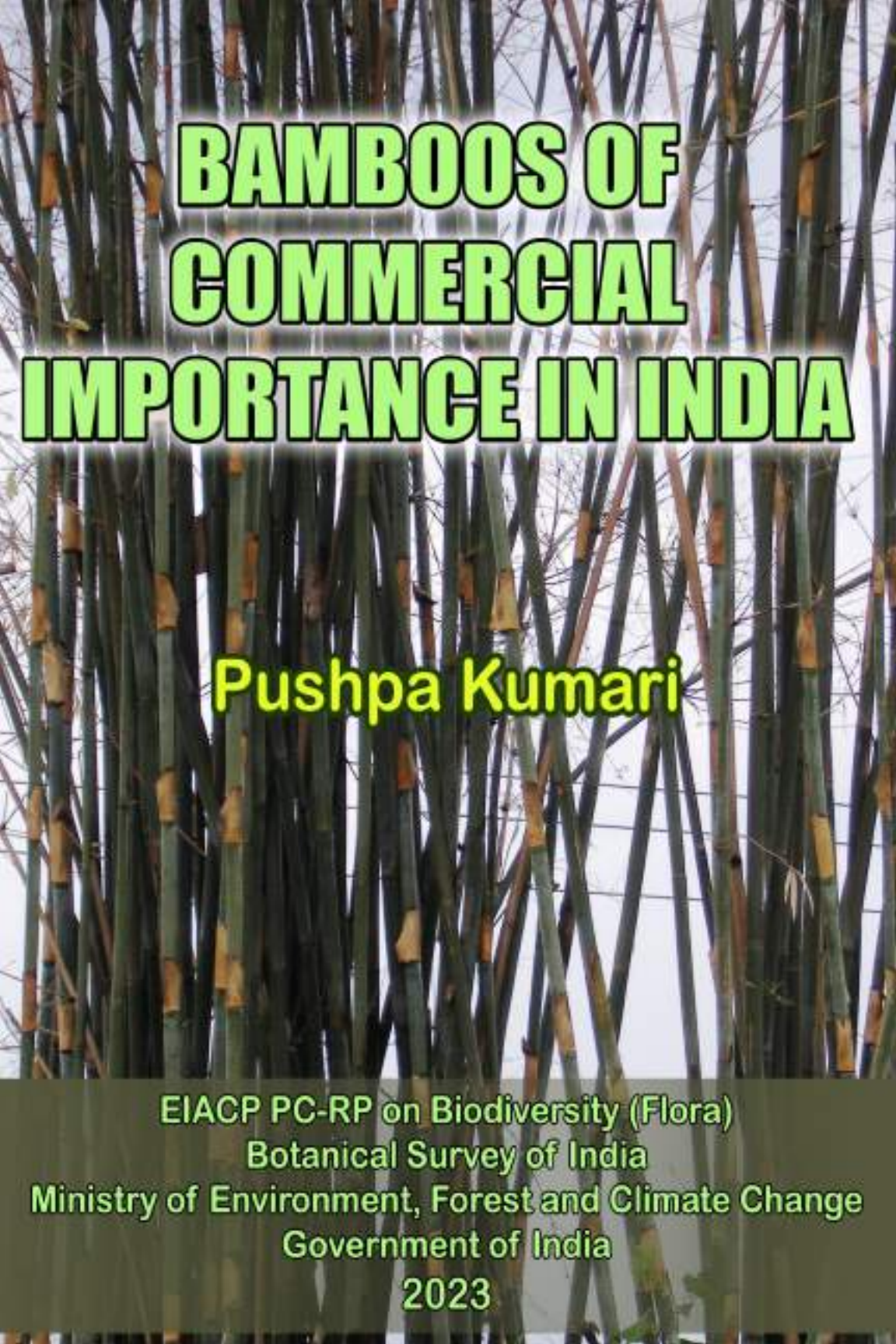

BAMBOOS OF COMMERCIAL IMPORTANCE IN INDIA

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Botanical Survey of India
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Environmental Information, Awareness, Capacity Building and Livelihood Programme (EIACP)
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Ministry of Environment, Forest and Climate Change

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INTRODUCTION

Bamboo is an ancient tallest grass with woody timber and covers ca 3% of the tropical and sub-tropical areas. They at once are the most wonderful production and the best gift of nature to the man. Bamboos have many uses, mainly in construction (flooring, roofing, designing and scaffolding), biofuel, furniture, food, fabrics, cloth, paper, pulp, charcoal, ornamental gardening, landscaping and environmental services such as a large carbon sink, good phytoremediation, improving soil structure and soil binding. They are the most economical forest plants and new applications of bamboos are found every few years. In recent years the entry of bamboos into the textile industry has created antibacterial and UV absorbing bamboo clothing. Bamboo as a green and sustainable natural resource plays an important role in new architecture and design, and the long known "poor man's timber" is fast becoming a highly recommended construction material worldwide. These days bamboo timbers are luxury woody material used in furniture, flooring, and architecture. Bamboo biofuel is another promising sector now a day. For thousands of years, bamboo has been an economic source of living and a natural workshop for local employment. However in recent decades, it has expanded its border and has led to creation of millions of jobs around the world. In general today's bamboos play a significant considerable role in human life and they cover a wide range of human needs from environmental protection to use as home appliances. Due to the special physical characteristics attributed to bamboo, it has a glorious past and a promising future as part of the solution to 21st century challenges. Globally, bamboo is being targeted for livelihood development and alleviation of both environment and social problems in such a way that it can rightly be called the plant of the century.

Bamboo has so many technical advantages over other plants for their vast uses. The strength of the culms, their straightness, smoothness, lightness combined with hardness and greater or less hollowness; the facility and regularity with which they can be split; the different sizes,

various length and thickness of their internodes, their abundance, the ease with which they are propagated and the short period in which they attain maturity, make them suitable for numerous purposes to serve for which other material would require much labour and preparation. Bamboo not only continues to make its age old contribution but is also rapidly gaining importance as a renewable plant resource with its multifarious uses even in today's world of plastic and steel.

Housing and Construction: The culms of different species come in use according to their greater or lesser strength and they may be used in different shapes and patterns as full, half, split or boards. The frame work and posts are made of full stronger culms of *Bambusa balcooa, B. bambos, B. tulda, Dendrocalamus strictus, D. hamiltonii, D. hookeri* etc. on account of their durability and strength, while floors, outer walls and inner partitions are made of species with thin walls which are easily split such as *Melocanna baccifera, Neohouzeaua dulloa* etc. Recent studies have shown that bamboo combined with reinforced concrete can increase building (construction) resistance to earthquakes, which can be an important benchmark for the use of these forest resources in earthquake-prone areas.

Bamboo is extensively used in constructional work mainly for scaffolding, bridges, masts and spars of small vessels, and rafts for floating timbers down the rivers. It is nowadays used as wood substitute in the form of bamboo ply boards, bamboo mat boards, bamboo laminates, particle composites etc. use of bamboo grids in road making is another potential area for its sizeable use. Bamboo, as an agricultural crop, has great potential for use in the design industry and polymer composites, which are identified as a natural engineering material.

Furniture and Handicrafts: Different types of durable, light, beautifully carved, eye catching and luxurious furniture are made of bamboos as table, chair, bed, bench, director's chair, weaving-chairs, almirah, boxes, partitions, screens etc. The thin split and shaved culms are used to

make products of everyday uses such as baskets, fans, betel boxes, cages, umbrellas etc.; the hollow internodes with single joints of large bamboos especially *Dendrocalums gigantens, D. hamiltonii, D. sikkimensis* etc. are used as buckets and containers whereas the thinner culm joints are used as bottles and jars to keep honey, fluids, salt, sugar, fish etc. and made into cups, bowls, ladles, candle sticks, hookahs, smoking pipes etc. The traditional musical instruments flutes, dhol, fife and crude violin, the weaponry bows and arrows, javelins, sticks and handles of swords, knives and axes, umbrella handles, walking sticks, chopsticks, painting brushes, various toys, kites, decorative handicrafts pieces, jewellery items etc. are the endless common ways in which bamboo is used. These handicrafts items fetch good revenue and provide employment to the people.

***Agricultural implements*:** Farmers and fishermen depend upon bamboos for variety of uses. Bamboo is fitted for yokes of cattle, axles and even springs of the smaller carts, often with a small bamboo house built upon. Baskets, cages, hencoops, large hats to protect from sun and rain shields made of bamboos are much essential for the daily works of a countryman in India. The fishing community utilizes bamboo for making fishing traps, fishing nets, fishing rods, floats for nets, rafts, oars, masts, and even the hooks for catching fishes. The fishermen construct huge fence like bamboo screens which may run from 100m to 5-10Km, to demarcate community wise and village-wise boundaries inside water. This is a big sector of bamboo consumption.

***Food & Fodder*:** Young bamboo shoots are favourite vegetables in Asian countries including India. the species being mainly *Dendrocalamus giganteus, D. hamiltonii*, *Bambusa balcooa, B. bambos, B. polymorpha, B. tulda, Melocanna baccifera* and *Chimonobambusa callosa* etc. These shoots are cleaned of the sheaths and the numerous stiff hairs, cut into small pieces, soaked in water and boiled and with other additions and seasoning form pickles, chutney or vegetables and regarded as delicacies in many parts of the world. The food industry based on bamboo shoots is expanding fast and in some cases it has a higher cash

value than rice. For example Thailand earns approximately US$ 30,000,000 through export of about 18 percent of Japan's canned bamboo shoot requirement. Besides, the seeds and fruits of many bamboos are eaten in years of famine and scarcity.

The leaves are much valued as fodder for cattle in regions where meadows or other grasses are scarce or wanting. Cattle and horses relish it. An analysis of the nutritive value of bamboo leaves revealed high nutrient contents.

Medicines: Bamboo roots, leaves, sprouts and grains are used in the Ayurvedic system of medicines for the treatment of many diseases. Bamboo roots are considered poisonous due to the presence of cyanogenic glucosides but the burnt roots are used for the treatment of ringworm, bleeding gums, painful joints and wounds. Decoction of roots of *B. vulgaris* is used as emolument and its young stem decoction with paste of long peppers as astringent and given to women to check excessive menstrual flows; the paste of young leaves of *B. vulgaris* and *D. strictus* with ginger paste is used for treatment of diabetes and young stem paste is given in the treatment of diarrhoea; the green culm epidermal layer cells of *B. balcooa* and *D. strictus* are applied on new cuts for stopping bleedings.

The water accumulating in hollow bamboo internodes is used against bowel-complaints. "Tabashir" a siliceous whitish floury substance, probably as a residuum in the interior of joints of several species (*B. bambos, M. baccifera*), is largely used as cooling, tonic, aphrodisiac and pectoral. It is effective in asthma, cough, paralytic complaints, flatulency and poisoning cases. In China, it plays a great role in Chinese medicines and pretty large quantity of tabashir is exported from India to that country. The culm epidermis of *Cephalostachyum capitatum* is used as antidote against snake bite and in places where ordinary surgical appliances are not available, the sheaths or carefully cleaned sections of culms may be used as splints.

Paper and Fabric Pulp: Although bamboo has been used from very ancient times in China for making paper, the large-scale manufacture of

For ornamental and landscape gardening, bamboo forms one of the most picturesque features. The beautiful species common in the gardens are *Bambusa vulgaris* var. *vittata, B. wamin, B. multiplex, Phyllostachys nigra, Pleioblastus viride-striatus, Pseudosasa japonica* etc.

Ecological services and Ecosystem improvements: The tropical forests are shrinking at alarming rate across the globe and so there is an urgent call for restriction on tree-felling, plantations of fast growing species, harvesting them at short rotations, and utilizing juvenile woods as building materials. In this context, bamboo assumes special significance fitting best in every criterion due to its fastest growing capacity, environmentally friendly nature, less required care and high potentiality than juvenile wood. Bamboo plays a protective role in decreasing soil degradation, including the reduction of biodiversity, soil nutrient depletion, and soil erosion. Bamboos are one of the most important plants in improving climate change due to the high bamboo biomass stocks and carbon storage. Bamboos, through their phytoremediation potential, can clean up polluted soils and can also accumulate silicon in their bodies to alleviate metal toxicity. Therefore, bamboo is a great recommendation for decreasing the negative effects of climate change and a big sink of carbon in nature, which plays an important role in adjusting and improving human ecosystems. And so bamboo species are extensively propagated in national afforestation programmes to meet not only industrial and rural requirements but also to check soil erosion, conserve soil and for improvement of environmental conditions.

Promising Potential: It seems that the most bottleneck problems existing in bamboo are related to lack of awareness of bamboo potentials and as well as a lack of enough attention to the development of marketing in this sector. So, the governmental organizations and national campaigns can help to raise awareness about bamboo. It can be utilized in various ways as in leading countries in this field like China. Due to the high demand for the use of environmentally friendly green products, the global bamboo market is expected to grow substantially

bamboo paper is a comparatively recent development. The successful utilization of bamboos for paper making in India began in 1923 and today it forms the most important raw material for Indian Paper Industries. For proper forest exploitation and obtaining maximum yield of cellulose, only mature culms 2-3 years old are used. The main species suitable for better and larger quantity of pulp production are- *Bambusa bambos, Dendrocalamus strictus, Melocanna baccifera*, and *Ochlandra tranvancorica. Bambusa tulda, B. polymorpha, Dendrocalamus longispathus, D. hamiltonii, Gigantochloa auriculata* and *Neohouzeaua dullooa* can be satisfactorily digested together for pulp-production. The green culms are scraped and cleaned; the thicker shavings are used for stuffing mattresses and pillows and the finer shavings are macerated in water and reduced to a paste, which forms various qualities of paper. The paper prepared from bamboo pulp is capable of standing considerable wear and tear, and retains its whiteness and brilliance for reasonably long periods.

Some attention has been paid of late to the bamboo as textile plant. A fibre has been obtained, from the culms of *Ochlandra travancorica* and few others, suitable for mixing with wool, rayon, cotton and even silk. It is said to be very soft and to take dyes very readily. For this the internodal portion is boiled in caustic soda for a lengthened time until the fibre has become somewhat soft, then put under heavy rollers to crush and finally combed, after which it is made up into bales for exportation. The fabric prepared is of fine quality and good for health and skin, since it absorbs sweat easily and its porous nature allows easy ventilation.

Hedges and landscaping: Several sorts of bamboo as *Phyllostachys mannii, P. bamusoides*, *Chimonobambusa callosa*, *Chimonocalamus griffithianus*, *Bambusa multiplex*, *B. bambos* etc. form good living hedges and are superior to the artificial ones on account of their durability and almost impenetrable thickets preventing unallowed entrance of man and animals. By trimming, the bamboo hedges can be kept low according to requirement.

in coming days. On the other hand, use of bamboo woods as one low-cost construction material encourages countries to use bamboo in the development of cities and villages, which can greatly contribute to the development of the bamboo trade in the world. Besides its role as a material for consumer products, bamboo has greater potential as an industrial raw material.

Industrial application of bamboo is in the areas given below

Biofuel & Electricity - Bamboo, as a fast-growing plant with a high yield of lignocellulosic biomass in short time, is considered a good option for use as a biofuel, such as bioethanol. Lignocelluloses have abundant sugar resources such as pentose and hexose and can be converted to fuel alcohol. Bamboo can also be used for production of electricity through gasification.

Bamboo fabrics – Bamboo fibres are inherently breathable and highly absorbent, which makes it smooth and cool to wear. It is naturally anti-bacterial and can kill odour-causing bacteria that live on skin and thus acting as deodorizer for the wearer.

Wood substitute - Bamboo is regarded as substitute of wood due to its physical and mechanical prosperities. It is now a day's increasingly used as wood substitute in some industrial product like bamboo ply board, bamboo mat roofing, door shutters, bamboo mat board, bamboo laminates etc after value addition.

Cottage Industries – Millions of tonnes of bamboos are utilized in different types of cottage industries such as agarbatti, matchsticks, kite and cracker industry, ice-cream industry etc. Bamboo from North Eastern states is transported all the way to Mysore and Bangalore for production of agarbatti.






















Key to the Species

1a. Erect bamboos, culms self-supporting 3
1b. Climbing bamboos, culms scrambling, drooping or spreading over other trees 2
2a. Nodes even; internodes hollow; culm-sheath auricles obscure or small ..... **Cephalostachyum capitatum**
2b. Nodes girdled; internodes almost solid; culm-sheath auricles falcate ..... **Melocalamus compactiflorus**
3a. Culms in open or diffuse clumps or distant; branches sub equal 4
3b. Culms in close clumps (except *M. ritchiei*); branches unequal 8
4a. Culm nodes thin, even, unarmed; internodes thin walled 5
4b. Culm nodes thick, swollen, armed with ring of spines; internodes thick walled ..... **Chimonobambusa callosa**
5a. Culms shrubby to moderate sized, with pendulous apex, not very smooth 6
5b. Culms arborescent, erect, very smooth 7
6a. Imperfect blade persistent or late deciduous, reflexed, shorter than sheath proper, lanceolate (subulate), striate ..... **Neohouzeaua dullooa**
6b. Imperfect blade deciduous, erect, as long as or longer than sheath proper, triangular, obliquely transverse veined ..... **Pseudostachyum polymorphum**
7a. Culms terete; culm-sheath shorter than internodes, convolute; branches many..... **Melocanna baccifera**
7a. Culms furrowed; culm-sheath longer than internodes, flattened; branches paired ..... **Phyllostachys bambusoides**
8a. Moderate to arborescent bamboos 9
8b. Shrubby or reed like bamboos 27
9a. Culm sheath auricles obscure or minute 10
9a. Culm sheath auricles distinct and prominent 14
10a. Culms somewhat loosely clumped; culm sheath ligule tall, fimbriate, outer ligule distinguished, ciliate ..... **Munrochloa ritchiei**

10b. Culms densely clumped; culm sheath ligule short, entire or ciliate, outer ligule not distinguishable, even …….. 11

11a. Culms solid; culm sheath thin; outer surface hair sharp, stiff; imperfect blade densely ciliate on inner surface ……. ……. **Dendrocalamus strictus**

11b. Culms semi solid; culm sheath thicker; outer surface hair soft, appressed; imperfect blade sparsely hairy on inner surface…. ……..…….. 12

12a. Culms straight; nodes without rootlets; culm sheaths persistent; leaves narrow …….. **Thyrsostachys siamensis**

12b. Culms arching above; nodes with rootlets; culm sheath deciduous; leaves broader ……..... 13

13a. Culm sheath shorter than internodes; nodal bud broadly ovate; leaves glabrous ……. **Dendrocalamus hamiltonii**

13b. Culm sheath longer than internodes; nodal bud rounded; leaves hairy …… **Bambusa balcooa**

14a. Culm sheath auricles similar in shape, nearly equal ……. 15

14b. Culm sheath auricles dissimilar in shape, unequal ……... 27

15a. Culm-sheath strongly convolute, persistent except on upper nodes …….. **Cephalostachyum pergracile**

15b. Culm-sheath flattened, deciduous except few easily removable sheaths on lower nodes …… 16

16a. Culm very large (up to 25m or more); culm-sheath dome shaped ……17

16b. Culm moderate sized; culm-sheath more or less triangular ..… …… 21

17a. Culm sheath glabrous or occasionally with sparse appressed hair; auricle without bristles; leaves glabrous ……. 18

17b. Culm sheath hairy; auricle with bristles; leaves hairy …….. 19

18a. Culm 15–20 m high, 8–16 cm in diameter; culm sheath orange yellow when young; nodal bud oval, c. 2.5 cm broad ..... ……... **Dendrocalamus latiflorus**

18b. Culm 25–30 m high, 15–20 cm in diameter; culm sheath purplish when young; nodal bud round, small ……..... …… **Dendrocalamus giganteus**

19a. Culm sheath late deciduous, clasping on lower nodes, densely appressed white hairy on outer surface; blade horizontally attached; leaves smaller, linear …….. **Bambusa polymorpha**

19b. Culm sheath deciduous, rarely seen on lower nodes, densely appressed brown-black on outer surface; blade erect (sometimes reflexed); leaves larger, oblong-lanceolate …….. 20

20a. Hair on culm sheath in 'V' shaped arrangement; culm sheath blade hairy on inner surface; auricles small, round, erect ……..…….. **Dendrocalamus hookeri**

20b. Hair on culm sheath uniformely arranged; culm sheath blade hairy on both surfaces; auricles large, falcate, often recurved …….. **Dendrocalamus sikkimensis**

21a. Culm-sheath auricles large in comparison with sheath size…... ……..…….. 22

21b. Culm-sheath auricles small in comparison with sheath size …. …….. 24

22a. Culm internodes glabrous; culm sheath glabrous or brown-black hairy outside …….. 23

22b. Culm internodes dense velvety, silver white pubescent; culm sheath golden hairy outside ……..…….. **Dendrocalamus asper**

23a. Culm green; culm-sheath nearly glabrous; auricles wavy with deciduous bristles; leaf pubescent on abaxial surface …….. …….. **Bambusa teres**

23b. Culm glossy green or yellow with green stripes; culm-sheath having dark hairs on outer surface; auricles flattened with persistent fringes; leaf glabrous on both surfaces …….. …….. **Bambusa vulgaris**

24a. Culms almost solid; nodes raised, with white rings above and below the nodal lines; culm sheath ligule fimbriate …….. …….. **Pseudoxytenanthera stocksii**

24b. Culms hollow; nodes even, without white rings above and below the nodal lines; culm sheath ligule entire …….. 25

25a. Culms sheath early deciduous, longer than internodes, truncate at top; blade triangular, as long as or longer than the sheath proper, erect; leaves white soft hairy on under surface; leaf sheath auricles bristly, on both sides ….. **Bambusa pallida**

25b. Culms sheath late deciduous, shorter than internodes, convex at top; blade lanceolate, shorter than the sheath proper, erect or reflexed; leaves glabrous on under surface, often sparse hairy on upper surface; leaf sheaths auricle glabrous, only on one side ..... **Gigantochloa andamanica**

26a. Culm internodes shorter, somewhat ridged; nodes knotty; branch and branchlet nodes armed with 2-3 thorns; culm sheaths longer than internodes, almost glabrous; blade densely brown black hairy on inner surface; auricles wrinkled, merging with the blade ..... **Bambusa bambos**

26b. Culm internodes longer, smooth; nodes even; branch and branchlet nodes unarmed; culm sheaths shorter than internodes, hairy; blade sparsely dark brown hairy on inner surface; auricles firm, distinct from blade ..... **Bambusa tulda**

27a. Reed like bamboos with fistulose hollow culms; nodes even; branches with one dominating, thick, straight; leaves broader 28

27b. Shrubby bamboos with strong, almost solid culms; nodes thickened; branches subequal, thin, geniculate; leaves linear... ..... **Drepanostachyum suberectum**

28a. Loosely clumped; culms with whitish horizontal rings; culm sheath with deciduous falcate auricles... **Ochlandra scriptoria**

28b. Densely clumped; culms without any whitish rings; culm sheath with obscure auricles 29

29a. Culm sheath ligule 1 cm tall in middle; blade reflexed; leaf sheath auricles elongate, with upto 1 cm long bristles .... **Ochlandra ebracteata**

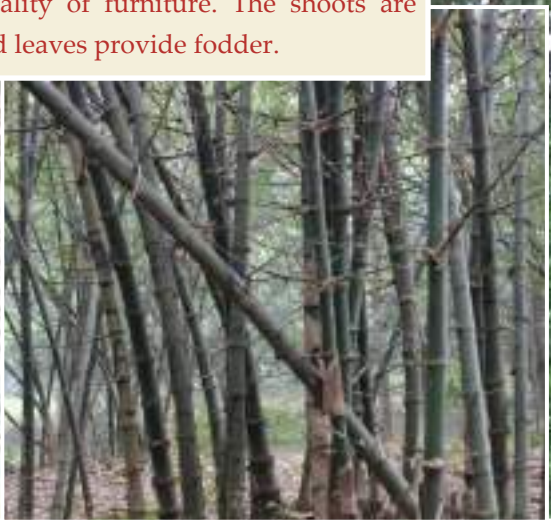
29b. Culm sheath ligule narrow; blade erect; leaf sheath auricles obscure, without bristles ..... **Ochlandra travancorica**

Bambusa balcooa Roxb., Fl. Ind. 2: 196. 1832.

Vern.: Baluka (Ass.); Balku (Beng.); Wamnah, Beru (Garo); Barak (Tripura).

Distribution: Arunachal Pradesh, Assam, Bihar, Kerala, Manipur, Meghalaya, Nagaland, Orissa, Tripura, Uttarakhand, Uttar Pradesh, West Bengal.

One of the strongest bamboos and highly preferred for structural applications in house construction, scaffolding, making ladders and props for small bridges. Large quantity of this bamboo species is also consumed in pulp and paper industries. It is also used in bamboo wood chip industry and good quality of furniture. The shoots are edible in nature with sweet taste and leaves provide fodder.

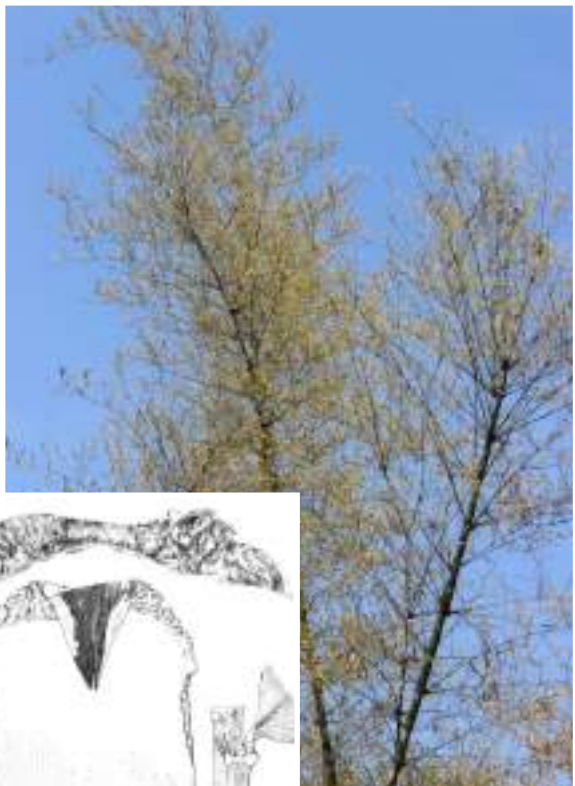


Bambusa bambos (L.) Voss, Vilm. Blumengartn. ed. 3. 1: 1189.

Vern.: Kotoba (Ass.); Baroowa, Behor, Ketuasi, Ketwa (Beng.); Saneibi (Manipuri); Daba, Kating (Orrisa); Mulkas veduru, Mullu veduru (Telugu).

Distribution: Andhra Pradesh, Assam, Chhattisgarh, Goa, Gujarat, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Rajasthan, Tamil Nadu, West Bengal.

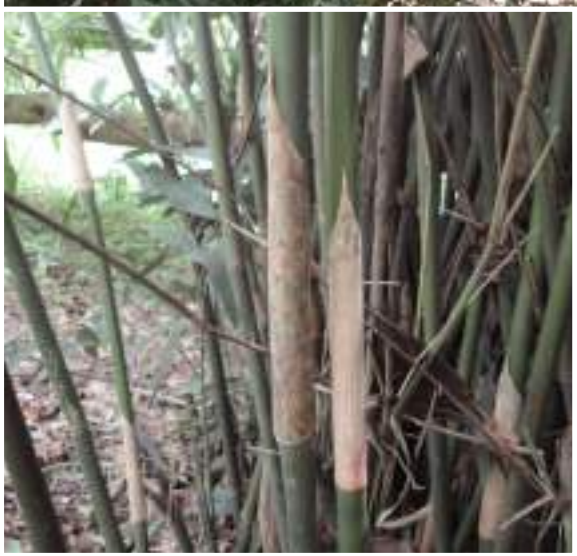
This is a major commercial structural bamboo species in many countries utilized as building materials and for making bamboo board and panel, pulp and paper, furniture of superior quality, cooking utensils and in other general purposes. Shoots and seeds are edible, leaves have medicinal value used for different ailments. This species is also planted as windbreaker.



Bambusa multiplex (Lour.) Raeusch. ex Schult. & Schult.f., Syst. Veg., ed. 15 bis [Roemer & Schultes] 7(2): 1350. 1830.

Distribution: Assam, Bihar, Meghalaya, West Bengal. Probably naturalized in addition to being cultivated.

This reed like bamboo is largely used for hedges which looks quite beautiful. Used for construction purposes, basketing and handicrafts.



Bambusa pallida Munro, Trans. Linn. Soc. London 26(1): 97. 1868.

Vern.: Bijli, Jowa, Makal, Walkthai (Ass.); Bakhal, Burwal (Cachar); Seskien, Skhen, Tneng, Usken (Khasi); Pashipo, Pshi, Pushee (Lepcha); Loto (Mikir); Tesero, Watoi (Naga); Makal (Tripura).

Distribution: Arunachal Pradesh, Assam, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, Uttar Pradesh, West Bengal.

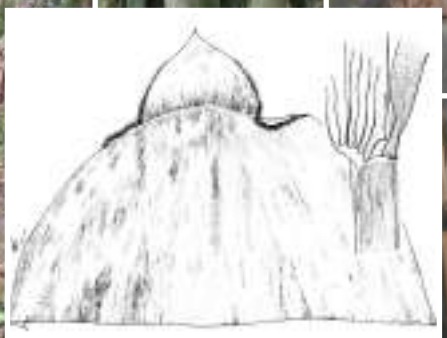
This species is used for making houses, baskets, mats, toys, wall plates, screen, wall hangers, jewellery and in many handicrafts items.

Bambusa polymorpha Munro, Trans. Linn. Soc. London 26(1): 98. 1868.

Vern.: Jama betwa, Betwa, Bethua-bah (Ass.); Betua, Jaibaroowa, Jama (Beng.); Narangi bhas (Madhya Pradesh); Bari (Tripura).

Distribution: Arunachal Pradesh, Assam, Karnataka, Kerala, Madhya Pradesh, Manipur, Meghalaya, Tamil Nadu, Tripura, West Bengal.

Primarily used in house building material for walling and roofing, for making fibre boards and as structural timber due to its outstanding mechanical strength and durability. It is also used locally for making baskets, paper pulp, and average quality furniture. Young shoots are edible which are considered best in the world. This is one of most elegant species used for landscaping.



Bambusa teres Buch.-Ham. ex Munro, Trans. Linn. Soc. London 26(1): 95. 1868.

Vern.: Bhaluki-makal (Ass.); Paora (Tripura); Saneibi (Manipuri); Ankuang Mizo); Vakila (Bru/ Riang).

Distribution: Arunachal Pradesh, Assam, Chhatisgarh, Madhya Pradesh, Meghalaya, Nagaland, Tripura, West Bengal.

This is a major species utilized in making agarbatti sticks, mats, baskets, etc. and general work.

Bambusa tulda Roxb., Fl. Ind. (Roxburgh) 2: 193. 1832.

Vern.: Wamuna, Wagi, Nal-bans (Ass.); Tulda, Jowa (Beng.); Kiranti, Matela (Duars); Wati (Garo); Bijuli, Jati, Jao, Ghora (Kamrup); Mirtinga (Tripura).

Distribution: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Jharkhand, Karnataka, Meghalaya, Mizoram, Nagaland, Orissa, Tripura, Uttar Pradesh, Uttarakhand, West Bengal.

One of the most useful species in India. It is a strong bamboo and easily mechanized for making bamboo boards and composites. Used in construction for scaffolding, reinforcement in cement and concrete, lumbar, manufacture of paper, It is favoured for a lot many other handicraft items such as toys, mats, screens, wall plates, wall hangers, hats, baskets, food grain containers etc. it has long been exported to Europe and the United States of America under the name of "Calcutta Canes" or 'East India Brown Bamboos". The young shoots are rich in phytosterols and can be used for extraction of sterol drugs.

Bambusa vulgaris Schrad, in J.C.Wendl. Coll. Pl, 2: 26, t. 47. 1810.

Vern.: Bakal (Beng. and Manipuri); Ranai-shilot (Khasi); Vairua (Mizo); Bachiabas (Chakma); Uasur (Bru/ Riang); Sunderkania bans (Orissa).

Distribution: Arunachal Pradesh, Assam, Bihar, Chhatisgarh, Goa, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Orissa, Rajasthan, West Bengal.

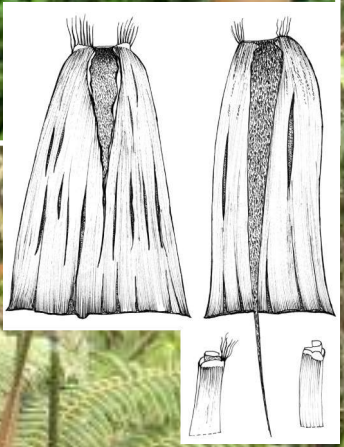
It is used for a variety of purposes, most commonly in scaffolding, furniture, fencing, handicrafts, paper and pulp, and landscaping.

Cephalostachyum capitatum Munro, Trans. Linn. Soc. London 26(1): 139. 1868.

Vern.: Gope bans (Nepal); Payong (Lepcha); Ternap (Khasi); Nhu, Naat (Manipuri); Nagatheo (Tangkhul); Nat (Mizo).

Distribution: Arunachal Pradesh, Assam, Meghalaya, Mizoram, Nagaland, Sikkim.

This species is mainly used for making different types of baskets, bows, arrows etc. and in skin diseases, stomach ache, as antidote against snakebite, etc.



Cephalostachyum pergracile Munro, Trans. Linn. Soc. London 26(1): 14. 1868.

Vern.: Bhala bans (Madhya Pradesh); Madang (Ass.); Wootang, Pungsang (Manipur); Latang (Naga); Luphul (Moyan Naga); Gulhang, Goekhang (Kuki); Mau-dang (Mizo); Dangi (Orrisa).

Distribution: Assam, Andhra Pradesh, Arunachal Pradesh, Bihar, Madhya Pradesh, Manipur, Nagaland, Orissa, West Bengal.

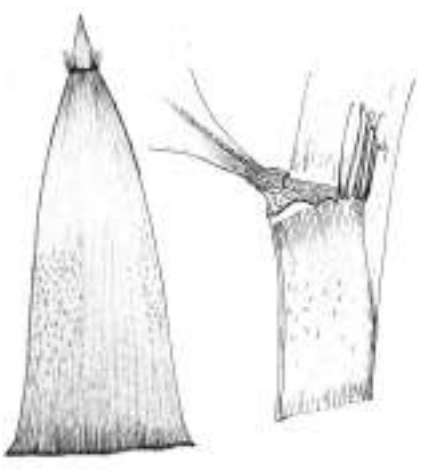
This species provides light quality structural timber, used largely for buildings, thatching and walling, general purpose furniture, handicrafts, fishing rods and basket making. This is a graceful species of horticultural value and culms are used for cooking rice, fish etc.

Chimonobambusa callosa (Munro) Nakai, J. Arnold Arbor. 6(3): 151. 1925.

Vern.: Uskong, Uspar, Spar, Sypar, Spar-iong (Khasi); Laiwa (Manipuri), Ngatha, Ngth (Tangkhul); Pangki (Kabui, Rongmei).

Distribution: Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland.

For making houses, roof, walls, thatches, good quality fishing rods and walking sticks. Young shoots are edible.



Dendrocalamus asper (Schult. & Schult.f.) Backer ex Heyne, Nutt. Pl. Ned.-Ind., ed. 2, 1:301. 1927.

Distribution: Kerala, Uttarakhand, West Bengal.

One of the most useful bamboos for heavy construction in rural communities due to the strength of the culms which are relatively durable. It is also used in making good quality furniture, musical instruments, containers, chopsticks, household utensils and handicrafts. Commercially valuable species for very good quality sweet, edible shoots.

Dendrocalamus giganteus Munro, Trans. Linn. Soc. London 26(1): 150. 1868.

Vern.: Worra (Ass.); Maroobob (Manipuri); U-ktang (Khasi).

Distribution: Arunachal Pradesh, Assam, Karnataka, Maharashtra, Meghalaya, Mizoram, Nagaland, Uttarakhand, West Bengal.

In north eastern India, the culms are widely used for house building, masts of boats, fencing, as container, water buckets, boxes, flower vases, and various decorative items. It is also better raw material for paper and pulp. In Manipur several vegetable products are prepared from tender shoots. Its use in the bamboo board industry can be expanded.

Dendrocalamus hamiltonii Nees & Arn. ex Munro, Trans. Linn. Soc. London 26(1): 151. 1868.

Vern.: Ka-Sejlei (Khasi); Wanok (Garo); Peidiau (Kabui, Rongmai); Pecha (Jiribam); Wanap, Unap (Manipuri); Kongha, Ramkaha (Tangkhul); Gova, Gonam (Kuki); Phulrua (Mizo); Ravaw, Arua, Ravawng (Mara); Rawpui (Paite); Uaktormah (Bru/ Riang).

Distribution: Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, Uttarakhand.

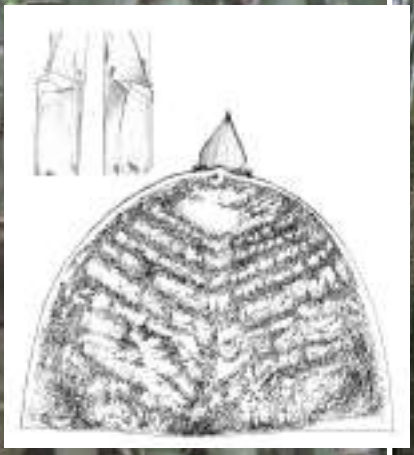
This bamboo is one of the most commonly used species in North eastern India. It is used in house building, construction, making of basket, mats, hats, rafts, agricultural implements, ropes, as container for water, milk and other eatable items. It is also used in paper and pulp industries in large quantity. Tender shoots are used to prepare vegetable.

Dendrocalamus hookeri Munro, Trans. Linn. Soc. London 26(1): 151. 1868.

Vern.: Seiat, Sejsai, Sijong, Ukotang (Ass.); Siejong, Ussey (Khasi); Denga (Garo); Patu (Lepcha); Ooer (Manipuri); Tili bans(Nepal); Rawpui, Rawlak, Rawkhauh (Mizo).

Distribution: Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, West Bengal.

Culms are used for construction purposes and for making buckets, containers and baskets.



Dendrocalamus latiflorus Munro, Trans. Linn. Soc. London 26(1): 152.1868.

Vern.: Hava, Kaha (Tangkhul); Gomi (Kuki, Paite); Maribob (Manipuri).

Distribution: Manipur, Mizoram, Nagaland. [Yunnan, Taiwan, Myanmar, Vietnam].

Used for medium quality structural timber in construction and production of quality furniture, chopsticks, crafts, basketry, paper pulp. Cultivated for edible shoot.

Dendrocalamus sikkimensis Gamble ex Oliver, Hooker's Icon. Pl. 18: t. 1770. 1888.

Vern.: Wadah (Garo); Pugriang (Lepcha); Rawami, Sangau (Mizo); Anong, Amoi, Ano (Mara); Paalm (Kabui, Rongmei); Bhalu bans (Nepali).

Distribution: Assam, Arunachal Pradesh, Meghalaya, Nagaland, Sikkim, West Bengal.

This is one of the largest bamboos preferred by Lepchas and Bhutias for making the Chungas for carrying water and milk. In Sikkim it is used for fencing, posts, huts, ropes, boxes, water pipes and as animal fodder. It can also be used for pulp and paper.

Dendrocalamus strictus (Roxb.) Nees, Linnaea 9: 476-477. 1834. *Bambos stricta* Roxb., Pl. Coromandel 1: 58. t. 80. 1795.

Vern.: Karali (Beng.); Nakur bans, Kiri bidiru (Gujrat); Male bamboo, Narvel (Maharashtra); Salia (Orrisa); Kalmungil (Tamil); Sadanapa Veduru (Telugu); Lathi bans (Tripura); Kallumua (Kerala).

Distribution: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhatisgarh, Dadra & Nagar Haveli, Gujarat, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Mizoram, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh. [Bangladesh, China, Pakistan, Nepal].

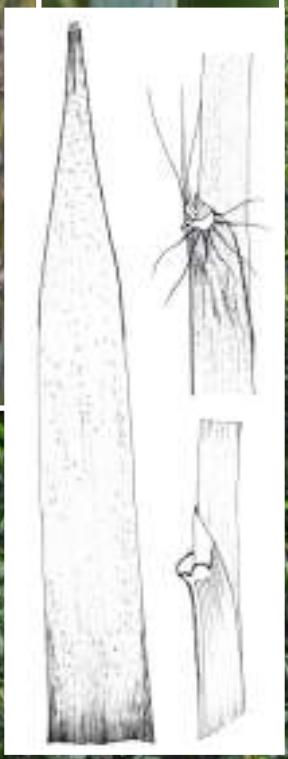
This is the strongest one and the most important bamboo species in India. Used for high quality timber, in place of steel rods in construction, furniture, agriculture implements, tool handles, musical instruments, chicks, and active charcoal. An important source for paper and rayon pulp. Besides, it is found suitable for reclamation of ravine lands. Leaves are good as forage. Decoction of leaves and nodes and siliceous matters is used in traditional medicines in India.

Drepanostachyum suberectum (Munro) R.B. Majumdar, Bull. Bot. Surv. India 25(1-4): 236. 1983. *Arundinaria suberecta* Munro, Trans. Linn. Soc. London 26(1): 32. 1868. *Sinarundinaria suberecta* (Munro) M. Kumar, Bamboos of India Compendium 286. 1998.

Vern.: Ukadai Namlang, Lamb-nag (Jaintia); Nam-long (Khasi).

Distribution: Arunachal Pradesh, Meghalaya, Sikkim. Endemic.

This species is in great demand for making walls of houses as they remain as strong even after 50–60 yrs. within the plastering mud, good quality of fishing rods and pony fodder.



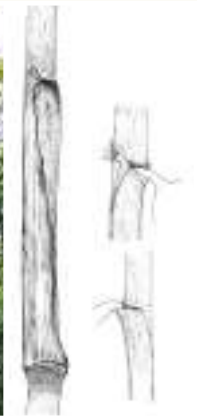
Gigantochloa andamanica (Kurz) Kurz, Prelim. Rep. For. Veg. Pegu, 1875. *Bambusa andamanica* Kurz, J. Asiat. Soc. Bengal n.s. 39 (2): 88. 1870.
Vern.: Chatai bamboo (Andaman), Ootal (Andamani); Pangnu, Pui (Kabui, Rongmei).
Distribution: Andaman Islands. [Bangladesh, Java, Laos, Myanmar, Sumatra, Thailand, Vietnam].
Used by Jarwas tribe for making huts, arrows, rafts, containers, torch fire, picking sticks, edible shoots, as splints for binding in bone fracture etc. This is a much useful species for handicrafts, furniture, agricultural tools, carts, rafts etc.

Melocalamus compactiflorus (Kurz) Benth., Gen. Pl. (Benth. & Hook.f.) 3: 1212. 1883. *Pseudostachyum compactiflorum* Kurz, J. Asiat. Soc. Bengal Pt. 2. Nat. Hist. 42: 252. 1873. *Dinochloa compactiflora* (Kurz) McClure, Bull. Misc. Inform. Kew 1936: 253. 1936. *Melocalamus mastersii* (Munro) R.B.Majumdar in Karthik. *et al*., Fl. Ind. Enumerat.- Monocot. 278. 1989. *Bambusa mastersii* Munro, Trans. Linn. Soc. London 26(1): 113. 1868.

Vern.: Lata-bans (Ass.); Dural, Doral (Beng.); Sairil (Mizo); Sairi (Mara); Uadu (Bru/ Riang); Chhairil (Lai).

Distribution: Assam, Manipur, Meghalaya, Mizoram, Tripura. [Bangladesh, China, Laos, Myanmar, Thailand, Vietnam].

Culms are largely used for basket works. When split in the green state may be reduced to such fine and pliable strands that they may be woven and used in making shoes.

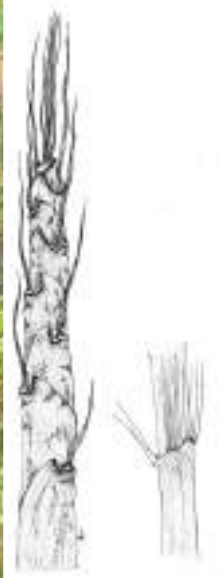


Melocanna baccifera (Roxb.) Kurz, Prelim. Rep. Forest Pegu 94. 1875. *Bambusa baccifera* Roxb., Pl. Coromandel 3: 37, t. 243. 1819. *Melocanna humilis* Kurz, Forest Fl. Burma 2: 569. 1877, non Roep. ex Trin. 1822. *Melocanna arundina* C.E.Parkinson, Indian Forester 61: 326. 1935.

Vern.: Muli, U-silli (Khasi); Wah-thri, Wa-sith, Watray, Warai (Garo); Moubi-wa (Manipuri); Mautak, Maomitvel (Mizo); Ramaw (Mara); Egochiabas (Chakma); Uarthoi (Bru/ Riang); Mou (Paithe).

Distribution: Assam, Karnataka, Maharashtra, Manipur, Meghalaya, Mizoram, Sikkim, Tripura, West Bengal. [Bangladesh, China, Myanmar, Nepal].

Thin walled but durable culms extensively used for roofing, thatching, matting and in house construction. Thus much demanded in cottage industries, pulp and paper and rayon mills. Young shoots are edible, fruits fleshy and edible, leaves used for preparing liquor. Tabashir an ancient elixir can be isolated from the culm and branches. Prefabricated wall called 'Tarja' or 'Chatai' made from the split culms are used for roofing and walls of huts and temporary barricade etc.



Munrochloa ritchiei (Munro) M. Kumar & Remesh, J. Bot. Res. Inst. Texas (1): 374. 2008. *Bambusa ritcheyi* Munro, Trans. Linn. Soc. London 26(1): 113.1868. *Pseudoxytenanthera ritcheyi* (Munro) H.B.Naithani, J. Bombay Nat. Hist. Soc. 87(3): 440. 1990.

Vern.: Choomaree, Choua, Chiwa, Chiwan, Chawa (Kannad); Huda, Udhe, Manga, Tandali (Marathi).

Distribution: Karnataka, Kerala, Maharashtra, Tamil Nadu. Endemic.

This is a medium sized bamboo with almost solid culms. It is used for strong punt poles, walking sticks, baskets, umbrella handles and also for fencing.

Neohouzeaua dullooa (Gamble) A.Camus, Bull. Mus. Hist. Nat. (Paris) 28: 100. 1922. *Teinostachyum dullooa* Gamble, Ann. Roy. Bot. Gard. Calcutta 7: 101. 1896. *Schizostachyum dullooa* (Gamble) R.B.Majumdar in Karthik. *et al*., Fl. Ind. Enumerat.- Monocot. 281. 1989.

Vern.: Dullooa (Ass.); Puksalu (Lepcha); Dongla (Khasi); Wadroo (Garo); Rawthlaw (Mizo); Uatlau (Bru); Dhulubans (Chakma); Gu, Goo (Kabui, Rongmei); Nat, Tolu, Phisautong (Manipuri); Gokhoo (Paite); Sedlar (Maring); Shia (Tangkhul).

Distribution: Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Uttarakhand, West Bengal. [Bangladesh, Bhutan, Myanmar].

The thin walled culms are used as water pails, manufacture of umbrellas, mats, baskets, thatches, and small boxes to carry pan leaves. This is also a suitable material for paper pulp. Culms are employed as floats for transporting timber along rivers from hilly areas.

Ochlandra ebracteata Raizada & Chatterjee, Indian Forester 89(5): 362. 1963.

Distribution: Kerala. Endemic.

Used in paper industry and for making baskets, mats and bamboo boards.

Ochlandra scriptoria (Dennst.) C.E.C.Fiseh., Fl. Madras 3(10): 1863. 1934. *Bambusa scriptoria* Dennst., Schltissel Hort. Malab. 31. 1818. *Ochlandra rheedii* (Kunth) Benth. & Hook.f. ex Gamble, Ann. Roy. Bot. Gard. Calcutta 7: 121. t. 107. 1896. *Beesha rheedii* Kunth, Enum. Pl. 1: 434, 1833.

Vern.: Ammei, Bheesha, Kolanji, Ottal (Malyali).

Distribution: Karnataka, Kerala, Tamil Nadu. Endemic.

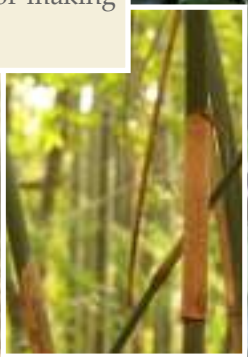
Used for paper pulp, making mats and baskets. Small culms are used for making flutes. It is suitable for planting along margins ponds and rice fields as soil binders. Used locally for house construction, most important for thatching and walling.

Ochlandra travancorica (Bedel.) Benth. ex Gamble, Ann. Roy. Bot. Gard. Calcutta 7: 125. t. 111. 1896. *Beesha travancorica* Bedd., Forester's Man. Bot. 234. 1873. *Ochlandra sivagiriana* (Gamble) E.G. Camus, Bambusees (Camus) 181.1. 99. f. c. 1913. *Ochlandra rheedii* Benth. ex Gamble var. *sivagiriana* Gamble, Ann. Roy. Bot. Gard. Calcutta 7: 122. t. 108. 1896. *Ochlandra soderstromiana* M. Kumar & Sequiera, Rheedea 9(1): 33. f. 2. 1999. *Ochlandra kadambarnii* M. Kumar, Unnikrishnana & Remesh, Bamboos of Penninsular India, KFRI Research report no. 399: 92. 2011. *Ochlandra travancorica* (Bedd.) Benth. ex Gamble var. *hirsuta* Gamble, Ann. Roy. Bot. Gard. Calcutta 7: 126. t. 112. 1896.

Vern.: Etta, Kar-eetta, Vei (Malyali); Eeral, Eera-kalli, Iral, Irul, Ita-kalli, Nanal, Odai (Tamil).

Distribution: Karnataka, Kerala, Tamil Nadu. Endemic.

An ideal raw material for paper manufacture. Culms are also used for mat and basket making, umbrella handles, fishing rods, handicraft and making walls of huts. The mats made from reeds are used for making bamboo ply.

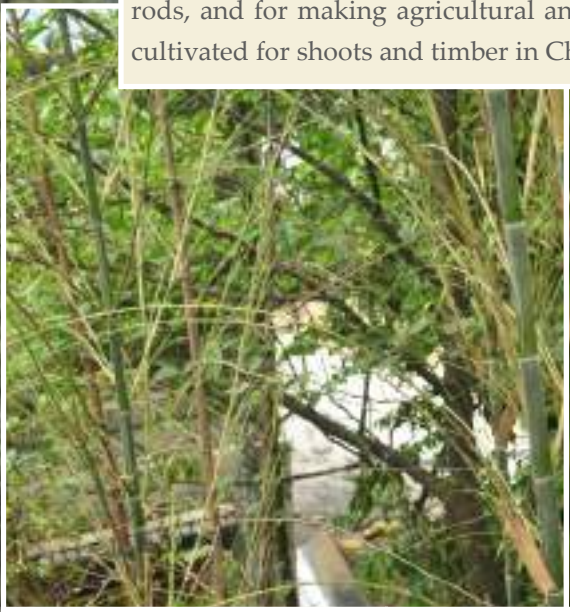


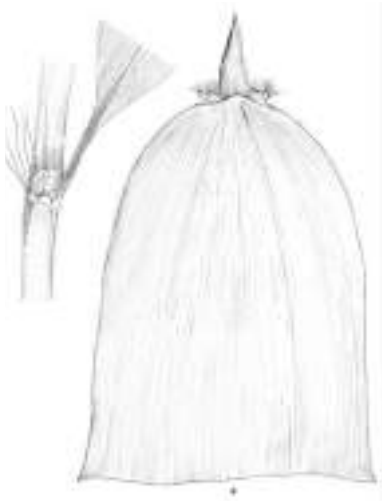
Phyllostachys bambusoides Siebold & Zucc., Abh. Math.-Phys. Cl. Konigl. Bayer. Akad. Wiss. 3(3): 746. pl. 5. f. 3. 1843.

Vern.: Makade (Japanese).

Distribution: Assam, Himachal Pradesh, Sikkim. [China]. Cultivated and possibly naturalized, native to China and Japan.

This species is used as building material, for interior decoration, merchandising kiosks, shade houses, flag poles, split bamboo fishing rods, and for making agricultural and household implements. Widely cultivated for shoots and timber in China, Japan and Korea.



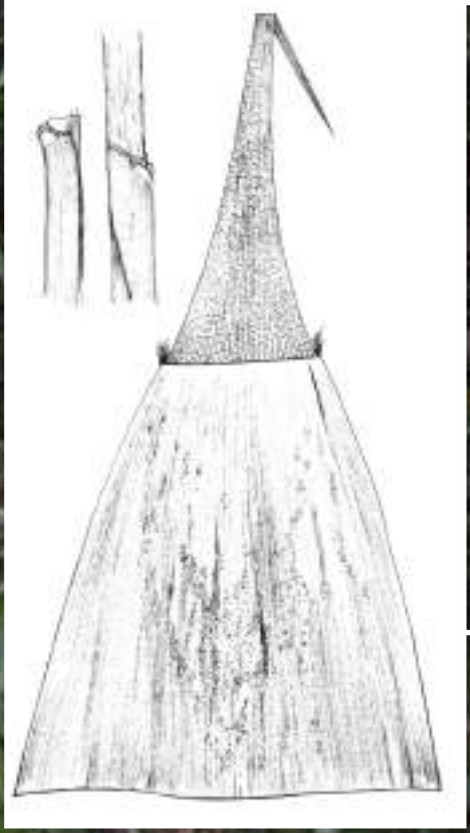


Pseudostachyum polymorphum Munro, Trans. Linn. Soc. London 26 (1): 142. t. 4. 1868. *Schizostachyum polymorphum* (Munro) R.B.Majumdar in Karthik. *et al*., Fl. Ind. Enumerat.- Monocot. 282. 1989.

Vern.: Bajal, Nal, Tolli (Ass.); Serim (Khasi); Wachall (Garo); Purphiok, Paphak (Lepcha); Pheling (Nepali); Talak (Myon Naga, Manipuri); Mareo, Nagachui (Tangkhul); Chal, Chail (Kuki); Rapai/ Ratai (Mara); Uanol (Bru).

Distribution: Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, West Bengal. [Bhutan, China, Myanmar, Nepal].

Very valuable species considered the best sort for the basket work used in tea estates. Also largely utilized in the manufacture of mats and in handicrafts. Culms are made into desired shape by bending them over heated iron rods.



Pseudoxytenanthera stocksii (Munro) T.Q. Nguyen, Bot. Zhurn. (Moscow & Leningrad) 76: 993. 1991. *Pseudoxytenanthera stocksii* (Munro) H.B. Naithani, J. Bombay Nat. Hist. Soc. 87(3): 440. 1990. *Dendrocalamus stocksii* (Munro) M. Kumar, Remesh & Unnikr., Sida 21 (1): 95. 2004. *Oxytenanthera stocksii* Munro Trans. Linn. Soc. London 26 (1): 130. 1868.

Vern.: Chivari, Mes (Marathi); Konda, Oor-shema (Kannad).

Distribution: Goa, Karnataka, Kerala, Maharashtra.

Culms are strong with a small lumen and are used for construction purposes, punt poles, umbrella handles and baskets.