. manures the cuttings were planted on the 24th and 25th February 1896, in the o centre. 14 waterings

•»*«d tataj iba* witk lae Iiaaat, J .-Uo,. A(Vr apraadit«t^ na> «ad furrow erajaai, tba rldpa bttaf tbrat faai apart fro* «a»tre i l**»iiM*li ,fi*t pi***! tbe |4«u wm wrf.r»d » waaJ. la all.

•were given during the ierjon. The crop wu *mxicd* and howl five tuna and earth d ip me* Tbe Mitlo dang and poodretta in pfcrta 2, 3, 4, and 5, the m l, tIV and the castor cake were applied to UM |>lutn in two iosUlmntt, onoe before plwiting ami *tb» m* cond time "' .lt"''' The plunfi wen; InwliwI ami lied Ulg|• tl , once from 8th to 10t I) August *mi* •boot tin- Inclining of St'pi*ml»r, tl|(! superfluous Kbuoti wort cttt off and removed. The catling and crushing of cwnw from fli*''1 p'0'* I**1''1 un t'' 29th June laT> B^nt two o* tlirw wc*'ffl e^l^r tl than usual on account of the clear a ,<I dry wi-itli.T tluU genanllj pmvftOad io the yea,. [| wan foil ml that the plants on t)u> poorer plo(» *vrvn>* fit for ratting and woul ,1 hiivc Uvci injuml bj <Ulav, l»m th.m- on I he botr«r ploiK, c.;;., niini?H'M 1, 8 and 9 would i have given digbtf; r better p-erccntage ofjur if tmrvwted about a fort-liitllit later.

Tb« following slaleroent »howi tbo rwnlu ttf HM experiments tit lor 1S06-97:-

Statement Mwinir *the* etwnjionrttw «/«rf o/ wr-fc«n *manuru on Madraai paunda.*

Plot number.	Plot area.	Manure applied per acre.	JU1U.I IMMitgraf »«w« •pptodp»r	Outturn per acre in lbs. WrifMuf MB*.	WrlrbLt 1*.	ITaltM	IV mataicof— Jotwto MM	Our to	Oar to	Weight Of | M top*.	Wrtrtt of dry Uana,
[illegible]	[illegible]	Cow-dung 125lb nitrogen per acre.	* U »	4MK>	»M»n	4,830	f M	Ifrl	11 4	lo.iw	G,7S0
[illegible]		Cow-dung 250lb nitrogen per acre.	« M	MJK	[illegible]	4:117 1	» /	ItT	l i t	&0M	a,i<a
[illegible]		Cow-dung 500lb nitrogen per acre.	r-..(•-..	i7.nw»	11.740	LMM	•01	17·01	114	SMI	,-, 1 - •
[illegible]		Poudrette 250lb nitrogen per acre.	47, I »	22,2[illegible]	H.:–.J	IJSO	04fl	lt-7	104	0J>W	e,0*s
[illegible]		Poudrette 500lb nitrogen per acre.	HMO	HUM	13.1H71	2,230	M I	10·9	10·6	WHM	0.1 *J
[illegible]		Unmanured ...	...	4,845	how	H i -'->	62·5	U 4	r«	*7W	MH
[illegible]		Bone-dust and saltpetre 125lb nitrogen each per acre.	/ 1.TIH	M M	U.r.'S-	i.»7a-6	«*•?	ITfl	118	tfiK	*7M
[illegible]		Castor cake 250lb nitrogen per acre.	MTO	MtUM	)o,loTi	I.4M-J&	62·5	17-OS	i t	11,873·5	MM
[illegible]		Castor cake 500lb nitrogen per acre.	7,140	•MM	• M »	UUfl	70·9	U*	i n	mm	7,000
[illegible]		Unmanured...	...	:'':.;.<'	IM»MI	MM 71	« g	10·9	H I	MM	•J85

The differences in the outturns between the manures are not entirely due to Ifa. diffe«a« in the nmariait, b«t .1 so to the several pi I s being of varying manurial condition originally. iullT. Tl.. pr- sent experi •«> l'« I— Mar.«I on tho« field-only during the year under report t, ^ . few jr-r. Of VOppbC .....T h.« Jo iUp before the several plots get into even tiwlu)ri.l condition aU.l J.ow fkithfully HK> nliliv, values of the manures. The high value of castor ,k« an a uwnure for n^U cane was, however, r untui«ukably »lia«-n bj U>« W^wtoi Bt, *mt*<\ AtlMMll i« EaaooMrdMM with that obtained at the Poona i Aperiowi.ul Karm, In ttic oeighlwurh.. d of Poona castor cake is esteemed highly by the cultivato n for cane ••• d potatoes, and in these provinces the cultivators of Farukhabad ihad UK cwUor rake lar gely for potatoes. Near Cawnpore and pe rbapl mar otln-r lnnff Wwtw *liw tawtor caLe U Iwgitming to i t a 14M* H a r*i[ular manuro Tor augawwe a nd potatoes. During the b«H »ud drr owtrtl^u- April, l»v, a.Kl .1.......*• u>m»»«r«l plut (num^r B) and lit* Nitjv ^tw l^^J^, plot (number 7) and to a s'"»»« ««n(plot* nun bers 3, 4 |>d 5 «(? red from the effects i hc*t .ml tool ed poor. But soon after the monwoi, «i in, i. e., •liwtl tlic Lncinnfnf of Juir, the condition of the crop in all the plots improved (•r»«tl v aa twwl aod tit* poudrrttr plots were found to make up their deficient growth very fast, while the unma ll)l,,f,l p| ot No. 6 contin<»d »U>w and poor in it* progress.

A »ot* oa lh» r««po«i ion of sugars "* *nd TMw »u lf»" f from the Agricultural < V i mist to the Government o. I«li. «ho Maywl at ti.r Farm dorm* part of the ... yse the juice t r:-: an appendix to this report.

(f) Permanent experiment with green manuring.

Series A.

This experiment was started in 1883-84 [illegible] manurial effect on wheat of—

(a) the ploughing in [illegible] the cultivati[illegible];

(b) the [illegible] residue of a leguminous crop taken immediately before wheat;

(c) [illegible] manure.

The present treatment of plots Nos. [illegible] 11 was adopted [illegible] accordance with the instructions received [illegible] Dr. Leather, Agricultural [illegible] to Government of India. All the plots were [illegible] ploughed four times, cultivat[illegible] with the [illegible] twice and levelled with *patela* six times. The seed of Muzaffarnagar wheat was selected carefully and sown on the 19th October at the rate of 1½ maunds per acre. The crop w[illegible] weeded, thinned out, and blank places filled in with seedlings raised [illegible] of November. Three waterings were given during the seas[illegible] of March.

As in the previous year the weights of the green plants that were ploughed in or removed from the different plots were taken down and are noted below:—

Plot No. 6	Hemp removed	...	...	... 15,270 lb per acre.
Do. No. 7	Do. ploughed in	...	...	... 15,879 lb ditto.
Do. No. 8	Indigo ditto	...	...	... 13,180 lb ditto.
Do. No. 9	Do. removed	...	...	... 14,396 lb ditto.
Do. No. 10	Urd ploughed in	...	...	... 11,331 lb ditto.
Do. No. 3	Rape ditto ...	...	...	... 248 lb ditto.

Series B.

Temporary green manuring experiment on wheat.

Another experiment underlying the same principle as the one just mentioned was started in 1893 in a separate field, viz., 27a, in order to test the effect on wheat of ploughing in certain leguminous crops, viz., hemp (*crotalaria juncea*), khurti (*Dolichos biflorus*), and urd (*Phaseolus radiatus*). The three leguminous crops were sown in June 1896, and the following quantities of green plants were ploughed in on the 10th and 11th of August 1896:—

Plot No. $\frac{27a}{1}$	Hemp ploughed in	...	...	... 15,106 lb per acre.
Do. No. $\frac{27a}{2}$	Khurti ditto	...	...	... 13,000 lb ditto.
Do. No. $\frac{27a}{3}$	[illegible]	...	...	... 11,400 lb ditto.

The wheat was sown on the 20th October 1896, and the plots received only one watering during the growth of the crop. This experiment has been denominated as "temporary," in order to distinguish it from the "permanent" experiment tried on plots of series A.

The outturns of the plots of Series A and B under the 'permanent' and the 'temporary' experiments with green manuring [illegible] in [illegible] statement (Table A) and the yield of the plots (of Series A) in which wheat is grown in alternation with leguminous crops is shown in Table B below. The outturns have been so arranged this year, in order to show separately in [illegible] produce from (a) all plots treated with green manures and (b) all plots in which wheat is grown in rotation with leguminous crops.

1888

TABLE A.

Showing the results of experiments to determine the effect of green manures on wheat.

Plot number.	Plot area.	Manure applied per acre.		Average outturn for five years 1883-84 to 1887-88.	Average outturn for five years 1888-89 to 1892-93.	1893-94.	1894-95.	1895-96.	1896-97.
		Permanent experiment.							
01		[illegible]	Grain...	1,477	[illegible]	1,548	117	[illegible]	[illegible]
			Straw...	[illegible]	[illegible]	4,187	[illegible]	[illegible]	[illegible]
01		[illegible] mixed, ploughed in.	Grain...	1,042	1,044	[illegible]	[illegible]	[illegible]	[illegible]
			Straw...	3,058	[illegible]	[illegible]	[illegible]	4,438	4,041
01		Green indigo ploughed in	Grain...	[illegible]	1,441	[illegible]	181	[illegible]	[illegible]
			Straw...	[illegible]	[illegible]	1,357		[illegible]	[illegible]
07		[illegible]	Grain...	1,079	[illegible]	[illegible]	[illegible]	1,401	1,407
			Straw...	[illegible]	[illegible]	1,794	[illegible]	[illegible]	
[illegible]		[illegible]	Grain...	1,417	[illegible]	[illegible]	[illegible]	419	
			Straw...	—	—	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			Grain...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,101
			Straw...	[illegible]	[illegible]	1,730	787		1,924
		Temporary experiment.							
[illegible]	[illegible]		Grain...	—	—	[illegible]	[illegible]	[illegible]	909
			Straw...	—	—	[illegible]	[illegible]	1,704	2,355
[illegible]	[illegible]	[illegible]	Grain...	—	—	[illegible]		[illegible]	
			Straw...	—	—	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	Grain...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
			Straw...	[illegible]	—	[illegible]	1,124	[illegible]	
[illegible]	[illegible]	[illegible]	Grain...	[illegible]	—	[illegible]	414	[illegible]	
			Straw...		[illegible]	[illegible]	[illegible]	1,141	[illegible]

TABLE B.

Showing the effect of growing leguminous crops in alternation with wheat (permanent experiment started in Series A).

Plot number.	Plot area.	Manure applied per acre.		Average outturn for 1885-86 to 1887-88.	Average outturn for 1888-89 to 1892-93.	1893-94.	1894-95.	1895-96.	1896-97.
						[illegible]	Wheat.	Gram.	Wheat.
G. 4		[illegible] Until 1893 this plot was treated with hemp water.	Grain...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Straw...	—	—	[illegible]	[illegible]	[illegible]	3,705
G. 6		Sun hemp and wheat alternately.	Grain...	993	1,004	[illegible]	408	[illegible]	1,718
			Straw...	1,879	1,949		1,041	2,241	3,194
G. 9		Indigo and wheat alternately	Grain...	1400	[illegible]	[illegible]	287	1,125	1,041
			Straw...	2,027	2,360	1,576	774	2,347	1,069
G. 10		Urd and wheat alternately. Until 1893 this plot was manured with green indigo and gypsum.	Grain...	[illegible]	1,212	[illegible]	[illegible]	[illegible]	1,422
			Straw...	—	—	[illegible]	[illegible]	2,739	[illegible]
G. 11		Arhar and wheat alternately. Until 1893 this plot was manured with green hemp and gypsum.	Grain...	1,001	1,107	[illegible]	[illegible]	[illegible]	[illegible]
			Straw...	—	—	[illegible]	[illegible]	[illegible]	[illegible]
G. 13		Lucerne and wheat alternately.	Grain...	—	—	1,405	—	1,165	—
			Straw...	—	—	[illegible]			—
G. 12		Lucerne and wheat alternately.	Grain...	—	—	—	—	—	[illegible]
			Straw...	—	—	—	702	—	[illegible]
G. 5		Unmanured	Grain...	1,027	1,064	877	287	1,743	1,101
			Straw...	2,004	2,026	1,240	787	2,403	[illegible]

Remarks on plots of

SERIES A.

It will be seen that the [illegible] with [illegible] am. Green [illegible] up [illegible] in [illegible] the next [illegible] results, and fresh indigo [illegible] next in respect of yield. The outturn from the rape plot [illegible] of the two [illegible] plots.

This [illegible] the fact, [illegible] out in the [illegible] report, that the rape being a rabi crop could not be [illegible] in the [illegible], [illegible] only a small number of imperfectly developed [illegible] in; the quantity of organic matter they were capable of supplying [illegible] insignificant, and therefore the [illegible] of wheat was low. The attempt to grow rape as a [illegible] crop so that it [illegible] utilised [illegible] for wheat [illegible] a total failure.

Among leguminous crops grown alternately with wheat, gram did better than other crops, the reason for which [illegible] sown and wheat alternately gets a longer period of rest (6 months) than those sown with wheat and other crops in alternation (*i.e.* 1½ month). The outturns of the rotation plots also [illegible] advantage in growing wheat alternately with leguminous crops as compared with growing it without manure.

SERIES B.

In this series the plot [illegible] under [illegible], which [illegible] not of four years [illegible] given smaller outturn of wheat [illegible] unmanured plot, [illegible] inferior [illegible] to as regards natural fertility. The experiment shows [illegible] of the crops for the purposes of green manuring.

IV.—METHODS OF CULTIVATION.

(*a*) [illegible]

The experiment [illegible] in 1887 with a [illegible] more profitable [illegible] The "early sown" [illegible] on the 20th June, and harvested on the [illegible] August. The [illegible] plot [illegible] on the [illegible] July, and harvested on the [illegible] September.

The [illegible] in 1896-97 [illegible] given in the [illegible] statement.

During the year under report the [illegible] the early [illegible] contrary to the experience of the previous years. The outturn of the early [illegible] account of particularly poor and uneven germination.

Early [illegible] *maize.*

Plot number.	Plot area.	Quantity of manure applied.	Description of sowing.		Outturn [illegible]									
					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Field No. [illegible]	[illegible]	[illegible]	Early sown	grain	734	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	213	[illegible]	[illegible]
				stalk	[illegible]	2,457	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			Late sown	grain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
				stalk	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

(*b*) *Experiment in early and late sowing of cotton.*

This was started in 1891.

The "early sown" plots were sown on [illegible] May and [illegible] sown" on [illegible] June. The results of the experiment in 1896-97 and in the previous [illegible] are given in the following statement, and it will be seen [illegible] [illegible] only did [illegible] plots. [illegible]

Statement showing the result of experiment with mixed crops.

Plot number.	Plot area.	Crop.	Quantity of seed sown in pounds.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Cost of cultivation including manure.	Value of outturn.	Net profit or loss.	Remarks.
M.C.1	Each plot—1,200 square [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
		Cotton	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
		Til	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
M.C.2		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
M.C.3		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
		Jute	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
M.C.4		Castor	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
		Cotton	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
		Urd	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				

(ii) Experiment with Lucerne.

This was started in 1893-94 with the object of determining the relative merits of sowing lucerne broadcast, in furrows, on the flat, and on ridges. As stated in last year's report no fresh sowings were made in 1896-97, but the crops of the previous year were kept on and cuttings taken from them. It will be seen from the following statement that the total quantities obtained from the several cuttings during the year fell off considerably as compared with the preceding year's yields. During the rains a number of plants sicken and die. The rainy weather appears to be the chief difficulty at the farm in keeping lucerne on the land for more than a year. The plot in which the lucerne was sown on ridges again yielded the largest amount of green fodder.

Statement showing the results of the experiment with Lucerne.

STATEMENT

Plot number.	Area.	Manure applied.	Treatment.	Outturn per acre in lb.				Remarks.
				1893-94.	1894-95.	1895-96.	1896-97.	
A.	Each plot=200 square yards.	[illegible]	Sown on ridges ...	1,709	[illegible]	[illegible]	13,041	
B.			Sown in furrows ...	1,771	[illegible]	10,870	11,186	
C.			Sown broadcast	[illegible]	6,008	[illegible]	11,677	

(c) Transplanting wheat.—As noted in last year's report a systematic trial was given, during the year under report, to transplanting wheat with the results detailed in the following statement. Acting on last year's experience the blank spaces in the crop of wheat at the farm and on the experimental plots were filled in by transplanting and [illegible]. The experiment has so far shown that transplanting wheat is [illegible] and that very good outturns may be obtained under favorable circumstances with this method of cultivation, but our data for forming an opinion as to whether this method will, after paying the cost, leave a margin of profit in its favour over the ordinary method of sowing, and how far it can be adopted where labour is available, are at present insufficient. This may be expected to be decided in one or two years. It may be noted here that barley and oats have also been found in this [illegible].

Statement showing the results of transplanted and broadcast wheat.

Plot number.	Plot area in square yards.	Treatment.		Outturn per acre.		Remarks.
		Manure.	Distance.	Grain.	Straw.	
				lb.	lb.	
A.B./1	200	Castor cake containing 25 lb nitrogen or 4.5 mds. cake *plus* nitre containing 25 lb nitrogen or 171 lb per acre.	Sown in the ordinary way, *i.e.*, dropped behind the plough.	2,552	3,058	
A.B./2	200	Castor cake containing 25 lb nitrogen or 4.5 mds. cake *plus* nitre containing 25 lb nitrogen or 171 lb per acre.	Transplanted at the distance of nine inches from row to row and six inches in the row.	2,752	3,629	
A.D./1	722	Castor cake containing 50 lb nitrogen or 9.6 mds. of cake per acre.	Fourteen inches from row to row and four inches in the row.	2,936	3,513	
A.D./2	780	Castor cake containing 50 lb nitrogen or 9.6 mds. of cake per acre.	Twenty inches and four inches from row to row alternately and six inches in the row in each case.	2,206	4,200	

V.—TRIAL OF IMPLEMENTS.

(a) *Permanent experiment with deep and shallow ploughing.*—This experiment [illegible] started in 1888, [illegible] for its object the [illegible] of the [illegible] of deep and sha[illegible] [illegible]ld of wheat. Of the three plots [illegible] to this experiment, No. 1 in the [illegible] given below is [illegible] nine inches deep, with an English plough (Howard's) No. [illegible] with the Watt's plough, while No. 3 is ploughed [illegible] deep with the country [illegible] being similar in all other respects. [illegible] in this experiment is to ascertai[n] [illegible] [illegible] the [illegible]

All the [illegible] plots w[illegible] night before sowing, which [illegible] on [illegible] ed on 1st April 1897. The subjoined [illegible] previous years:—

Statement showing the results of the experiment with deep and shallow ploughing.

Plot number.	Plot size.	Treatment.		Outturn per acre in lb.						Remarks.
				Average outturns for four years.			Individual outturns for—			
				1882-83 to 1885-86.	1885-87 [illegible]	[illegible]	[illegible]-94.	1895-96.	1896-97.	
P1	Each plot = [illegible] square yards.	Ploughed nine inches deep with improved plough.	Grain...	[illegible]	[illegible]	1,084·50	202	[illegible]	[illegible]	
			Straw...	[illegible]	[illegible]	[illegible]	808	2,000	2,148	
P2		Ploughed five inches deep with improved plough.	Grain...	[illegible]	[illegible]	990·25	238	1,250	1,230	
			Straw...	1,333·75	1,333·00	2,009·50	464	1,949	1,803	
P3		Ploughed three inches deep [illegible]	Grain...	481·00	679·00	849·25	193	1,434	1,104	
			Straw...	[illegible]	1,768·00	1,318·25	420	2,077	1,609	

The [illegible] the two plots ploughed with the improved ploughs has [illegible] greater than [illegible] with [illegible] plough as [illegible] the previous years, a fact sufficiently indicative of the advantage of deep ploughing in the particular [illegible] soil [illegible] The undoubted saving of time and labour [illegible] preparing the ground with the improved ploughs, especially the Watt's, is another [illegible] [illegible]proved plough. It is to be noted that the same kind [illegible] improved [illegible] plough.

(b) Testing of new or improved implements.

(1) *The wooden country seed drill.*—This implement has been referred to in the past year's report as having been received from the Central Provinces. The results of its trial side by side with the ordinary method of sowing, namely, dropping the seed behind the native plough, are given [illegible] the accompanying statement for the year under report and the previous year.

The only manure used was a top dressing of the saline earth known as *lona* which contains a certain percentage of crude [illegible] to in last year's report, namely, that the central tine [illegible] the lateral ones, was easily got over by substituting the central [illegible] meter. It was expected [illegible] one advantage of the drill would be in the capability of the drilled crop for being hoed with bullock power at a smaller cost than by manual labour, but the damage done to the crop by the feet of the cattle and to a certain extent by the unavoidable irregular course of the tines of the hoe, appears to more than counterbalance [illegible] saving that may be effected in the cost of hoeing by cattle power as compared with manual labour.

11 roar, however, be noted ben Hint the drill hu only been ttiwd tor wheat. If j wow wed for tall crops «^. cotton or arhar, tho rows would bf. mool further apart and «ont«Hwnl]y it would I* much easier to use a bullock hoe. At any rate in Central India the crops an hoed by bullocks.

StaUmnU tkowivo the rtmiti of the different mtthodt of awing wheat.

I	Plot area in square yards.	iMfcMat		Outturn p*T ten in ft. 1HM-1W.	1*1* -'7.	
V	1,210 / 906	S*WT> wlti U. drill	Grain / Straw	2,022 / 3,802	2,270 / 4,068	
V	1,210 / 906	Sown in the ordinary way.	Grain / Straw	t.104 / 3,328	1.607 Ma	

2. Tin- pbtK-t J. *IL* Jlonw hoe, the small lurrowand the Howard's Pony plough refern.fl to in hut year's report have continual lo give satisfaction and arc now more commonly naed at the farm and on the student*' plots. It has heen found that where tlit planet J. K. Hone hoe is in constant use, tho harrow ia lew needed and may even be dispensed with.

VI.—VARIETIES OF CHOPS.

(a) Experiment with vatiitiu of cotton.

Tbe experiment with tue foreign varieties of cotton was started in 1888; its object being to compare the yield of the different imported varieties mi-1 to lkttnrrflW which, if any, onbem went must mutable for cultivation in the toil ami . limate of the Doab.

Certain Indian vurwliw were al»added (o this experiment in 1894. In previous years the Itulmn and foreign varieties were grown in different fluid.* under somewhat different condition*, but during the year under report th* native and tho foreign varieties were all grown in the *ai>* fold and received a uniform nyslem of treatment with regard to cultivation and manuring. Some new Indian varitfie* won aJao introduced, and tbe outturn of tuoii of tbeap a» were sown in good time, and gave a produce, have been included fc the statement given below, while the ntadoM of those which were received and sown late or which failed to give a produoe owing to the I rhangr of climate have not bren shown in the statement and wilt, ff they do better, be reported on in the naxt year.

DttaiU of cuitivai'um.

Tillage.—Ploughed I OIK*, mbeoilsd once, tmwb-ploughed once and cultivated with P. J. B. horse boe once.

*Ma**ring.*—tittle dung applied at the f»t<- of 300 rnanndi per aore.

SwutQ.—Thi* was done on the 24th June with careful 7 elected aeed. The Mods were dibUed with hand, 3 feet by 2 feet >I>art in tho *emm* of *the* foreign varieties and 3 foci by 1 feel apart in the oast of the Indian \-mriuti0s.

Thinning.—Wht>n Ilic *imp* was about three wtflts old, tho •nperfluoni pUnte ««re uulW out, l-avingooe good plant in tho *ntm* of the foreign varieties and two good plant* in the *am* of the Indian varietisft. Thus *mnh* plant of the fotvign variely gw« •!« •I"" **»* lo Rf°w **& »P l<td OB. *wl that of Ibe Iodbn variety 1j *!«•« •* This difference ,,l llw *\ space for bdivklaal plant-w» allow"! in I view of the bail dQfcsnd liahiu of growth ivfernd to In last year'* rrpurt, naroclv, that lx< Indian varieties grow Uil and trot with comparatively few *ioVI i branches, where w tbe An»erinn and Ibe Kg> plian varictini p»l f'^0 " "umU r of rtde-liranchw aod are Men spreadiag to tbair nature. While thinning tbe pbaili, the Wank •pMM Wtre filled ia by fresh sowuig.

Wmting and *o«»ff.-Tbs crop w* bullock boed lwi« *uA* b«d weetW once.

Weeding.—Was done once before sowing to soften the soil and three times during the growth of the crop.

Diseases and injuries.—The insect curculionid beetle referred to in the last year's report attacked the crop again [illegible] any [illegible] frost in winter however affected [illegible] plants and [illegible] more injuriously this year than [illegible] years.

Picking.—Commenced at the beginning of October in the case of the local variety, [illegible] the rest of the varieties about the middle of that month, and came to a close practically with all the varieties about the middle of December.

The accompanying statement gives the results obtained in the year under report and in the previous years. It will be seen that no Indian or foreign variety came up to the local variety in point of yield both of fibre and seed.

Statement showing the outturn of different varieties of cotton (Foreign and Indian).

Field numbers in 1896-97.	Plot area, 1896-97.	Name of cotton.		1888-89.	1889-90.	1890-91.	[illegible]	[illegible]	1893-94.	1894-95.	1895-96.	[illegible]	[illegible]
No. 12 and 13.	[illegible] yards each.	[illegible]	Fibre / Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Louisiana	Fibre / Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible] Hill	Fibre / Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Fibre / Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Sea Island	Fibre / Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Fibre / Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Hinganghat	Fibre / Seed	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Nankin	Fibre / Seed	[illegible]	—	[illegible]	—	—	—	—	[illegible]	—	[illegible]
		[illegible]	Fibre / Seed	[illegible]	—	—	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Fibre / Seed	[illegible]	—	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Fibre / Seed	[illegible]	—	—	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Fibre / Seed	[illegible]	—	—	—	—	—	—	[illegible]	[illegible]	[illegible]
		[illegible]	Fibre / Seed	[illegible]	—	—	—	—	—	—	—	—	[illegible]
		[illegible]	Fibre / Seed	—	—	—	—	—	—	—	—	—	[illegible]
		Hyderabadi	Fibre / Seed	—	—	—	—	—	—	—	—	—	[illegible]

Experiment in allowing cotton to stand on the field a second year.

In this Department's letter No. 1793, dated 19th October 1893, forwarding the past year's report on the Farm to Government, it was pointed out that several varieties under trial at the Farm were capable of yielding successive outturns of fibre and seed, if the plants were, instead of being cut down at the end of the first picking, allowed to stand in the field. The experiment described in this connection in the past year was continued during the year under report, with a view to determining the economy of this method of cultivating cotton. Noticing briefly the plot under report is ... (shown in the following table of outturn) were sown on the 23rd of June 1895. The first picking was made from the middle of October 1895 to the middle of January 1896. The second crop was gathered in May and June 1896. The plants again bore a crop in the rains of 1896 and the third picking was made in October, November and December 1896. The outturn obtained in the three pickings is given in the accompanying statement.

Though the quantity of the produce gathered in the third picking was good, the quality of the staple was inferior in colour and in other respects to that produced by the same plants in the previous year, i. e., as an ordinary (first crop). This was apparently due to the fact that the plants grew too luxuriantly on the commencement of the monsoon rains and subsequently bore a considerable number of inferior bolls, unusually small in size, which again were injuriously affected by the rains, attacked by insects and otherwise damaged. The general aspect of the experiment does not therefore seem to be hopeful.

Statement showing the results obtained when plants of different varieties of cotton were allowed to stand a second year.

Field number.	Plot area.	Names of cotton.		Outturn per acre in lb. 1895-96 (first crop).	Second crop in 1896.	Third crop in 1896-97.	Remarks.
41	340 square yards	Tree cotton	Fibre	260	141	305	
			Seed	628	285	606	
		Louisiana	Fibre	310	223	427	
			Seed	718	403	806	
13	300 square yards.	Garo Hill	Fibre	220	108	128	
			Seed	415	197	249	
42	340 square yards each.	Hybrid	Fibre	283	105	334	
			Seed	773	209	800	
		Sea Island	Fibre	230	180	252	
			Seed	805	300	614	
		Egyptian	Fibre	214	154	228	
			Seed	869	222	821	
		Hinganghat	Fibre	237	118	250	
			Seed	640	232	618	
15	300 square yards	Jari (Khandesh)	Fibre	221	133	469	
			Seed	616	278	900	
		Bani Ditto	Fibre	118	97	147	
			Seed	294	298	378	
		Jaatiya	Fibre	230	207	282	
			Seed	433	344	633	

Experiment with Canadian oats.

This was started in 1890 and has been continued ever since. The seed this year was sown on the 16th October, earlier than usual, with a view to allow more time for the growth of the crop. The outturns of grain, probably on this account, were better than in the previous years generally.

Before sowing, the field was watered once in September, and the seed was sown at the rate of 120 lb. per acre. The harvesting was done on the 5th of April 1897. The high outturn of grain in the case of each variety again goes to establish the value of Canadian oats as a good crop for fodder purposes.

StaUmttU thawing tk outturn of Canadian oaU.*

Plot number.	Plot area.	Variety of oats.		Outturn per acre in lb. 1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	Average from 1890-91 to 1894-95.	1895-96.	1896-97.	Remarks.
	Each plot = 400 square yards.	Prize Cluster	Grain	520	240	344	178	140	290	217	575	
			Straw	2,142	1,128	10,280	5,456	3,000	4,400	8,307	7,280	
		Canadian triumph	Grain	757	240	316	100	71	316	135	580	
			Straw	2,227	1,050	9,070	5,230	2,317	4,320	6,730	6,474	
		Rennie's prize	Grain	472	158	300	544	184	330	167	387	
			Straw	1,390	242	8,712	13,080	3,300	5,720	8,727	4,645	
		Welcome	Grain	709	240	435	300	71	318	179	573	
			Straw	2,308	750	8,780	5,320	2,800	4,334	7,027	6,479	
		Bonanza	Grain	757	332	277	330	140	300	175	472	
			Straw	2,573	912	10,578	13,000	3,080	6,221	7,720	6,461	
		White Egyptian	Grain	947	300	254	120	64	281	133	545	
			Straw	2,049	390	7,110	5,300	2,308	3,701	6,061	5,728	

Experiment' v%tk American wktat.

Th» variety TO ir«iv*l from the Political Ageat, Bandelkhud, who aaw U growing U, the ganl« of . AUUrfj. fr» from mat, whlU iht neighbouring Mdt were attacked by the disease. He was told it was an A is hard, semi-transparent, nJdUfa wd bmgir tku that of tbeunlitwi?cwiqtry wheal.

3rd r r ^ ^ wu o n lh- Mrd Oelfflb* J «««J th««op hmw.lo.tbi

W. Th. whmt W AOWB ao .igo, o(nwl during tb* two rwn it bM b«en imd* trid t bat it .boold b, M(«1 ti^i i n t b ^ T ^ • n tinu 7 wbttf cnp. were "" with n« eiU«; Tb. K^p^yi,, •.to ent h * JE n obtained in tlw r«r under report and in tbo pftviwu y«r t—

Statement showing the results of the experiment with American wheat.

Plot number.	Plot area.	Name of variety.	Outturn per acre in lb. 1895-96. Grain.	1895-96. Straw.	1896-97. Grain.	1896-97. Straw.	Remarks.
V	605 sq. yards.	American wheat	2,256	[illegible]	—	—	
28(a)	1,210 sq. yards.	Ditto	—	—	2,450	4,450	

(c) Experiment with varieties

Tilt* WM oriciwllv atvtod in 1KM, »D<1 detaiU of the amner in whi'li it ni < carried on until Uw put r«r haw* *hem* fully dMeribod in pnrviow *ymi>» twfort* T\f* •obMM of manuring ha* bwa, (n Kwordwc* with tba anggirtliiiw from lite Agr> cultnnl Cbemiat to UM Oorvratn«ol of Indat, au *amtmiMf* sltenrf in Iba *ftmtmtdm* rfiwrtthatUi*- eipenawnt may l» if^irdwl a* a practUlly ww one. TV varieties —tiunt to *h** iba *mam-* a* wrr» tnajtwawl in Iba bat *jmkt't* npotto.

Details of cultivation.

Tillage.—Commenced oa the Id of January and consisted in ail of two ploughings with UK. improvwl plough, two aabtoil ploughings, one trench ploughing, one cultivating with tba J. K. hot and oot rolling, *Manuring.*—Manure* were applied as detailed in the two statements whi< fallow.

Planting.—Thi» waa done on the 22nd and 23rd February 1890, on the ridge and furrow ayrtcro. The Arrow* for *lh& pa*n409, i.t.,* the *Madrati, Suh&ranpw* ard *Poona* caaoa wen 2} feet apart from centre to centre and far the other variSiM 2 feet apart.

Irrigation—*Fifteen waterings W«M given in all from time of planting to that of cutting.

AJUr-evllivati'm.—Weeding mid hoeing five times for the plots in wlik-li tnan-tres eatitaining 5001b of nitrogen were applied nnd (lireo times for those in which manures equivalent to • SS09| of nitrogen were uwd. JvnriliiE g once, f>irig and trashing and cutting fthootfl once for eaeh plot. But the " «U, " [tbi A I M varieties shown last in the atatementa below) on all tl e six pl tta wanrtak in iln-ir growth and fe!! dnwii nwre I y their own weight than aa a result of winda and rwjuiml utmt-laat attention in tying and lifting up. Iu npito of all attention a large number ofcanwia (lie «M crops were "laid "or Calho at ttu time of oaUing and conw-quently yielded ;ur poorer in quality an<J quantity. This r.tnk grow*h of the " *ubh* * varktie* waa due to their receiving a quantity of manure much higher tban »- ordi-ii irilv civm to them by cultivator*.

Tii' two aeoo-ttiKitiyitig rtatcmcntg give the r*«iiilt* »f ilie •xparinoal in the year nader report. *A.** W.H anticipated the Madnui Paunda has yielded the 1ighest outturn "I *ijv-r* on both the series, but for deciding the relative merits of the other varieties the continnance of the experiment for a few yean w *Xkexmatry.*

Questions relating to i lie jiri-jKirtinii of juice to cane, making *gur* from tbtjnioe anl liming tin- juice prifling it <(own with a view to preventing tlw conveiraioo of canecugnr intogiuooao, have bnon entered into fully in tlw la*t year's report and do nut require any detailed notice here. It was tiotintl t>»t yMZ that excess of lime bad a bad effect on the colour of tlw *gur,* but during the year under rrnort, it ha* been fouud thai by liming two-third of the juice f« pin ao aa to make it somewhat alkalin to litinua and then adding one-third of the juice not treated with liiix- to the [w!) l«fon> boiling it, the nolotir of (be *gun-unU ho* maintuined. In the *m,* however, the inwenion is prev•. «d to » unaller degroe only, and th« question !•M boen dimuwed at length by I»i»Jor Leather in hi* note on the dhamical composition >>f Migaroan* and raw Migar [mb)b!ted a* a boUodfl in '\>- India Governraent ljedp* S•• ies. The fall jwingare the analywa and valuation by Mr. McGlashan, r, the chemist to theaugar work* at Cawnpore, of the *gur* prepared witli limed [and unliuxU juice and lotd to the factory :—

	Limed gur.	1'hiiBwdnrr.
Sucrose	n«o	[illegible]
Invert sugar	[illegible]	[illegible]
Organic MI matter	[illegible]	4 H
Ash { Soluble	i-w	1 M
{ Insoluble	•M	[illegible]
Water	[illegible]	• H
	100·00	100·00

Mr. McGluban nrmarka t—

"In fixing the value I took a fmir* •tamlanl, ai year J»r » much cleaner than the ordinary run of *gur,* and came to the conclusion that I the liiwd aamplc wae worth R „ *U:* 10 per maund of 40 wen ««I *!»' '1|0 '''I''*'' ''»n»H» *a» worth Ha.: -12-1 per maund of 40 seers. The limoil jwf h«# a lower analyfia than J expected it would have. The invert sugar is high.

"I see on looking b«di i» «»r l»«k tk»* l ^^ »»lf»• of two of your lait yfar'a «?w oue of wbkb bu—

Sucrose	80·60	fir cent.
sugar	<8i	dim.
(Saharanpur cane)		

It mar U «bawv«l that tbt latl J«rt ?«• «fcwd to by Mi AK<ila#hnn, wa* madp with Jnlw, rix-««alk« of whWt had bees tMoinlivad wiih KM, while this year r'.^rwa. made with J-ie. o.dy two-third. of vkU w« n«.tral«ed, in order to k.<Tlbe«4o«roftb»p.r«tit.l-rtMwallt.totoi.n>«"'ff rain or crystals.

It may be noted [illegible] that the [illegible] supplied to the [illegible] work and [illegible] Mr. [illegible] would [illegible] fetched Rs. 3 [illegible] the Cawnpore market [illegible] the [illegible] price [illegible] by him.

It might be noticed [illegible] Doctor [illegible] tried to put the [illegible] on [illegible] footing this year [illegible] cultivator could work on. [illegible] to him [illegible] could not [illegible] to [illegible] But [illegible] to two-thirds and get [illegible] good [illegible].

State [illegible] cane.

Field number.	Plot area.	Manure applied per acre in 1896-97.	[illegible]	Outturn per acre. Weight of cane.	Weight of [illegible]	Weight of gur.	Percentage of— [illegible] to cane.	Gur to juice.	Gur to cane.
10 and 11	Each plot = 605 square yards.	Poudrette 250 lb nitrogen per acre.	Madrasi paunda,	37,3[illegible]	25,402·[illegible]	2813·2	62·0[illegible]	[illegible]	[illegible]
		Ditto ...	Saharanpur ...	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
		Ditto ...	Poona ...	25,280·[illegible]	[illegible]		62·[illegible]	[illegible]	[illegible]
		Ditto ...	Dikkhan ukh ...	[illegible]	[illegible]		[illegible]	11·1	[illegible]
		Ditto ...	Dhaul ...	35,100·2	21,280·[illegible]	[illegible]	60·[illegible]	10·5	[illegible]
		Ditto ...	Maina ...	36,505	22,144		[illegible]	10·2	[illegible]
A. B. Plots ... No. 12	Each plot = 400 square yards.	Poudrette 300 lb nitrogen per acre.	Madrasi paunda,	33,[illegible]	20,017·55	3,300·[illegible]	[illegible]	14·2	10·03
		Ditto ...	Saharanpur ...	23,[illegible]	15,[illegible]·65	2,439·[illegible]	60·[illegible]	[illegible]	
		Ditto ...	Poona ...	21,[illegible]	14,004·7	2,[illegible]	65·[illegible]	[illegible]	
		Ditto ...	Dikkhan ...	46,001·2	30,304·12	3,[illegible]	66·[illegible]	[illegible]	7·1
		Ditto ...	[illegible]	37,[illegible]	22,474	3,540·15	[illegible]	[illegible]	[illegible]
		Ditto ...	Maina ...	34,243	23,080·1	3,073·4	66·[illegible]	[illegible]	

(f) [illegible] carrot seed.

Over one hundre[illegible] during the year und[illegible] provinces as an emergent crop, and seve[illegible] Experimental Farm. An ac[illegible] submitted to Government separately an[illegible] in extenso in a [illegible]ate publicatio[illegible] experiments are, therefore, embodied [illegible] When the first consignment of the seed reached Cawnpore, it was not known that the seed despatched from England was of different sorts, and two plots which had been set apart for [illegible] carrot seed experiment were, therefore, thought quite sufficient for [illegible] purpose. One of them was sown on the 20th November 1896. Subsequently when it was discovered that the supply consisted of three varieties of seed, viz., red, white and yellow "Mediterranean" and that for each variety there were two kinds of seed, cleaned and uncleaned, several other plots were added to the experiment with the object of determining the following points:—

(a) The relative merits of the six sorts of seed.

(b) The effects of sowing the seed on different dates so as to find out how the outturn was affected by later sowings.

(c) The economy of different methods of cultivation.

(d) The effect of different treatments of land as regards tillage, manure, and irrigation.

JUtOgOthw -10 |i]cita of land were «own with the various kindsofsced. It i^ needless to discuss here in detail the treatment of the (lifFurcn: series of plots under lliu nrioMtzptrioMata a- it baa b «n fully described in tlic rnport on this subject referred lo al- . . J'.riefly speaking M»ne ptotawm ploug'icd willi the, oouotry mid gAm witb improved pl.Kighc wM nrodogup wirli the pattern <. M.-inure was applied to *oni<* df tlicni wlii! others remained Dnmcotmd AH rcf^inU irrigation, .tome fields revived copiou* waterings, while otii r-i only a limitml numlwr of them sm:li as the ordinary ruliivjitiTi oould afl'ord lo givo in » year of drmi[»U- Tlia neeA vrn *>wn on diffiutntdatH between the 29th Novem n[m and 12th January under different nw-thods, viz., broidcnol, inj'urmwa and on ridges. TLo atop «tt frnjiii'iitlv w« ded during the perio | of growUi »nd harvested on diInr-nt .!ates between l£)th April ami fitb May 18"• In tone plots asthe* were Pftrinklcd a- a prcvoiitivo mauniro for rbe ottn t of inw:s. Tbo following rcmarkt will give * general ides of tbu ntiulu obtaincnl :—

(a) *Gtrmination and qwtlity of tee J.*—All tlic ctain«l noodgcrtnioitod very well, but il» germitwii'on of the *tat* **bued Mtd of** t!ie wliit<- and ***jttiom vmrk/6m*** was v*rv poor indi.«d. <J •nrr.Jl.v fpp>kingtb<: **red** • ! ,'n.l - • nnin i!- I iK^Uinong the three kind* of cleftnvd MeadiL **Tbf (Brmiiwdofl** of i!i<' r< 1 iMiftlttirH **M6d** M ijttitii *cut* good a*, **ftnd** in como CUM t> -tti-r than that of the 1 **ntt>iwrt** Tin* (^miinatirc |M>W<T of the yellow *m* **and** white cleaned **wed appeared** to be almost equal. When tiic land was too Jiurrkntly iirvparai] and muM not be,tho*rv*ugLly •'lwiit.il of **lb«VOO*i** of lroubl«omfl weeds\ before fowio^, all **kiadi of md** Isilwl lo g Tminni'- **preptriy**t owing to tbo fat that the von Mi! ,-jirMtit* were entirely aubduoJ lit* thn mure viguroDH and <juick-growing plants of the **weed*.**

There u no rnuo to admit thai late sowing bad any materially injurious e0uct on tiio g'nnin*(ion; tho rleined swd »*« as late as I2th January 1S97, having in two plot.- out of ill • tbfwe prndu -<l piiti:* &» numiro B« US can be expected in an ordinary good season by timely sowing.

(6) *Tk» amount oft/ulJ.*— Country and acclimatised **doarrot** Milt were sown in **•mail** pate be* at tho **Farm,** without manure elr. y in Oct **>bar,** and tho crop* gall:ered in ilte behind'ng of March. T.ic oaluulalod outturn of the different **plofJ variad** from 214 maunds to 486; **maoadl** pr acre, and in unecaw wber the yie.1 **waa** lowest it amounted to tieirly lOJi mipud- j*r acre.

But in no <m*« did I lie ottltura obtainod from ttio imported Mod approach even the low.ot outturu-.ielded by (be crop Mwn itt **Ootobar,** nliuwiug clearly that the most prominent cause of t*m* low yield lay in tb« IttteneM of sowing, The highest outturn* obtain*! from *Cw* diB rent kini* ui" Europoan carrot *i:v&* are shown in tba tubjoioad ublo t—

Kinds of seed.	Highe•* outturn.	
	o« m m] bat.	O« Muawwe4 laad.
	MiU. fca r:-.	Maa, Sr», Cfc
Yellow cleaned	1M I 0	71 St 0
Red cleaned	90 3* 10	IT S 0
White cleaned	10* n o	01 I) S
Yellow uncleaned	M • «	I• * 0
Red uncleaned	76 $ i	tl a D
White uncleaned	» *: 1	tt 22 8

The average outturn per acre from the different kinds of seed was as follows:—

Kinds of seed.	Average outturn. On manured land.			On unmanured land.			On the whole.		
	Mds.	Srs.	Ch.	Mds.	Srs.	Ch.	Mds.	Srs.	Ch.
White cleaned	51	22	0	49	0	0	51	30	11
White uncleaned	10	19	2	23	22	0	12	11	7
Yellow cleaned	51	7	4	74	25	0	54	24	14
Yellow uncleaned	9	18	1	20	9	0	14	19	9
Red cleaned	42	11	7	37	5	4	41	30	13
Red uncleaned	18	8	4	23	22	0	13	30	5

The figures of average outturn on unmanured land represent the outturn of only one plot except in regard to the white cleaned seed, in the case of which the average is based on the outturn of two plots.

It is believed that if seed had been sown on unmanured land later than on [illegible] simultaneously with the sowings on the manured land, the average outturn from the unmanured land would have fallen very considerably. Speaking generally about the results obtained with the cleaned seed, the outturn of the yellow variety was [illegible] of the white variety higher than [illegible] the red. The outturn of the plots cropped with uncleaned seed was very [illegible], except [illegible] of the red [illegible] high an outturn [illegible] in some [illegible] yield than the different kinds of cleaned seed. Carrots cannot be grown successfully either in [illegible] or in [illegible] without the aid of [illegible] and it [illegible] of [illegible] not [illegible] which the [illegible] of manuring is most marked. One might, therefore, have [illegible] expected to [illegible] a better outturn from the manured than from the unmanured lands in these experiments; but the whole the [illegible] not [illegible]. These were altogether [illegible] manured and [illegible] unmanured plots. The former were all sown later than the latter. Of the former only [illegible] plots give a higher yield than the highest outturn obtained from the unmanured land. [illegible] is only [illegible] conclusion that the lower outturn obtained in a large number of [illegible] from the manured plots was due to comparatively late sowing.

(c) The quality of [illegible] the germination [illegible] very slow and the crop was not sufficiently thinned out [illegible] were very few), the roots produced were very thin. [illegible] plots sown with uncleaned seed of the white and yellow varieties, the germination was very poor but the [illegible] thicker [illegible] to the fact that the few isolated plants [illegible] in each plot had [illegible] to grow in [illegible] thin roots were generally longer than the thicker [illegible] thick roots in the plots prepared with the native [illegible] were smaller than [illegible] roots in the [illegible] ploughed with the [illegible].

The roots in the manured plots were generally heavier than in the unmanured plots and also of more uniform thickness.

[illegible] portion of the [illegible] varied of roots from [illegible] to [illegible] in length. About 20 per cent. of these had a girth of 2" to 4" at the top and 2 to [illegible] inches in the middle, and the remainder [illegible] 70 per cent. were 2 to [illegible] inches in circumference at the top and not more than [illegible] inch in the middle. Some of the best carrots were 12 to 15 inches long having a circumference of 5 to 6 inches at the top, but these were far from numerous and were found only in the [illegible] and [illegible] manured lands sown in the middle of December. No carrots were smaller than 4 inches in length or thinner than the smallest finger. All the carrots when harvested appeared to possess a more or less disagreeable taste, which was particularly marked in the produce of too ptoti which root-mil less than nix watering*. Thin unpleasant*atnum* of the Ufrte existed in tlw laatt degree in the red v.iriuiv, wUok remained fairly {tab table up to the *<ud* of the Imrvvst.

Until Murnh »U the uurots wen sufficiently nine to rat, 1ml ihe eBV'ot *of* increasing heat in April on the flavour WM very injtirious anI brought about • degree of bitterMM in the gnrroti which rendered them almost uaelew for human ooMomptloa.

The white and yillow carrot* wen hard, and the red though not quite so hard were lurdcr tlmn uittivc c«rr>ts. The roots of the white variety ageared to be tho coarsest[of all. No duformitiw were nolkwd in any kind of carrot*.

In the majority of carrot* th« flrahy sii< iilmt]t..rii<m was only about one-epiarter of the bulk of the root, ibe remaining; thrcftHpiarter* IH-JIIJ; the inner hard portion known in vernacular as *kadda* (bone). The carrot* from the manured land were Invariably better to cat llwn tbo« fan the nnmanured.

(dj Method of cull*ivation—Of all tin- im<tmxl» triad, (hut of M wing with manure on ridgm not more than 1 foot apart and *5* inches high proved moat economical. It cannot be affirmed with certainty after one trial only thnt tlii- natbod i* tlw best. It is. however, iiol fitlloww) by ilie iiiltivntor ami U wwrlhy ol hi« attention *AH* well a. Of the further trial* at ibe *t"mna.*

(i) Tke harvesting opcntlu>n.—hi* April ihe ground becamo *to* hard tint tlie root* could not be dug «iwpt with *phaura* awl at a high cxpeoM on manual labour. The crop* had therefore to be watered once, nimply in order to faoiliL-m; the iligging.

(j) Dixutt and injuries.*—The crop was rem&rkably free from the*.

(g) Tht proportion of leaw to roots.*—The outturn of leari« WM lowor than tb.ili.>fr>'ots in 32 >ni of I'J pint*. In 13 plot* it waft higher and of them, 8 were nndrr i w l w ed seed. In ot>r pl<>(milr whtnh »«. -dw. iinder unsl ined *«i, *t\»* weight of ,,,AU«M 4>|U») t> that of leaves. In a plot wW- the crop failed entirely the proportion uf Imvfr. <n rn>t was the highest. It wn generally higher in the maniiml liian In llw tinuumur-d |>lots. In the Lite nown pint- lie crops (pmrr*]lx showed a tend-ency to develop more foliage :h«» rwl*. Tin- pfppwtion of |,«v«-* I" root* wa» highw in all un-l-tuied wtd jdot-, *txnft* thnv, a» (Vimptred with plots •own with olraoed *MH*L*

VII—DISTRIBUTION OP IKPLEHENT8.

The f.-11-iwiiit: »l»i' ment ahowa lh« dirfnbulion of impt?m TI!- iltining the year under report, compand with Iba pa*t year. The docrea«o,uf).: for ploughs, kibble n .ud chaffcut i«r» ia du« to the (act that mo«t of the Afri ttltan] atiown in w!> ich these Impfc)- j *Q^A lo* K,]) trera abaodonwl during the ye*r «n art* of scirrity. Then* has, however, b«M» a markwJ imreww under < Inin *\mtnps* Ba!dw> watr-rlift tad lairing tooW—tmpltmwit* «>nn»'<ed «wltwiwly with irri^iinu, a nutter of upeoud importance uwina rear of dromrbt, A» r«jrard» chain pnrujM it in woteworthy tliat ttMOtwaa double '.oin pn«p#ork«l will cattle gear, which on account of its ^peww waj not hitherto adopted by, i«mln<Undiditotfaittoatlr- ...et their special notice this year. Three wealthy landholders, one from Aligirh and lb* othor two from Unao am] KM lUwli. came j istly Li M« Itw working of tint doubl- jiimp at th« K»rm. On being satisfied -•«* pv* an order for one d «**• !"""p. Th«e wen oonatrunttl and wld to lien at sort priot Taryinir frnn) R«. 225 to Rft. 255. Th# inonaae nnd#tr borimt tool* !• owiof I" •« ottr*ordinarily lt«»7 demand from Hie *l^Tim.* ...nt for the atr- rtova of well—«nke« in rosn*-li<>n wiihtb»i-on»tr ...ction of .«lldi«rrif<donMext^ Mvaly Urh f«r. Tlw BaW» (k>r mill ref• «*• lu in ibl> *lm*t* year[1]! report IIM *m* ...t yet ciwa full •ati.ilM'Uun. Tl." impro«><l •• like plou -1> «H»«and«d the largeat «lr, M (I lU ,..4 r«r, and it* *am* anwaf aatiw enlUvaton. *i** gndoaily iarteaainf in parts r Hanlvi aod FanikbabaJ dwtrida, *Statement showing the distribution of implements during the year ending 31st March 1897 with that of previous year.*

Name.	1895-96.				1896-97.					
	[illegible]	Total.	Hire.	Total.	[illegible]	Total.	Hire.	Total.	Mem.	[illegible]
Ploughs	[illegible]	30	27	[illegible]	[illegible]	8	[illegible]	121	—	
Chain pumps	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—
[illegible]	[illegible]	—	—	1	3	1	—	4	[illegible]	—
[illegible]	[illegible]	—	—	3	—	—	—	—	—	—
B. Hunt's kibblers	[illegible]	1	—	22	3	—	—	3	—	19
Native ditto	[illegible]	—	—	[illegible]	2	—	—	2	—	2
Chaffcutter	[illegible]	1	—	[illegible]	4	1	—	5	—	11
Sugar pan	—	—	1	[illegible]	—	—	—	—	—	—
Harrow	1	—	—	[illegible]	2	—	—	2	1	—
Sisal-press	1	—	—	[illegible]	1	—	—	1	—	—
Dredgers	—	2	8	10	—	2	5	7	—	3
[illegible]	—	6	1	7	—	13	—	13	6	—
[illegible]	—	—	—	—	2	—	—	2	—	—
	—	—	—	—	—	—	—	—	—	—

VIII.—DISTRIBUTION OF SEED.

Details of distribution of [illegible] are given in the table below. The increase [illegible] chiefly to the heavy supply of 150,000 lb. of soft white wheat to the Director of [illegible] for experimental cultivation in the Shan States. [illegible] The seed distributed was imported from Europe and a very small portion of it procured from India. The distribution of this seed has [illegible] separate report to Government. The farm stock was insufficient to meet fully the indents for Cape oat, hence the decrease under that head. The paddy was supplied to the Superintendent of Agricultural School, [illegible], for experimental purposes, having been imported from the best [illegible] districts [illegible] provinces.

Statement showing distribution [illegible] ending 31st March 1897 with that of previous year.

Seed.	Lbs. 1895-96.	Lbs. 1896-97.	Remarks.
Wheat	3,598	1,56,386½	
Cape oats	11,855	9,970	
Maize	3	40	
Sorghum	20	120½	
Lucerne	47	12	
Paddy	525	112	
Cotton seed	—	50.5	
Ingudulola	—	24	
Bajra	—	420	
Belal	—	120	
Hill potatoes	—	820	
Indigo	—	8	
Carrot seed	—	160,448	

IX.—SERICULTURE.

The experiments in rearing the *eri* silkworms, having failed in previous years, were [illegible] resumed during the year under report.

X.—HORSE-BREEDING.

[illegible] Arab [illegible] year. His [illegible] has been good and he has so far done [illegible] satisfactorily. He [illegible] been put to the plough but is given riding exercise every morning and even[illegible]. The Superintendent and the Inspector [illegible] Civil Veterinary Department, who visited the Farm during the year, were fully satisfied with the general management of the stallion.

The mares received for covering, however, are not generally of good breeding class as reported in previous years, and this fact mainly accounts for want of more successful results in our horse breeding operations. The results of the past year's covering were not known in 29 cases when the last report was submitted. Since then six of those mam have fouled, one died, and the remaining were either failures or not reported on by the owners, During the year tinder iv|ort the stallion nerved 35 mares of which i ii-IT have hitherto foaled, fan are reports] !<• be In fool or "Jio/nr/iil" mid four (o have been Mnwd lllir""—*Mty*. The results of covering have not yet been reported by fJie owtwn it) ill" ntnaining cans.

IX-CATTLE AND CATTLE BREEDING.

(n) Cattle brttdinfl-—During the year ante npori • nil MM *mppStA* to Jfr< Ai] <i Tal, one Parolinr bull to the HliShjalianpur Miinii-ijwdity, Kliairiearhbullto the Court of Wards, Babraicli, and five bulls of different Klieri breeds to tbe Director of Land Records, Aatua. All then wen procured by the Deput-tn< nt.

Two more Pan'har hull* liave been pun-hasr*! and are kept at iho Farm for bread-iiip purpow*. The *K<m* bull referred to in I he past year's report has wntinwid to give and bil pr»tf'ny in general » of remarkably good finality. H« served iWt during the yew under report of whi'h noven have calved NO far, two are .live died, uine covering* proved umueowiful and tlie results of *eo*\- are not yet known in th« remaining m u .

Oi ' ug» done in the put year rwulta were not known in 24 UMM »hen lie report for (hat year wx* drawn up. Of thtse seven have stnoe oalved, 15 have *am* and iwn arc reported to have

TbciKoti bull *of* the Farm i« very mtifih fari'i^l bj tbflvisjtonaiid bappnektad N^n randenU of Cawn]iore an wrll at) by tho native breeder, in tin

Pan-liar bull* iventtly aildol liavo not yet been freely p,,t t0 ,, i bey «rvod five town during the yuor, an.l tl». n-wlts will I* t. • >r.

The VtUrinary UotpitaL

A report on d attachi-d lo lh« I pNW « p r • tin- fivi[1] I" IB 75oowi w«: „ , J <iiiring Ihe j >ar under roiwrt, »ffaiu-i *Tl* in thr p«.-t year. Tlje Bomber of pati«nt» would liavi- hirgely itwre: iug to thu Dtf nmtd ha vi' »tt«nd"d th<? Hi-pi tal fontinumt-lv during lli" *jmt.* Ht *h*<* b be depuled I < pl»<x« for |KI "all* ami had also to lr.« rtaiu in AMMID, in diarj- ' i r *of* Afrkadi bil ab«e»i« the di^»'it"an' wan practically doaed. Of tbe 75 *ti>* ami 'uer 12 suff-r • from slota nd t!t» nwt *km* >rrul om>wa*dm)lopn«vRi««Uandth«otIi> tattoo is'• •piiiwiated by the cultivator* of tin? wigl' (•*

(e) IfsKKLUraO

f+rimenU in diferent «y«f«ww *o/%ouring cattl*.*

The two oh)' in vi<-w in ihew* **xrwriment« are to determine (1) tha qoantity of manure that can lie oblaine* In a yoar from a [wir of work. o bent roethonl of utilising tbe ur b ountains more *xi>*- m but ma* of wltioh *m* allied by I>< atdfaM • go an waste.

li Ihea* oblecta different tjnUBM *ttt* tried in diJTi-rrnt «hedi M per detail below:—

*Sh,*JA.—ln* tlii. aim) tli- dung •lm|i|*-il during iti- nighl U -;in:i! tal «<»veml witii .'» B>, lilt Eqg and tin- dung and • are reman*] tl the end of the month.

,SW *B.—Tlir* MM »W1 u in Shod A, for absorb-ing tbe uriue hut UM< dung i* rwoovol ewry mormi

Thaw two witwu have benn un*ler (rial for tbe hu4 throe ye*r».

M,j r.—Tltc bos tyvtrm ileaerilwl in deteil in diu lart year[1]* report U tried la Uifc shod aod lu» Dow had aboul two yean* that

Shed D.—No litter is used in [illegible] shed but simple dry [illegible] absorb the urine and keep the shed clean and free from smell. [illegible] ed flows down a drain into a pot sunk into the ground for collecting it. The cattle of this [illegible] concentrated food such as cotton seed, &c. This system has been under trial for about a year and a half.

[illegible] the cattle kept in [illegible] experiment is to see how [illegible] concentrated [illegible] as a manure, especially as regards percentage of nitrogen. This [illegible] been started during the year under report.

These several systems have been described in detail in the last year's report on the Farm. For Sheds D and E about 4 lb of dry earth in the hot weather and cold weather months, *i.e.*, from October to June, and about 10 lb of dry earth for the rainy months are sufficient for a pair of cattle for a day.

The quantities of manure obtained under these several methods from a pair of working cattle in a year are :—

	lb.
Shed A.—Dung [illegible]	
Shed B.—Dung alone	9,449
Shed B.—Litter and urine	9,302
Shed C.—The box manure	8,520
Shed D.—Dung alone	7,342
Shed E.—[illegible]	9,113
[illegible]	[illegible],747

The following statement of analyses made by Dr. Leather shows [illegible] of urine as a manurial agent :—

Statement showing analyses made by Dr. J. [illegible], Agricultural [illegible], Government of India.

		Percentage of moisture.	Percentage of Nitrogen.
(*a*)	Fresh dry earth before using in the shed	9.72	[illegible]
(*b*)	The above earth after using once in the shed of cattle receiving no concentrated food	13.08	·169
(*c*)	The earth after using once in the shed of cattle getting concentrated food	3.20	·224
(*d*)	When the earth was used twice in (*b*) *i. e.*, shed of cattle getting no concentrated food	8.88	·203
(*e*)	Earth used twice in shed of cattle getting concentrated food	4.02	·295
(*f*)	Poudrette of Cawnpore Municipality sold at Rs. 1 a cart load	2.19	·42
(*g*)	Cattle dung bought in the Cawnpore bazar	Not known	·26

It will be seen that in the case of cattle gett[illegible] [illegible]trated food, the percent[illegible] about ten times [illegible] getting concentrated food when [illegible] [illegible] concentrated [illegible] of [illegible] the [illegible] of the [illegible] ordinary cattle dung. [illegible]

CAWNPORE:
25th September 1897.

S. [illegible], M.R.A.C.,
Assistant Director.

APPE.VPIX I.

Third not on tkt eomjmition of tugarcani and raw »ugar$.*

Objtetscftkttxperiwuntt.—The principal obJMh of the ex|wrin>ents on s."gor-*Q*M,* winch am being carrlnt ottl •(Die KxporitaenUl Furm* at Pooia, Cawnpore, I>ooira<in and Hurdwae, wi>jv briefly detailod i'i tin; firxi paragraph of my 2nd Note on •Wcoimposition of sugarcuie and raw Migars *{vide* the Agrijuliur.il Le.lgor I of 18

They ar<(l) to determine whit qnnatity of manure may b> most eeonomial'y applied to ibn <rop, and (i) wlial varietica are the best aug.ir pr<iucers. Forth nmlta of the field experiments refereooe miwt be *mvh* to the Annail Reports of the farm* concerned.

2. The investigation* into the dwrnk-al composition of the sngareane and its products, which I commenced in the told weather of 1SU4-W1 and continued iu that of 18•Tt-yo, have again ooouji iod my attention during the patt aeaaon.

3. Of the several subjects mentioned in paragraph 2 of 1 .I HIM I I,.alger No. *IV* of lctW, nome I aoimdertd did not call for further attention at pnesent.

1 bo amount* of Nitrogen and Phosphoric Acid, whi^li arc removed by the crop, must naturally vary according to the weight of crop, and consequently the approximate ectiuutte given on pagtt20-21 will be sufficient for t!ie purpose of giving ua idea of tin- I'PUI amounts of these plant foods nmoted in ihi? crop.

Ag>in, the amount of mgar which it removed in the scum during the boiling down of Ihe juice is a matter which I haw not further enquired into, beoaune, in the Aral place, it U tmpoMibte under the <onditions Ea irbiok lit • cullivutor workl to tiavid taking wigsr witii tho aeum, and, secondly, tbit augar it not waated, but i- put to one uacful purjKMF or another.

Bearding thin matter, however, I atay here point to the desirability of takii*g* off the scum M qoloklj at po»>i!'!-. It will be cloar that the long»r tli« anum fnaaioM floating on the pan ol boiling juice, the more concent rated the juiou become*, and -imv approii m*tely the *auu** union ut of liquid will be carried with tbo * *mm* whencn-r it u mnoved, tlint li'iuiil will cuulii more UBf ifthi jui<c has been allowed to concentrate first, than if the KUIO b« removed whilst the jukxt *in* atlll dilute.

The acorn rtaea rapidly a* soon *m* the liquid boils and the skimming should be ji-rformed quickly aad iburooglily at OK*.

Tlirn a small quantity of milk [olmt *i* oi.) may be Mvantageonslj added, which will nuna little more scum to form and thia should again be got rid of at soon a* may be.

Tin- utlur tdl'jf i- mrniiontd, *le.)* have again formed thetobjeot of expert nent.

In •'Iddition, ho*twr, 11 t'-t experiments whioh have been made on calws gri>wn at the farms, a mnudf raL>l number of experiments have bc*u made on cane gruwu by cultivators.

The investigatiaa of previous years Lad thnwn thnt it wa« most important to determine, as far as possible, two items in relation tI tU diff*erent varieties commonly grown, one being the amount of juice obtainable, an•I the otto Utr prr.centage of sugar in the juice. A further matter eng• ip-1 my rttwUon, naiwly, tl>c idintification of varieties. The cultivators know their own varietisjg ptffsotly wHl aii'i hav« Dames for them, but unfortunately theonsuMsrc freqai-nlly of uo saxvioe at alUnfi.idIn[B]' out whether one is dealing in two different districts, with the same or different varieties. Consequently it seemed desirable to decide on a system of describing varieties, their appearances, &c., so that a variety grown, say, in places far apart might be identified by different observers.

The descriptions of the varieties met with will be submitted in a separate paper, together with such information as has been collected relative to the percentage of juice and its quality. Another matter on which some additional information was obtained this season was the effect produced on the juice by the cane being "laid." In the case of the crop of "Ma[illegible]" variety grown at Cawnpore in 1894-95, a good deal of the crop was laid [illegible]n, and it [illegible]d that the juice of such cane contained less sugar than that of [illegible]ng cane.

The crop of 1895-96 was not "laid" at all, but this year, owing to [illegible] which many of the varieties [illegible] down, [illegible] the fal[illegible] was [illegible] separately.

A third [illegible] comparative quantity and quality of the [illegible] of the [illegible] portion of the cane. [illegible] Burdwan district the [illegible] from the "tops" of canes, whilst in most other parts the whole cane is cut up for seed. [illegible] (vide paragraph 8) [illegible] Burdwan practice is an economical one.

A further subject [illegible] is the relationship between the specific gravity or density of the juice and the percentage of total sugar. Information on this point will be of service to those who may wish to know the amount of sugar in juice, but who have not the means at hand to determine it chemically.

The subject matter of the present note may accordingly be conveniently dealt with under the following heads:—

1. The amounts of cane-sugar and glucose in sugarcane juice.

2. The relative composition of the top and the main part of sugarcane.

3. The relationship between the specific gravity of juice and the percentage of total sugar.

4. The composition of raw sugar ("gur" or "gul").

5. The amount of [illegible] during the boiling process and the effect of liming.

6. Hand Centrifugal made sugar.

1. *The amounts of Cane Sugar and of Glucose in the Juice.*—The quality of the juice may be conveniently dealt with under three heads (vide p. 2), namely:—

(1) the comparative quality of the juice of different varieties grown at the same place;

(2) the effect on the quality of the juice of the cane being [illegible];

(3) the comparative quality of the juice of the same variety grown with different amounts of manure.

5. *The amounts of Cane Sugar and Glucose in different varieties grown at the same place.*—Cawnpore. At this farm the same six varieties were again cultivated as in 1895-96 and the Statement No. 1 exhibits the results. Each variety was grown on two plots, all of which were manured with poudrette, the one set of plots receiving about 250 lb of nitrogen per acre in the manure, the other set about 500 lb nitrogen. Although the cultivation was very good indeed, the crops grew so tall that they fell down a good deal [illegible] attempt

was ma[de] to tie [illegible] up with the dry leaves, a method commonly practised in the Burdwan district of Bengal, but [illegible] was not altogether effective. This method of keeping the crop erect is very suc[illegible] property done, but no one at Cawnpore had [illegible] and it is probable that [illegible] tying up commenced too late. At Burdwan the tying commences when the crop is only a couple of feet high. It is necessary to mention this because cane, even when 14 and 16 feet high, will remain erect if properly supported in this manner.

STATEMENT No. I.

Composition of juice of varieties of Cane, Cawnpore, 1896-97.

Variety.	Manured with poudrette—[illegible] lb nitrogen per acre.											
	Madrasi.		Sahâranpuri.		Poona.		Dikchan.		Dhaul.		[illegible]	
Quality of cane.	Standing.	Fallen.	Standing.	Fallen.	Standing.	Fallen.	Standing.	Fallen.	Standing.	Fallen.	Standing.	Fallen.
Cane Sugar	[illegible]	[illegible]	[illegible]	10·23	12·36	14·22	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Glucose	1·44	·60	[illegible]	2·25	·62	·77	·43	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total Sugar ...	[illegible]	[illegible]	[illegible]	[illegible]	13·08	[illegible]	[illegible]	9·77	13·89	12·35	[illegible]	12·34
Ratio: Total Sugar to Glucose ...	11·25	6·28	[illegible]	17·58	6·27	[illegible]	[illegible]	[illegible]	4·10	[illegible]	[illegible]	[illegible]

Variety.	Manured with poudrette—250 lb nitrogen per acre.											
	[illegible]		[illegible]		Poona.		[illegible]		[illegible]		[illegible]	
Quality of cane.	Standing.	Fallen.	Standing.	Fallen.	Standing.	Fallen.	Standing.	Fallen.	Standing.	Fallen.	Standing.	Fallen.
Cane Sugar	13·30	11·90	[illegible]	[illegible]	12·52	10·02	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9·54
Glucose	·94	1·56	[illegible]	·64	1·14	1·57	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1·54
Total Sugar ...	14·44	13·46	13·29	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12·53	[illegible]	[illegible]	[illegible]
Ratio: Total Sugar to Glucose ...	4·11	11·07	[illegible]	[illegible]	9·04	[illegible]	13·70	23·05	10·22	9·00	[illegible]	13·8

Statement No. 1 exhibits the analyses of the juice of [illegible] varieties grown, each on two plots [illegible] the juice of [illegible] which remained [illegible] which fell. [illegible] each case, the juice of [illegible] sugars. The loss is not, however [illegible] crop of "Ma[illegible]" in 1894-95, which [illegible] 1895).

Generally it [illegible] the same in each of the varieties with the exception [illegible] range which [illegible] a later paragraph.

Dumraon.—[illegible] varieties were [illegible] In 1896-97 [illegible] was [illegible] two plots, one being manured with Castor Cake containing [illegible] 250 lb nitrogen per acre, the other receiving Cattle Dung containing 250 lb nitrogen per acre. At this farm the water-supply [illegible] and [illegible] the crops, especially the "Poona" [illegible] "Red Bombay" [illegible] large extent and were attacked by white ants.

At this farm the tying up was done well by [illegible] from Burdwan, otherwise it is probable that all the [illegible] fallen.

Before crushing, the [illegible] completely as possible from the sound cane and the analyses in Statement No. 2 are those of the [illegible] only.

[illegible], it will be [illegible] with Castor Cake [illegible] poorer [illegible] than [illegible] from the plot manured with Cattle Dung. [illegible] point which will be referred to in a subsequent paragraph (no. 7). [illegible]

Generally the [illegible] greater than in the [illegible] proportion of glucose has [illegible] in several cases.

Burdwan [illegible] first occasion on which analyses of varieties of sugar-cane have been made at this farm. Only two varieties were grown there and the composition of the juice is exhibited in [illegible] No. 3.

STATEMENT No. 2.

[illegible] of Juice and Gur of varieties. Dumraon, 1897.

Variety.	Mungo.		[illegible]		Samsara.		Red Bombay.		[illegible]		Khari.	
Treatment: [illegible] 250 lb. per acre.	Castor cake.	Cattle dung.	Castor cake.	Cattle dung.	Castor cake.	Cattle dung.	Castor cake.	Cattle dung.	Castor cake.	Cattle dung.	Castor cake.	Cattle dung.
Cane Sugar ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Glucose ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total Sugar ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ratio: Total Sugar to Glucose ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

STATEMENT No. 3.

Analysis of Juice of varieties grown at Burdwan Farm.

Variety.	[illegible]	[illegible]
[illegible]	[illegible] N = 250	Cattle Dung N = 250 lb per acre.
[illegible]	[illegible]	[illegible]
Total Sugar ...	[illegible]	[illegible]
Ratio: Total Sugar to Glucose ...	[illegible]	[illegible]

STATEMENT No. 4.

Showing the amount of Sugar in the Juice of varieties grown at various places in the Bombay Presidency, 1897.

Variety.	Where grown.	% Cane sugar.	% Glucose.	Where grown.	% Cane sugar.	% Glucose.
Pundia ...	Khanapur ...	16.50	.93	Poona.	12.00	1.48
Pana Hill kabba.	Ditto ...	13.81	1.59	Do.	17.08	.68
Kari kabba ...	Belgaum ...	11.47	1.07	Do.	11.97	1.34
Ditto ...	Khanapur ...	10.62	1.11	Do.	[illegible]	2.57
Patta kabba ...	Belgaum ...	18.3	.77	Do.	9.10	1.19
Halla kabba ...	Ditto ...	14.08	.43	Do.	16.00	Very little.

The "Samsara" cane was [illegible] on a [illegible] plot manured with Castor Cake; the juice of this plot [illegible] that analysed.

6. *The effect on the juice of transferring cane to long distances.*—At the time of writing my last report on this subject, there were only two cases which could be quoted in evidence of the effects produced on cane by transference to long distances. The one was the case of the two varieties of Mauritius Cane, imported in 1894. These two varieties were supposed to be very rich in sugar when they were first obtained, and it was surprising to find that both in the crop of 1894-95, as also in that of 1895-96, the juice contained comparatively little sugar. They were grown again in 1896-97 at Poona and it is satisfactory to find that in both cases the percentage of sugar has risen. [illegible] the Mauritius," which contained about 12 per cent. cane sugar and 1·4 glucose in 1895, produced a juice containing 14·71 per cent. cane sugar and [illegible] per cent. [illegible] in the past year's crop [illegible] "Red Mauritius", which had only about 10 per cent. cane sugar and 2 per cent. [illegible] crop of 1895-96, [illegible] 12·7 per cent. cane sugar and 1·6 per cent. glucose in the past year's crop. Thus in both cases there has been a very marked improvement.

The second case quoted in my last year's note was that of the "Poona Pondia" variety, which had been grown in 1895-96 at Cawnpore and Dumraon. It was then found that, instead of containing about 17 to 18 per cent. of total sugar, the crop, at the Cawnpore Farm, contained only about 11 per cent. of total sugar (*vide*, p. 5). [illegible] variety was again grown at the two farms last year, and [illegible] will be seen from a comparison of the quality of the juice of the "Poona" variety, as exhibited in Statements Nos. 1 and 2 of Agricultu[illegible] corresponding figures in Statements Nos. 1 and 2 of this note, the per[illegible] remains about the same [illegible] improvement has yet taken place.

Some further evidence on this point was obtained during the past season. A number of [illegible] of canes [illegible] grown in the Bombay [illegible] y were collected at the close of 189[illegible] [illegible] at Poona during the past cold weather. These were all analysed. Later I visited [illegible] villages in [illegible] neighbourhood of Belgaum and Dharwar and analysed [illegible] of these [illegible] variety grown by the cultivators, and the results may [illegible] It will be seen from the figures in the statement that [illegible] [illegible] at the place [illegible] [illegible] the quality remained [illegible] [illegible].

7. *The juice of the same variety grown with different manures.*—When reporting [illegible] year on the effect which manuring has on the quality of sugar cane [illegible] in neither of which had the manuring [illegible] the quality natural [illegible] therefore drawn that manuring had no effect on [illegible] of canes. The one was the "Poona Pondia" grown at Poona, and the other was the "Matna" variety grown at Cawnpore.

This year another variety, the "Madrasi Poonda", a [illegible] largely grown in the North-Western Provinces and Oudh, was grown at Cawnpore with [illegible] amounts of manure, and the composition of the juice [illegible] in Statement [illegible]

In this case likewise the manuring, neither in amount nor kind, has produced any [illegible] on the quality of the juice, and I may also add that the percentage of juice expressed in the mills was also apparently unaffected.

Statement No. 5.

Cawnpore sugarcane experiments 1896-97, *Madrasi Poonda, Manure series.*

Plot.	Plot 2. Dung = 225 B. M.	Plot 3. Dung = 300 B. M.	Plot 4. Poudrette = 225 B. M.	Plot 5. Poudrette = 300 B. M.	Plot 6. No manure.	Plot 7. Bone meal 12 B. Saltpetre 12 B.	Plot 8. Castor cake 150 B. M.
Quality of cane.	I	I	I	I	I	I	I
Cane sugar	15·33	14·55	14·37	14·05	13·62	14·04	13·06
Glucose	·78	·73	·58	·67	·49	·49	·72
Total ...	16·11	15·28	14·95	14·72	14·11	14·53	13·78
Ratio : Glucose per 100 of Total Sugar.	4·95	5·03	4·09	4·20	3·04	3·25	5·18

Tbe " Poona Pundia " is one of tbe largest varwl w* grown in India, it h n lively cultivated in tbe Dcocwn and R<mtlnrn Mah rafts oounlry and » generally, if not alwny-i, nmitur>d hiavjly. It WM at**i grown with large amount* of manaro at the lVrna Kami. I >i" iaa MIUII iliin am extensively pawn in aont* pan- inom and Oudh and in usually tumurcd but li' it WM grown with oompir —— V quautitii* of manure.

It lliB* #o lutppriml that in eaoh eate the partionUr varirtv, oo w! . evj*Ietiw ofttio rffrct of manuring n*fod, WM mantimd in tnoea tbvaune manner they wereaoouatoaMxl to. The cue of Inn "Madra rml to wtwU Ukewine afford evidence that manuring h»N no ra Vt oa t04 j,. | . orou of nwPundia" Rriinn.ilVi.m n aaalymj thift ymr. T tobeno obj,x.i in reneiitiiig the wtprr HIM the quality ,f id jui^ nauuml ooiwtant for two you* (vitb Agrioaltnral Udgmr* N««. 13 of 1SW, pag« 2 and HI of lSytf, page 6).

I). tbe O H M : Uaa • variety, it WM grown at Cawnpon in 18864)7 on two plots, bo td adremngof pundreUe in one OMB conlai ninnil-rogen «^nal to 60u* i»er acre, in tbe oi .Cen rqual to 250B> per a. Luih aaioanf* of uurnurv being far more tli«n in usually given Hie grew about t* ice a* high a* muaL But in Ibu cue manuring Mnn> lo h*vo b»d - auUrial effect upon tbe cane. In 1804-86 thi* variety grown with -null tiianure yielded on an avenge of *it \>ln* ideal tbe h a-bao it WM again grown with email amoonln of mannrv on *9* I«rwniageof *}<* ted wa» 1>S96>97 when it was grown witb large snwunr* of mauiirc *the* ptrorotag- .iainol WM 60*3. On the oth*r bawl, , -raontage of ane sugar in tbe jute* of tb«M crop* WM *HO, 10%* ll-'J for tlio corn-: tan and of glmoee 0-1 and 1-0 per oenL in il.<- lu.-t two Tin *<ge* of juioc ha» inertawd very ottnatderaltly witb tbe suiF[,ly of owuun , il.e percentage of Mtgar bufitilcn very Mtioualy.

At t);c «me lime, although Ibu nsull muat b* attributed to tbe heavy manur-ing, it would not be at all profier to infer that heavy manuring is lo be deprecated generally nully a caa« of having grown a certain variety of oaoa uotler tit wudtliotu to (l..-c to wht-'li it *m* vJnaUy *mecwtonal,*

Auotlieram of a ajmilar nature may l» qtJotoJ. TIM Bin. "•IUHJ;» IM* oj' Ittiir Juvf Iv4'ii gm r- at Duuraon with Urgi amount* of manure. (*Vitk* • of 18My page S ami 8uiea> of ; j The peroealage of loUl »agar in I he jnioa of tbe Uunfu i 1886 wa« •mill -ntage of mgir in lh*l in I sy»; awl 1-1-5 an.1 Ma I b*ppcn< analyet a Mmplc of tbe mixn) Jnin of th«M I wo variHia* *i* ihr-y an> commonly grown them a* nth liitlnur »•• ma -nt. of julc« WM «xpriH«il and it coniai; • r rert nuw> mgar awl "23 of gtoooM; an amount much in e»Mt«r that foiiml »l Damrmoa, and owe m» **t* tbe bfnvy maimr*intc* at Dumraos W rv.Ii <«ge of *u|pir. Tbo caw *m* ••rnlM I" ibat of Ibe Matna varv-ir al fawnjvirF' ; in mrJi, varietie* hav« Iweo (tro wn BDt l*>r *B—nlMf* diff'. tuvaeewtomeJ, and Cbb apjxan *U>* bave bail adifrfurbtrx

Wo bav> l«aoe not only that can* may nnVr from a ebang* of dunate but abo il. M taatorially ebaogril from tli..-> under which id. plan< h*i bn»n t" "" <]tu!ll> may Iw lowrn*!. Wb» i t!»- (|«MuMy) 1>. jiro-du(vd<>n<vrf ,.*vy manuring, il n«4 not \- a*.itm-d Ibal r.vt. On ta« contrary, jwflfng by ill- Bhttrii aad Mnngo varie-Itea grown at Dumrnun, one may • r (be normal proportfo*

Moreover, and it ia a (till mom important factor, with an increased supply «f tnaniiTv. a much heavier crop is obtained for outbalancing such jquxiaUag tfl. jni h«vo bwn quoted.

8. *Th* composition of the top end and tki main portion of wgarcant*.*—As alrntoly explained in paragraph 3, it " of interest to know the comparative qualify irla of OAK* became in some places, naoh a» Burdwan district in Ben i grow tin- nr*p -viu-ivtly from §et« cut from the top most jmri' of I It cane is cut Up for plunting.

>re made five experiment! at Burdwan in whioh a baadk of whole <*n*a wa» Uketi in each *am,* tlw top* eut off and I be two portions weighed. They wwe thrn pa**d (hr.d^b ibft mill gepunrtalj, and I analysed in tbreecasea, Cheip<.Tifiogravity alunc l«i»j; dateminwi in the other two.

. n«utii of these experimenuj are let out in Statement No. 6. in the nppr part ofwWhiigitentlie weigh! of caoeopwated upon and the percentage of juice obtained whilst in the lower part ia given the analysis of ihejuica.

.^ place, it will be nutiwl 11,it tbo amount *otjmm* obtainable from the top end of eaoe u verr much le«a titan from the main portion of the rtna, the percenUf« in the former eM varying between *46** and 66-1, whilst in the tatter it wai between 91 and 74-1,

Then, secondly, it *ill b« rr«n lt»t tlw troounl of ciw rognr and of Wai atgar tt moqL hi^>r in U»e jui«e of tbo main part of the men than in that of th« top*, but the amount of (rfuco* i« mu< h town in Ihi furmfr tban b the btler. That tbia ia not ia any way exceptional to the MM grown at ltnnlwan vtiU be evident from an inspection of the an»Jy«i detailed in Statement No. 7.

STATEMKNT No. 7.

Compowititm of juice of difertnt parU of tugargint. Paona, 1895.

	Medium sized cane. %	Large cane. %	Small cane. %	Small cane. %
	Cane sugar.	Cane sugar.	Cane sugar.	Cane sugar.
Top end	13·38	10·41	12·24	ST
Middle	20·21	18·07	17·70	in-,
Bottom end	11·05	19·36	19·13	[illegible]

w!, n»tnI8'.' lined the perwnUgo of oaoeaigar in difltrcnt larif of foor «w»'« <*«• »' m Pui*di*'"

l aw the analyst an of tint jok« of tingk cane*, but the evidence u quite uniform and counm* lU» obtained thii y«ar at Burdwan.

8TATEMEK

Showing the comparative compo tition of the tap and main portion of tuffarmnr. liur.hran,* 1807.

Variety.	Samsara cattle dung plot.		Samsara cattle dung plot.		Samsara outer <*k. plot.		Sumnmi.t(ib plot.		Khari cattle dung plot.	
	ItilfUt of cane.	ftp	Main part of cane.	Tops.	Rail !•«•' of cane.	Tops.	Main , - t ..(cane.	Tops.	Main part of cane.	Tops.
	lb. oz.	lb. oz.	ft. «•.	lb. oz.	a «.	lb. oz.	ft. M.	ft. M-	lb. oz.	lb. oz.
Weight of cane or tops ...	47 0	4 3	M •	• 4	w •	1 14		I 1	19 0	2 6
" juice ...	34 8	2 2	n i	1 9	14 0	1 0	U 4	S 14	11 12	1 2
Percentage of juice ...	73·4	51·5	BIO	[illegible]	I¹*!	Ol	74-1	HI	[illegible]	[illegible]
Mean weight of canes or tops.	3·9	·22	—	—	—	—	JC	·33	II	ii
Specific gravity ...	1,073	1,050	1,078	1,060	1,082	UMI	1,081	[illegible]	1,084	1,071
Composition of juice cane sugar.	14·65	7·05	Approximately, equal to	Approximately, equal to	Approximately, equal to	mal-	17·17	n-ao	[illegible]	IMI
Glucose ...	1·66	MI				r.(.»: t l	1·08	t-M	[illegible]	t :
Total sugar ...	16·31		17·0	13·5	15·0	14·6	18·25	[illegible]	[illegible]	1 4 •
Ratio: Total sugar to glucose.	10·18	•ni	—	—	—	—	[illegible]	10 71	I'M	Ni

At just at good a crop will be obtained from plan tine with iba only iu»teaU of cutting tip tbe whole MM, and further that cane will | from being thus propagated, it will be rvidrnl that it ii mnoh more eeoontntfal >° grow from • top> " only. It la iliffi tilt to wtimate ibo g .in from the adoption of the Rtmlwan ru-i.-.m. bir -almlajion baasd <m the figure* quoted in SUle-mmt No. 6 will pirliap* exemplify tbo differ A •miming thai 1*2,000 «ct* of Sanuara variety am planted p> I that r*!i " *ct " from tbe main part of the cauo wi-igii* •Cilfc. then tbe wtright of cane required for mwing one acre wotiM bo 4,200 !b. If thia were cntabed for ngar pro I • weight of gur obtainable may be cak-nlalod, thiio it may be aantmed that 70 pef oenl. of juice will that tbe parentage of total •og-.r will I- 17; tha 10 per crnl. of the sugar would be taken off with tbe »<nm, an.I that tbe gnrw<> •> 80 per cent, of total augar. Then from tb» -t.AMIb of oane, 2,!MOlh of would be obtained, containing 5001b of pnreangar ; 1 wt in tbe wum aod tbc remaining 450ft of pan tup roduee about 500m of gur.

OB amount of gur obtun id «aoaf may be ealeulated ihu*. K*»h eat will weigh *mf* '. aod the weight of cane planted would that be 3,3001b. Ifrnuhed, tbi* eaiie I yield, say, J Mgar. Tbu the 3,3W)tt> of cane, l.fWIlb of jut, e would be ulKaincd, oont. 'Ib *at* pnre eugar. DtJu-1 10 per mil. loal in the tcutn. or *t* Ib and tbe rtmaiu> give about 236m of gur.

Thna, ajaoming that thtt ctea fairly tllurtnUi tbe different imrnii"* of g»r obtainable from the lop end* and tbe main portion of tha Samaua variety, planting the whole rane mount a *km* of torn 3301b of gnr per aore planted.

A einuUc caicnlation for tbe other variety, namely, Khan, wbk-h wa» npnf> manted upon, abowia loea of about I tUBb of gttr by planting from tbe *aw* I of the cane. Thia variety w a thin ODD and the »U weigh ootMaqatatly rnuon lee* than do thote of the thick "Sanwara " cane.

la any MM, tbe robject i* worth experimetiting upon, and MMM cane will he grown from the top end* and main portion* of rane at one or twu of the Farm*.

Tbe evidence at hand certainly doe* not indmte that oaae depteeiatei fi bring contiunowly propagated from tbe lop ead«. The " Hamtara " <»oe at wan u an exceptionally good cart- g about70 ptr<«ni »t the milk and aome 15 to 18 per cent to total Mgar in the jaioi: and apparently the method ba» b»eo*ui vogue for a long time tbnv.

9, *T'M rtlaiion* I wwn *th** epaei^c *gravity of mtgarcam* juic* and tkt amount a/ Mat* M£ar *frtmtf in it*__Tbe value of a cane may be «id to depeod in a gnat meaeure on the percentage of juii* oUainable fram it and the peraalage of Mgar in that jti

Tbe former may be readily detarmlaad by onufalaf 80 off lOOJb of any partieular variety and weighing the Juice expreawd. Iron mill* are to be bv) al anywhere. BOW, aod the nprratioa caa be earrknl oat by any on* who poateaMa ; baJaaea.

The pamalage of eagari in tbe juir can only be aoewatalj detenaiaed by f eertaia tihaaiwej oixraliou*. for the j«r f-rnun-* in Iba vpprr part of which a rial training ia wraatary. In the <w oi Haul* pnre aolnliona of Mo gravity baui a deiii aalagi of pagans and they may iipvnV together vi >K»I tlir titiv i In the OMD *nt* oaae JaMv b»*' r wtnrtaaew ate *ymm* ut wl lb» aui*v rrlalioo aal Ktarml #>, |)u». v, r, thai thtt pmpoetioa of tUe<c other enhetaama might ba, tolerably MM.! A oane jm*. Reaanlly, aad in thai oeje table* ejighl .aaijy be pt^auW K tbr ptnrutag* of total aapn which wrm^ood ^ tbe i

STAT. No. 5.

Showing fptcifie gravity ofjv juice at 15·5° centigrade with *ralcvlatid j*rwniagt,* total sugar[1] and percentage, total sugar found.

Sample.	Spwrifl* irrmtitf at	IM>1 M[jp*r ^^'rII	Percentage total hnL	Difference.
jnUrn *M*kt*tl*n/omm*.*				
Kw*KiMn, KhkMpar	vom	SI	J7-9	
			17 4	11
ItHit, KMaafRi	ton ion	m	18 V	15
w i It .1 ivir	KM	to	19-0	Id
			IM	39
Iluilu Kal-liU, N»W • • ' " • '	ton	1		t-8
f*t4U, SMrti H«tfW...		fs	»9	It
IS.dk. K.lftrf OK.T«r (6o«t«n		•g	1S-3	17
I'm.!,.. K*tpri !«»«« (MI *»w»4)		to	17-»	11
		19	17*3	17
8tfi»4ou«.K>trlrt ...		to		M
H»lto Kihbo. AhF»«*	ton			n
Hindi*. Kimdn		10	17 1	
Piadk, Kwtatn	1070	tal	16-t	SS
K»* !£»»*•. X«rmilr»	1U71	17t	iei	1-4
K.rc K>l>i.». S«*Ir« - -	i..sr	a	|»|	lit
	107H		104	14
		IB	I.WI	11
RMMMJ I*udfc, M»ojri Plot	ion	IS	11!	.*
	IOM		ICO	—

5

(H-pW.	Specific gravity at 15·5° Centigrade	Total .:k-.r *mt* (r,.m •;»•.	ToUl •..•1-r •tMd.	t)lff«nnM.
Q»—• wt *—•				JJ
		1S	101	
		»	in	18
	1<T1		16-6	1-9
n» * * ^ •		let		1*4
IKK «» **• ,		17		
	IOtU		1W	M
			1.VJ	1-7
			13-S	*7
				M
i^ ** t[1]				Ti
" i *				to
	I'«!7	101		M
P^ ** *•• ,	IOM	iaa	14-9	i-e
	iota	ist	1S-0	14
DZ J* ««*.		I»	) M	S3
	ifMO	14	131	M
			M I	M
mill-[1] i*	ima	1*	11*1)	M
	HIM	IBS	131	»4
roMTMA J*		17'	151	1*
Pi *••	IOM	If		M
		11-	B8	M
£•		10	139	1-1
r»wi		»•	ISO	11
	1007	irtS	MI	*«
	IOM		ISt	
1 an ij ij. A i		17	15»	17
	IMt	17-	11 >	17
D!/ * *		lfr	H I	SI
	IOM	la>	111	Sit
	n>:.a	141	116	*to*
	loot	It	JJ«	
	1044	11-		»4
	I'Wt	10-	*n*	
	i«n	I*	its	n
	IOM	]*•	11 4	M
		It		I-»
	1040	1*		19
....* . *„• ,-v				
	10U	14-	1 »	11
• iiiii'-f"	InM	lfr	14-0	M
			141	N
			101	W
•bartlattl* '...			143	11
-ST^.SSS • - -		»4	US	1-1

STATEMENT No. 8.

Showing specific gravity of juices at 15·5° centigrade with calculated percentage total sugar and percentage of total sugar found—(concluded).

[illegible]					Specific gravity at 15·5 centigrade.	Total sugar calculated from specific gravity.	Total sugar determined.	Difference.
Varieties at Dumraon Farm—(continued).								
Samsara castor cake	...	...	...	...	1067	16·5	13·7	2·8*
Do. cattle dung	...	...	...	...	1074	18·0	16·1	1·9
Khari castor cake	...	...	...	...	1060	14¼	11·6	2·7
Do. cattle dung	...	...	...	...	1073	18	15·7	2·3
Poona castor cake	...	...	...	...	1063	15·5	13·6	1·9
Do. cattle dung	...	...	...	...	1062	15·	13·7	1·3
Varieties at Burdwan.								
Kajli (Ryots)	...	...	...	...	1081	19·5	19·6	·2
Samsara (Ryots)	...	...	...	...	1079	19·0	17·1	1·9
Do. (Farm)	...	...	...	...	1075	18·0	16·1	1·9
Khari (Farm)	...	...	...	...	1078	19·0	17·6	1·4
Varieties at Behea.								
Patnahi (Behea)	...	...	...	...	1071	17·0	15·0	2·0
Mango (Behea)	...	...	...	...	1082	19·5	18·1	1·4

[illegible] -lerable numbe[illegible] f samples of juice of different va[illegible] ies of cane have now been examined chemically, [illegible] I the percentage of cane [illegible] determined in them. I have therefore put these together in Statement No. 8, in which is also entered the specific gravity of the juice at 15·5° Centigrade and the percentage of sugar which corresponds to the specific gravity in [illegible] assumption that [illegible] density is entirely due to sugar.

[illegible] wing to the presence of the other substances referred to, this calculated proportion of sugar will always be too high; and it was with the object [illegible] out whether the difference between the calculated and true percentage of sugar remained fairly constant that the comparison was made. There is no [illegible] -termining the amount of these other substances [illegible] minous matters, [illegible] a simple method is to make a [illegible] eliminations of the one factor (in [illegible] case sugar) [illegible] ther material or "difference" [illegible] constant.

In [illegible] column of the statement is entered the difference between the calculated and [illegible] unt of sugars in each sample of juice examined.

It [illegible] from this column that, although the "difference figure" is not by any means constant, yet it lies between moderately narrow limits.

O[illegible] the [illegible] yzed it is less than 1·7 [illegible] 1·7 and 2·2 in 40 cases, between 2·2 and 2·7 in [illegible] in 7 cases and over 3·2 per cent. [illegible] lay between 1·7 and 2·2 and in [illegible] it lay between 2·2 and 2·7. If, therefore, 2·0 be deducted from the percentage of sugar as calculated [illegible] error would [illegible] comparatively narrow limits and a fairly ac[illegible] ld be obtained of the amount of sugar present in the juice of any variety [illegible] ned.

[illegible] derations, I give as an Appendix to this [illegible] tables from which [illegible] density may be reduced to density at 60°F. and 84°F., and, secondly, the approximate percentage of total sugars which correspond to the specific gravity of juices.

*Specific gravity of these samples of juice from the cane of these villages being so nearly equal, only one analysis was made. The juice was mixed and boiled down together.

10. *The amount of cane sugar and glucose in "rab".*—In the Agricultural Ledger No. 19 of 1896 is given the composition of a number of samples of "gur" or "rab." Some further [illegible] of this material were made; this was done [illegible] in connection with experiments in liming juice, and these will be referred to in the next paragraph. Another description of [illegible] sugar is prepared in some parts, for instance Behea and Bardwan, and this consists of a [illegible] mass obtained by stopping the boiling process a little sooner than is the case when ordinary "gur" is made. It is transferred from the boiling pan whilst still hot to an earthen "gharra" or "[illegible]," and in this it is allowed to cool slowly, when it is considered that a larger proportion of the cane sugar crystallises out. At Bardwan this substance goes by the name of "gur," but at Behea it is called "rab."

STATEMENT No. [illegible]—*Analyses of [illegible] and [illegible] at Burdwan, 189[illegible].*

[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Villages Bangaon, Hartsimal, Kashi [illegible]	Villages Bangaon, Hartsimal, Kashi [illegible]	Experimental Farm.	Experimental [illegible]	Village.	Behea.
Treatment (Manure).	(*Average sample.)	(*Average sample.)	Castor cake plot.	[illegible]	—	—
Juice— Specific gravity	1080, [illegible], 1,080	1073, 1076, 1,078	1073, 1072	[illegible]	[illegible]	—
Cane sugar	[illegible]	13·24	[illegible]	[illegible]	[illegible]	
Glucose	[illegible]	1·96	[illegible]	[illegible]	[illegible]	
Total, Sugar	[illegible]	17·20	[illegible]	[illegible]	[illegible]	
Ratio: Total sugar to glucose	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Gur (rab)— Cane sugar	[illegible]	64·34	[illegible]	[illegible]	[illegible]	[illegible]
Glucose	[illegible]	19·01	[illegible]	[illegible]	[illegible]	[illegible]
Total, Sugar	74·18	83·27	[illegible]	[illegible]	[illegible]	[illegible]
Ratio: Total sugar to glucose	[illegible]	22·0	14·31	9·88	[illegible]	[illegible]

* Specific gravity of these three samples of juice [illegible]

The analyses of this material, which are quoted in the accompanying Statement No. [illegible], are interesting chiefly as showing its composition, and may be compared with analyses of "gur" published in my previous paper. In addition four other samples of "rab," detailed in Statement No. 12. [illegible] were prepared at [illegible] analyses of the juice are also given.

There is considerable variation in the composition of [illegible] not only in the [illegible] amount of sugar but also in the [illegible] of glucose.

11. *The amount of [illegible] in the boiling process and the effect of liming.*—The experiments which were made last year to determine to what extent the formation of glucose could be prevented by the addition of lime to the juice showed that [illegible] could be stopped almost completely, but that in order to add the most desirable amount of lime, [illegible] was required. Thus in Statement No. 9 of Agricultural Ledger No. 19 of 1896 it was shown that if about nine-tenths of the acidity in the juice was neutralised, very little inversion took place, but that [illegible] "inversion" took place if one-fourth of the acidity was left. Still even [illegible] an [illegible] quantity [illegible]. On the other hand, however, if [illegible] of the juice was neutralised and a slight excess of lime employed, then resulted [illegible] black.

Although there is no difficulty in testing for acidity in the juice with litmus paper, provided a little care is bestowed upon the operation, still it was felt that if the process could be simplified in [illegible]

The first experiments which I made (at Cawnpore) this year had the object of simplifying if possible the use of litmus paper. A few words may here be said in reference to [illegible] this "indicator" is used. As is well known, litmus is a vegetable l«r Uw colour of «Uwh bcMimr* r*d in th* prwMiM of arid* and bloc in ttio ptf wntfufttl'.-alis. In :j»i yf»r'-i fS|»Tii»>uiii liiw *a» adifal K» * certain poriifl ibo jutw until that portion bmunc .i*tiy n#uM»/, tl> at is neither ≪ nor all. For thu novi« Ihw joint of twutndiiy in, lumrv*T, »#o»e«li»i diffi'-ult on- i> liit off eyacllj : it is generally «w er to detect if • !i'jiii>i b »i<l '>r illuliw ilian • x»etly neatAl, ntxl it WM to »roid (he DMtaitjr ofwrivii.g at (hi* nnnrul |»iut that lit* first exptrrimfittii wi-n- tn»lc. It will n.iw U< nmti r-t.-^l tliat Mi|>j>--iiifi llnw b" •tl4cd to juia« mitil : is in I •—, tW i. until lU.-jui.* tweonM aJUliw, thi* <*n be readily detected . fornd litmus J«J- r *ill 1M- iluu.pr«l to l>iur. Tlmn, hn«ever, •uffi. ient juice mfl-i !«• wltlrd to rondrr thin ounlunftl porti»ti ii»tin>-tly w ut apiit>> Consequently it so large a portion as $\frac{9}{10}$ of the juice limed in th U man l if r, i. «., a ith an excess of lime, the remaining $\frac{1}{10}$ would not be sufficient to prevent the resulting gnr hcvoninf iUrk cilonnd.

In the experiments"•* si CWwnpurv | of lite jni«> wtu lp«btl with liiw unfit rf<:;'>' D I!H- rvnuiimtig j -.t' il- juW MMnl to il w •• to render it adiil. In tlii* wny MintrwW mon than | of tfao a'uU in tbr jnier Im-am* neutralised.

STATEMENT No. 10.—SAotrinjr (1* r/fcf 9/ tMKfnt&tny tV juwv tn(A *Litn*. I'aienfKirt Farm.*

Variety of cane.	V..1-K.		Madras Pounda, Field A.B.		ru-i 1		Field A.B.		Field 10-11.		Field 10-1.	
Tmli	Poudrette.		Poudrette -twX.		Poudrette		Poudrette		Poudrette		Poudrette	
Juice— Cane sugar … Glucose …	14·45 ·80		12·03 ·99		13·54 ·67		7·81 ·96		8·57 1·19		10·30 1·12	
Total, lit*- …	IVtt		13·02		14·21		8·77		10·10		11·42	
Ratio 1 QhKMt to ttUJ «• I"	5·24		6·58		4·73		10·55		11·7		9·20	
	Not limed.	limed.	Not limed.	limed.	Not limed.	limed.	Not limed.	I. h«.	Not limed.	limed.	Not limed.	limed.
Gur— Cane sugar … Glucose …	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] !**.
T «•!, . sugar …	T4W	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
EttioiSlw-cw par 100 of total sugar.	12 96	T70	li}4	942	S36J7H		3i:STt7M		[illegible]	[illegible]	1*8	[illegible]

STATEMENT No. 11.—Showing the effect of neutralising sugarcane juice *trxth t\mM f: -i Farm)*

Variety of cane.	Farm.	CCT		
Hun.	Castor cake.		CaMatMk*.	
Juice— OlMOW …	•it		I M> ·71	
Total, Sugar …	UM		11 <-!	
UIW ToUliw[M to |t»MM …	H6		111	
	Not tmmL	1t«Md.	UBHA	-Jti.
•ft— Cane sugar … Glucose …	[illegible]	Tito	:.-u Mi	«»4
Total, Sugar …	• IT."	[illegible]	[illegible]	[illegible]
Ratio Total awUaftc—t	10·23	9·43	[illegible]	[illegible]

Murwvrr, in onlor to put tb« pro«M on • ptw*k»l fooim,-. the liming was performed tb» »imi. 'lit. of ttw Agriculiiml Kh ool.

The r Wto of th* npmoH.ni* tm drt-ikd is 8tai«amii Ko. 10. In «JI OMW - w^Hilmc- w •!»*« to hart LM gftb*] iVoa. lb* appjkuum of ibj lim in th-above described manner, though the advantage it not so great as it was in some of last year's experiments. In the first three cases, however, the amount of inversion which occurred without lime was not great, and the effect of liming is somewhat marked. In the second three cases the proportion of glucose in the juice was already very high; in one of these inversion was almost stopped, but in the other two it was considerable.

12. About this time I determined to try to do without litmus paper altogether. I had noticed that the many varieties of sugarcane juice which I had examined, all contained a colouring matter which was affected by alkalis: and it was clear that if this colouring matter could be utilized as an indicator, instead of litmus, an advantage would be gained, in that nothing but the lime would be required.

The colour of fresh cane juice varies and is not in any case well defined, but it is always more or less greenish brown. This colour is, however, almost entirely due to insoluble matters and chlorophyl and the juice itself is almost colourless. The froth which forms when it is stirred rapidly is nearly white. If, however, an excess of an alkali such as lime be added, the juice becomes yellow coloured, a colour which would be much more easily seen if it were not for the presence of the insoluble matters named; the froth of alkaline juice is very yellow. When, however, this yellow colour becomes apparent, it will be found that a considerable excess of lime has been employed and that the juice is strongly alkaline. On this account it was deemed advisable to add lime to only half the juice until it became yellow and then to add the other half of the juice to render it all acid again.

The following are the results of two experiments made at Dumraon in this way, in which ordinary hand-made gur was made: It will be seen there is evidence that liming was needed, but the amount of inversion in both uncontrolled cases was only small. At Bebsa also three lots of juice were partly neutralised with lime, and the rab, the turbine sugar, syrup and gur from the syrup all analysed.

Numbers 1, 2 and 3 in the accompanying Statements 12 and 15 are from the limed juice, while No. 4 is from unlimed juice. The effect of lime is apparent in Nos. 1 and 2 right through the series, and in the turbine sugar No. 3 and gur No. 3. The limed rab No. 1 is probably better than most. (Compare analyses in Statement No. 9):—

STATEMENT No. 12.

Composition of Rab made at Bebsa, 1897.

	Limed rab, No. 1.	Limed rab, No. 2.	Limed rab, No. 3.	Unlimed rab, No. 4.
Cane sugar	[illegible]	[illegible]	[illegible]	7·40
Glucose	13·8	[illegible]	[illegible]	4·M
Lime	·15	·14	·1	·M
Other soluble mineral matter	[illegible]	[illegible]	·85	·04
Water	[illegible]	[illegible]	[illegible]	[illegible]
Other impurities	[illegible]	[illegible]	[illegible]	[illegible]
Total, Sugar	100·00	100·00	100·00	100·00
Ratio Total sugar to glucose	3·0	1·4	[illegible]	6·1

STATEMENT No. 13.

Composition of turbine sugar from the rab.

	Turbine sugar, No. 1.	Turbine sugar, No. 2.	Turbine sugar, No. 3.	Unlimed turbine sugar, No. 4.
Cane sugar	[illegible]	[illegible]	[illegible]	[illegible]
Glucose	·77	[illegible]	·17	·84
Insoluble mineral matter	·17	[illegible]	·17	·11
Lime	·40	[illegible]	·44	[illegible]
Other soluble mineral matter	·43	[illegible]	·77	[illegible]
Water	2·97	[illegible]	1·97	2·66
Other impurities	[illegible]	[illegible]	[illegible]	[illegible]
Total, Sugar	100·00	100·00	100·00	100·00
Ratio Total Sugar to glucose	1	1·0	[illegible]	2·1

STATEMENT No. 14.

Composition oftha syrup or molasses from the four samples of rah.

	Syiu]> Xo. 1.	Sjrap No. 2.	Syrap No. 3.	Syrup No. 4.
Cane sugar	•n;-no	57·33	47-40	51-31
Glucose	MM	4·20	5-51	G-:fii
Insoluble imnerul matter	£6	•It	•14	•J2
Lime.	•40	•28		•42
Otncr soluble mineral matter	I'M	a-ra	'"2-36	2'11
Water, &c, ...	47-35	[illegible]	44-59	[illegible]
Total Sugar ,,,	100-00	100-00	100-00	100-W)
Ratio: Total Sugar to glucose ...	**80**	e-9	**10-4**	**110**

STATEMENT No. 15.

Composition of the gv,r made from the four syrups.

	No. 1.	No. 2.	No. 3.	Ho. 4.
Csue sujur ,,, ,,, ...	78-S5	61'0-t	7O-S7	60-42
Gluoonc ,.. ,,, ... ,,.	6'31	5-LH	031	8-07
ImoluLilo turners! mutter	**•20**	•77	•68	**•33**
l^inc ... ... -.	**•37**	•89	**•31**	•SB
Qttier iol able mineral mutt or	*z-fyi*	2-84	**3TS**	3-28
Water, Sc, ...	**IS'IO**	9-06	**18-80**	2073
Total Sugar ...	**IQO'OO**	100-00	X00-00	100W
Ratio: Total Sugar toGloucse ...	[illegible]	6-8	**116**	11·9

It **fa possible** that liming **might** be carried somewhat, further than was the oase in the experiments quoted. Tlie degree to which the process might safely go, that is, the proportion of juice which might safely **be tendered** yellow with lime, had to be guessed at. I think if likely **that two-thirds of** the juice might safely be rendered yellow by lime without effecting the colour of fhe resulting sugar, AB will bo seen from analyses quoted iu the next **paragraph,** it is **probable** that the quality of **tar-**bine Bugar is raised by the addition of lime before boiling down.

13. *Hand Centrifugal made sugar.*—In paragraph 9 of Agricultural Ledger Bo. 19 of 1896, the object of the Hand Centrifugal sugar separator which Messrs. Thomson andMyline Lave been gradually introducing, was briefly explained, "Whilst on tour this year I embraced an **opportunity which** offered of itself determining how much of the 6emi-refined sugur, **which** there goes by the name " turbine Sugar " and " kuchha chtni ", is obtainable from the Eab as generally made by cultivators, and the following gives die result:—

Exjjerimentl.—22§ seers of rah gave 11 seers of Turbine sugar or 48-8 percent.

Experiment 2.—26 scors of rab gave **13J** seers of turbine sugar or 51-9 per cent.

Thus judgiug by the results of tlieso two tests it may be assumed that about half weight of the rab will be obtained* as Turbine sugar.

I made some further enquiries as to the relative values of the several materials.

The prices whinh-were current at the timo of my visit were turbine sugar Ks. 5-4-0 gur, i'rom mousses Iis. 2-12-0, and ordinary gur from wliole juice Rs. 3-1-0 per ruimnd.

Tims assuming that rab yields 50 percent, of turbine sugar and the rest JB boiled down to gur, there would be obtained from one uiuund of " rab " 20 see« of turbine sugar, worth Es. 2-10-0 and about 14 seers of gur, worth lie. I, or si total of Us. 3-10-0 instead of Ks. 3-4-0 for ordinary gur.

The amount of this turbiae sugar which is made annually must be very consider-able now, and the value may be gauged iu Isvkhs of rupees. It is sent as far as Peshawar and is largely used iasweotmeat-makiug in addition to the reiiuirjuieots of the Bffgc sugar refiners.

There is also a larger market for the gar prepared from the molasses than I had previously understood. Judging by the analyses quoted in Statement *So. IS* it is quite as good as very much of the gur commonly preparea from the whole juice.

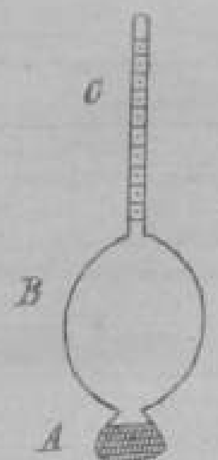
The ckeaiical composition of the several products, nib, turbine sugar, molasses and gur have been already dealt with in the previous **paragraph.**

J. WALTER LEATHER.

APPENDIX.

To find the per centage of sugar from the density of the juice. Explanation of the use of the tables. A few words in exphttuition may be of service to those who are not accustomed to use the Hydrometer.

In the first pluce it will bo well to explain that there are several descriptions of Hydrometers made, ali of which however are essentially the same in principle, and **tha** accompanying diagram represents a very common shape. Occasionally they are made of brass, bat more frequently of glass. The iastrument may be divided into three parts. A, a small bulb containing some heavy material such as mercury or shot; *B,* a larger bulb containing nothing but air; and C, the stem in which is fixed a scale of figures by which the density of the liquid is registered. The Hydrometer floats upright in liquids. So that the btdb A is downwards, and the **instrument** eouics to rest with **a** part of the stem C above the surface. The degree on the scale, whieh coincides with the surface of the liquid, corresponds to its density. Thus in a dense liquid the Hydrometer will not sink so far as it will in a lighter liquid.



In using these Hydrometers the cane juice or other liquid to bo tested is poured into a glass cylinder and the Hydrometer then put into it.

There is considerable difference between the density of such light liquids as etber and alcohol nnd such heavy ones as oil of vilriol. On this account it has been foutid convenient to make Hydrometers for liquids of only a *certain range of density* Thus for instance a series of specific) gravity Hydrometers might be the following j:—COO-SOO, 800-1,000,1,000-1,200,1,200-1,400, 1,400-1,600,1,600-1,800, 1,800-2,000. Twaddoll's Hydrometers range as follows;—No. 10°—24°, No. 2, 24°—48° ; No. 3, 48°—74°; No. 4, 74°—102"; No. 5, 102°—138°; No. 6, 138°—170°.

Thus for sugar juices one would require the specific gravity Hydrometer reading between 1,000—1,200 or Twaddell's No. 1.

There are sevend descriptions of Hydrometers mode, but only two will be here referred *to,* namely, the sjKxtific gravity Hydrometer and the Twaddell's Hydrometer. The former is (-ommonly usod for scientific work, the latter for technical purposes. I find that Twaddell'a Hydrometers are stocked by the larger firms of Apothecaries in India and they are thus readily av:iilab!e.

It will bo clear that the scale in the Hydrometer stem, is purely **arbitrary,** and as a matter of fact the two instruments here described have essentially diilerent scales.

The specific gravity Hydrometer registers the specific gravity of liquids, **that** is, the relative weights of equal volumes **of different** liquids. Thus, for simple, 1,000 on its scale is the specific gravity of water, and 1,080 might be the specific **gravity** of some sample of sugarcane juice j this wouldvnean that if we weighed, say, a quart cf **water and** a quart of the juice, we should find that the weights were k this **proportion** of 1,000 to 1,0S0.

Twaddell's Hydr.'ometer does not register thia directly. Water is registered by it as 0, and then for heavior liquids the scale ascends. Nevertheless this scale bears a simple relation to the true specific gravity, and is expressed by the following equation: degrees TwaddelW —— E —• Thus for example sp. gr. 1075= —— 5 or 15° Tw; and sp. gr. 1 0 6 0 = - ^ ^ or 12° Tw.

TABLE I.—TO *reduce observed specific gravity to specific gravity at* 15*6C *Centigrade or* 60° *Fahrenheit.*

Observed tenipcrtfcuro Centigrade,	10°—13°	14°—ir	18D-21	22—25	£6—38	39-31	33—31
Observed temperature Fahrenheit	5O'-5G°	57°-63°	d—71	72—7B	79-83	8*—89	90—93
Amount to be uldei) to or subtracted from obterved specific gmvitj.	—1	...	+ 1	+ 2	+3	+4	+5

TABLE II.—TO *reduce observed de-a&ity on TwaddeU'e Hydrometer to density at* 60° *Fahrenheit.*

Observed temperature Fahrtnbeit	to—es	56—63	01-71	73—79	80-87	86—So
Amount to be added to or snbtracted from observed density on Twfcdilcll's Hjdromoter.	—i	...	+ i	+1	+ i	+ 1

TABLE III,—*To reduw ohst-rved density on Twaddell's Hydrometer to density at* 84° *Fahrenheit.*

Oltservod temperature, FVibrenbeit M ...	40—55	6G-G3	64-71	72—79	90-87	88-93
Atnoojit to bo added to or Mibtawted from observed duusilv ou Twaddeil's Hjilromotor,	—1	-i	- i	—*	...	—1

TALIJ: IV.—*To find percentage of total sugar from s-pecific gravity or density on Twuddell's Hydrometer.*

Specific Gravity ...	IWO-il	1042-43	1041.40	1(147-18	1049-61	1063-5—	1054-66
Degrees Twadilcll ...	8	SJ	9	91	10	101	11
Per ceut. Sugar ...	8	81	9	M	lot	11	m
Specific Gravity ...	1057—S8	IO50 - 0 1	1OC2-U3	10C4-GG	10(57-68	1066-71	1072-74
Degree* Twnddalt ...	in	12	121	13	M|	11	lit
Per cent. Sojrnr	12	12|	13i	14	Hi	15	151
SpeciSc Gravity ...	1O7B-76	LO77.7L*	10!<0-S1	10S2-S4	10S5-B6	1087-69	
DegTOes Twaflrtell „	ir>	w	1G	1H1	17	m	
Per cent. Sugar ...	10	I6J	m	18	IBi	19	

It ia necessary **now** to say a word in explanation why the temperature of the **liquid** should be recorded as well as its density. Suppose a cylinder of juioe be taken, »nd the Hydrometer floated tnit, at, say, a temperature of 65° F., and the density bo found to be 12° Tw. (assuming the instrument has been standardised or compared with water at 60° F).

If the jar of jnieo with the Hydrometer be then placed in a can of warm water, so that tbejuiuo will gradually be warmed, it will be noticed that the Hydrometer sinke lower as the temperature of the jnioe rises, that is, to say the liquid becomes ligh*term* less dense. In the case quoted, the juice shows a density of12°Tw. at. 65° F. If the temperature rosu to, say,184° ~*E.,* it would "be found that the Hydrometer had sunk to 114° Tw.

Or we may suppose we hsd put the Hydrometer into aome juice early in the morning in the cold weaker of Upper Iudia, wo might haw observed thiB density of 12° Tw. and then inter in the day as it grew hot the same juioe miglit have registered only 1H^w., a change **due** simply to **the juice** becoming warmer.

A word may now be said in explanation of the difference between Hydrometers standardised at different temperatures.

The density of water on Twnddell'a Ecale is 0°. But manifestly ths temperature has something to say to this point. For example, if we put into the jar of watei a Twaddell's Hydrometer which has been standardised at 60° F., and supposing the temperature of the water is just about 60° F., we shall find the Hydrometer sinks to 0° Tw. Now warm the water until the Thermometer shows that its temperature is about 84° F., and it **will** be seen that the water has become lighter, just as the juice did in the above quoted case, and that the Hydrometer lias sunk below 0° to about —}° below. Now take this Hydrometer out and put into the water at 34° F., the Twaddell's Hydrometer which has been standardised at S4° F. It will be found to register 0° Tw. Cool the water again or put some of the cold water at 60° F. in the jar and it will be seen that (lie Hydrometer has rison a little out of the cooler water ; that is, the water lias become heavier again, and the Hydrometer registers about +1° Tw.

It is hoped that the foregoing will explain the difference between Hydrometers, why it is necessary to note the temperature of the liquid as well as the density, and what the difference is between Hydrometers standardised at one or another temperature. Usually Hydrometers are standardised at 60° F. in England, but I find that Some of those imported for use in India are standardised at 84° F. The use of the tables will now be readily explained by a few examples.

Supposing in the first place we have a *specific gravity* Hydrometer which has been standardised at 60° *F.,* and that when it is put into ajar of juice it registers 1059 and that the temperature of the juice is 72° F., we have, in tlie first place, to find from Table I what the density of the liquid would be at 60° F. Looking along the line of "observed Temperature Fahrenheit," we find under 72° the figure "+2" entered as " the amount to be added to the observed specific gravity." Consequently 2 is added to 1059 ; 1001 is the specific gravity of the liquid at 60° F. Now refer to Table 4 and under speoifio gravity 1061 we find 12| as the corresponding percentage of sugar-

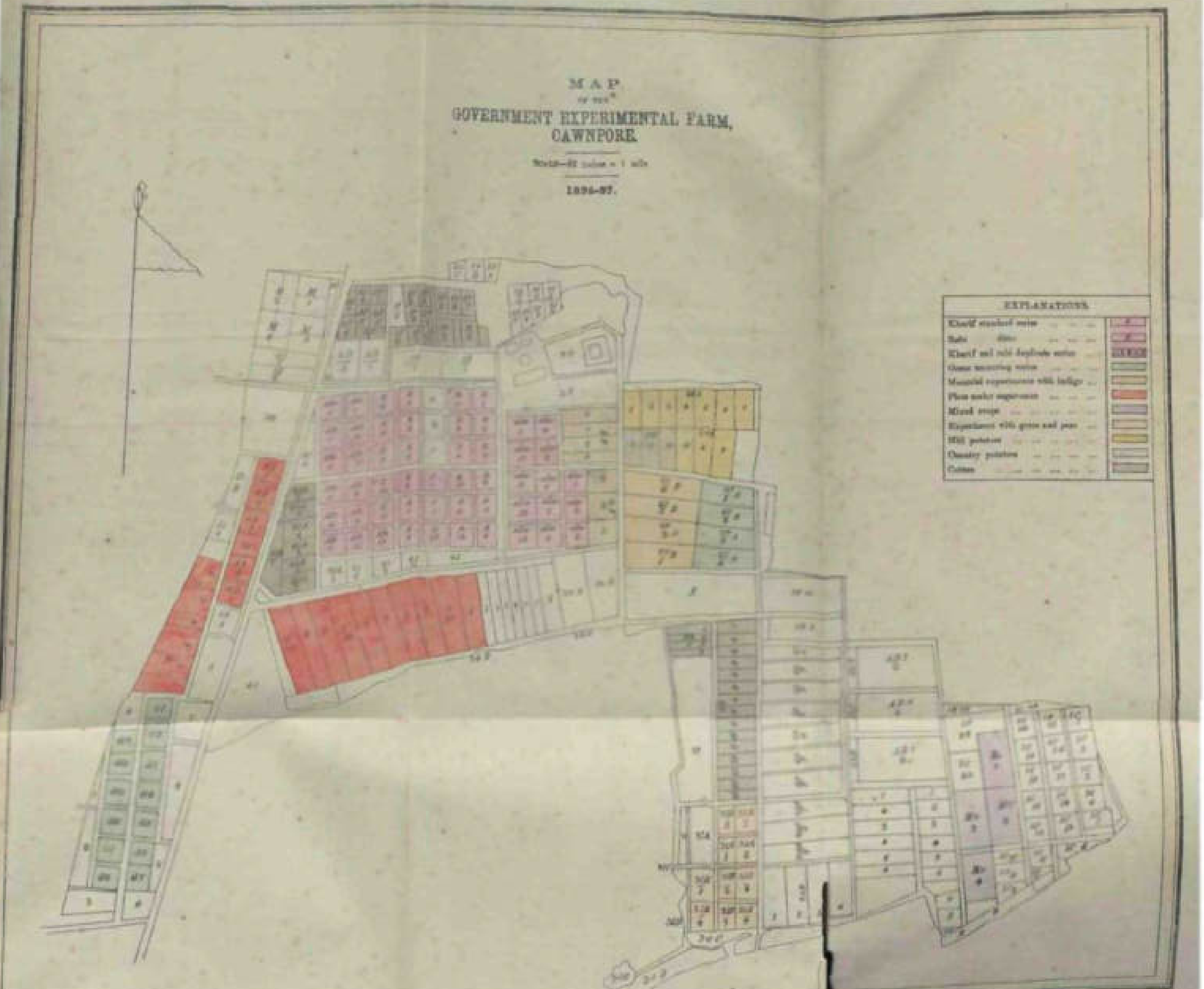
Example 2.—Supposing wo have a Twaddell's Hydrometer *No.* 1 which Las been standardised at 60° F., and when placed in ajar of juice it indicates a density of 13 Tw. at temperature 55° F. On reference to Table 2 we find that for any temperature between 49° and 55° F. J° Tw. must be subtracted from the density in order to find the density at 60° F., because the juice at 55° F. is denser than it would be at 60° F. The density of this juice would therefore be 12£° Tw. at 60° F. On reference to Table 4 we find that 12J° Tw. corresponds to I3J per cent, sugar and 13° Tw. to 14 per cent, sugar. The juice in question therefore contains between 13$ and 14 per cent, sugar or, say, 13$ per cent., which is as near the troth as we can get by this method.

Example 3.—Taking the same Hydrometer for another sample of juice pressed, may be, in the hot parfof theday or the afternoon. We find (hat it registers 16° Tw., the temperature being 86° F. From Table 2 we find that for temperatures between 80° and 87° F, we must add£°to the reading of this Hydrometer in order to find the cor**teot** density at 60° F. The density of this juice will therefore bo 16£° Tw. at 60° F, From Table 4 we find that the percentage of sugar for **s** density of 16$ ° Tw. is 18 and for a density of 17° Tw. it is 18£ ; a density of 16|° Tw. will therefore correspond to about 18J per cent, sugar.

Example 4.__Suppose **that** Me have **a** TwaddelPs Hydrometer No. 1 which has been standardised at 84° F. We have in this case to use Table 3 to correct its reading. A sample of juice is found to have a density of 14° Tw. and the temperature 75° If. On reference to Table 3 we find that for any temperature between 72° and 79° F. wt must deduct £D from the Hydrometer reading in order to find the density at 84° *F.* Thus the density of this juice will be 13|° Tw., and from T;tble 4 we find **that this** density corresponds to 14$ per ceot. sugar.

Example 5.—Another example may lie given for using this Hydrometer. A sample of juice is found to have a density of 10° Tw. at 66" F. Oa reference to Table 3 we find that for temperatures between 64° and 71° F. we must deduct 1°, thus the density at 84° F. would be 9J° Tw., and from Table 4 we find that 9J° Tw. corresponds to 9J per cent, sugar.

T. WALTER LEATHER.


MAP
OF THE
GOVERNMENT EXPERIMENTAL FARM,
CAWNPORE.
1896-97.
EXPLANATIONS.
Kharif standard series
Rabi ditto
Kharif and rabi duplicate series
Green manuring series
Manurial experiments with indigo
Plots under sugarcane
Mixed crops
Experiments with gram and peas
Hill potatoes
Country potatoes
Cotton

REPORT

ON THE

CAWNPORE EXPERIMENTAL FARM

FOR THE

KHARIF AND RABI SEASONS, 1897-98.

ALLAHABAD:

Printed by tha Sup»rIntendant - Qovornmiint Prass, N.-W. P. and Oudh.

1898.

After the work just described, the green manuring experiments nre perhaps the most interesting *ia the* Farm. After fifteen years of systematic trials, it may now be taken as fairly well established :—*(a)* that indigo refuse (old by preference) is a better fertilizer than any green crop ploughed into the ground: and *(b)* that to plough ia a greon crop gives better results than to cut the crop and plough in only thu roots : but *(o)* that eveu the root residue of a leguminous crop has a marked manorial value, the outturn, *e,g.,* of wheat *do-fadi* after the removal of a crop of hump or indigo being, *ceieris paribus,* butter than that *o[ek-fadi* wheat. It would also seem to have beau established that, when ploughed in, hemp and indigo are the best fertilizer of all the leguminous crops tried, although it is still doubtful which of those two is the richer : and that rape is the poorest fertilizer of all the crops experimented with. In their general results these conclusions are in accord with the experience of scientific agriculturists elsewhere: and the area devoted to the experiments might BOW be very materially restricted. The comparative nitrogenous value of the root residue of different leguminous crops seems the chief point of practical interest for India j the ordinary cultivator of this country will rarely be able to sacrifice a *kharif* crop by ploughing it up as green manure for his *rabi* sowings; nor has it yet been proved that it would pay him to do so.

Some useful experiments wore made in potato-growing. The country (Madrasi) potato gave its best results when treated with nitrogen (in oileake) to the amount of 100 lbs, per acre. But the outturn of the Naini *Tai* or hill potato was better all round, the best fertilizer iu this ease having been poudretle at the rate of 200 His. to the acre. Potatoes were also grown after sugarcane, getting no manure except thie residual influence *of* what had been given to the cane. The results under these conclitioaa were distinctly poor; but the experiment is only a new one and may probably not be insisted on by the Agricultural Chemist.

For sugarcane the best manurial application seems to have been 250 lbs. per acre of nitrogen (in cowduug). A very interesting table ofprofit and loss is given at page 12 of the report. It doe3 not tell us much that we did not know already t but it proves the absolutely prohibitive cost of bono manuring, and it throws doubt on the theory that the *paurtda* or chewing cane can be profitably crushed for *gitr* making. Dr. Leather, however, vigorously disputes this latter conclusion, aud further trials seem called for.

4. *Methods of cultivation,—The* most instructive experiments here have been the testings of the comparative merits of early aud late sowings for maize and cotton. Maize sown before the break of the rains has done better than seed sown after the first rainfall; but the results have not been altogether consistent in past years, and the trials must be con(iuued for some time. With cotton the advantages of early sowing iiave been fully established, aud this set of experiments is to be closed. Several new experiments are alluded to by the Assistant Director, but it is too soon to draw any conclusions from them.

5. *Varieties of crops.*—A considerable area has been devoted for some years to the growth of different varieties of native and imported cotton. Samples of the products wore submitted to the Muir Mills Company, from whom we have obtained a thoroughly practical business-like opinion. While finding some of our foreign varieties much superior to others, the expert who examined them advises us strongly against trying to acclimatise American and other exotic cottons, which he believes are aimost all sure to deteriorate as time goes on. Our efforts, he urges, should be directed towards improving the quality of the local co-ttons, especially of the variety grown ia Buadelkuand and socially suited to the soil of that country. The same fate ha? long ago overtaken cotton iu these provinces that now threatens sugai* cane: competition overriding and killing out our rough and wasteful indigenous methods. The great decline during the last 30 years in the area under cotton in many Nortli-Western Provinces districts has unquestionably had other causes than the poverty of the manufactured staple; but I think we might well profit by the advice of the Muir Mills' management and devote more attention in future to

No. 2g? OP 1S98.

J. 8. MEST02J, ESQ., I.C.S.,

DIRECTOR OP LASD RECORDS AND AGRICULTURE,

N.-"\V. PROVINCES AKD ODDH.

To

THE CHIEF SECRETARY ro GOVERNMENT,

N.-W. PROVINCES AND OTTPH,

ALLAHABAD.

Dated Cavmpore, the 7th of October 1J98.

SIR,

I HAVE the honour to submit a report on the working of the Cawnpore Experimental Farm for the agricultural year 1897-93. The preparation of the report has been delayed by the unfortunate absenoe of Mr. P. V. Subbiah, the Principal of the Agricultural School, who was in direct charge of the Farm during the first iialf of the year, Mr. Snbbiah took privilege leave in February and went home to Madras, where he became seriously ill. He has not yet been able to rejoin his post; and as he left no complete memoranda on the working of the Farm, it was not easy to collect the materials for this report. The Assistant Director, however, has bsen in immediate charge since February, and he has been able to tabulate*all necessary information, which he has embodied in an unusually full and interesting report.

The report has been submitted, before printing, to Dr. Leather, the Assistant Agricultural Chemist to the Government of India, who has suggested some modifications in details, and whose more important criticisms are printed in italics in the margin of the paragraphs to which they directly refer.

2. The season was a good one on the whole. The rainfall was under the normal, but it was well distributed ; and the canal irrigation prevents any untoward results from the exceptionally dry nature of the cold weather,

t

3. *Manures*-—The mamma! experiments have hitherto been among the most prominent features of the Farm work. Tho "Standard " and "Duplicate" series show, side by side, the effects of certain manures on fields where only maize is grown, where only wheat is growc, and where maize and wheat are growa in alternation. Cowdung and sheeptlung have again proved their superiority to chemical manures, though poudrette runs them close; and the results have so uniformly pointed to the same conclusion that the Agricultural Chemist will be asked to suggest some other points for determination in connection with this long established series of experimental plots.

Maize grown on fields where nothing but maize is over grown has yielded the abnormally high outturn of 3,733 lbs per acre: on fields where it alternates with wheat, the maximum yield was only 100 lbs. iess; and even the unmannred plots were as productive as the manured land has often been in former years. This exceptional fertility may bo partly due to the excellence of the season: but one of its main causes was the fact that the maize seed had been dibbled into the ground instead of being sown in the plough furrow. This change in the method of cultivation may give instructive results, and will be watched with interest in future. The maximum jieldof wheat was the same, 2,880 His. per acre, in both the Standard and Dupiicato series: in uumanurod ground, where it was sown *do-fasli* after maize, the best outturn was 2,360 lbs. per acre. The presumption is strong that, *ceteris paribiis,* the rotation of maize and wheat will always be more profitable to the husbandman than either *ek-faeli* wheat or *ek-fadi* maize; and the object of the "Standard" series of experiments need not be taken as an endeavour to prove any superior profit in tho *elc-fasli* method.

working up the better local varieties. At the same time, as Dr. Leather points out, a consistent study of the behaviour of foreign cottons at the Farm should give valuable assistance in the general question of improving the staple.

American wheat and Canadian oats have botli given excellent crops. The former shows promise of maintaining its reputation as being rust-proof. Experiments with Australian wheat and imported carrots have formed the subject of separate and detailed reports to Government.

6. *Implements.*—A great deal of the Farm work has again been done with improved ploughs, anil the Assistant Director's comments on their working (pages 30 and 31) are interesting, A deep furrow, he concludes, *has* little, if any, advantages over a shallow one in a dry season, but it saves time and labour aud gets the seed-bed ready quicker than is possible with tlio country plough.

The]>opu!arity of our improved ploughs is steadily increasing. We soil 158 thia year as against 99 last year, and the number of indents that continue to come in is encouraging. Our chain pumps, too, are in considerable request: their value as water-lifts from a depth which is just too much for ;i single *berl* is well recognised. The Batdeo water-lift is being carofully tested and improved ; to visitors it is tito most attractive feature in our implement yard, and it has a useful future before it. "We continue to find constant employment for our well-borers and their tools and would be glad if we could afford several new sets of the necessary instruments to meet the many requisitions that reach as.

7. *Distribution of seed.*—Tiie table on page 31 shows the extent to which this very useful work is being carried out by this Department. Excluding carrot seed whicli was being distributed under the orders of Government, WR issued altogether 54 tons of selected seed during the year. Last year the issue waa only S tons, if we exclude the exceptional indents for wheat (150,000lbs.) from the- Shan States as well as the imported carrots; and in the year before it was 10 tons. Even if wo leave out of account the large quantities of kodon, *&O.,* that we specially collected for the Eerars during the year under report, our business as seed agents covered close ou 30 tons. This branch of our work is steadily increasing, and the resources of our small staff are at times severely strained to meet the demand on it.

At my s]>ecial request, the Assistant Director has devoted some laad in the Farm to specific experiments in the improvement of seed. The system is the same as English growers follow in establishing pedigree wheat, and the recognition of its value in this country is badly needed. So far tho experiments have extended only to maize: but wheat will be taken up in the coming *rabi* season.

8. There has been very little spare titue to devote to the great question of cattle breeding, but a certain amount of useful work lias becu done in that direction. Wo are slowly establishing a reserve of good breeding cattle at the Farm, and we endeavour to procure bulls of the most suitable strains for persons who consult us in the matter.

9. In concluding this review I would ask the permission of Government to offer B few remarks on certain allusions made in the Board's Revenue Administration Report for 1S9G-97 to the agricultural side of tho working of this Department. The allusions were of a two-fold nature,—criticisms on our methods, and suggestions for tho future. The latter may be dealt with first. In paragraph 28 of its review of tho Administration Report, Government expressed a wish that we should devote, attention to measures calculated to improvo tho quality of seed stocks. In paragraph 7 of this letter, I hnvo endeavoured to show that the subject tins already a most prominent place in the work of the Dtspartmant, tmd no opportunity ie lost of uxlumliDg our Operations in this direction. The question of establishing local depots for the purchase and sale of selected seed is a large and not altogether an easy ono; but, during the coming tour season, I will consult District Officers as to the project, and will thou address Government as to tho extent of the preliminary assistance that will be necessary for carrying the scheme into effect. In the meanwhile, officers who are interested in the improvement of seed stocks would greatly help us if they would

encourage agriculturists in their district to indent on our Farm office at **Cawnpoffl** for any improved varieties of seeds that tbey are unable lo procure in tlie local markets.

The strictures pnsspd hy the Board at page OS of the **Administration** Report o "the mothods of the ordinary experimental **Farms"** are presumably of a **general** import and are not directed at the Cnwnpore Farm, where **experiments** with unprocurable chemical sutetances are not carried on except to the most limited extent. During the last agricultural year onr outlay on purchased manures "waB Us. 570. For the simplest and most every -day fnrtn of maun re for the same area we should have had to pay at least Rs. 300, so tbat tlia cost of onr experiments " regarding the fertilizing power of different manures and chemical substances" **cants** 1o not more than RH. 270. Mr, Eruce's *obiter dictum,* on which the Board's strictures were based, was also wide of our work at the Cawnpore Farm. Neither Dr. Leather, who has been consulted in the matter, nor the Assistant Director nor myself can call to mind at Cawnpore any precise " agricultural experiments which modern bacteriological researches have rendered obsolete." Our work at Cawnpore is, so for as possl bte, **carried** out on lines which any intelligent agriculturist in this country can follow. **Where** this is not the case, the experiments have been taken up under the direction of experts deputed to advisa us by the Imperial Government, and are not lightly to he set aside. The discoveries of bacteriological science, *e.g.,* in regard to the conversion of nitrogen into plant food *hy* the agenoy of bacteria and in regard to the part played hy certain leguminous plants in its assimilation, are carefully watuhed by the Farm authorities: hut it would bo a mistake to assume that, these discoveries dispense with the necessity for **quantitative** experiments conducted with due reference to local conditions.

I have tho honour to be,

SIR,

Your most obedient servant,

J. S. MESTOX,

Director.

Report on the Cawnpore Experimental Farm for the Kharifand Mail Seasons 1807-08.

I.-HISTOBY OF THE FARM.

THE Government Experimental Farm ia situated in village Gotaiya about three miles south-west, of the Cawnpore city, within a few yards of the Kawatpur Station of the C'awnpore-Acbnera Railway, and at a distance of about four miles from the Cavnpore East Indian Railway and the Oudh and Rohilkband Railway Stations. The land occupied was originally rooted from the *zamind&rs* of Gotaiya in May 18S1, and in that year the important manurial experiments still carried on iu the " standard" and " duplicate" series, which will be described presently, were started by Mr. J. B. Fuller, then Assistant Director of the Department of Land Records and Agriculture. Within a short distance of the Farm premises, a small workshop for making and repairing agricultural implements and a seed store, botii etill in cxistemce, were erected.

During the first years of management the aica of the Farm underwent frequent changes, but of late it has not varied. The Farm proper, of which a map is attached, extends over 51'33 acres excluding the land covered by the distributary from the Ganges Canal, whicii is the only source of irrigation for the crops grown.

The ownership of the Farm channel had been a subject of dispute between the Canal De]>artment and the Department of Agriculture for some time, but it was ettled amicably during the year uudcr report, the Caual Department having agreed o an arrangement under which a timely supply of water sufficient to meet the require- ents of ihe Farm is guaranteed, and the use of tho channel by private cultivators the neighbourhood of the Farm restricted.

The soil of the Farm may ba accepted as a fair sample of the light reddish loam hich occurs ttver a large portion of the Ganges-Jumna Do£b. It was chemicnlly analysed some time before 1882 by Mr. S. A. Hill, B.Sc., Meteorological Reporter to the Government of the North-Western Provinces, and the analysis is givan below :—

Constituents.	Composition
Combin<sl water	2-04
Organic matter	0-16
Carbon dioxide	0·16
Ammonia	J'ona.
Nitric peatuiida	0'11
Cliioriui!	Tr«ce.
Sulpbur Ixiositln	Do.
P)it«[>bornfl penloxide	O·ol
Silicn nnd Uiigntic oiido	0·12
Alumina	i-SO
Oiidea of iron and manganese	S-59
Lime	0'90
Magnesia	0·91
Potasb	0-38
Soda	O'OS
CIsy Jeoomposoi *by* II-S1V (AIuniidB and oiide of iron	3-37
Silica	
Insotullo s;uul	78-50

Dr, Voelcker in his report on " Improvements of Indian Agriculture " records the following opinion regarding the Farm:—

" In fact, I was much pleased with the Cawnpore Farm, and was not prepared to find in India anything which so nearly came up to my idea of what an esperimen- staiion should be,"

Several fields had been found by experience to suffer from water-logging when **much** rain fell within a limited period. The level of such fields, ***vis.,*** plots No. 4, £j), 10 and 11 of the " *kkarif* standard series" and plots I, % and 3 Ala of tho "duplicate series,'- was wised ia ISOiby means of spreading earth.*dag* out from uncultivated strips of land adjoining, in order to improve the drainage.

same year large quantities of earth taken from the canal distributary were spread for similar purpose on a plot (field No. 9 on the map) which used to be under water in the greater part of the rainy season every year.

II.-GENEEAL CHAKACTER OF THE SEASON.

The year under report was on the whole not quite favourable for agricultural operations, the total rainfall during the year having been about 8 indies below normal. In none of the rainy months did the **rainfall** attain the normal figure, yet it was-well distributed and proved just sufficient to meet the requirements of tha *hkarlf* crops which on the whole produced a good yield, the highest outturn of maize (3,733 fts. per acre) having beaten the record of **the** Farm. The monsoon rains practically ceased in the middle of September and iu the beginning of October ; the Farm received a.rainfall of only '22 inches which was followed by continuous hot and sunny weather. As a result the soil of the Farm could not retain the amount of moistuTe necessary for good germination, and was unusually dry at the time of sowing. It was expected that the deficiency might bo made iqi by timely winter rains, btit these did not oome on unfortunately until as late as the tOth of February, when, instead of proving beneficial to the crops, they did tbctn some injury, accompanied as they were with high winds, by knocking down the more luxuriant plants in fields under high cultivation and favouring development of rust iu others ; the crops having bo?n already sufficiently watered before the rain fell. The *Tabi* season, therefore, was not altogether favourable, and the wheat crop suffered mainly from the circumstances just mentioned, though the damage was by no means of a serious character.

The following table compares the rainfall of the year under report with that of the past year.

Table^howing the amount of rainfall dwiwj the year under rejwrt and the year preceding it.

Xratk	Actual.				KormaE.	
	Kaiufall.		Itiiny day i.		Eaiufall.	Beta] days.
	1800-97.	1B97.98.	183U-97.	L887-99.		
AF;I	...	...	...	...	•11	.
May	•25	...	1	...	-6B	1
Juno	3-80	1-20	10	G	3-J1	4
July	540	5-lfc	17	13	10-2,)	12
Au^nst	t-31	10-33	17	at	10-08	13
September	•59	4-30	2	;t	[illegible]	[illegible]
OutobtT	...	•22	...	[illegible]	1'22	2
November	•48	...	1	...	...	...
December	•99	...	2	...	•31	1
January	1-23	...	»	...	•01	1
February	...	1*63	...	3	•23	1
March	...	•03	...	1	•26	1
Total	1775	£5-73	52	58'	3113	43

EL-TRIAL OF MANURES.

(a) *Permanent manurial experiment with maize and wheat.*

These oxperiments are carried on on four seta of 13 plots each. One set is sowu with maize and another with wheat, year after year, and the remaining two with maize and wheat alternately, so that maize follows wheat after a fallow of about three months, and wheat fallows maize after a fallow of nearly 13 months. Thus, when one of these two sets bears maize, the other remains fallow. The two sets cropped every year with maize and wheat are respectively called the *hkarlf* and the *rahi* standard series, and tho other two are known as the duplicate or alternate series. The manurial treatment of a plot in the " standard series " is idcnfical with that of the corresponding plot in the "duplicate series " in case of maize as well as wheat.

DETAILS OF CULTIVATION.

The kharif standard series.

The plots of the *kharif* **standard** series were ploughed with the Howard's pony plough twice, **subsoiled with** the Watt's plough once, cultivated with the Planet Jr. horse-hoe five times, and **levelled** with the *paiela* (wooden flat beam) three times. The **different** kinds of manures were applied to the **various** plots on the 1st of June, except saltpetre, which was applied on the 2Gth of June. Selected maize seed of the Jaunpur variety was sown on **the** H1h of June.

In the year under report a new method of sowing was adopted which consisted in dibbling two grains in holes made on regular lines, **each** two feet apart from each other. The distance kept between two holes was one foot; and thus each plant got two square feet of ground to grow and spread on. Under this new method of cultivation the plants grew more luxuriantly and vigorously than in former years under the ordinary method of sowing the seed in furrows behind the country plough, and the cobs sprang up at *a.* higher place in the stem beyond the reach of wild animals which usually damage the crop.

The seed began to germinate after five or six days and after 15 days the weaker plants were thinned out. The crop was weeded and earthed up twice during the season. In order to soften the land and make it fit for ploughing, canal water had been applied once in October 1898 just after the removal of the previous crop. In 1897, two waterings were given during the period of growth of the crop and two before sowing. The crop was harvested on the 5th of September 1S97.

The kharif duplicate series.

In this series it is not possible to carry out the tillage operations to the same elaborate extent as is done in the standard series, because the latter gets a rest of nine months while the former remains fallow for three months only; but, except for the number of ploughings the treatment of both the series in respect **of tillage** is practically the same.

The respective outturns of the two series of the maize plots are shown in the two subjoined statements :—

(I) *Statement showing the outturn of the kharif standard series*—**Maize.**

Plot number.	Plot area.	Treatment with reference to manure per acre.		Outturn per acre in pounds. Average outturn for four years 1883-84 to 1886-87.	Average outturn for four years 188H-90 to 1892-93.	Average outturn for four years 1893-94 to 1896-97.	1897-98.
K 3	Each plot = 400 square yards.	Cow-dung 180 maunds	Grain	1,139	9G8	1.793	8.1SS
			Straw	4,387	4,810	9,488	13,11G
K 1		Cow-dung 180 maunds and bone-meal 41 maunds.	Grain	1,600	1,010	1,821	3,243
			Straw	5,353	G.Klu	9.811	14,826
K 2		Cow-dung 180 maunds and gypsum 3 maunds	Grain	1,289	1,219	1.860	3,424
			Straw	5,30!)	6,816	10,487	11,774
K 10		Sheep-dung 180 maunds	Grain	7ii!)	995	2,338	3,733
			Straw	4,463	6,399	10,206	14,907
K 7		Sheep-dung 180 maunds and ...	Grain	1,149	1,258	2,291	3,025
			Straw	6,049	6,668	10,960	12,047
K 12		Sheep-dung 180 maunds and gypsum 3 maunds.	Grain	1,005	1,189	2,0U	:i,225
			Straw	4,251	4.970	9,772	11,047
K 9		Poudrette 180 maunds	Grain	1.Dl')	10,71	1,801	3,527
			Straw	fi,144	0,522	8,7lJ8	14,950
K 5		Saltpetre 3 maunds	Grain	1,113	733	1,00?	2,.-,U
			Straw	5.GSQ	3,777	(5,702	11,079
K 11		Saltpetre 3 maunds and bone-meal ... maunds.	Grain	1,150	835	1,232	3fi96
			Straw	5,273	5,351	5,702	13,467
K 6		Saltpetre 3 maunds and bone ... superphosphate 3 maunds.	Grain	1,003	1,025	1,552	2,810
			Straw	3,958	3,981	7,018	H.257
K 4		Ashes of 180 maunds of cow-dung	Grain	802	680	982	S.411
			Straw	4,C07	6,019	G.G81	[illegible]
K 8		Ashes of 180 maunds of cow-dung and saltpetre	Grain	1,233	9S9	1,649	S,713
			Straw	4,964	5,551	6,447	12,Sii2
K 13		No manure	Grain	702	478	813	3,021
			Straw	4,377	3,082	6,'tiu	8,047

In 1887-88 and 1888-89 the crop of maize was destroyed by rain and no produce was obtained, hence no outturn for these years has been shown in this statement. For individual outturns of the year for which averages have been given in columns 4 and 5 above, the reader may refer to the report for the year 1895-96.

(2) *Statement, showing the outturn of the hharif alternate* **series—Maiae.**

Plot		Treatment with reference to manure per acre.		Outturn pec at re in pound i. Average outtnrn for four years 1888-84 to 1BSG-87.	Average outturn fo four years 1889.80 to 1802-113.	Av£ra«o •"IIIMTj fo] four y.-ars 18H3-»4 to 18'J6 U7.	1897-98,
Alb, C		Cow-dnng 180 inanndi	,,, f *Onia* ...	1,005	ST>3	1.001	S,S89
			Straw	4,531	4,0 5H	6,015	H.G53
» 7		Cow-duup 180 maniidt and bone-dual *11* inminda.	(Grain	1,0i;i)	1,098	901	1,123
			£ Straw	4,037	6,201	E.822	7,7HL>
., 8		Coiriliiii^ l.so maundj **and.** gyp. aiiiu It iiiiitiiiiis.	(Grain	L'T.i	971	1,088	2,LIi2
			£ Straw	4,53(1	6,401	G,389	12,040
.. 1		Shwp-dmtg ISO uidundj ...	(&'«"	**914**	\3$l	1.C0J	1,B7a
			Straw	**4,860**	6,330	**7,259**	10,442
,. 10		**Steep-dung 180** mauudaund bone-iluat -!i lnminds.	GmiTi	7>:r.	**1.160**	1,400	8,688
			(Stmw	3,740	5.0C0	7,5!U	**13.794**
,, 12	3	Sheep-dung ISO nrnnnds Mid gyp. mm 3 inuanda.	< Grain	833	1,143	**1,390**	3,373
	E		I Straw	4,085	6,424	7i«a	1 I.1S-1
» 2		Poudrttte lSOmaunda	[Grain	1,213	1,406	4,213	**1,794**
			j. Straw	4,618	C.479	[illegible]	10.019
> 4		Ssltpetre 3 maiiDdi...	J?™n	*en*	*Ki*	ME	2,228
			Straw	*SflOQ*	4.271	5302	7.7E*a
., E		Saltpetre 3 raauti da and bona-d.u6t **amnai,,**	t Brain	1,201	8-tC	9S3	2,493
			[Straw	3,870	6,«02	8,108	**16,648**
« n	J 1	baltpetre 3 mauncis and bone snporplioapU»t«3mauntU.	i Grain	*l-.ir,*	1,009	701	1,410
			\ Straw	8,888	4,034	5,738	3,946
.. 0	1	Ashca of 180 tnaunds of cow-dung	j j*™'"	555	820	G78	2,133
			Straw	8,621	6,197	6,091	6,301
a 3		AahesoC 130 raannda of cow^niig and aaJtpatre 3 maunds.	C Grain	902	1.U12	II-,	2,015V
			[Strsiv	**5,2as**		7,702	10 903
u 13	1	Unmatmrcd	J Grnin	441	C17	514	1,867
			I Straw ...	3,145	3.020	**4,064**	11,314

if. *B.— Vidt* footnote to fcbe last precediug statement.

tfft ran- '-"> *mon* *pntetg* """,,*{Z* UMIIU

J- *W, LEATHER.*

It wiil ^ seen that during the year under report the plots treated wttti sbeep-dung* alone or in combination with concentrated manures gave the best outturns as ia PreTious Jears» the cow-dung aud poudrette plots coming next. These results confirm tb0Se obtailled *in* former)'ea^> *vis., that* nitrogenous manures arc specially **beneficial** to **maize.**

It will **also** appear that the outturns obtained during the year under report have been much higher than those **obtained** in previous years, the unmanured plots yielding 2,021 jfea. per acre in the **standard** and^ 1,857 lbs. per acre **in** the duplicate series, whieh' tile manured plots did not yield in many eases in past years. In fact tbe highest outturn, 3,733 as., obtained this **year** has never been attained siace the commencement of the experiment The reason seems to lie in the new method of sowing adopted during the year under report In early and late sowing experiments to be noticed further on in part IV of this report, **the** plot sown with maize by the ordinary country method yielded less than the unmauured plots sown by the improved method in the **two** scries just described.

***The** rabi standard and duplicate* series—Wheat.

The t illagef opemt ions of these series consisted of four ploughings with the Watt's **plough** aud two with the 3:irgc Howard's plough, cultivating twice with the Planet **Jr. horse-hoe** and levelling four times with the *pateta* {wooden flat beam). Before-snwmix, ,],,. **ground ma dearod »£ weeds** ***eon.*** All **msnorea except saltpetre, which** was used asa top dressing on tho 29th of October 1S97, wen spread on the lOthand 11th of October and ploughed in. Muzaffarnagai wheat seed was sown on the 12th of October 1897 at the rate of lOOfts. per acre. The crop was weeded once in the first week of December aud irrigated fiva times during the Beason. Where germination had been poor in a plot, tho blank spaces were filled in by transplanting **plants** from that portion of the plot where tho germination **had** been too close. This method of filling **vacancies** has been practised since 1895-96.

I « L **V? !aHi. 'ra!™tered I'U « J 1897 to (often tbe soil for ploughing nnd the tilings commenced on **tte** J3ib of Jloy. TIis fields were ploughed *tv-ite* ju Hay, «tice in July, once in Aticuat, onco in Scptcmbor aud once IU October ; tUo last llireo plong!iitu>j woro fuUttwod *hy* ImlUog tlie (tround witn tlio *patela.* Tbe plote wera cultivated oa^ein *May* und itgoln it. October, tbe ground bciiiR levelled with the *patela* after tbo cultivHting in October. Tho crop was irrigated ouco a month from October 1807 to Februarj

The crop in plots No. 1, 2, 4, 5, 10 and 12 of the duplicate series was severely knocked down by the high wind and rain of the 10th February 1898. The fields were harvested on the 27th and 28th of March 1898. The following statements show the results obtained during the year under report and in previous years :—

(3) *Statement showing the outturn of the rabi standard series.*—Wheat.

Plot number.	Plot area.	Treatment with reference to manure per acre.		Average outturn for five years 1883-84 to 1887-88.	Average outturn for five years 1888-89 to 1892-93.	1893-94.	1894-95.	1895-96.	1896-97.	1897-98.
				Outturn per acre in pounds.						
R 3	Each plot=400 square yards.	Cow-dung 180 maunds ...	Grain	[illegible]	1,581	I.6S8	1,0(34	2.7C5	[illegible]	2,381
			Straw	2,477	S,0M	3.333	[illegible]	4,283	6,070	[illegible]
R 4		Cow-dung 180 maunds and bone-dust 41 maunds,	Grain	1.S60	1,7HJO	1,700	[illegible]	2,310	2.472	2,880
			Straw	3,243	[illegible]	9,908	1,113	[illegible]	4,662	4,198
R 5		Cow-dung 180 maunds and gypsum 3 maunds,	Grain	1,496	[illegible]	1,63!]	1,984	[illegible]	s,5S8	[illegible]
			Straw	8,430	3,070	3,122	793	5.7$ i	I 4,fi74	4781
R 6		Sheep-dung 180 maunds ...	Grain	1,370	[illegible]	2,016	1,110	3,001	8,976	2,543
			Straw	2.1OS	[illegible]	3,77S	1.U95	[illegible]	JS.J3J	0.518
R 8		Sheep-dung 180 maunds and bone dust 41 maunds.	Grain	1.oas	1,584	8,088	2.->JX	[illegible]	3.107	[illegible]
			Straw	3,031	,337	Mini)	W74	[illegible]	6,311	1.46S
R 10		Sheep-dung 180 maunds and gypsum 3 maunds ...	Grain	1,193	1,7+8	,331)	[illegible]	3,146	S,*;6	2,263
			Straw	3.27!i	3,009	J.7C9	2,232	[illegible]	4.S7I	[illegible]
R 12		Pondrette 180 maunds ...	Grain	1.25S	1,699	.528	1,181	2,819	2.S89	[illegible]
			Straw	1,030	3.U11	.7G4	2,299	5,975	•1.107	[illegible]
R 1		Saltpetre, 3 maunds ...	Grain	1,357	1.119	,G30	1,313	1.889	1,853	.851
			Straw	2,503	2,77(i	,327	1,839	2,432	8,486	[illegible]
R 2		Saltpetre 3 maunds and bone-dust 41 maunds ...	Grain	1,206	1,480	,053	1,064	2.0U3	1,948	2,154
			Straw	2,r,:ii3	B.666	,SS6	1,851	[illegible]	2.703	4.29U
R 9		Saltpetre 3 maunds and superphosphate 3 maunds,	Grain	1.HS0	1.427	[illegible]	1.156	2,436	3,830	[illegible]
			Straw	E.886	2,808	[illegible]	2,105	3,310	•kWS	,533
R 7		Ashes of 180 maunds of cow-dung.	Grain	[illegible]	1,339	[illegible]	72ti	[illegible]	1,757	,743
			Straw	1,846	2.4L3	[illegible]	[illegible]	(.881	3,261	,928
R 13		Ashes of 180 maunds of cow-dung and saltpetre 3 maunds.	Grain	1,298	[illegible]	[illegible]	998	3^96	2,188	,827
			Straw	2,305	[illegible]	[illegible]	1.742	3,606	[illegible]	,+73
R 11		Unmanured ...	Grain	91S	[illegible]	[illegible]	4S4	2.257	J.723	,n-r
			Straw	[illegible]	[illegible]	[illegible]	9SG	[illegible]	3.Q10	,154

N.B.—The reader will find in the report on the Farm for 1895-96 the individual outturns for the years of which the averages have been given in columns 4 and 5 above.

(4) *Statement showing the outturn of the rabi duplicate series*—Wheat.

Plot number.	Plot area.	Treatment with reference to manure per acre.		Average outturn for five years 1883-84 to 1887-88.	Average outturn for five years 1888-89 to 1892-93.	1893-94.	1894-95.	1895-96.	1896-97.	1897-98.
				Outturn per acre in pounds.						
Ala 3	Each plot=400 square yards.	Cow-dung 180 maunds	Grain	[illegible]	1,81"	U4S2	874	2,184	2,729	2,H2
			Straw	3,016	3,352	[illegible]	1,730	S.80S	e,I31	S,3fi«
Ala 4		Cow-dung 180 maunds and bone-dust 41 maunds.	Grain	1,739	1.5S2	1,263	1.2S0	1,900	2,553	2,041
			Straw	2,873	3,1 H2	2,532	I,fl21		[illegible]	[illegible]
Ala 5		Cow-dung 180 maunds and gypsum 3 maunds.	Grain	J.773		1,713	1,074		-',71']	2,268
			Straw	2,770	2,074	3,433	1.7MI;	[illegible]	4.471	|3,(J78
Ala 6		Sheep-dung 180 maunds	Grain	1,002	i.noi	1,730	U6S6	[illegible]	[illegible]	[illegible]
			Straw	3,U54	2,886	3,784	2,747	5,817	[illegible]	3.5S2
Ala 8		Sheep-dung 180 maunds and bone-dust 41 maunds,	Grain	1,750	1.742	2,033	1,2s,;	3,104	2,777	2,lMl
			Straw	2,948	8,(66	3,545	J IE6	5,121	[illegible]	3,2-13
Ala 10		Sheep-dung 180 maunds and gypsum 3 maunds	Grain	1,589	1,:<2t	1.0G0	1.21.1	2.tt83	[illegible]	2,565
			Straw	2,908	8,579	4,283	2,154	5,263	[illegible]	fi.OKS
Ala 12		Pondrette 180 maunds ...	Grain	1,6-W	1,PG8	1^75	1,180	3,0<)l	3,219	2,553
			Straw	2,9 fW	3,944	4,253	2,130	6,820	[illegible]	E,13O
Ala 1		Saltpetre 3 maunds ...	Grain	1.7S5	1,123	,736	1,443	2,353	[illegible]	2,880
			Straw	3,132	[illegible]	3,'Jlt>	2,2D1	4,501	J.830	4,477
Ala 2		Saltpetre 3 maunds and bone-dust 41 maunds.	Grain	2.137	1.G20	,742	1.4U1	,5JiJ	[illegible]	2,372
			Straw	3,682	3,034	[illegible]	2,11s	JBII	[illegible]	6,276
Ala 9		Saltpetre 3 maunds and bone-superphosphate 3 maunds,	Grain	1,803	1,51)5	[illegible]	1,261	,927	[illegible]	1,307
			Straw	3,370	2,505	[illegible]	2,323	,09S	[illegible]	2,275
Ala 7		Ashes of 180 maunds of cow-dung.	Grain	1,457	1,260	[illegible]	1,032	fiSO	[illegible]	2,239
			Straw	2,57G	2,0:t8	[illegible]	1,767	,985	[illegible]	1,078
Ala 13		Ashes of 180 maunds of cow-dung and saltpetre 3 maunds.	Grain	i,2aa	1,564	[illegible]	1,2.19	,408	[illegible]	1,246
			Straw	3,874	B8W	[illegible]	2,C57	,102	[illegible]	I,CM
Ala 11		Unmanured ...	Grain	1,318	[illegible]	[illegible]	SW	,183	[illegible]	2,3 CO
			Straw	2,407	i',475	[illegible]	1,077	,170	[illegible]	3,812

N.B.—Vide note to the last preceding statement.

It will be seen that in the standard series the best results have been obtained during the year from nitrogenous manures, [illegible] cow-dung and sheep-dung, with or without bone-dust, and saltpetre with bone-superphosphate. In [illegible] result is consistent with the conclusion arrived at [illegible] past year, [illegible] have been [illegible] that [illegible] sheep-dung plus gypsum an[d] [illegible] manures [illegible] applied alone and with bone-dust [illegible] best outturns. But the rem[aining] [illegible] and pondrette nitrogenous manures have given the [illegible] red plot No. [illegible] is due to the fact that the season [illegible] than [illegible] the seed-bed, when prepared, lacked in the degree of moisture necessary for perfectly healthy germination, and that the seed was sown a few days earlier than usual. In some plots the seed germinated [illegible]ly, in others the young plants succumbed t[o the] effects of the heat,—[an u]nfortunate circumstance wh[illegible] be [illegible]pletely by transplanting young plants into the blank [illegible] an[illegible]turn was the inevitable consequence. It may be added that under similar circumstances fields were re-sown by cultivators in the neighbourhood of the Farm and by the students of the Agricultural School. But of course in experimental cultivation such a procedure would have been open to serious objections, and was therefore not adopted.

(b) Manurial experiments with potatoes.

This experiment in its present form was started in 1896 under the directions of Dr. Leather, as mentioned in the last year's report. Two varieties of potatoes, *viz.*, the white-skinned Madrasi of Farukhabad and the hill variety of Naini Tal, were grown on two sets of ten plots each.

Detail of cultivation of the Madrasi variety.

Tillage.—Ploughing with Watt's [illegible] twice, and levelling with *patela* three times.

Manuring.—The manures were applied on 14th November.

Sowing.—This was done on 16th and 17th October on ridges two feet apart made by the Planet Jr. horse-hoe, whole tubers being dibbled in holes nine inches apart along the ridges at the rate of 808 lbs. per acre.

Weeding and earthing up.—Once during the growth.

Irrigation.—Once before sowing and nine times afterwards.

Harvesting.—The crop was dug up on 12th and 13th March 1898.

The subjoined table gives the result of the experiment obtained during the year under report and the previous year.

Statement showing the effects of certain manures on country potato (Madrasi variety).

Plot number.	Plot area.	Manures applied per acre.	Actual quantity of manure applied per acre in 1897-98.	Outturn per acre in lbs. for 1896-97.	Outturn per acre in lbs. for 1897-98.
1	Each plot = 484 square yards.	Unmanured	...	9,800	6,500
2		Pondrette @ 200 lbs. nitrogen per acre ...	93,020	7,720	11,640
3		Ditto @ 100 lbs. ditto ...	46,510	5,700	9,730
4		Cow-dung @ 200 lbs. ditto ...	37,040	9,730	9,130
5		Ditto @ 100 lbs. ditto ...	18,520	9,260	7,340
6		Castor cake @ 200 lbs. ditto ...	2,900	4,740	9,410
7		Ditto @ 100 lbs. ditto ...	1,450	8,430	10,280
8		Saltpetre @ 50 lbs. nitrogen per acre and bone meal @ 50 lbs. nitrogen per acre ...	530 1,450	7,900	9,200
9		Saltpetre @ 50 lbs. nitrogen per acre and bone superphosphate @ 50 lbs. nitrogen per acre ...	530 1,850	6,780	1,000
10		Unmanured	...	4,080	6,100

It was stated in the past year's report that no attempt could ba made at drawing any conclusions from the results of that year as the plots were obviously not of uniform fertility at the commencement. From the results obtained during the year under report it *is* expected that aftor a year or two it will be possible to arrive at Bome definile conclusion, because, contrary to the past year's result, the manured plots except the one treated with cow-dung at lOOIbs. nitrogen per acre have givon better outturns than the unmauured plots.

The chief reason for the low outturn of plot N"o. $\frac{24}{5}$ seems to lie in uneven germination, caused by water-logging in the low lying portions of the field.

Details of cultivation of thu ^faini Tal variety.

The same operations were carried 0l1 in this series of plots under the above-named variety as in the series sown with country potatoes. In this cose, however, cut tubers or ' sets' were planted at the rate of 1,107 Hbs. per acre on the 18th, 19th and 20th of November. The germination waa not quite evea, and the blanks were filled in by re-sowing at the end of December. Twelve waterings were given during the period of growth and *one* before sowing. The crop waa harvested on 25th March 1898.

The outturns obtained in these plots are tabulated in the following statement :—

Statement showing (Ae effect of certain wwwes *on the hill potato*
(Naini Tal variety).

Plot number.	§ area.	Treatment.	Actual quail«ty of npplicd per icrd in \tit-, 1897-98.	Outturn per aero in i!ia, for 1838-97.	Outturn per »ore in Ba, for 1897-99.
SOa / 1	Each plot = 484 sure yards.	Unmmurod	...	13.5G0	8,310
2G» / 2		I'outirette @ 200 lbs. nitrogen per acra ...	10,020	15,020	16.2C0
26a / 3		Ditto ® 100 Bis. ditto ...	4*510	1S.260	10,920
26a / ~4		Cow-dung @ 200 ISs. ditto ...	39,220	13,410	10,390
36a / S		Uitto (g 100 Ibt, ditto ...	27,400	18,540	7,040
JBa / G		Caltor caliO @ 200 lbs. ditto ...	2,900	6,100	12,830
23a / 7		Ditto © 100 Ha. ditto ...	1,450	9,970	8,700
8		Snltpctre @ 50tb*.jindl feme meal @ 60 lbs. } ditto ...	590 1,450	6,400	7,190
2Gre / 9		Saltpetre @ GO !bo, an3 bone superphosphate @ 50 Bis. } ditto ...	530 1,880	9,850	11,470
28* / 10		l'nin:inmtil	...	0,090	6,350

In the year under report one of the unmauured plots has given a higher yield than two of the manured plots, and it is therefore clear that the residua of manures applied to the former plot before the potato experiment commenced has not yet been completely consumed; and this remark may be applicable to other plots also. It is hoped another year's cropping will bring about the required uniformity in the natural condition of the plots. The circumstance just mentioned would not, however, justify an attempt to draw any definite conclusions. Yet it will be seen that where 200 fbs. of nitrogen had heeiiapplied the yield was uniformly higber than when only 100 Sis. bad been applied. The use of bones in the shape of superphosphate in conjunction with saltpotre has proved more effective so far than when applied in the shape of bone meal mixed with saltjwtre, both in 1896-97 and in the year under report. The greater solubility of the superphosphate may account for this result.

(a) Manurial experiment with indigo.

This experiment was closed in the year nnder report before giving any definite conclusions to make room for another experiment of a different kind .ug-estcd by the Agricultural Chemist to the Government of India, for which the land occupied in previous years by the indigo experiment was, I understand, pointed out by the Superintendent of the Farm as most suitable.

(d) *Manurial experiments with gram and peas.*

The object of these experiments is to determine the effect of gypsum and ground kankar as compared with other manures on gram and peas.

The outturn of different plots nnder these experiment*, are shown in the following statement;—

Statement showina the comparative effect of certain manures on ***gram*** *and peas.*

Plot number. Gram.	Plot number. Peas.	Plot area.	Manure applied per acre.		Outturn per acre of gram in lbs. 1893-94.	1894-95.	1895-96.	1896-97.	1897-98.	Outturn per acre of peas in lbs. 1894-95.	1895-96.	1896-97.	1897-98.
311	31a	Each plot is equal to 400 square yards.											
1	1		Farm-yard manure 100 maunds	Grain ...		3*4	1,510	tso	145	ES9	375	454	611
				Straw ...	1,080	4-18	U7S	89S	839	1,783	810	1,912	3,327
311	31a												
2	2		Gypsum 3 maunds	Grain ...	1,730	321	1,512		S30	2m	£02	367	199
311	31a			Straw ...	1,470	less	387	GS9	888	411	S12	033	GS3
3	3		Ground kankar ... maunds.	Grain ...	1,183		1,100	614	254	327	381	399	121
311	31a			Straw ...	1,001	1G7	1,204	60S	3S7	6U5	356		GBG
4	4		Bone superphosphate 3 maunds.	Grain ...	1.128	61	780	411	278	31S	430	(iS-t	387
				Straw ...	9SS	182	920	484	750	•i:fu	805	1,815	1,767
311	31a		Unmanured	Grain ...	856	21	72G	408	1254	134	31S	351	774
5	5			Straw ...	035	85	041	544	•03	254	(J41	656	4

The rcsnlta obtained in these experiments have been very indifferent during the year under report, on account of scanty germination in general, dne to dryneas of the soil and also to flooding of some of the gram plots on 27th October 1S97 by a sudden overflow of the canal distributary. It is to be regretted that the results consequently led to no conclusions tli» year.

(e) Manorial experiment with sugar-cane.

This experiment was originally started in 1S94 with a view to determining the **effect** of certain manures on the Cawnpore variety of sugar-cane known us " matna." It was carried on for two successive years in fiolds No. 29 and 30. The results of tueae two yours have been fully discussed in the Farm reports for the years 1891-95 and 1895-96. In 1895, however, the plan of the experiment was completely **modified** by Dr. Leather, then Agricultural Chemist to the Government of India, who prescribed larger quantities of manure, replaced the matna by a variety known as « **Mad**-**Wnda** » and directed that instead of being carried out year after year* in the same plot it **should** he tried on two series of plots alternatively, and that after cutting the sugar-cane, country potatoes should be planted in the autumn without applying any manures so that manures applied for sugar-cane might benefit both crops, viz., ... fields were accordingly allotted to the experiment in *(a)* fields No. 29 and 30 and *(b)* fields No. 37, 38 and 39. According ... the experiment was carried out in fields No. 37, 38 **and** 39 in 188S-8? and the results of (he experiment were noticed indetail in the Farm **ceoprt** for that year. Dunng the year nnder report potatoes followed **the** sugar-cane U. these plots, which, as required by the Agricultural Chemist, received no manures

* **W* tit ifffMHot** *btcaute it u practic-* ***allf*** *imponiile to pla*l conn in lutctrd-tap ytart on the tame* ***la*d,for a*** *i, ao 11.J2 mouths' trap 1 And in any fait tren if it mere* ***practically*** *it u* ***not dttiraUt, lettmut*** *the. land would ham no opportunity for* ... *properly evltivaltd or* ... *planting potatoes after* ... *manure reiidtiet, it* ... *that I cmueai.* ... *prejMual.to,,* ... ***tit*** *tame time I e*... *pretttd a dault ,,,* ... *itt desirability.*

J- W. LZAT'HER

beyond what had been applied for the sugar-cane. The outturn of potatoes obtained from the various plots is given in the following taljie:—

Plot number.	riot area.	Trcstmant.	Oattnrn per at'ii in lbs.
37, 38, 39 / 1	[illegible]	t'oir-duug @ 125 Iba. nitrogen par acre	4,050
37, 38, 3D / 2		Ditto @ £50 fts. ditto	2,425
37, 38, 39 / 3		Ditto @ 500 lbs. ditto	2,435
37, 3S, 39 / 4		Poudretto (§ 250 ftfl. ditto	1,365
87, 38, 33 / 6		I Ditto @ 500 lbs. ditto	1,050
37, 3H, 39 / 6		Uu manured	1,030
37, 38, 39 / 7		Bone meal and saltpetre Mali @ 135 QH nitrogen per acre	1.SS6
37. 38, 30 / 8		Castor coke @ 250 ttt. nitrogan pt; acre	1,300
37, 38, 39 / 9		Ditto (g 500 Hit. ditto	1,885
37, 38, 30 / 10		I'limit ii ured	S4£

From the above statement it will appear that the outturns were **generally** so poor as to hardly cover even the coat of the seed. The results have been **obviously** far from encouraging during the year under report, ;ind the next year's results will !je watched witli interest Perhaps some other crop like *chena (panicum miUacium)* or gotnds **might** be more suitable to grow than potatoes. The fidds allotted to the manurial stigiir-eaoe experiment during the year under report were Nos. 29 and SO, consisting of1O plofs. These were ploughed once with Howard's plough, twice with Wall's plough, sub-soiled twiue, cultivated with Planet Jr. horse-hoe once, and levelled with *patela* five times. After applying the manures, cuttings of Madrasi *pwnda* were planted on 20th aud 22nd February in furrows made between ridges two feet apart. As usual the plots lVore watered with canal water just after planting. In all 17 waterings were given during the season. The crop was weeded and hood scvea times. The crop iu general suffered slightly from the effects of heat in summer, but recovered ita vigour during the rains. The plants that were laid by rain and high winds were lifted up, tied and earthed up in October. The cattle dung, poudrettc aud saltpetre were applied in two instalments ; once before sowing and the second time iu the first week of July. The cutting aud crushing began from 21st January 1S!)8. Only half the cropineach plot was crushed for *gwr*—makings the otlur half being out and Bold ii marke- by public motioj. Tlle foilowing' statemeat eho vs the results obtained :—

cine KJ mowing the compm feei of certain «ic.nuret on Ir adra ni paunda.

T		Manure applied par acre.	1 M a 9 ^ a-a "a 'H. •A-	Outturn per ucre in BM			Pereeiitnpa of—			S 1 to	i 1 -3 o td
i lo(	P.			i S i	m u "3	to •a &	S S v o H	d D $ h S a	B £3 g b n		
2 U 0 I 39,30		tTumanured ,,,		41,82	22,440	4,76	70-3	16-17	11'3	7,01	12,OSS
2 2E>, 30		Catilo dnne @125B,ni-tfogea per aero.	34,72	*6,7U	SG,3!>	4,5S	57-62	17'21	0-9	4,723	11,033
3 20, 30	1	Ci'tlo duoff @2B0B>»a;. trogon per aoro.	69,-IM	ifl,132	37,248	e,3s	8003	17*20	18-70	6,312	13,732
4 -J. 31		Cattle dqnp @ GOOftsai. trogsn pcrocra.	1.38,888	61,528	39,221	6,0«)	G3-80	1G-*O	3-00	4,46-	II/.IS
5 23,30		Pondratto @ 250 lbs nitro-gon per acre.	00,975	7,520	33,083	6.2BG	70'90	16-78	11'15	4,440	15,711
G	S	Pondret(i9@S00;nij oitro- If en per acre.	1,21,9S0	46,382	32,520	6,008	70-10	1540	10-88	4,392	16,400
2f, 30 ~~7~"	1	Bono «oporp)iogphate ana Mltpeiru end, nt 125 tt» nitropcu per acre.	8.SG7 1,^120	0,eoc	8,216	4,5i8	6933	16-50	H-40	3,GG1	7,672
8 20,30	1 W	Bono dust sad naltpetro «wli @ 125 Un nitroean por acre.	3,284 1,420	8,466	0,752	4,616	09-68	1771	12'00	4,502	8,73G
9 29, ;j'i		Castor eako ®25Ofttnl. tro^n pot ,,,,(._	3,788	7,3C8	32,328	SfiSC	60-51	17-17	1193	6,608	8,353
		Castor caks @ fafc &,,,[. J	7,576	1,768	30.3GO	4,912	67-C	16-17	10'97	3,864	7,sie

Tins ueirjg the first year of the experiBlent ia its present form in this set <)f piots it is premature to euter into a diedssion oi' tlie efieets of mmures on the qiantity of the oitturn< Txim : . . s> >e juice of the cane yras liim-il as in former ;renrs [irior to boilmg. Tho?tw obtained, though fairly rich in crystals, was of thin co!is is tency ant I \)rn i P in Qiiijiii'ii 1 appearance and fetched tlie lo\i' price of I;! 6eers per njpee in the JJIWHI >ore bazdr. J IIA lir\rt^* y-ii,,,I ! j A ,i or rai -me poor quality of the gur wa.s in some measure due to oc<:asiomil cloi•dy uy weather during tho cru shJDg seasoa.

The financial aspect of tbi3 e^periment has not >een]ooked into in forEtier yesrs, and tlL question lormeti a Etibject of tallc in some quarterH last yea|\ Dttring the year under report the cnat nf n,a whole experinaent taa been cart fully calculated, imd the following is a brief memor.im luEa off nt.

•Actual o03t of cultivation and manufacture of aw from li »crea-c^, Uf tUc crop wb;d[n&i rt'inl-irtil ^ ... Es.fiOG 0 4

I^ca of ,«r obtains from the >bo«! CTop ... Hi. 209 E 6 ... Ita. 296 10 10

S°«t o(too balf cton Hat™* ind sold as caues — cut

Priffn % oL dUHM ... Us. 3S1 0 4 Bt. 275 5 6 ... Us 75 10 10

Total cat on tLo 21 aere> ... R». 857 0 8

·rctal incotno from ,»ie of gvr hai •line ... Rs. 484 L a

Total loss ... Rs. 372 G 8

TJJC figures of cost given above d<> not inelu je c«; the OOHUission paid u auction eers, wliich is 5 per cent, o^ tlic price realized • CM t /» i boiling gur; and (c) one or two other pett;/ charges. I) W io pn 3e of iiiel useo iOI lie ne therefore was som what greater than that shown above, and should noi be reckoned at less than Rs. 170 per acre. It will appear that the loss Las been less in disposing of the crop in the form of cane than in the sbnpe of *gur*. This is of course due to the heavy cost of the manufacture of *gur*. In an experimental business, however, where tbe cane of each plot, the juice obtained from it and the *gwr* produced have to be weighed and dealt with separately, the cost under tbe.se heads necessarily runs up to o high figure including, as it does, items of expenditure which the ordinary cultivator will not have to incur.

As stated already half the crop was converted iuto *gir<r* and the other half sold ns canes. From the figures of coskincurrod under the two systems of disposing of the crop the following statemeut has been prepared showing the calculated profit or loss per acre from eaeh plot under experiment and the relative economy of growing the *paunda* cane with the various manuroa for the production of sugar and as a crop for tlie market.

Statement showing the calculated profit or loss per acre from each plot under sugar-cane experiment.

Plot number.	Area.	Treatment.	Rent.	Ploughing.	Price of manure.	Wages weighing, carting and spreading.	Price of seed.	Wages of sowing.	Weeding, hoeing, digging and earthing.	Canal dues.	Labour.	Cutting, crushing, and gur making.	Total.	Calculated value of gur per acre.	Profit or loss per acre.	Total expenditure shown in columns 4 to 12.	Cutting and carting.	Total.	*Average calculated price of canes per acre.	Profit or loss per acre.	Price of the various manures per maund (82 lbs).
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	20	17	18	19	20	21	22
				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs.	Rs.	Rs. a. p.	Rs. a. p.	Rs.	Rs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
29—30 / 1	Each plot 1,210 square yards.	Unmanured ...	13	7 8 0	...	...	50	7	124 2 0	3 6 4	31	136	260 16 4	187 1 1	—73 14 3	124 15 4	12	130 15 4	230 4 5	+83 5 1	
29—30 / 2		Cow-dung at 125 lbs. nitrogen per acre.	12	7 8 0	15 13 1	2 8 0	50	7	24 2 0	3 5 4	21	136	283 4 11	177 10 3	—105 6 8	147 4 11	12	169 4 11	230 4 6	+60 15 6	
29—30 / 3		Cow-dung at 250 lbs. nitrogen per acre.	12	7 8 0	30 11 5	5 0 0	50	7	24 2 0	3 5 4	31	136	308 10 0	248 11 0	—60 15 0	169 10 0	12	181 10 0	230 4 5	+48 10 5	
29—30 / 4		Cow-dung at 500 lbs. nitrogen per acre.	12	7 8 0	79 6 4	10 0 0	50	7	21 2 0	3 5 4	21	130	350 6 8	237 0 0	—112 U 8	214 5 8	12	226 5 8	220 4 5	- 6 1 3	
29—30 / 5		Poudrette at 250 lbs. nitrogen per acre,	15	7 8 0	23 3 1	5 0 0	50	7	34 2 0	3 6 4	21	130	289 3 1	208 2 1	- 81 1 0	163 3 1	12	166 3 1	220 4 5	+ 55 1 4	
29—30 / 6		Poudrette at 500 lbs. nitrogen per acre.	15	7 8 0	46 7 6	10 0 0	50	7	24 2 0	3 6 4	21	136	317 0 10	130 13 0	—120 a io	[illegible]	12	103 6 10	220 4 6	+26 13 7	
7 / 29—30		Bone superphosphate and saltpetre each at 125 lbs. nitrogen per acre.	15	7 8 0	180 8 0	0 1 0	50	7	24 2 0	3 5 4	31	130	1,103 11 6	162 10 6	—921 1 0	967 11 8	12	979 11 8	220 4 8	—759 7 3	
8 / 29—30		Bone dust and saltpetre each at 125 lbs. nitrogen per acre	12	7 8 0	186 9 4	0 1 0	50	7	34 9 0	3 5 1	21	130	467 10 10	181 6 6	-286 4 4	271 10 10	12	283 10 10	330 4 5	—63 6 5	
9 / 29—30		Castor cake at 250 lbs. nitrogen per acre.	12	7 8 0	60 1 4	0 1 0	50	7	24 2 0	3 5 4	21	130	330 i 8	222 4 6	—108 0 2	194 4 8	12	206 4 8	220 4 5	+13 15 9	
10		Castor cake at 500 lbs. nitrogen per acre.	12	7 8 0	138 8 8	0 2 0	50	7	24 2 0	3 5 4	21	130	390 10 0	193 0 8	-200 9 4	263 10 0	12	276 10 0	230 4 8	—55 5 7	

*The cane of each plot was not sold separately, hence an average of each plot has been struck from the total price realized for the whole crop sold off.

This year's results ahow that wink it **appeared** profitable to grow *paunda* as a crop for the market it proved far from economical to do so for tho production of sugar,—a fact most commonly believed by the cultivators of this part of the co mi try. Among the manures tried the cost of bone superphosphate seems to be simply prohibitive,*

if) Experiment with vegetable and green man-wres and alternation of wheat ***with*** *leguminous crops.*

This experiment was started in 1SS3-84. It has for its object the determination of the manurial effect on wheat of—

(1) the ploughing in of certain greeu leguminous ero|>8 in the rains preceding the cultivation of wheat;

(2) the root residue "of a leguminous crop taken immediately before wheat;

(3) indigo refuse as manure.

The experiment is carried out iu two sets of plots, *vis.*, G 1 to G J3 and 27A1 to 27A4. The portion of the experiment tried in the second series which commenced in 1S93 is denominated as " temporary " in order to distinguish it from the "permanent " cxpsrimout started iu series G 1 to G 13 in 1S33. For (he sake of convenience the plots treated with the two kinds of indigo refuse and with green manures are arr/nged in one place in the tablo A,—and the plots in which wheat is taken in rotation with leguminous crops in the table B following. Table A covers **ttelf-a-dozea plots of** the " permanent" besides the four plofa of **tho "temporary"** series, while in table B all tho plots happen to be of the "permanent" series.

In Hay 1S97, nil the plots of the "permanent" series, except the two indigo plots sown in April, were watered once with canal water to soften the soil for ploughing and M-ere ploughed four times, sub-soiled once, cultivated with the Planet Jr. horse-hoe twice, and levelled **with** the *pxtela* five times. Selected MitzaIfarnagar wheat seed was sown on tho 14th and 15th October at the rate of 100 &3. per acre. Where the germination had been uneven blanks were filled in by transplanting towards the end of November. Weeding was done in the second week of December, and five waterings were givun iu all during the period of growth.

The following are the weights of green plauts that were ploughed in or removed fro™ the different plots in tho " permanent" series :—

J'Jot No. G. 0, Hemp romorod ,,	...	...	...	18,937 1*8.	pet acre.
,, 0-7, ii ploughed in	...	...	...	13,150	,, ,,
,, 0. 8, Indigo	...	...	...	11,713	,, ,,
,, 0. 9, ,, removed ...	...	...	...	13,455	,, ,,
,, G.10, Crd ,, ...	...	...	...	13.0G3	,, ,,
,, '0,3, Rapo ploughed in	,,	...	...	1W	,, ,,

Last year the green itrd crop was ploughed in, but during the year under report it was removed.

The quantities of green plants that were ploughed in, in the temporary series, are given below :—

HrtSo. 27a/1 Hemp ploughed in	...	...	...	17,201 D)i.	per aero.
	...	...	...	13,405	,, ,,
Hi urd	...	...	...	17,480	,, ,,

In this series the wheat was sown on 19th October 1S97, and received three waterings in all.

Tho results obtained in tho two series of experiments are given in the following tables A and B.

NOTE.—It is hardly necessary for mt tu" mo (hat I disagree Kiti Bitch a motle of calistt I at tuff the cost of production of gnr at detailed above. The principal objection it vf courte that the icaget paid by Goterw meat are douhtteit higher than those paid ty a notice grottier a large part of tohich he would Mmrelfpro. tide. Then again, eon* tider the item Us. 00 for cane cuttings (seed)! These crops weighed, if lam vot maehmistaieit.at least ten fimet that of the cut tinge planted—probably tnore—^ierea* only Jls. 220 per acrt tea* realized tu the bazaar for the cane told as tueh. Other detailt might jutt at readily be criticised. But the most serious objection to the paragraph it that it maJcts out (hut it does not pay to grow pnunda for gur making! There it n«3 reason for befitting (hat tuch it not the case. In He sidency, in the Central Provinces, in Bea parts of Madrf, "psunda" O/B;I» sort or another i, principally or entirely grown for "rat" manufacture. and it is only in £ehar and North-Western Provinces (I leave out the majority) where ilan, hard and poor belies are 3Z,,n, gro,cn too n ,, very common pardon to be made f all at the f ^ then grow some .wu,,? fhiK-iVA liberal ,»;,,,,,.. tng and OH ridge,, a, agatmt the "mBtiim" on the fiat with a f,ivial amount of manure and then tee K/tirA' «>iUca*ie the greater loss. Attoprojlt if (, rery t^fiemlt to make on* af a,,s eiveri. mental fiirm.*

J. W. LEATHER.

TABLE A.

Showing the result of experiments to determine the effect of indigo refuse and green manures on wheat.

Plot number.	Plot area.	Manure applied per acre.		Average outturn for five years 1883-84 to 1887-88.	Average outturn for five years 1888-89 to 1892-93.	Outturn per acre in lbs. 1893-94.	1894-95.	1895-96.	1896-97.	1897-98.
		Permanent Experiment.								
G.1	Each plot = 400 square yards.	Old indigo refuse 120 mds. ploughed in.	grain ...	1,577	1,644	1,513	517	2,729	2,074	2,142
			straw ...	2,921	3,653	4,187	1,079	5,221	3,952	4,189
G.2		Fresh indigo refuse 120 mds. ploughed in.	grain ...	1,646	1,624	1,349	209	2,354	2,250	1,513
			straw ...	3,058	3,427	5,858	774	4,438	4,041	3,194
G.8		Green indigo ploughed in	grain ...	1,007	1,442	750	281	722	1,464	1,004
			straw ...	3,011	2,503	1,557	7,200	1,165	3,315	2,949
G.7		Green sann ploughed in	grain ...	1,079	1,302	935	420	1,401	2,407	1,428
			straw ...	2,193	2,421	1,704	1,089	2,423	4,332	3,001
G.3		Rape ploughed in (until 1893 the plot was treated with indigo water)	grain ...	1,427	953	756	290	420	1,238	950
			straw ...	...	...	1,957	750	826	1,912	1,597
*G.5		Unmanured	grain ...	1,027	1,004	877	287	1,745	1,101	871
			straw ...	2,004	1,026	1,730	787	2,465	1,924	1,283
		Temporary Experiment.								
27A.1	730	Green hemp ploughed in	grain ...	...	...	837	264	975	969	1,057
			straw ...	...	...	2,147	832	1,704	2,355	1,979
27A.2	780	Green kulthi ploughed in	grain ...	...	...	858	206	1,059	1,200	983
			straw ...	...	...	1,943	896	2,117	2,007	1,903
27A.3	930	Green urd ploughed in	grain ...	...	...	720	370	791	713	762
			straw ...	...	...	1,556	2,124	1,318	1,183	1,380
27A.4	960	Unmanured	grain ...	...	...	641	414	1,128	889	897
			straw ...	...	...	1,589	1,056	3,153	1,822	1,646

* This has been also included in Table B for the sake of facility in comparing the results.

TABLE B.

Showing the effect of growing leguminous crops in alternation with wheat.

Plot number.	Plot area.	Manure applied per acre.		Average outturn for five years 1883-84 to 1887-88.	Average outturn for five years 1888-89 to 1892-93.	Outturn per acre in lbs. 1893-94.	1894-95.	1895-96.	1896-97.	1897-98.
		Permanent Experiment.				gram.	wheat.	gram.	wheat.	wheat.
*G.4	Each plot = 400 square yards.	Gram and wheat alternately (until 1893 this plot was treated with hemp water).	grain ...	1,171	1,060	1,113	300	1,097	2,130	944
			straw ...	...	...	1,222	750	2,517	3,705	1,428
G.6		Sun hemp and wheat alternately	grain ...	933	1,004	1,031	409	1,624	1,718	1,307
			straw ...	1,879	1,949	2,139	1,041	2,241	3,194	2,503
G.9		Indigo and wheat alternately	grain ...	1,430	1,304	499	287	1,125	1,041	980
			straw ...	2,627	2,309	1,579	774	2,347	1,640	1,803
G.10		Urd and wheat alternately (until 1893 this plot was manured with green indigo and gypsum).	grain ...	1,723	1,312	935	439	1,301	1,422	1,488
			straw ...	...	...	1,878	986	3,759	2,632	2,311
G.11		Arhar and wheat alternately (until 1893 this plot was manured with green lucerne and gypsum).	grain ...	1,321	1,167	1,028	arhar 968	wheat 1,359	arhar 864	wheat 1,355
			straw ...	...	...	2,154	1,513	3,107	6,316	2,021
G.12		Lucerne and wheat alternately	grain ...	...	...	1,168	lucerne	1,185	lucerne	847
			straw ...	...	...	2,955	...	2,387	...	1,234
G.13		Lucerne and wheat alternately	grain ...	...	...	...	402	lucerne	1,123	lucerne
			straw ...	...	...	...	762	...	1,022	...
G.5		Unmanured	grain ...	1,027	1,004	877	287	1,745	1,101	871
			straw ...	2,004	1,026	1,730	1,730	2,465	1,924	1,283

* In the ordinary course this plot should have borne gram in the year under report, but in accordance with the opinion expressed by Dr. Leather that arhar in plot G. 11 and gram in plot G. 4 should come in the same year, wheat was sown in the latter plot so as to give effect to his wishes in the year 1898-99.

Eemarks on plots of Table **A.**

Among these the highest outturn of wheat has been obtained during the year ••Under report from the plot treated with old indigo refuse. Fresh indigo refuse stood next as a fertiliser. Among the green manures hemp ploughed in gave better Jesuits in both plots .than the jest.

Jtcmarlx on plots of Table B,

Iu the rotation series tlie plot from which a crop of urd had been removed gave the highest outturn or' wheat; tho next beet outturns being obtained from plots in which san hemp and arliar had preceded the **wheat** crop.

General Eeinarks.

It is too early to discuss the result of the ' temporary ' experiment with refer-ence to the effect oi' green manures; but the ' permanent' experiment lias been fifteen **years** under trial, and it is now time to consider what deductions might be drawn from the results it lias given. The plots whoBe treatment has undergone changes during -.this period might be left ont of consideration at present and the discussiou confined to plots wbich have been uniformly treated since the commencement of the experi-ment, *viz.,* plots No. Cr 1, G % G 8, G 7, G C, G 9 and G 5.

A brief statement is appended showing the average outturn of wheat from each of these plots during tho three quinquennial periods:—

jPlofc Vfrt. •^ v.	Treatment.	Average outturn in lbs.			
		for the E v..-;•.!•, 1863 - 84 to 1887-88.	[•'or *Oa t* ;.. u- • 1888 39 to 1892 93.	For the 5 years 1H93- M ! i 1897-98.	For tlie IS j-esrs 1BS3-S-l to 1SU7-9a:
CL	Old imttgo MfuFe 120 mtfs. ptougliod in ...	1,577	**1,011**	1,021	i,nt
V.2	Vre-li ind go ji'fuse ISO tiula. ploughed ia ...	**1,648**	***Ifiti***	1,5CT	1,589
G8	Grtcn indigo ploughed En ... >. ...	1,697	1,442	844	1,328
07	**lin.... lieijiji ploughed In ..,**	1,079	**J,:in-J**	1,313	1,233
GG	Hemp mid whoikfc altarnatoly ... ..,	933	1,004	**1,2^1)**	l,U5"i
.G9	**[wlljjo** untl wheat H! to mutely	1,130	1,30-1	810	UM
.05 ,	Unman a red	1,027	1.OD4	076	***tfiSi***

The value of indigo refuse as a vegetable manure suitable for wheat may now be &iken as fidly established; old indigo refuse being on tho whole more useful and consequently preferable. Tho results further go to prove that it is also advantageous to **plough** in a green crop in tho rsius, and that it is better to take a leguminous crop off tho ground intended for wheat than to keep it bare fallow, tho root residue of the leguminous crop decidedly enriching the land. Ploughing in a green leguminous crop improves the condition of the soil in a more **marked** degree than if it were takea off .tho land.

A question now arises which of the two leguminous crops—indigo and hemp—it is preferable to grow for the purpose of ploughing to or removing from the field before the wheat is sown. The results obtained have not been so uniform sis to enable one to form an absolutely definite opinion on the subject. Taking, however) the twe plots G 7 and G 8 into consideration it wfll appear that iu the first two quinquennial periods indigo plouglicd in produced a higher outturn of wheat than hemp ploughed in ; but comparing the average outturn as well as the Individual outturn* of the two plots during the la.et iive years, tbe outturn from the hemp plot was in each year higher **than** that from the itidigo plot. Exactly the same remarks apply to the plots - No, GG and G9 in which hemp and indigo respectively were removed before the sowing of wheat.

Comparing **the** individual annual outturns of these plots it is found that during tho last *six* years tlie ontturn from **the** hemp plot lias been higher without exception in each year than that of the indigo plot;. while in the years preceding the said period of six years, the result has been exactly the reverse in each year.

• i'or tbe uulivrtniil outturns tlie reinler is referred to. the Ksyort on tho farm for 1895-86; page 13.

The only explanation for this remarkable circumstance that suggests itself is that as a crop of hemp ploughed in supplies more organic matter to the soil than a crop of indigo ploughed in, also that the root residue of a hemp crop is larger in quantity than the root residue of an indigo crop, therefore hemp whether ploughed in or taken off the ground enriches the soil to a greater extent in the long run than indigo ploughed in or taken off, but the organic matter supplied by hemp in both cases takes a longer time on account of comparative thickness of stems and roots to decompose than the organic matter of indigo stalks and roots which are more tender. I think that on this account the two hemp plots have become richer in condition than the two indigo-plots in course of the first few years, by slow and gradual decomposition of the larger quantity of the organic matter they received, and being thus enriched they have been giving higher outturns of wheat than the corresponding indigo plots. Probably this theory is correct, but it is necessary to continue the experiment for some years to come in order to ascertain its accuracy. If finally proved it would establish the superiority of hemp over indigo both for green manuring and for rotation purposes, and might eventually show that where a quick return is the object, indigo is better than hemp to be grown for either purpose. The futility of rape as a rain crop for green manuring purposes has been further established from the result of the year under report.

IV.—METHODS OF CULTIVATION.

(a) The early and late sowing of maize.

This experiment was started in 1887, having for its object the determination of the effect of early and late sowing on the yield of maize. The early sown plot was sown on 1st June 1897 before the commencement of rain, and the crop harvested on 1st September 1897. The late sown plot was sown on the 24th June, somewhat earlier than last year, and the crop harvested on 15th September 1897.

Contrary to the results of the last three years, but in accordance with the general experience, the early sown plots gave better outturns during the year under report.

The following statement shows the results obtained in this experiment:—

The early and late sowing of maize.

Plot number.	Plot area.	Quantity of manure applied.	Description of sowing.		Outturn per acre in lbs.										
				1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	1895-96.	1896-97.	1897-98.
35a	Each plot = 1,522 square yards.	Farm-yard manure 250 maunds per acre.	Early sown { Grain ...	734	1,183	2,832	500	1,045	1,678	1,835	213	553	260	1,532
			Early sown { Stalk ...	3,751	2,457	7,000	7,000	3,088	7,724	5,782	4,978	5,006	4,784	11,731
35b			Late sown { Grain ...	810	1,033	1,853	458	1,500	1,328	1,501	270	1,053	1,322	1,132
			Late sown { Stalk ...	4,004	3,302	5,040	5,124	3,070	6,514	6,329	4,545	3,831	9,403	6,033

(b) Experiment in early and late sowing of cotton.

This experiment was started in 1891 in order to ascertain whether it is more economical to sow cotton before the rains by the aid of artificial irrigation than after the rains, as is ordinarily done by cultivators.

The early sown plots were watered twice before sowing on 27th April and 30th May 1897 and once after sowing on 7th July 1897, ploughed four times with

Watt's plough, manured on 1st June 1897 and sown on 5tti June IS07, a/lowing **a** space of four square feet for each plant of the foreign varieties and two square feet in the case of the country variety. The lafe sown plots ooukl be ploughed only twice, and were sown on the 21st of June 1897.

The results of the experiments are embodied in the following statement:—

Statement showing the results of early and late sowing of cotton.

1 Plot!s	Plot!∞	Trent∞nt with rel to m5	Varieties.	Outturn per ocra in Us.													
				1891-92		18D2-93		1893-94		1894-96		1S05-9G		189607.		1897-38.	
				Fibre.	1	Fibre,	I	Fibre.	•2	1	at	1 IS	1' EC	1	(Q	s	1
17 / 1 A.C / 1			VaradLi... 5 /•Early...	120	295	93	223	55	63	33	39	125	304	08	256	1£3	817
			Cute ...	60	102	70	t45	118	•28	£8	CO	85	237	29	70	27	2
17 / 2 A.C. / 2			Baal ... j { Enrly,.,	115	281	C5	158	35	68	27	89	103	290	SI	245	111	
			C Lute ...	30	C2	63	103	Z\	80	10	27	ES	148	23	CS	ID	42
17 / 8 AC ~~5"		A	blinrnarU < / Early...	185	447	123	298	22	78	17	20	07	13	40	385	07	378
	1	5	(Late ...	42	110	10	218	37	30	e	10	SI	37	32	S3	SO	62
17 ~ 4~ A.C. 4	ta E 1	1 1	Birodlm,,. i Early...	172	417	33	26S	29	09	39	86	48	15	77	m	202	[illegible]
	S		tUto ...	32	57	CO	145	43	5G	19	17	B9	71	60	54	26	I
17 / 5 A.C, 'TT	it 1	44	LottiaUua, < /Early...	72	20	28	280	42	20	31	to	34	34	"I	we	306	
	1	3	Late ...	£2	45	50	25	M	19S	i'l	23	M	.68	71	209	60	
17 / 6 A.C. / 6			Jiri ... j (KarJif...	CO	82	18	33	55	12S	21	26	11	302	98	298	86	31G
			(.LatB ...	22	4C	76	85	64	60	13	20	28	338	83	252	43	10S
17 / 7 A.C. / 7			Country... \ /Early...	73	15	53	33	L14	327	64	70	38	BS	22	120	02	512
			Late ...	22	24	13	50	71	L80	13	93	GO	)70	to	HO	GO	143-

It is conclusively proved that early sowing of cotton, where artificial irrigation is available, is an improvement on the present practice of sowing cotton after the commencement of the monsoon. This definite conclusion having been arrived at, the experiment will be discontinued next year.

(c) *Experiment with mixed crops.*

This experiment was started six years ago with the object of determining:—(a) the comparative outturn of certain *kharlf* crops in some of the more common mixtures **in which** crops are generally grown by the ordinary cultivators; (6) the mixture whose produce yiulds the most profitable outturn. The fields are prepared in the ordinary native **fashion** and lhe mixtures are sown broadcast. The following jstutoment ahows the outturn :— , *Statement showing the result of experiment with mixed crops.*

Plot number.	Plot area.	Name of crop.		Quantity of seed in pounds.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	1895-96.	1896-97.	1897-98.	Cost of cultivation including labour, rent &c., per acre.	Value of outturn.	Net profit or loss.
					Outturn per acre in lbs.												
M. C. 1.	Each plot = 1,200 square...	Arhar	Grain.	...	...	...	...	1,390	137	1,180	608	128	260	850	22 12 0	30 4 0	+13 8 0
			Straw.	1	...	...	...	[illegible]	508	3,996	2,432	436	1,040	5,052			
		Cotton	Fibre.	...	...	...	...	36	5	1	12	23	24	8			
			Seed.	2	...	...	...	81	12	3	21	53	60	17			
		Til	Grain.	¼	...	...	...	80	...	...	...	2	12	21			
		Urd	Grain.	...	...	...	...	180	21	31	65	56	12	114			
			Straw.	¼	...	...	...	928	298	212	182	224	178	1,232			
M. C. 2.		Arhar	Grain.	...	97	8	97	610	371	756	...	161	96	296	24 13 0	30 9 3	+14 12 3
			Straw.	1	...	...	...	734	1,100	2,302	1,194	479	336	984			
		Bajra	Grain.	...	...	...	...	85	524	280	...	320	28	932			
			Straw.	2	338	2,038	968	1,488	4,007	2,434	...	1,900	1,500	6,264			
M. C. 3.		Arhar	Grain.	...	363	333	387	630	1,424	536	556	155	280	304	24 13 0	45 2 0	+20 5 0
			Straw.	1	...	...	...	1,670	3,406	2,210	1,541	460	1,048	2,872			
		Juar	Grain.	...	...	...	...	682	[illegible]	848	52	724	280	1,072			
			Straw.	2	5,046	[illegible]	[illegible]	8,871	8,268	3,082	2,315	4,456	2,544	8,824			
M. C. 4.		Castor	Seed.	1	...	...	...	432	387	332	...	84	8	332	21 15 0	23 7 3	+1 8 3
		Cotton	Fibre.	...	...	...	...	36	1	2	7	20	28	7			
			Seed.	2	...	...	...	60	2	3	11	55	52	13			
		Til	Grain.	¼	...	...	...	52	...	...	...	4	6	4			
		Urd	Grain.	...	...	...	...	81	7	23	60	164	8	136			
			Straw.	¼	...	...	...	403	50	225	153	1,008	348	1,008			

The highest return of money value was obtained from sowing *arhar* in conjunction with *juar* as in the two previous years.

(d) Experiment with lucerne.

This experiment having proved that it was more profitable to sow lucerne on ridges than in furrows or broadcast, has been abandoned during the year under report.

(e) Experiment with transplating wheat.

This experiment was carried on during the year under report on the same plot as in the past year but without application of any manures.

The subjoined table shows the outturn obtained :—

Statement showing the outturn of transplanted Muzaffarnagar wheat.

Plot number.	Plot area.	Distance.	Outturn per acre in lbs. Grain.	Outturn per acre in lbs. Straw.
1	733	Transplanted at the distance of 20 inches from row to row and 6 inches in the row.	1,356	2,720
2	330	Transplanted at the distance of 14 inches from row to row and 6 inches in the row.	1,663	3,251
3	390	Transplanted at the distance of 9 inches from row to row and 6 inches in the row.		[illegible]

The experiment has again proved the possibility of growing wheat by transplanting, and more time is necessary to determine the economical value of the method.

(b) Testing of new or improved implemet

The following implements were tested at the Farm during the year under report:—

(1) *The Meston plough.*—This implement has been perfected during the year, and combines all the good **qualities** ordinarily desirable in a plough. It weighs only about 26 lbs,, and though suitable specially for the lighter class of soils it can be worked without difficulty on clayey soils. The draught is not heavy even for the inferior type of cattle generally found in Oudh and the eastern districts of the jSTorth-'\Vesfern Provinces. The ploughman has little exertion to undergo in working the plough beyond the handling of the stilt. The motikl board boing made of wrought iron is particularly strong, and the body and the share which are made of cast iron are also **substantial.** It was found to plough au acre of ground in 11 to 12 Lours according to the quality of the soil; tho width of the furrow being about 7 inches and the depth varying from 4 to 5 inches. Its price is Rs. 4 only.

(2) *The Stoney water lift.*—The Stonoy water lift consists of two self-emptying buckets of special construction, and is worked by one pair of bullocks on tho same principle as the double *inot,* the buckets being raised and let down **alternately.** The bullockg have to reverse their course of motion after each round and have to be trained to do so. Its price is Its. 150. The water lift is on **the** whole a fairly good coutrivance for irrigation from deep wells. In trials held at the Cawnpore Farm it has lifted roughly about 700 gallons of water per hour from a depth of 45 feet, but has been found to require more skill to erect and keep it in working order than is possessed by the ordinary blacksmith of this country. It has co"St the Department over Us. 200, besides the price, to import the water-lift from Madras and to set it upon a well, and the total cost of the machine has therefore been very high indeed. There is no chance of its ever being introduced among the **native** *cultivators* on account of the heavy *coat* and skilled supervision under **which** alone it can be properly worked.

(3) *The Oawnpore swing basket (beri),*—This is commonly used by the cultivators for raising water from depths not exceeding 4£ feet. It works satisfactorily up to a height of 3* feet for raising water, but not with advantage for greater heights. When water has to bo lifted at a height exceeding 4£ feet, it is generally raised from one channel into another on a higher level by baling—a swing basket being at ea^h baling station. The quantity of water lifted by it pur hour in ordinary daily work may bo taken to range from 750 to 850 cubic feet per hour according to the depth and the strength of men working it.

(4) *The Cawnpore chain pump,*—These irrigation implements are now pretty well-known in the United Provinces, and a number of them is sold and given on hire or for **trial** every year. Printed partioulura are supplied free on application. During the year under report a number of these pumps were tried at depths varying from *3i* to 17 feet at the Farm with a view to comparing their work with that of the swing basket a:id the results of the trials are summarised below :—

(a) 'fhe chain pump at a height not exceeding 3J *feet* may *ho* taken to raise ordinarily about 1,000 to 1,200 cubic feet of water per hour, *i.e.,* about 40 per cent, more of water than the swing basket tried. The work is more taxing than that of the basket, butnot beyond the capacity of ordinary labourers—men, women, and boys over 15 years of age. The increased quantity lifted may be taken to more than compensate for the greater initial outlay in purchase. The daily experience at the Farm, the established lower rate at which the labourers at the Farm and the neighbourhood, undertake to irrigate a *bigha* on contract when supplied with the pump than when supplied with the basket, and the keen requests of the neighbouring villagers for the loan of the pump for a day or two when crops require immediate watering, place its superiority over the basket beyond doubt.

(6) *The chain pump at* **a** *height of 5 feet* might be taken to raise ia ordinary practice about 800 cubic feet of water per hour, or about double tho quantity done with tho basket at that height. The work is not beyond the strength of ordinary labourers—men, well-built women, and boys over 18 years old.

(*l*) *Experiments in growing maize without manure after country and hill potatoes with manure.*

These experiments have been started during tho year under report under the instructions of Dr. Leather with a view to ascertaining liow far the residne of certain manures applied in certain quantities to a crop of potatoes will benefit the succeeding crop of maize. The plots were sown accord lug to the new method described in the case of the *klw.rif* standaad aud duplicate series, but as stated already no manures were applied for the **maufe** The result arc embodied in the two following statements :—

NOTE.—*Thitwat hutii ltd* toiYA */At idea of utilizing manure mi-dvt in (he same may as Mr. Suhbiith wished to utilise the manure Tttidve* i» *tie ottit of >Hgar-ca»e plots. It U done purely nriii an idea of economy, and hardly rankt~ at a it par ale experiment. It ikwld jlittt a place it tht tame paragraph at that in nfiirA the potato experiment is dtsi-ribed. It rtmaiat to be tetn whether it it desirable to contisKt it, Gtnerutli/ the pro-cedure is not to be re-commended is experi-ment since it compli-fatet the issues ; but at the manuring for both sugar-cane and pota-toes is very Aeaey, Mr, Sulbiah mggtsted Korkingup the manure residue in this way; and I thought the rugget-lion might toell be acted upon for a time at least.*
J. W. LEATMEE.

Statement showing the outturn of maize sown after hill potatoes.

Plot numlwr.	Plot area-	Treatment only for the previous crop (i.i. potato).	Outtnrn perncrii in lbs.	
			Grain.	Straw.
2G« / 1		Umnannred	2,300	11,700
26a / 2		Poudretta @ 200 lbn. nitrogen per acre	S,3flS	12,800
S		Do @ 100 lbs. ditto	2,530	13,800
2t!o / 4		CatUc .lung @ 200 fos ditto	2,910	11,090
5		Ditto @ 100 fos. ditto	2,580	12,840
20a / 6	*i*	Castor calr« @ 200 Bis. ditto	2,0.15	13,070
26a / 7		Ditto 100 fb». ditto	2,613	10,310
2C4 / H		Saltpetre (g 60 Hi. nitrogen per aero und bonc-dast (Si 50 ft!, nit-rogen per acre.	3,150	9,720
26b / 9		Saltpetre and bouo saporpuospliats eaoh @ SO Ibi. per aero ...	3,050	8,970
2Ci / 10		Unmnnurcil	2,rt75	3,780

Statement shouting the outturn of maize sown after country potatoes.

Plot number.	Plot area.	Treatment only for tie previous erop (i.s. potato).	Outturn per aero lull *t.*	
			Grain.	Straw.
25 / T		Uiioinnnrod	B,1M	10,760
25 / 2	i	poudrette @ 200 fti. nitrogen per oere	3,400	fl,fl70
25 / y		Ditto 100 lbs. ditto	3,2G6	11.KO
21 / T	i	CiUlo dung (g 200 ftm. ditto	3,O3B	11,030
21 / 7	i	Ditta @ lOOIbB. ditto	2,955	12,630
6	'En	Caator cako @ 200 ft«. ditto	2,603	14,000
y	1	Ditto @ 100 lbs. ditto	2,533	13,010
20b / 6	W	S»Upctro @ SO lbs. nitrogen per aero and bone-doit @ E0 lbs. nitro-fjen per ULTO.	2,958	11,720
26b / 9		Ssltpetro and bouo snperphoipbatfl each @ GOJba, nitrogen per Wro	3,043	11,800
2(Sb / 10		L*ti manured	3.005	15,010

It will be seen tbat the outturns obtained were very good, but *AS* the unmanned plo .ts in the two *sets* yielded mow corn than many of the manured plois—aud this is only the first year of the experiment—it is possible the high outturns might be due more to tho new method of sowing than to the effects of the residue of manures. Indeedj it is premature to discuss the results*.

"It should be noted that the outturns of pota toe) on the untnaaHred plots have been decid-edly high, and it may be assumed that these plots Ktrt decidedly rick at tJie commencement of the experiment; hence it is not surprising to find that the crops of maize from them should hane been good* **alto**
J. W. LEAIUEK.

V.-TRIAL OP IMPLEMENTS.

(a) *Permanent experiment with deep and, shallow ploughing.*

This waa started in 18S2. Its object is to determine the relative economy of deep and shallow ploughing in preparing the ground for wheat and the effect thereof on the outturn. Of the three plots assigned to the experiment two are ploughed four times with improved ploughs, one nine inches deep and the other five inches deep ; while the third plot is ploughed eight times three inches deep witjh the country plough in ordinary use in the Cawnpore district; the treatment of all plots being similar in all otlier respects. No manure is applied to these plots. All tha plots were sowtt on the lGth aud 17th of October 1897 with Muzaffarnagar wheat, and the crops harvested on the 2nd and 3rd April 1S98. They were watered four times during the season of growth. The subjoined table compares the outturns obtained in various years.

Statement showing the results of the experiment with deep and shallow ploughing.

Plot number.	Plot area.	Trcatmeut.		Outturn per acre in poundi.						
				Average outturn, for four yenrs.			I h dividual outturn for—•			
				1882-83 to 1885-86.	18SG-87 to isse-eo.	1800-31 to 1803-0*.	JS0.1-96.	16D5-EJG,	1306-97.	1S97-08.
VI	p. 1=2,450 square yards.	Ploughed niiii) inches deep with Impro-• ved plough.	(Grain..,	330-25	833'6J	**1,024-50**	**265**	**1,139**	**1,277**	**713**
			(Straw...	l^UT'OO	1,15833	**2,052-00**	SOS	2,003	**2,148**	**1,358**
P2		Pln-jghcd fiTO inches deep with imjfu- j Ted plough.	f Grain,.,	**63B-50**	661-C6	**SDG25**	**see**	1,250	**1,230**	**1,190**
			(Straw,.;	**1,325-75**	1,SSS'OO	**2,009-SO**	**464**	1,949	**1,833**	**1.0O2**
P3		Planglied three inches duep with native < plough.	r Gr»in...	•isroo	G02-O0	**860-25**	183	1,431	**1,101**	**1,148**
			(Straw...	**SBS'OO**	1.O48C0	**1,918-25**	**453**	2,077	**1359**	**2,035**

During the year under report the plot ploughed deepest gave the poorest outturn, contrary to gen oral experience. In this case the loss of moisture from the seed bod due to the unusual heat of the weather which prevailed in the beginning of the *rabi* season was naturally greater than from the plots ploughed less deep. The germination in the former plot was consequently poor. The same thing happened in another dry season, 1895-96. These results suggest the advisability of adopting invariably, in dry years, the practice not uncommonly followed of flushing or irrigating the land in October before sowing, if deep ploughing is to he resorted to. The plot ploughed five inches deep witb the improved plough gave n somewhat better result than that ploughed three inches deep with the native plough. But as stated in fflrtaer years the advantages of the improved plough lie chiefly in the greater economy of time, labour aud money, speed and efficiency with which the seed bed is got ready for sowing, and uot in the increased outturn which may or may not follow; although, aa a matter of fai:t, deep ploughing has in the majority of instances produced a markedly increased yield in the particular class *o£dnmat* soil concerned.

The improved plough is, moreover, drawn by the *ordinary* cattle of Cawnpore and ploughs quite as much land in a day as the indigenous ploughs. Assuming eight ploughings with the native as equivalent to four with the improved plough, and the cattle and manual power employed to be worth 10 auuns per aero, there is a clear gain to the cultivators of about Rs. 2-8-0 per acre in using the improved plough. Thus the saving effected in ploughing three acres of land more than covers the cost of the beat and most expensive improved plough of the Farm, *viz.,* the " Wart's."

With reference to the time required for preparing the ground, the cultivator can with the.use of the improved plough manage twice as largo a holding as he could with the country plough, or make his seed bed ready for sowing *rabi* crops of the first order in time after removal of a *kharif* crop, whiali lie could do but imperfectly if ho were to use the native plough.

*(c) The chain pump at a height of IZ to 17 f*eet can be expected to raise about 400 cubio feet of water per hour in actual practice. Ordinary male labourers are a*ble to work it conveniently.

(a) *The Baldeo balti* which has been noticed in previous years' reports was placed under **special** test during the year, but the particular implement tried was rather leaky, aud the results were therefore not conclusive. Further **trials** will be made.

The water lift experiments mentioned above (except those- with tlte Stony water lift) were not conducted under my peraomd supervision, and for the figures aud notes regarding thorn I am indebted to Mr. P. V. Subbiaii, Superintendent of the Farm, who carried them out.

VI. VARIETIES OF CSOPS.

(ci) *Experiment with varieties of cotton.*

This experiment was originally started in 1S83 Vith the object of determining which, if T i HffZ ^ foreign TMrieties Of COttoa wercatiitable for estivation in the DoSb.

la ltHtt four varieties wliioh had proved to be inferior were eliminated as not deserving of further trial; and certain varieties of Assam cotton were added to the experiment. As in the previous year all the varieties were grown in the same field, and were treated alike with regard to cultivation and manuring.

Details of cultivation.

Tillage.-^ $U_n d$ was ploughed with Watt's plough three time,, cultivated with Uie 1 lant Jr. bone-hoe once and levelled three times.

Manuring.-CMie dung applied at the rate of 200 manuds per acre

made ^ ^ - S e e d was dibbled on the ^26th ^of June in holest,vo feet apart along lines in t! at interva ficl, h fa Jn countr the

varies where the hole, were only one foot apart: eaeh hole received abou, five ,,cd.,

hole ^Tn7*r g. Wi the crop wasab<>llt 15dayao3d,theweak, yp laniaateacll

hole we« pulled off **leaving** one, **ttd** strongest plant, at th. place. While thinning Ihe **plant.,** the blank SI>aee3) where the seed had failed to germinate, were filled up by

I

l,.ef ««««, of the comparatn-ely low outturn during the year under report,

the SSZ^ZnSf*the *mmiB* of November 1897 - — *t0

ft I «S T I(S of i h0 6Xperimeat8 are tabulatc(l - the following statement :-

Statement slowing the outturn of different varieties of cotton [foreign and Indian .

Field Nos. 1897-98.	Plot 1897	Name of cotton.		1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	1895-96.	Second year 1896.	1896-97.	1897-98.
Field Nos. 32 and 33.	302 square yards each.	Tree cotton ...	f Fibre.	111	143	115	Bi	100	21	23	700	141	213	in
			I Seed .	sn	U5-i	251	m	[201	71	41	92a	28S	BM	207
		Louisiana ...	f Fibre .	...	l!14	,12(J	,'D	103	::-.	65	BID		217	178
			t Seed	863	457	SK>	128		77	90	IS	toa	480	417
		Gars Uil]	(Fibre,	LSH	LM	SI	tea	S8	B8	19	320	168	M	84
			) Seud .	24B	803	137	1S6	217	167	38	US	I..7	72	47
		Hjbrid	f Fibra.	B3	183	L03	ED	160	::s	97	ess	[flt	28B	[SO
			t Seed .	207	n->	:(!;{	L88	288	-srt	47	77:;	390	732	315
		Sea Island	} Fibre.	i 97	104	til	M			38	320	IS.)	2G7	179
			(Seed .	[sas	r.li	861	185	58S	7(1	69	805	BW	U72	409
		Egyptian	C Fibre,		19-1	I 80	6G	I-'-."		29	314	164	272	178
			Seed	97	i.i I	K'l	162	BOS	i:.	70	3U9	382	t)58	380
		Hinganghat ...	(Fibre a „	111	1H3	103	64	153		23	237	113	128	i-a
			I Seed .	235	ir.7	B61	tS8	SOU	SO	41		[£83	339	140
		ffuikln	(Fibro.,	...	...	...	...	...	88	...	...	...	108	09
			I Seed .	...	...	...	...	...	...	...	...	...	-,\>	
		Jantiya	(Mb» .	...	...	...	...	...	...	6	220	JO7	B0	55
			"(Seed .	...	...	...	...	...	...	13	•130'	:.l I	n;	10
		Bald	I Seed	...	...	...	...	...	...	10	118	:>7		tii
				...	...	...	...	...	...	21	SM	I28.S	89	1218
		Jari	(Fibre	...	...	...	...	...	...	17	221	33	334	110
			{ Seed	...	...	...	...	...	...	34	418	276	858	lass
		Country, i. *., lucul variety. Cawnpore	f Fibre .	...	...	...	...	...	...	...	...	...	11	80
			[Seed .	...	...	...	...	...	...	...	...	...	981	133
		Hydr&badi ...	(Fibre	...	...	...	...	...	...	...	...	...	372	99
			Seed	...	...	...	...	...	...	...	...	...	576	168

It would **appear that** foreign varieties gave better outtnrus ia several cases during the year under report thau the indigenous and the Assam varieties, contrary to the experience of the past year.' This *vraa* due to the plots having been unfortunately flooded by a sudden overflow of the canal distributary on 27th October 1897 and 7tii November 1S97. The water was drained off us quickly as possible, but this could not be effectively done in the easo of plots which have given poof results on acoouut of their comparatively low-lying situation, and consequently those plots, besides some other* not mentioned ia this experiment but situated in continuation of the series of expert mental plots, were damaged, some of them very seriously.

The system of allowing a crop of cotton to stand on the field a second year with a view to obtaining successive outturns of fibre and seed has ultimately proved to be far from economical, and has therefore, not been tried again.

With a view to obtaining dkpert opinions on the quality of the different varieties of cotton, samples of the varieties enumerated in the above table, anil of certain other varieties not included in the experiment but grown on the Farm during the year (except the indigenous variety) were sent to the Managing Directors of Muir Mills Company and Cotton Mills Company, Cawnpore*. The Managing Director of the Muir Mills Company has very kindly furnished his opinion about each variety which *in* quoted below : —

1. *Louisiana Cotton*—A «** silky cotton; medium to long staple; fibre evenly; suited to fine «u> ts; would apparently gin easily leaving fairly clean large «*.

2. *Hybrid Cotton*—A silky, fairly long staple cotton, and very strong; suited to spinning fine counts.

3. *Air Cotton*—A soft cotton; some of •» staple very long averaging 1¼ to 1½ inches, but variable; cotton apparently from Egyptian seed; fibre not strong.

4. *Sea Island*—Differs materially from real Sea Island cotton; staple very short and weak for Sea Island, and if sample is from imported Sea Island seed the cotton shows marked deterioration.

5. *Hinganghat*—Except in regard to abundance of seed the sample does not compare favourably with real Hinghanghat. The staple is short and somewhat woolly.

[The foregoing two samples, viz., Sea Island and Hinganghat, show such marked deterioration that I should say that they are quite unsuited to the soil and climate of the Cawnpore district.]

6. *D... ari* *«—A .oft .hot stapled cotton; fibre weak; abundant seed.

7. ... cotton, with very fine and fairly long staple; fibre not strong.

8. *Oare mil Cotton* -A woolly, .hort -topic cotton , ftb» v«r, ro.gL but «trone, notMa* to commend itself in this variety.

9. *Barodha Cotton*—A medium staple cotton : iUplc ^ but not ... tTOne: 8Uikd *oBpinBine medium counts, but not an attractive cotton.

10. *Nankin Cotton*—An absolutely worthless cotton. T^ writer of *m.* report cultivated it for a series of years, and found that with each successive year the staple became weaker u ^ . l W * BOmething like thistle—down and could not be worked. The colour is fugitive.

11. *Egyptian Cotton*—A very white silky cotton; long staple, but not all equal to the staple of the p... t stock.

12. *Bani Cotton*—A soft silky cotton; medium staple, but strong; would spin well.

13. *Egyptian Madrasi Cotton*—A soft silky long-stapled cotton , .uporior to S-. 11.

14. *Country Cotton*—A very white, somewhat coarse cotton, but finer and longer staple than is grown in the Cawnpore district.

15. *Tree Cotton*—A very soft medium to long staple silky cotton; staple weak and very fine; doubtful huw it wottld work-

16. *Jari Cotton*—A short staple coarse cotton; good colour, but not commendable.

17. *Coole', tons* rf-pfa-1 SJ^did cotton, long ttUfom staple, <Dd w, -tr0Bg , good .olour.

18. *Jaulia Cotton*—A coarse short staple cotton, somewhat resembling ... in Northern Bengal.

General.

"My opinion of imported cottons is that they always deteriorate on an Iadi" «oil* the deterioration being in the direction of a gradually weakening staple until the cotton is no longer workable. This applies only to such cottons as are greatly superior to Indian cottons, such as Sea Island or fine Egyptian.

* 1/ (At« r*p<w of «» *Manager, Muir Afiltt, be compared aitk kit similar report* 1894, *it mitt be teen that Louit-* • tono. *Hybrid, and Tret eattcrii have not dtpreciated;SeaIt!tsnd,* -ffttt-*g&anghai, Garo Hit I, an Egyptian* bave *deptrciit'trit. This is spt~eialiy narked t* the eascofOaro Hill cotton for which* mu> *seed was, I think, obtained in* 189* *or* 1895. *It it vert/ important. If I hail to decide about lhi$ experiment I would get new seed of these varieties and proa loth the present stock and the ttev ttoei for some t/eart and again obtain expert opinion. I do not thini that such rapid depreciation has been observed in cottons elieahete and if the depreciation it proved, it would go* fnr *to settle the question of improvement of cotton in India.*

J. W. LEATHER.

What the result would be o£ tba grauwl blending of a good imported cotton with an Indian variety it is difflmlt to soy.

The opinion in **the** Bombay Presidency is, I think, that in the course of yours the prodnce esnnnt bo (liitiiit'iiisliiil from the original stock. Hinvcvrr this maybe, it would appear u» if nurli an experiment would ho risky ; if the imporUnl strain was always made to predominate tlu'rv would probably boa long cotton but with ft weak staple. If on tbo other liand tliu indigenous growth predominated, the iitii>orto*l strain would hnvu but little **eflwi.**

1 balins—and my belief him been coiifirmod by experiment*—tliat nil efforts should bo in the direction of improving indigenous growths, not by importing foreign cottons, but (1J by selection of seed and (3) by mora careful cultivation, wpeoially in the direction of deep ploughing.

In parts of Tiundelkband tUerc are varieties of cotton aome of which are neatly as good &s any grown in India; **the toil** is sn eminently suitahle our, and tho diatrict is deserving of greater attention brought than it appears *ta* receive. 1 bdievo there is a Rroat deal of laiHUyiiiR wasto in parts wbicb might be brought uudcr cultivation and made tu produce :i cotton equal to any In India."

In paragraph 2 of the letter forwarding bis pinion tbe Managing Director of Muir Hills says—

" I would, however, venture tn repeat **that** but. **little,** if any, practical good in likely to result from experiments with imported *weed,* egpucinlly as Uu'sc experiments must be conducted under eonditinna which would not generally prevail or be **•ttsinablo. If** cultivators wcr« en enurngod to always select seed and to plough deeper, I am convinced that beneficial results wonld immediately follow and that theao aro the beet, safest, and chnapiijt means by which Indian eottnns o^n be improved." Hia suggestions regarding selection of seed and deep ploughing will be given affect to.

(6) *Experiment with Canadian oats.*

This waa started in 1890. The plots under tbe experiments wore watered once with canal water on 24th October 1897 to soften the soil. They were ploughed four times with Wait's plough, cultivated with Jr. horee-lioe once and levelled four times with the *patela.* The seed was sowtl on 2nd November 1897 :ii (In; rste of 120 lbs. per acre. Two wittering* were given during the period of growth, ami tlie orop harvested oa 29th March 1898.

The following table shows the outturn obtained fronj the six plots :—

Statement show ing the outturn of Canadian oats.

Plot No.	Plot area.	Variety of oats.		Outturn per acre in tt>fl. 1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	Average from 1890-91 to 1894-95.	1895-96.	1896-97.	1897-98.
36/1	Each plot = 400 square yards.	Prize Cluster ...	Grain ...	620	240	*3U*	178	149	29C	217	57S	2,045
			Straw ...	2,112	1,125	10,239	S.456	3,0u'G	4,-WC	8,307	7,230	5,639
2		Canadian triamph.	(Grain ...	787	2JC	31G	100	71	31C	126	620	8,360
			\ Straw ...	2,527	1,050	9,070	6,588	2,917	4,220	0,730	6,474	5,917
M/3		Rennie's prize,	(Grain. ...	**478**	IDS	300	544	134	339	**167**	3S7	**3^32**
			Straw ...	1,980	942	3,731	**18,680**	3,300	5,729	8,787	5.G15	5,403
36/4		Welcome ...	(ftrsiu ...	70S	240	•13E	£00	71	313	*in*	071)	2.-108
			*X*Strav ...	**2.3U8**	756	9,730	5,920	2,806	4,334	7,8^7	6,173	6,244
36/5		Bonanza ...	Grain ...	787	252	277	336	US	3S0	175	**472**	032
			Straw ...	2,573	013	10,578	13,960	3,UB'J	6,221	7,73»	6,861	6,873
-38./6		White Egyptian,	Grain ...	**847**	300	25-t	192	64	331	192	545	1.0O9
			Straw ...	2,638	336	7,110	5,368	2.903	3,701	6.9B1	5.72S	U.-137

These oata need to yield a very high proportion of titraw as **compared** with the grain, a feature **which** they maintained (brougbout the period of the past ciglu years; but contrary to this experience they produced during the year under report 3 much.

higher outtura of grain in proportion to straw than usual.* Tlie only change in treatment introduced during the year was the artificial irrigation of land prior to its preparation for sowing on account of timieual dryness of tha soil. This resulted in excellent germination of the seed. It is, however, noteworthy tliat plants were somewhat stunt.-il in growth *as* compared with former years, but bore larger and more numerous ears, alt full of grain. Tiiis may be due possibly to the peculiar dryness of the first half of the past *rabi* season. Tlie current year's result of this experiment will be watched with much interest.

•XOTE.—*TAt Outturn nf ttrate t&iit/far it prac-tirall.t/ equal to that °f tie foregoing year, and thuTefart if* fir *Hrna* ipa» *shorter in* 1807-88, *tit plant, must have tilt art d mart frefill to taakt up the wtighi.*

J. HI. *LXATEER.*

(c) *Experiment with Am&rican wheat.*

The American variety received from the Pi>litii3al Agent of Bundelkhand, who had found it growing i'ree from mst in the ginlcn of a native chief while the neighbour ing fields wjre attacked with the disease, has been under trial at the Farm siuce 1805, and was grown in different plots during thia period of three years. Duriog the year under report the wheat was sown on the 4th of November 1897 in the ordi-nary way, and the crop harvested on the 29th of March 1898. No signs of rust appeared on this crop, though other crops of wheat grown on tho Farm did suffer from it. The American variety had also been free from rust during tlie two previous years, but the trial must be continued for a series of years to determine whether it 13 really mat proof. The statement given below shows the outturn obtained:—

Statement showing the results of the experiment with American wheat supposed to be runt proof.

£ *fu*	flot area.	Nirac of variety.	Outturn p<T riero in UIN.					
			18D5-:'i!.		1896-07.		1897-38.	
			3 *a* 5	1	a 1 O	1	q *a*	1
18 T	COS square yards ...	.'Vmericiui wheat ...	E£56	5,872	...	...	...	...
2a Co)	1,210 ditto ...	Ditto ...	...	...	2.1.-0	6,450	...	...
SG 7	800 ditto ... •	Ditto ...	...	...	...	...	1,150	2,7155

(*d*\ *Experiment with varieties of sugar-cane.*

This was originally started in 1894 along with the mannrial experiment already noticed, but tho character of the experiment was subsequently changed altogether under the instructions of Dr. Leather. Six varieties are now tried in two series of plots. Tliroe of them belong to the *paunda* class (chewing ones) and three to the *ukh* class (canes usually grown for the production of sugar), the manures applied in oue series being twice as rutiuh in quantity as those used in the other. The experi-ment is carried out in two sets of plots iu alternate years.

Details of cultivation.

Tillayc.—The plots wore ploughed once, subsoilcd ODCC, cultivated with Planet Jr. horse-hoe once and levelled with the *patela.*

Manuring.—The manures were applied on the 6th of February 1S97.

Planting.—-Cuttings were planted on the 7th of February 1897 in the usual manner iu furrows.

After—cultivation.—.The plots that received 500 lbs. nitrogen per acre were weeded eight times and -watered fourteen times altogether, while the plots treat-ed with 250 lbs. nitrogen per acre were weeded seven times and watered seventeen times.

The crop in all the plots grew with such extraordinary luxuriance and vigour that it became quite " laid up," the plants having failed to keep standing in spite of having been lifted up, tied and earthed up oftener than usual. The popular belief was that the quantity of manure (nearly 847 mds. per acre) used even in the 250 lbs. nitrogen plots was excessive, at least for the *ukh* varieties.

The cutting and crushing began on 26th January 1898. The *gur* made from the various plots was of a very poor quality, having little consistency or grain, which lowered its market value considerably. It looked little better than a thick syrup. The outturns are tabulated in the following statement, the highest having been obtained from the Madrasi *paunda* as in the past year:—

Statement showing the results of the experiment with six varieties of sugar-cane.

Field No.	Plot area.	Manure applied per acre in 1897-98.	Name of variety.	Actual quantity of manure per acre in lbs.	1897-98. Outturn per acre in lbs. — Weight of cane.	Weight of juice.	Weight of gur.	Percentage of — Juice to cane.	Gur to juice.	Gur to cane.
1 to 6 east. 1	Each plot [illegible] of an acre.	Poudrette @ 250 lbs. nitrogen per acre.	Saháranpuri	69,444	49,840	30,256	4,896	60·07	16·18	9·82
2		Do. ...	Madrasi ...	Do. ...	55,296	42,848	7,008	77·50	16·35	12·67
3		Do. ...	Poona ...	Do. ...	48,008	32,320	3,712	66·30	11·47	7·61
4		Do. ...	Dikchanukh	Do. ...	55,728	33,714	4,004	60·53	12·04	7·29
5		Do. ...	Dhaul ukh	Do. ...	46,528	25,904	3,840	55·67	14·82	8·25
6		Do. ...	Ratna ...	Do. ...	44,088	24,912	3,904	55·74	15·67	8·73
[illegible] 1		Poudrette @ 500 lbs. nitrogen per acre.	Saháranpuri	138,888	46,176	36,708	5,896	79·63	16·04	12·77
2		Do. ...	Madrasi ...	Do. ...	67,18[illegible]	48,880	7,844	72·73	16·05	11·60
3		Do. ...	Poona ...	Do. ...	36,3[illegible]0	[illegible]1,540	3,100	67·53	12·63	8·53
4		Do. ...	Dikchanukh ...	Do. ...	60,336	38,512	4,384	63·83	11·38	7·27
5		Do. ...	Dhaul ukh ...	Do. ...	46,[illegible]80	27,21[illegible]	3,672	57·06	13·50	7·80
6		Do. ...	Ratna ...	Do. ...	37,[illegible]52	22,4[illegible]	3,152	59·19	14·02	8·39

(e) Experiment with old imported carrot seed.

A report on [illegible] experiment was submitted to Government (separately in May last and [illegible]) reproduced here with a view to publishing it with the general record of experimental work done at the Farm during the year.

The undistributed European carrot seed returned by District [illegible] was preserved at Cawnpore during the rains of the year under report in air tight chambers, which were opened early in September 1897. One bag of cleaned seed of each variety, which had never be[en] opened since it left Europe, was selected for experimental sowings at Cawnpore, and the contents were used for the purpose. Uncleaned seed was also sown, but this was taken out of bags which had been opened in the beginning of 1897 in districts.

Several plots were selected at the Farm proper and in the garden attached to the Farm for experimental cultivation, and [illegible] land was prepared in the ordinary native method, with the exception that the plough used was an improved plough (the Watt's), and that certain plots were laid out in ridges. At the Farm only two varieties, viz., the white and the red, were [illegible], as the [illegible] yellow seed had [illegible] exhausted in distribution before the Farm sowings [illegible]. The two [illegible] of seed were sown at the Farm on ridges between the 4th and 6th of October 1897.

At the [illegible]den, [illegible]er, all the three varieties were tried, [illegible] country [illegible] the [illegible]ous Cawnpore variety) was [illegible] the same time [illegible] the imported [illegible] sowings at the garden were done by three different methods, viz., (1) [illegible], (2) on ridges and (3) in furrows. Besides, some plots were sown within the nor[ma]l period, while others were sown comparatively late in order to determine the relative merits of timely and late sowing. The usual time for sowing carrot, in the Doáb is from the middle of August to the end of September. At the Garden three series of plots were sown between the 25th and the 27th of September, and may be regarded as sown at the proper time. One series [illegible] of October, and another, the last, on the 19th of October. The last two may be treated as somewhat late sown plots.

No manure was used at the Garden, but at tlie Farm cow-dung at the rate of 200 muunds per acre wits applied, aud on flirs account ,the outturn of the Farm plots was generally much higher, carrot being a crop which requires plenty of plant food in the soil. Only cleaned seed was tried at the Farm, but both cleaned aud uneleaued seed were sown at the garden, tho former at the rate of 14 to 24 H>3. per acre aud the latter up tp 36 lbs. per acre. From six to nine wate*iDga were given to the various plots, and the crops were weeded, when necessary, thinned out and earthed up, where the seed had been sown in furrows. The uucleaned seed did nol germinate iu most cases, and where it did germinate the outtaro was exceedingly poor.

The sui-jriined table shows tlie highest, the lowest nnd the average outturn obtained from the imported varieties compared with the country variety :—

Variety.	Manured.				Un manured.				Kemarks.
	Aa. of p i	il f w8	HI A	Average produce of all plots.	u v z;	a a. 1 - £	5 p.	si's	
		1Kb	Mils.	Mds.		Mds.	Mds.	Mds.	Tin; out mm* obtained from plots sown with nn cleaned «w(i have not bemi slionn in this statement.
Red Jtoditerrntienn ...	4,	338-30	NJSM-J	255 -i	5	200·39	2'JO	62·39	
White ditto ...	S	40128	168·24	300*1	5	1 I'rllL'	BW1	01·82	
Yellow dttUi ...	...	...	...	...	5	]:J9'27	38*!)3	10531	
Coun t r v (Ca n n p o r s variety).	3	331-28	177-20	271-8	5	315-34	14310	209'60	

JV. *lit*— A mann(l=S2 flu.

It would appear that, with regard to the bulk of produce, the white Mediterranean gave the best result on manured land; that the highest outturn of the red variety was somewhat above the highest outturn of tlie country variety; and that tlie average outturn of tlie red variety was not very much below the average outturn of the country variety. On unui inured land the country variety yielded, on the whole, a considerably larger product) of roots than any of the imported varieties. Among the latter tho red **Mediterranean** gave the highest yield. The highest outturns of the white and yellow are very nearly equal. The average outturn per acre of tlie yellow variety was higher than that of the other imported varieties *(a* result similar to that obtained last year), but was over a hundred mauuds less than the average outturn of the country variety. These results show that under high cultivation quite as large an outturn may be oxpeeted from tlie imported **red** variety as from the indigenous variety, and that the **white Mediterranean** *may* yield a much larger bulk of roote than the country variety provided tlie seed is eown at the proper time. On unnaKred laud tho resnljs have been **indifferent;** yet they go to show that, while country seed may do tolerably well on -inmanured land, the English carrots cannot be grown with certaiaty of success without manure.

As regards the germinative power of the. seed, tho experiment has shown that, fully matured foreign feed, preserved carefully in air tight cells during the rains in India, keeps its germinating qualities sufficiently well, and ***thai*** the belief current in some circles that, unless exported from England iu hermetically sealed vessels, or if the seed is over one year old, it gets spoiled or is not quite tit for cultivation iu **India,** is groundless.

Tlie highest outturn per acre on unmaniired land was obtained at the Garden from the broadcast sown plots, contrary to the experience of the past year, when the seed sown oa ridges had given the highest produce of roots. The reason for this result soems to lie chicily in too close •germination of the seed sown on ridges, and insufficient (liinninj of the plants, as also to the fact that the crops on ridges were over-irrigated and therefore developed more foliage than roots.

The experiments carried on at the[1] Farm proper, where all kinds of seed were sown on ridges alone in manured lajid, show distinctly (lie superiority of that method of cultivation, not only because they have yielded more roots than any of the broadcast sown plots at the garden, but also because such heavy out turns are not obtained oven under high cultivation by the native cultivators, who usually sow carrot seed broadcast on flat ground. *m*

With reference to the quality of the outturn it may be observed (hat European carrots were generally longer und more tsipsring than native carrots, but not so fleshy as the latter. The red European carrots were very pleasant to the taste, but the country carrots were a shade sweeter, though not otherwise as nice as tho red. The •white and yellow carrots were comparatively coarso, and these, especially the former, may be considered more suitable for feeding cattle than for human consumption ia a year of agricultural prosperity. The red and yellow carrots were generally of average size, comparing very favourably, as regards thickness, with the country carrots; but the •white carrots were both longer and thicker -than all other uarrots, including the country carrots. Some of them were extraordinarily long and fat, and measurements of five of sneh carrots are given below.

	Length.	*Circumfertatt at He top.*
English white canota	((1) 1' 4"	
	I (2) 1' 3"	n *i*"
	4 (3) I'1'	• fli"
		s"
	I (6) 1 1"	7 4"

The advantages of timely sowiug'as compared with late sowing are jwsrfectly clear from the foil owing statement, bised on tUe results obtained at the Garden, where tho sjjcd was sown on different dates:—

Time oC soi ring.		Number uf plots.	lliffiitst outturn per acre :; !]ii^.]:iiUL	Utirut out-turn per Be re in mauiidu.	Average outturn •i> t' acie in Liiiins.]^.	lie [ii irks.
Month.	Date.					
September	25th	3	203 33	130-27	1GO'97	Thentitlnrtw in tliPs'steinentBliav-c been sliown iviitumtrefewmee to any juirtifiiliir imtiEirU."! vskrifit.v. 'f ha outtume nbtnined from plots with uneleaned European seed liiivc not beeasbown either.
!•	27th	3	172-37	107-37	130-23	
n	28th	3	12107	2102	77 83	
October	3rd	3	113 23	17-42	07-70	
,.	I9to	3	50 91	2-19	3067	

N. S.—A nmund=S2 pounds.

At the Farm, European carrots were sown ou3y on.tlie 4tli and Gth of Ociolier. The plots sown on the Inst mentioned date gave a distinctly lower outturn than the other plots. Seed obtained from Ahmeclabad (Bombay) was sown at the garden *on unmanuredlandonlhe* 25th of September 1397, and at the Farm *on manured land* on the 3rd of November 1S97. In the former case tho outturn was 255'95 maunds, but in the latter only 135-26 maunds. The Bombay carrots proved very liable to 'forking' in this country. They were very fleshy, bit exceedingly poor in sugar.

Attempts to produce seed of the imported varieties have failed, both at the Garden and at thePurin.* The "sets" were planted in the usual manner, and grew fairly well but did not hear seed. 'Sets' of country carrots of several varieties were planted similarly at the same time as those of the imported varieties, and they gave very good crops of seed. Experiments to produce tho seed of the imported varieties must be repeated under modified treatment.

Tho two Statements A mid E appended herewith show in detail the individual outturns obtained from the various plots under experiment.

(A)St itement showing tlte outturns of English and country carrots sown at the Farm in 1897-98.

Field No.	Area	Cowdung per ...	Date of Sowing.	Date of Harvesting.	Crop.	Outturn per plot in maunds. Roots.	Outturn per plot in maunds. Leaves.	Outturn per acre in maunds. Roots.	Outturn per acre in maunds. Leaves.	Average outturn per acre. Roots.	Average outturn per acre. Leaves.
						M. S.	M. S.	M. S.	M. S.	M. S.	M. S.
	200		Ith October 1898.	ICtli January 1698.	English red carrot (tlic large red Sleiliterranean.)	14 (	2 8	J38 8	S3 2S		
y	200		nitto ...	Ditto ...	Ditto ...	14 (	2 20	::-s I>n	61 13	j.235 4	42 36
	224		Ditto ...	Ditto ...	Ditto ...	8 3	1 lit	174 30	S. 0		
•	224		Cth October 1898.	Ditto ...	Ditto ...	7 31	1 12	1 ... 1 4	27 BE		
	200	i	4th October J8E8.	Ditto ...	English white carrot (largo white Mediterr* auean).	16 i<	2 16	104 24	KB 12		
	200	f	Ditto ...	Ditto ...	Ditto ...	16 3£	3 11	181 3fi	79 3	>300 !	55 24
	200		Ditto ...	Ditto ...	Ditto ...	13 S	Z 0	;U7 1-	•15 10		
	21	i	Ditto ,,	Ditto ...	Ditto ...	10 3	2 11	318 4	it 0		
	200	i	tjth October 1898.	Ditto ...	Ditto ...	7 3i	21 30	ics a	•11 10		
	200	•	4th October 1898.	Ditto ...	Country red carrot, (CawnpoHs variety}.	1 IS	4 2H	177 20	114 10		
	200	t,	Ditto ...	Ditto ...	Ditto ...	13 a	9 0	334 2S	1- 25		
•	200		Ditto ...	Ditto ,,	Ditto ...	12 IS	S 16	301 24	32	i11 D	la& 0
1	224		Ditto ...	Ditto ...	Coantry white carrot.	7 V,	G 32	153 3	ta 4		
	200		6th October isea	Ditto ...	Acclimatized Ditto ...	S I	1 2G	122 20	40 C	110 2*	85 7
	200		4th October 1698.	Ditto ...	Couutry yellow carrot.	1 1 f	Q E	271 8	us	271 4	148 28
4	600		3rd Nnvomber 1838.	Ditto ...	Country Bombay carrota	Id SS	1d.1;	133 2G	S 0	135	83 0

Ous maund = 82 Ebs.

(B) Statement sJtowing results of cultivation of carrots at the Garden in 1897-98.

Field No.	Data of sowing.	Data of harvesting.	Manure	Area	Name of variety sown.	Outturn per plot in maunds. Roots.	Outturn per plot in maunds. Leaves.	Outturn per acre in maunds. Roots.	Outturn per acre in maunds. Leaves.
						M. S. C	M. S. C		
1	9th October 1897	January 1898.	V	J21	Rod carrot, unclcuDCd,	0 5 (	0 3 0	E-00	3-00
			V	Iil	Wbita ditto ,,	0 9 t	0 0 (	:ciin	e-oo
			V	121	Yellow ditto	0 IB t	0 3 0	1200	300
			V	117	Country carrot of Uonibfly.	3 0 I	1 27 t	12410	69-29
			V	5G2	Carrot of mixed variation.	0 20 t	0 4 0	4-30	0-85
2	5th September 1897.	14th January 1898.		230S	Country carrots of Cawnpore.	S 0 (	8 33 0	31534	86-58
			V	230J	;»rr«U of liiiuibiiy ,..	2 7 t	a SO 0	235-05	120-35
				230J	English carrot, yellow, cleaned'	G 20 (	3 35 I	130-27	81-46
			¥	23OJ	Unelittt carrot, wbJte, cleaned.	6 27 0	2 35 0	140-32	CO'«
			¥	230J	En IT! iah cirrotj rod cleaned.	92T 0	2 5 0	203-39	44-67
3	Ditto ...	8tb January 1898.		106i	Englifh carrot, yellow, uncleaued.	0 15 0	0 7 B	17-01	8'83
			¥	10C1	Englieli carrot, wbite, anclesucd.	1 10 0	020 B	58-22	S4-1G
			¥	I06J	English carrot, rod, uncleaned.	1 3 E	0 IS 0	60 08	70-01

• Tbo *seed* was sown broadcast.

(B) Statement showing results of cultivation of carrots at the Garden in 1897-98—(concluded).

	Date of sowing.	Date of harvesting.	Plot		Name of variety sown.	Outturn per plot in pounds. Roots.	Leaves.	Outturn per acre in pounds. Roots.	Leaves.
						U.S. C	M. ii, C		
	381ft September 1897.	21st and 22nd January 1898.	V	170}	Conntry carrot (Cawnporo.)	7 S 0	2 !5 0	2020C	61-33
				170J	Country carrot (Bombay).	5 4	1 i» 0	14*88	4P-C3
			V	170J	English carrot, spoile: (cleaned) f.	2 30 0	1 0 0	77-OS	21 SO
			¥	170i	Engiisti carrot, yellow	4 15 0	i :13 0	13107	51-04
			¥	170|	English carrot, white cleft n tKi.	3 &	1 0 0	87-91	21-W
				168J	English carrot, Ted cleaned.	0 30 0	0]10 0	21-53	717
S5	27th September 1W7.	18th January 1808.		1634	Country ctrrob (Cawnpore).	7 20 0	S: 19 0	221-94	88-03
			V		White carrot (Bom. bay).	i 35 (	2 3 0	144-26	61-40
			V	I68f	Wbita carrot (Corn. pore).	6 10 0	1 1!6 0	4S5-3G	48-08
			V		Eng-lisb tartot, yellow	3 30 0	2 0 0	111-06	60-18
			¥	163J	English carrot, white, clennpd.	3 £5 0	1 15 0	107 27	40'OS
			Y	168}	English carrot, red, cleaned.	5 33 0	1]13 0	172-37	39 20
•c	3rd October 1897.	23rd and 24th January, 1898.	y	177J	?onntry carrot (Cawapore).	4 15 0	1 30 0	1-K'-Kl	47'G4
			V	69}	Knglish carrot, wd, cleaned.	0 10	0 3 0	17-1B	6-as
			...		Enp-lisli carrot, white, el^iMicd.	0 3C (	0 12 0	727Z	B088
			...		Sngliib canot, yellow, cleaned.	1 25 0	0 25 0	113-23	43 5G
'7	9tb October 189?.	19th, 20th, and 21st January 180b.		SOS	English carrot, te&. ijeaned.	0 5 \	0 3 0	2-99	1-79
			don i	202	On^lish carrot, white,	2 0 D	0 SO 0	5001	IMS
				202	English carrot, yellow, rl-:irjC'l.	1 S3	0 25 0	3B'0S	14-B7
				S03	Carrot (Botntisj)	Z3 33 0	4 11 0	30719	102M3
			no*	202	Country carrot (.Caivnpore).	6 27 D	1 36 0	159-33	44'92

* This seed was sown broadcast.
† This was damaged by rain. ‡ In this Krioi seed was (owe infnrrows.
§ Seed wai sown on ridges.

TIL-DISTRIBUTION OF IMPLEMENTS.

XJie following statement shows the **distribution** of implement; during the year under report as compared **with 1**ho past year :—

	1BDG-97.				1897-98.					
Plonghi	99	8	14	121	158	13	7	178	57	...
	24	G	6	35	12	fl	4	22		13
Enid™ water-lifts	8	1		4	u	...				...
It. Hnnfs liibblers	8			3	8	...		S	5	-
Kahnn libblcrs	2			2	S	"1		5	3	
Chaffcuttera	4	1		C	10			11	G	
Harrow	2			2	1	:::		1		
Sivni (vermicelli) presi	1			1	1			1		
Dredgtrs				7				1		
Set of Loring tools...		13		13		14		14	"1	...
Baldeo ilonr mill	n					0				
40 feet pump complete with tlo gear.					1	...		4	"1	

The ilemand for chain **pumpa** and dredgers was not go brisk during the year nuder report as iu the praeeding year of drought. The exhibition of the Cnwnpore double chain pumps at work iu some of the western districts formed a new feature of the department's programme of work iu the **direction** of bringing improved implements to the notice of native agriculturists during the year under report. One of these pumps was supplied to a wealthy zaniludiir of the Lucknow district who sought the advice of the department as regards purchasing irrigation apparatus suitable for his purpose.

In the distribution of all other implements except the improved native harrow there has been a very marked increase which is specially noticeable iu the case of ploughs, chaffutitters, and kibblers. This was brought about chiefly by the efforts of the representative of the department at the agricultural fairs, aud was also due partly to causes mentioaod iu the next succeeding section of this report.

The Meston plough referred to in the chapter on trial of implements attracted considerable atteution at the fairs, and commanded the largest sule during the year.

The demand for boring tools was much greater than the **department** could possibly meet with the limited number of boring sets at its disposal, and there is much room for extending operations iu this useful direction. The agricultural public willj no doubt, be grateful ii' this is done.

m-DISTBIBUTIOH OP SEED.

The following table compares the figures of distribution during the year under report and **the** two preceding years :—

Xnrae of seed.	Weight in lbs. supplied daring 1B05-06	Woiglit In D>s. supplied flaring 18eB-a7	Weigbt in ills- mii | I:_L1 aoring 1807-03.
Miixe cobf	...	...	441
Wai™	6	40	10,013
Sorghum impi	20	1231	•u J
Lucerne...	•17	IS	84
Paddy	525	112	*Si*
Desi bsjra *(J'tnnisgiua Typieidcum)*	...	120*	1,892
Gujrkti bujr*	...	«.•	1,808
Arhur *{Cajauvt Indica)*	...	...	S3
Guinea gross	...	...	1
Tlrd *(Phattoltu Eadiatut)*	...	M1	180J
Sorghum TTilgnre	...	...	725
Tilli *{Setamum Indicvm)*	...	..•	2. "I
Wheat	9.933	156,3BG-5	[illegible]
Cape *onla*	11,655	[illegible]	[illegible]
Hit) itutatws	...	820	.*.
Barley	...	...	1,0C6
Canadian oats	...	...	118
Seed canes	...	...	T lii r ten banJred ciiiiGi iu number.
Peas	...	...	666
White gram	...	...	•ftp.
Country prrani	...	...	123
Cot!'in seed	...	G1J-5	97
[illegible]	...	[illegible]	£11
Babul *{Acacia Arabics)*	...	188	[illegible]
Indigo seed	...	B	S2
Carrot seed	...	140,143	60,503
Jffoni cotton seed	...	...	10
Nankin ditto	...	44.	6
White poppy	...	...	73
AIsi *(Linum Usitatistimnfn)*	...	...	11
W:irson *(Urussica Camvettris)*	...	...	6
Tobacco...	...	...	SO
San wan (panic um *Utiliaceum aai Panicum Frumtn-* [illegible])	...	...	8,768
ILiiidun *(Eleusiw Caracana)*	...	...	2,091
Kodou *{Bitjpalum Scrabicutatvtn)*	...	...	63,3-12

This subject has been receiviug special attentioa from the officers of the department since the past year, and as a reKtilt this branoh of the department's agricultural business has, it will appear from the statemeat, developed very considerably during tBe year under report.

Under the Board's orders the special managers of some of the important Court of "Wards Estates of the United Provinces assembled at Cawnpore on two occasions during the year to sice the Farm and discuss some agricultural questions of practical utility. Among the matters considered at these ineBtitigs, one, perhaps the most important, **was** the **utilization** of the resources of the Farm for the **supply** of sound and selected agricultural seeds to the common cultivators. IudeiiSs for different kinds of seeds from the various Special **Managers** followed, **and** were duly complied with. My increasing familiarity **with teitiqcUrs** and zamiud&rs during **my** tours has also been productive of some good in this respect.

Experiments have bean started recently with the object of improving (he quality of the seed stock of the Farm by sowing specially selected seed of the Jaunpur and the Cawnpore varieties of **maize** with a view to ultimately establishing two kinds of " pedigree maize," and the results just obtained from the ***kharif*** harvest promise a real success in thi3 direction in course of time. Similar experiments with one or two varieties of wheat will bo commenced in the ensuing *rabi* season, and a very useful future for them might be expected. *Two* of the Court of "Wards estates (Gh&zipur and Sitapur) have each indented fora "saed separator" through the Department from England. This useful implement efficiently separates the thick and plump grains, **Specially** suitable for seed puqwses, from the thin ones. "When the seed passed through this machine £a freely distributed and sown in the estates, there will no doubt be a very marked change in the quality of the produce of the cultivators' fields.

"With reference to the table above, the apparent decrease under wheat as compared with the past year U due to thti inclusion in the past year's figures of 150,000 ftw. of white wheat procured from Meerut for the Director of Laud Records, Burma, who required it for experimental cultivation in the Southern Shan States. This was an extraordinary demand, and if it were not taken into consideration, the figures of the year under report will show an enormous increase compared with the previous year. Among other agricultural seeds the iacreaso is particularly marked tinder maize, bajra, barley, Canadian oats, urd, juar, peas and gram.

The poppy seed was supplied under the orders of tlio Government of India to the Premier of New South "Wales who required genuine seed of the white variety for experimental cultivation. The seed canos were supplied to the Collectors of Miraipur nix! **Gys** and the Ingadnlcis seed chiefly to the Superintendent, Family Domains of the Mabirija of Banares, for cultivation id poor soils. It inny be remarked that Ingadulcis is a particularly qniok-growing plant specially suitable to bo grown as a hedge and for' fuel or for making shady avenues.

The large supply of *kodon, mnwan,* and *mavdaa* seeds was sent to the Conservator of Forests in tiie Hyderabad Assigned Districts, and the Department had to take special pains in procuring the seed3 in such considerable quantities on account of tho scarcity which prevailed in the United Provinces when the indent was taken *in* hand.

Tho whole of the month of September and the greater part of October were taken np with tho laborious task of distributing the past year's surplus stock of European carrot seed, with reference to which a separate report has been enbrn'tted to Government.

IX.-SERICULTTOE.

Nothing could he done during tho year towards resumption of the silkworm experiment, l_a the month **of Jane,** which was the time to study practically the iuettiod followed by Raja Rarapal Singh at ICalfikankar in order to keep tho moths alive in the height of summer, I was out in Kohilkhand and Meerat Divisions inquiring into the condition of the sugar trade and industry, »nd could nut get away. The matter will be taken up i_u the next hot -wether.

X.-HOKSE BREEDING.

The Arab shllion "Latora" maintaiuedat the Farm for breeding purposes has kept very good health during the year, and done his work satisfactorily. The

Superintendent of the Civil Veterinary Department, who examined him in the middle of the year, recorded a favourable opinion of the condition of the auimal.

The results of the past year's coverings were not known in 29 oases when the last report was submitted. Since then five have fouled, one died, and the remaining were either failures or not reported on by their oivuers.

During the year nuder report the stallion served 40 marcs, the results of which will be noticed next year.

XI—CATTLE AND CATTIE BREEDING.

(a) Cattle. Breeding.

During the year under report one Kosi bull was supplied to the Superintendent, Lunatic Asylum, Ikreilly and another to the Special Manager, Court of Wards Estates Situpur (Oudh), besides four bulls of different Kheri breeds to the Managers, Court of Wards, Bara Banki and Bahrawh, all procured by the Department.

Of the coverings by the breeding bulls kept at the Farm, done in the past year, results were not known hi 30 eases when the report for Chat year was drawn up. Of these, 17 have since calved, 10 have been failures, and 9 are reported to have died. The Kosi bull of the Farm reported last- year maintains ita reputation, and is much appreciated generally. He served 54 cows during the year under report > the results in 30 coses are not yet known, 14 have calved, 5 have died, and G proved to have been servel unsuccessfully.

The two Parehar bulls reported in the past year commenced regular work during the year under rei>ort They served altogether 18 cows during the year, of which 4 have calved, 2 are reported to have di&l, ant] 5 coverings proved unsuccessful. The results iu the remaining eases are not yet known.

(b) The Veterinary Hospital,

This small institution has been maintained especially for the benefit of the Farm and the neighbouring villages. The *salotri* in oharge of the dispensary has to bfr absent, on and off, for procuring breading bulls, and duriug his absence no patients are treated.

During the year the former *salotri* was deputed to Meerut on agricultural work, and his place given to a qualified *salotri* who was obtained from the Civil Veterinary Department, B;»bugarh, in the hope that under him the work of the hospital would materially improve ; but the man proved most careless and negligent. His services were dispensed with, and th? old luciimbeut called back from Meerut.

Altogether 21 patients suffering from various disorders were treated during the year, all being cured except one.

(c) *Miscellcmeous.*

Experiments in different systems of conserving cattle manure.

The objects kept iu view in these experiments are (1) to determine the quantity of manure that can be obtained ia a year from a pair of working cattle ; and (2) to utilize the urine, which contains more nitrogen thaD dung, but most of which is wasted in the ordinary practice of the cultivators. "With these objects various systems are tried in differevit sheds as detailed below.

Sited A.—la this shed the dung dropped in course of 24 hours is spread and covered over with 5 tti3, of litter per pair every ntoruiug and the dung, nrine and Iittor are removed together at the end of the month.

Sktol B.—Tito same quantity of litter is used in this shed as in shed A for absorbing tho urine, but the dung is removed every morning and the litter at the end of each month.

Shed C—The box system of preserving dung and urine is tried in this shed, and has now had three years' trial. The box consists of a pit 3£ feet deep, 7 feet broad and 10 feet long, having its bottom plastered with clay, sprinkled over wi A ashes, and a thin layer of straw spread thereou. In front there is the manger for the fodder. The dung dropped duriug the night is spread evenly and covered over with a fresli supply of litter at 5 lbs. a pair every morning.

After a period of about six months the pit gets full, when its contents are taken out aud used directly as manure, having undergone sufficient fermentation in the pit. The manure from the upper SttriUce is, however, separated from the well-fermented mass below and is kept back'again *in* the pit. The pit is sometimes **emptied** sooner if manure is required for fields.

Shed D.—The absence **of material** to be used as litter might be a difficulty **with** some cultivators, even supposing they get to recognize the importance of urine as manure and the necessity of preserving it. Hence no litter is used in this shed, but **l>li!a** dry earth is employed for the absorption of the urine and keeping the filled clean and free from smell. TJie urine not ao absorbed flows down *a* drain into fi pot sunk into the ground for collecting it. The cattle of this shed get concentrated food, such as cotton seed, gram *&c.* This system which has now been under trial for ubout two years and a half has received the approbation in particular of the Special Managers of Court of Wards estates and all other visitors to the Farm, being the simplest and oleanest of all.

Shed E.—The same system is followed in this as in shed D, but tho cattle kept in it are of older age and get no conceui rated food. The object of this experiment is to see how far concentrated food improves the quality of the dung and the urine aa a manure, specially as regards the percentage of nitrogen. This was started in the past yeaT.

The quantities of manure obtained under these methods from a pair of **working** cattle during the year under report and the preceding years are given in the following statement:—

Name of shed.	Desert ptiou.	QimntittcB of uisnnrun obtained finder the Re-vuriil method* fruin » pair of working cuttle		
		1806-96-	1SLSG-97.	1897-B8-
		lbs.	ft«.	lbs.
A.	Dunp, litter, and urine	7,821	9,449	10,863
B.	Duii^ alone	7,32s	8,808	1%069
B.	LitSet nud urine	2,371	3,52-J	2,903
C.	Tbe box luunuro		7,:,VZ	9,800
D.	Sung a It) no	10,517		14,100
£.	Ditto	...	8,717	11,203

Samples of all the manures'prepared **onder'&e** different systems couM not bo analysed chemically daring tho year under report owing to the absence of Dr. Leather from India since November 1897, but a few of these manures were analysed, together **with** certain other manures used at the Farm, by the Assistant Agricultural Chemist at Dehra DGn. The figures are given in the following table :—

Statement showing analyses made by the Assistant Agricultural Chemist to the (rovernment of India.

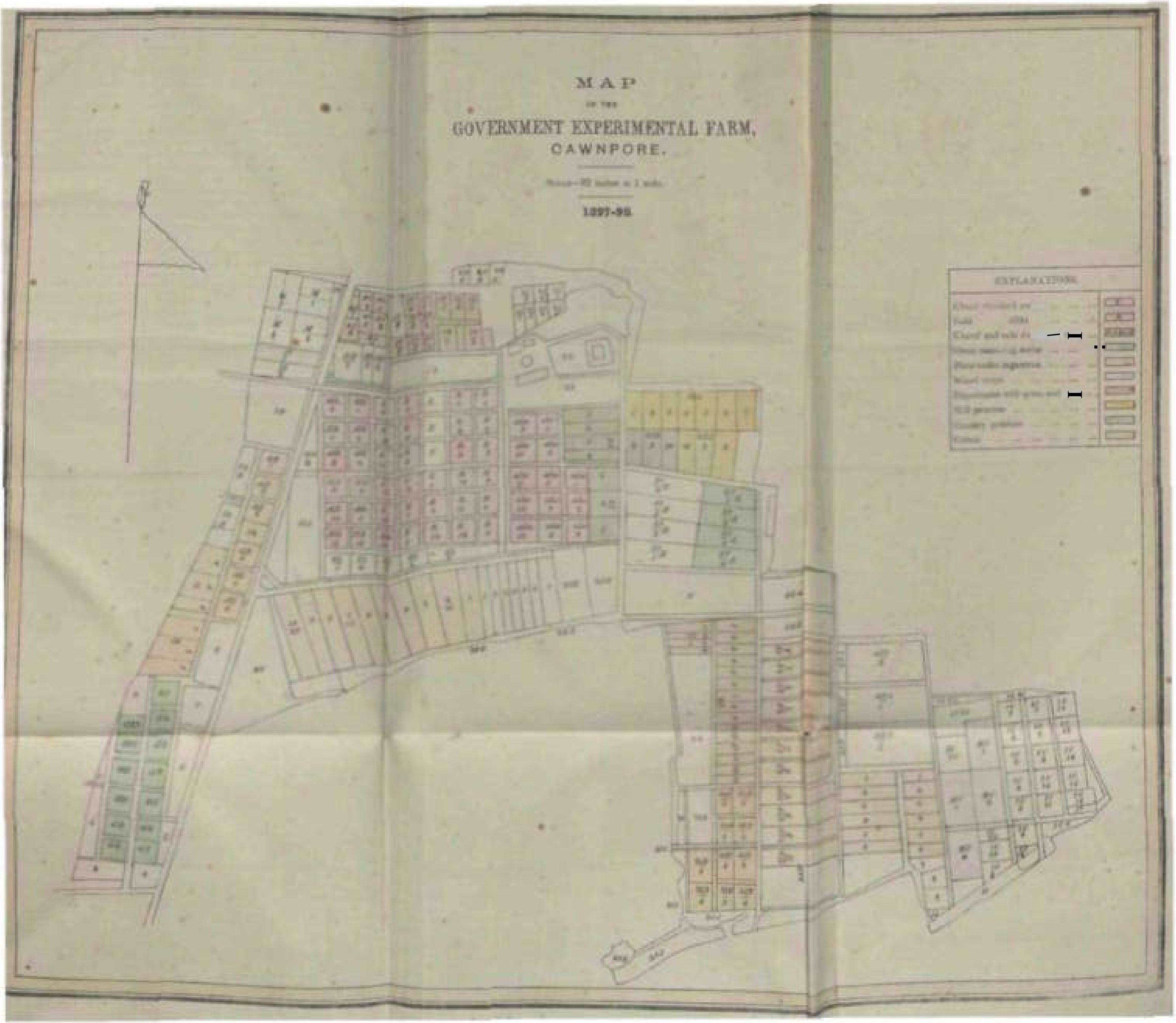
No.	Description,	Percentage of moisture.	Percentage of nitrogen.
1	rinnp. Utter. an<] nrint? of i]jod A*	36·21	·70
2	Dung of ihtd B.	76·45	·32
3	Tiitn^ o£ *ted D, fcattlo Rettim; conceutrnted tood)	70·81	·33
4	(.'iittlc dung bi>ug})t from tiio bnjiir	26·30	·440
5	rnn'!r-tta of Cfcwnpore munieipality bought at *lit.* In eatt-lo»d ...	24·92	·895
6	Saltpetre Wngtt from Camvpore bazaar at Ra. &-4-0 n mana ...	...	13.4

The above statement shows that of the organic mauures analysed, the farm-yard manures prepared under s^led A was richest in nitrogen.

DATED CATVNPOBE : ~) S. M. TIADI,

M. R. A. C., M. R. A. S.

The 20(>i *of September* 1S98.) *Assistant Director.*


MAP
OF THE
GOVERNMENT EXPERIMENTAL FARM,
CAWNPORE.
1897-98.
EXPLANATIONS.