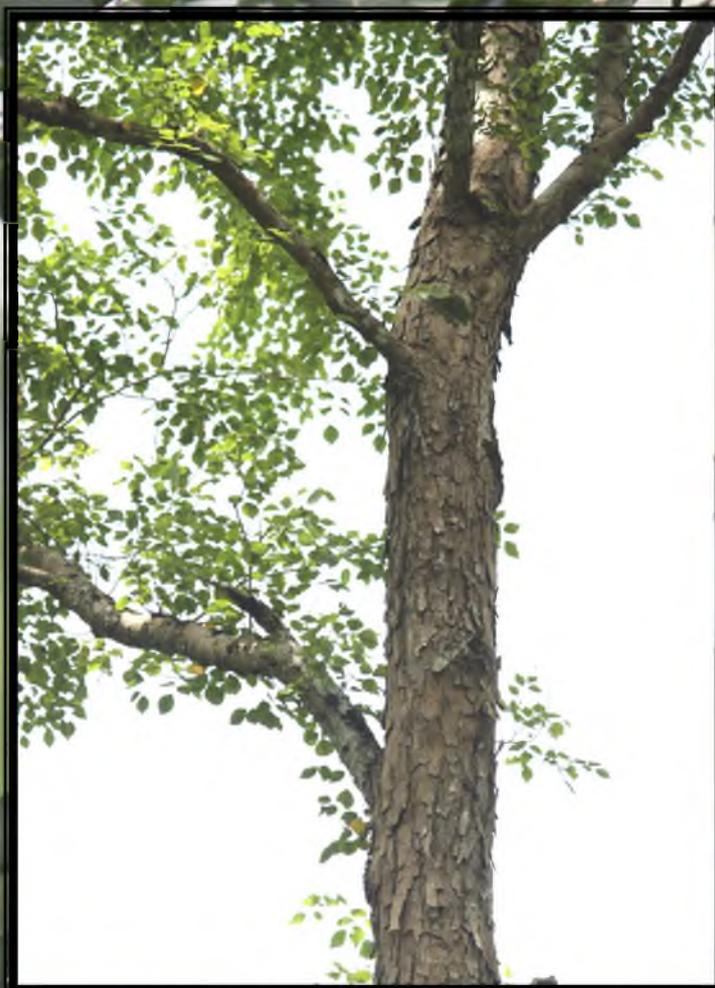




Report on Non-Detriment Findings (NDFs) of *Dalbergia sissoo* DC. in India



Botanical Survey of India
Ministry of Environment, Forest and Climate Change

2018



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CONTENTS

Introduction	1
Methodology	3
Dalbergia sissoo DC.	4
Background Information on the Taxa	4
Non Detriment Findings (NDFs) of <i>Dalbergia sissoo</i> in India	.....	6
Step 1: Review of Specimen Identification	.....	6
Step 2: Review of Compliance with Artificial Propagation Requirements	.....	6
Step 3: Review of Relevant Exclusions and Previously-Made NDFs	.....	6
Step 4: Evaluation of Conservation Concern	.....	6
Step 5: Evaluation of Potential Intrinsic Biological Risk of Wild Harvest	.....	9
Step 6: Evaluation of Impacts of Wild Harvest Step	.....	17
Step 7: Evaluation of Impacts of Trade	.....	19
Step 8: Evaluation of Effectiveness of Management Measures	.....	22
Step 9: Non-Detriment Finding and Related Advice	.....	39
References	.....	40
Annexure 1A	.....	42
Annexure 1B	.....	44

Introduction



The tropical genus *Dalbergia* L.f. belonging to the family Fabaceae comprises about 250 species in world (Mabberley, 2017). In India, the genus is represented by about 35 species (Thothathri, 1987), which includes various life-forms such as trees, shrubs and lianas. Several species of this genus are commonly known as “rosewood” or “palisander”, which produce timbers of high economic value. The genus is native to the tropical regions of Central and South America, Africa, Madagascar and Southern Asia, with fragmented distribution. Many species are under threat due to non-sustainable harvest practices, natural and artificial fires and other anthropogenic activities.

Dalbergia nigra (Vell.) Benth. (Brazilian rosewood) has been listed in Appendix I of CITES since 1992 and all other species belonging to the genus have been listed in Appendix II of CITES since 2nd January 2017 as they face severe threat for survival due to uncontrolled trade.

The Ministry of Environment, Forest and Climate Change (MoEF & CC), Government of India commissioned a study through Botanical Survey of India (BSI), Kolkata for conducting the Non-Detriment Findings (NDFs) on two tree species namely *Dalbergia latifolia* Roxb. and *D. sissoo* DC., which was sanctioned (F. No. 4-6/2017/WL dated 7th March, 2018) in a project mode during March, 2018 and executed by a team of scientific staff/researchers of BSI.

Title of the project: "Non-Detriment Findings (NDFs) study on *Dalbergia latifolia* Roxb. and *D. sissoo* DC. in India". Separate reports are being submitted for each species, but with common (except some photographs) ‘Acknowledgements’, ‘Introduction’ and ‘Methodology’.

Executing/Implementing Agency: Botanical Survey of India, CGO Complex, 3rd MSO Building, Block F(5th and 6th Floor), DF Block, Sector I, Salt lake City, Kolkata 700 064, West Bengal, India.

Duration: Six months (extended for one month due to severe flood in Kerala)

Starting date: Upon receiving funding for the project (28.03.2018)

Funded by: Ministry of Environment, Forest and Climate Change (Wildlife Division), Government of India, New Delhi under the scheme ‘Wildlife Crime Control Bureau’

Budget: Rs. 25,00000/- (Rupees twenty five lakh only; fide F. No. 4-6/2017/WL dated 7th March, 2018; fund received on 28.03.18)

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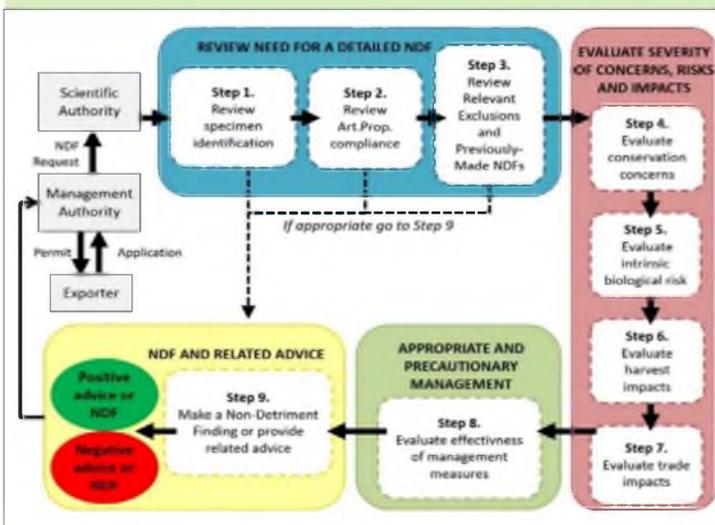
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Methodology



The representative specimens of *Dalbergia latifolia* and *D. sissoo* housed at different herbaria (ASSAM, BSA, BSD, BSJO, BSI, BSIS, CAL, MH) of Botanical Survey of India have been consulted (before conducting field surveys) to observe and understand the phenotypic variations of the species, localities of occurrence, flowering and fruiting period and other pertinent information. Simultaneously, the relevant literature also referred. Based on the preliminary data retrieved from herbarium and literature consultation, the BSI team conducted forty two field surveys in different parts (including protected areas) of Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Dadra and Nagar Haveli, Daman and Diu, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Sikkim, Tamil Nadu, Telangana, Tripura, Uttarakhand, Uttar Pradesh and West Bengal to assess the population status, harvest and management practices, threats, trade, etc., of the two species. The information from the remaining states and union territories (Andaman and Nicobar Islands, Lakshadweep, Manipur, Meghalaya, Mizoram, Nagaland and Sikkim) where these two species were either underrepresented or unreported have been obtained from the Forest Departments of these states/union territories and/or researchers working at the Regional Centres of BSI and also from other scientists/researchers/academicians working in different academic and research institutes of these states/union territories. The specimens deposited at other major Indian herbaria, viz., CALI, FRC, FRLH, KFRI, RHT and TBGT have also been consulted. The team members recorded geographical coordinates of the subpopulations/individuals (in wild and on cultivation, separately) by random sampling for mapping with ArcGIS software to estimate Extent of Occurrence (EOO) of these two species in India. The national conservation status of the two species was assessed by following the ‘Guidelines for Application of IUCN Red List Criteria at Regional and National Levels: Version 4.0’ (IUCN, 2012). The population size, density (wherever possible), DBH (Diameter at Breast Height) of the boles, height, tentative ages of the plants were noted during field visits. The data on present stocks in cultivation/nurseries/depots of forest departments as well as in private nurseries/plantations were also recorded as much as possible during the field surveys. Information have also been collected from the scientists/scientific staff/researchers of different units and regional centres of BSI and scientists/researchers/academicians of other academic and research institutes of India. The information received from some of the forest departments of Indian states and union territories were also considered. Semi-formal field interviews with villagers, traders, stakeholders were also conducted, whenever possible. The work has been carried out by following ‘CITES Non-Detriment Findings Guidance for Perennial Plants’ (Wolf & al., 2016).



Nine-Step Pathway for making Non-Detriment Findings for Perennial Plant Species listed in CITES Appendix II



Dalbergia sissoo



II. DALBERGIA SISSOO DC.

A) BACKGROUND INFORMATION ON THE TAXA

i. Scientific, Vernacular/Common Names

Currently Accepted Scientific Name: *Dalbergia sissoo* DC.

Synonym: *Amerimnon sissoo* (Roxb. ex DC.) Kuntze

Vernacular Names: *Shisu, Shishu, Sisu, Sissoo* (Bengali); *Shisham, Shisham tali, Sissai, Sissu, Tahli, Tali* (Hindi); *Sihunti* (Kangri); *Agara, Agar, Bindi, Birade, Biradi, Cishmabage, Gette, Hambacharu, Hambadavu, Ibadi, Ibadi mara, Iragundimaavu, Iragundimara, Irukuntimavu, Karimara, Nooke mara, Shishmabage, Shisso, Shista baage, Shivanakadalu, Simsape, Simsupe* (Kannada); *Irupul, Iruvil, Pivala-sesba, Sisam, Sissu, Tali* (Malayalam); *Shisham, Siso, Sissu, Sisva* (Marathi); *Sissau, Sisham* (Nepali); *Aguru, Shishapa, Agurushinshupa, Dhira, Dhumrika, Kalamusarya, Kapila, Kapila-sinsapa, Krishnasara, Mandalapatri, Pichhila, Pipala, Shingshupa, Shishapa, Shyama, Simsapa, Sinsapa, Tivrathumaka, Vira, Yugapatrika* (Sanskrit), *Cicamaram, Cice, Cicumaram, Cincupam, Sisuitti, Gette, Kannacaram, Nukkam, Nukku, Nukku kattai, Sisso, Sisu-itti, Tesimaram, Yette* (Tamil); *Errasissu, Errasissu, Ettasissu, Sinsupa, Sissoo, Sissu, Sissu-karra, Sissukarrha, Yerrasissu* (Telugu); *Urada shisham, Burada shishan, Sheesham, Shisham* (Urdu).

Common Names: Indian rosewood, Himalaya raintree, Indian *Dalbergia*, Penny leaf tree, Sisso.

ii. Etymology

The generic name is after the Swedish brothers Nils and Carl Dalberg, who lived in the 18th century. The former was a botanist and the latter explored Surinam. The specific epithet is derived from its vernacular name 'sissoo'/'shisu' by which the plant was known in erstwhile 'Bengal'.

Dalbergia sissoo was first described by A.P. de Candolle in 'Prodromus Systematis Naturalis Regni Vegetabilis, volume II' (de Candolle, 1825).

iii. Botanical Description

Deciduous trees, 10–30 m high; trunk 2–4 m in girth at base; bark grey to pale brown, flaking in narrow longitudinal strips; branches spreading, tomentose when young. Leaves imparipinnate, alternate, 5.5–8 cm long; main rachis zigzag, sometimes puberulous to pubescent when young; leaflets usually 5, sometimes 3, rarely 4, alternate, suborbicular, obcordate, broadly ovate to obliquely ovate, 3.9–9 × 3–7 cm, rarely obtusely acute or



Dalbergia sissoo from William Roxburgh's 'Flora Indica' drawings (Roxburgh Number 970) [©Central National Herbarium, Botanical Survey of India, Howrah]

obtuse, narrow to rounded at base, entire at margins, conspicuously and abruptly cuspidate at apex, coriaceous, puberulous to pubescent when young, glabrous when old, distal leaflets always larger; lateral veins 8–12 pairs; petiolules 3–7 mm long, pubescent at first, glabrous later; stipels absent. Inflorescences panicles composed of several short, subsecund branches, axillary, 3.5–7 cm long; rachis and branches pubescent. Flowers yellowish white, 7–9 mm long, sessile to shortly pedicellate sometimes; bracts present; bracteoles 2, oblong, c. 2 mm long, puberulous to pubescent, caducous. Calyx campanulate, 4.5–6 mm long, puberulous to pubescent externally; segments 5, oblong, ciliate, two upper ones rounded, three lower acute with the middle one longest. Petals 5; vexillum suborbicular, 7–8 mm long, narrowed at base into a long claw, emarginate at apex; wings and keels oblong, distinctly clawed. Stamens 9, monadelphous, staminal sheath 5.5–7 mm long, split open dorsally; anthers 2-celled. Ovary oblong, 4–8 mm long, stipitate, puberulous to pubescent; style short; stigma capitate; ovules 5 or 6. Pods linear-oblong, strap-shaped, indehiscent, 4.8–9.7 × 9.7–1.3 cm, stipitate, acute at apex, rounded sometimes, mucronulate, base narrow, distinctly reticulated against the seeds, usually 1–3-seeded, rarely 4-seeded, glabrous; seeds reniform, 8–9.5 × 4–5.5 mm, brown to brownish black.

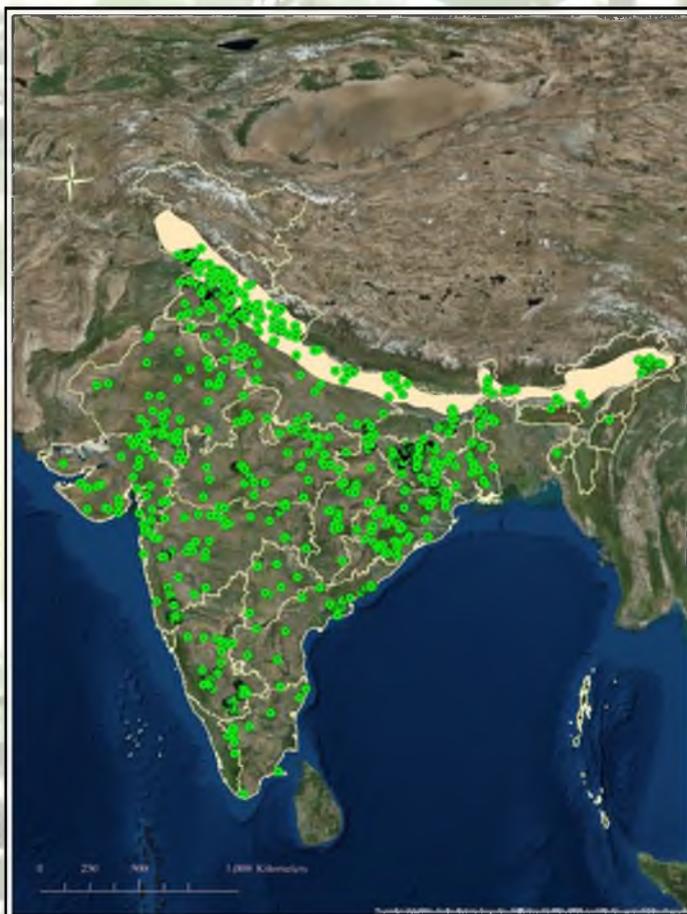
iii. Distribution

Native: Afghanistan, Bangladesh, Bhutan, India, Islamic Republic of Iran, Iraq, Myanmar, Nepal, Pakistan, Philippines, South Africa.

Exotic: Antigua and Barbuda, Australia, Cameroon, Chad, China, Cyprus, Dominican Republic, Ethiopia, French Polynesia, Ghana, Guinea-Bissau, Indonesia, Israel, Kenya, Mauritius, Malaysia, Mozambique, New Caledonia, Niger, Nigeria, Oman, Paraguay, Philippines, Puerto Rico, Senegal, Sierra Leone, Sri Lanka, Sudan, Thailand, Togo, Uganda, United Republic of Tanzania, United States of America, Virgin Islands of the USA, Zambia, Zimbabwe.

India*: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Punjab, Rajasthan, Sikkim, Tamil Nadu, Telangana, Tripura, Uttarakhand, Uttar Pradesh and West Bengal; Union Territories of Daman and Diu, Dadra and Nagar Haveli, Delhi and Puducherry.

**Dalbergia sissoo* is found almost throughout the country and it is difficult to assess the localities where the species is truly wild. As per the best available



information the species is indigenous to gravelly river beds of the sub-Himalayan tracts and outer Himalayan valleys extending from Assam to Jammu and Kashmir. However, it is found naturalised outside its wild occurrence, extending up to South India.

B. NON DETRIMENT FINDINGS (NDFs) OF *DALBERGIA SISSOO* IN INDIA

STEP 1: REVIEW OF SPECIMEN IDENTIFICATION

1.1 Has the plant/specimen been correctly identified, and, is the scientific name used compliant with the appropriate CITES standard?

Yes

STEP 2: REVIEW OF COMPLIANCE WITH ARTIFICIAL PROPAGATION REQUIREMENTS

2.1 Is the permit application for Art. Prop. specimens?

Depends on samples.

In India, almost all the samples under export are sourced from the trees growing in farmers' land, gardens, plantations etc. (i.e. under controlled conditions). These trees are grown from seeds, cuttings, stumps, propagules derived from cultivated parental stock and therefore should be considered as 'artificially propagated'. However, a few samples can also be sourced from the trees growing in wild where there is no legal restriction to harvest the species. Therefore, the source should be verified and certified before exporting the samples.

STEP 3: REVIEW OF RELEVANT EXCLUSIONS AND PREVIOUSLY-MADE NDFs

3.1. Is the export of wild-harvested specimens of this species permitted?

Yes

There was no restriction on export of legally procured specimens of *D. sissoo* from India before inclusion of the entire genus *Dalbergia* under Appendix II of CITES in 2017. Presently the wild-harvested specimens in compliance with the CITES Comparable Certificate or Vriksh Shipment Certificate are only exported from India after verifying the legality and legal origin.

3.2. Is the specimen covered by CITES Appendix II?

Yes

3.3. Has a science-based NDF been made for this species that is still valid and sufficient to evaluate the current application?

No

STEP 4: EVALUATION OF CONSERVATION CONCERN

4.1. Has the conservation status of this species been assessed?

The conservation status of this species at national level has been assessed as **Near Threatened (NT)** during the present study by following the 'IUCN Red List Categories and Criteria, Version 3.1, 2nd Edition' (IUCN, 2012). No assessment of *D. sissoo* is available in 'IUCN Red List of Threatened Species' at global context.

4.2. Considering existing conservation status assessments, what is the indicated severity of conservation concern?

Severity of Conservation Concern: Low

National conservation status for the case study: Near Threatened (NT)

Dalbergia sissoo is found almost throughout the country and it is difficult to clearly demarcate the localities where the species is truly wild. However, as per the best available information the species is indigenous to gravelly river beds of the sub-Himalayan tracts and outer Himalayan valleys extending from Assam to Jammu and Kashmir.

Beyond its wild range of distribution, the species is found naturalised in many parts of country, extended up to South India. The wild subpopulations of *D. sissoo* are reported from several Protected Areas of the country, viz. Nandini Wildlife Sanctuary of Jammu and Kashmir; Corbett National Park, Rajaji National Park of Uttarakhand; Sher Jung National Park of Himachal Pradesh; Morni hills of Haryana and Punjab; Pilibhit Tiger Reserve, Dudhwa National Park of Uttar Pradesh; Valmiki Tiger Reserve, Kanwar Lake Bird Sanctuary of Bihar; Daying Ering Wildlife Sanctuary of Arunachal Pradesh; Bura Chapori Wildlife Sanctuary of Assam etc. and therefore,

removal of the species (even the dead/ fallen trees) is prohibited from these Protected Areas under the Wild Life (Protection) Act, 1972. The regeneration of this species in its wild range of distribution is also high. The harvest is allowed only from plantations/ cultivations, private lands, reserve forests, social forestry areas. Further, the species is also listed as 'restricted species' in the states of Jharkhand, West Bengal, and permission is required for harvesting (in private lands), transportation and marketing of this species. In Assam, *D. sissoo* is 'reserved tree' and therefore, felling and transit of the species is regulated.

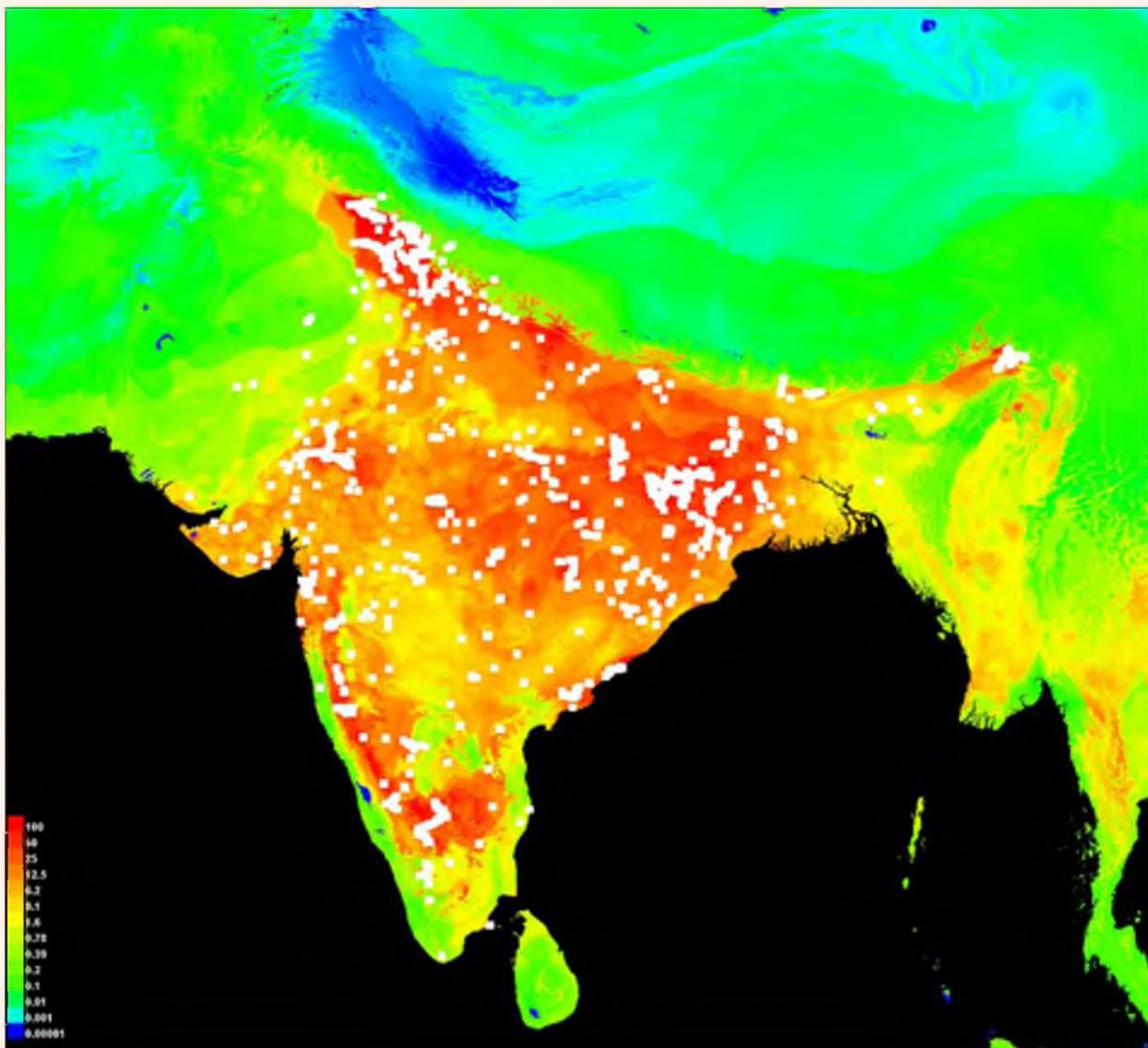
The main threats to the wild, naturalised as well as cultivated/ planted populations of *D. sissoo* are fungal and bacterial diseases and from insects. But due to very high regeneration and growth rate the overall population is not much affected. However, the frequency of mortality due to diseases is lower in wild/ naturalised subpopulations than that of on cultivation/ plantation.

In Mala Range of Pilibhit Tiger Reserve, Uttar Pradesh, several plants of *D. sissoo* are found affected by insect and fungus. In Bihar, in northern part of Bhagalpur district, the common problems of *D. sissoo* are die-back and wilting of foliage. In Assam, at Lanka area, often the leaves of *D. sissoo* are reported to be affected by caterpillars. In Bilaspur and Mandi districts of Himachal Pradesh, some living plants are found infected with fungus and some are found dead. In Jammu and Kashmir, several plants of *D. sissoo* are found affected with termites and many are dried at Akhnoor, Udhampur, Jaganoo Range, Nandini Wildlife Sanctuary due to fungal infections.



At Panchvhaya, Raiganj, West Bengal, many trees of *D. sissoo* have been found affected by die-back. As per the information received from the staff of forest department of Raiganj, the trees of *D. sissoo* use to get dried and become dead after attaining 14–15 years of age.

The Extent of Occurrence (EOO; criterion B1) of *D. sissoo* in India is at least 1,98,974 km² considering only the sub-Himalayan tracts from where wild subpopulations the species are reported. The number of mature individuals (criteria C, D) in India in wild observed during hectare wise random field surveys is > 120000; however, the suspected/ projected number of mature individual is more than eight times in the country. During certain limitations it has not been possible to survey all locations from where *D. sissoo* can be found in wild. Though there is reduction in wild, naturalised and cultivated/ planted population size in last two decades mainly due to diseases, the inferred or suspected reduction (criterion A1) in wild population of the species in India is < 50%.



Representation of the Maxent model (Maximum Entropy) for *Dalbergia sissoo*. Warmer colours show areas with better predicted conditions (potential distribution of species) and white dots show the presence locations

Based on population size, reduction in population, geographic range in the form of EOO (Criteria B1) along with its associated threats *D. sissoo* is assessed as Near Threatened (NT) in India.

STEP 5: EVALUATION OF POTENTIAL INTRINSIC BIOLOGICAL RISK OF WILD HARVEST

5. What is the severity of intrinsic biological risk factors?

1. Plant part harvested versus life form of species

Risk severity: High

Primarily harvest of whole plants for timber; also harvested for firewood and fodder; leaves, bark and seeds are also harvested for ethno-medicines but in less extent.

2. Resilience of the species

Risk severity: High

The main threats of *D. sissoo* in its wild, naturalised subpopulations as well as in cultivation/plantation are fungal and bacterial diseases and infestation of insects. However, the frequency of mortality due to diseases is lower in wild/ naturalised subpopulations than



Stump of *D. sissoo* after harvesting the whole tree

that of in cultivation/ plantation. Several insects, especially two defoliators, *Plecoptera reflexa* Guenée and *Dichomeris eridantis* Meyrick have been reported to damage sissoo. *Plecoptera reflexa* is a serious defoliator in nurseries and young plantations (Sharma & al., 2000). There are two major diseases severely damaging *D. sissoo*, wilt and dieback, caused by three fungi i.e., *Fusarium solani* (Mart.) Sacc., *Ganoderma lucidum* (Curtis) P. Karst. and *Phellinus gilvus* (Schwein.) Pat. The *Fusarium* wilt disease has been reported from Uttar Pradesh, Bihar and Punjab in plantations, raised on unsuitable sites i.e., stiff, clayey soils and water logged conditions. Trees of advanced age are usually susceptible to the disease. The affected trees die within a few months (Bakshi, 1954). Root rot of *D. sissoo* due to

Ganoderma lucidum is common both in natural forests and in plantations. It causes white spongy rot in the sapwood. The affected trees exhibit a stag-headed appearance and are eventually killed. Lateral spread of the disease in plantations is through root contact, which results in gaps in pure plantations. Another fungus causing root rot is *Phellinus gilvus* which is a wound parasite and is known to infect plantation trees (Sharma & al., 2000). According to Gill & al., (2001) the primary cause of dieback in *D. sissoo* is *Phytophthora cinamomi* Rands. Powdery mildew disease is caused by another fungus, *Phyllactinia corylea* (Pers.) P. Karst. (Singh, 2011). Stem canker in



Wilt affected saplings of *D. sissoo*

trees of advanced age is caused by *Polyporus gilvus* (Schwein.) Fr. and can be seen in naturally growing trees of terai region, outskirts of villages and canal banks in Punjab and Uttar Pradesh. Collar rot of seedlings is caused by *Rhizoctonia solani* J.G. Kühn (CSIR, 1952). The Root-Knot Nematode *Meloidogyne javanica* (Treub) Chitwood has been recorded to form galls on roots of *D. sissoo* from Lachhiwala range nursery, Dehra Dun (Mehrotra & Sharma 1992). Heavy infestations of the nematode affect plant growth adversely.



Different types of diseases in *Dalbergia sissoo*

3. Geographic distribution

Risk severity: Low

The species is native to Afghanistan, Bangladesh, Bhutan, India, Islamic Republic of Iran, Iraq, Myanmar, Nepal, Pakistan, Philippines, South Africa and exotic to Antigua and Barbuda, Australia, Cameroon, Chad, China, Cyprus, Dominican Republic, Ethiopia, French Polynesia, Ghana, Guinea-Bissau, Indonesia, Israel, Kenya, Mauritius, Malaysia, Mozambique, New Caledonia, Niger, Nigeria, Oman Paraguay, Philippines, Puerto Rico, Senegal, Sierra Leone, Sri Lanka, Sudan, Thailand, Togo, Uganda, United Republic of Tanzania, United States of America, Virgin Islands of the USA, Zambia, Zimbabwe. In India, the species is found almost throughout the country. However, it is difficult to assess the wild localities of *D. sissoo* in the country due to its wide use in agroforestry, plantation, afforestation, reforestation programmes and as a result the species is now found naturalised in many places from where it was not found earlier as wild. As per the best available information the species is indigenous to gravelly river beds of the sub-Himalayan tracts and outer Himalayan valleys extending from Assam to Jammu and Kashmir. Further, it is found naturalised outside its wild occurrence, extending up to southern India. Therefore, by considering its wide range of distribution the risk severity is assessed as low in India.

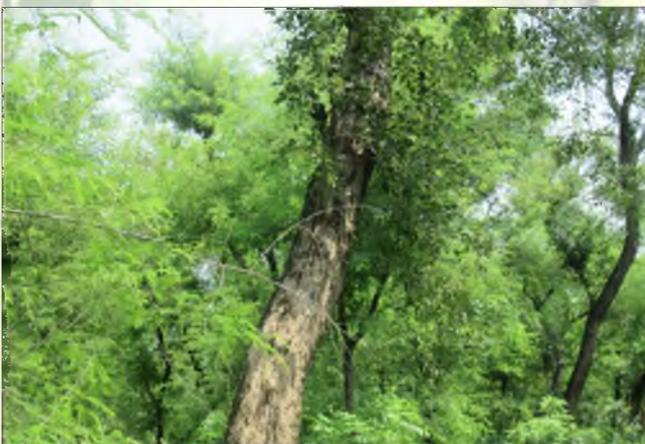
4. National population size and abundance

Risk severity: Medium

Wild subpopulations of *D. sissoo* are mostly medium-sized, sometimes large and unevenly distributed. The species is found in wild in sub-Himalayan tracts and outer Himalayan valleys, mostly along riverine tracts of Jammu and Kashmir, Punjab, Haryana, Himachal Pradesh, Uttarakhand, Uttar Pradesh, Bihar, West Bengal, Assam and Arunachal Pradesh.

The wild/ naturalised populations of *D. sissoo* are reported from Nagrauta, Jagti, Tanda, Jammu forest and adjacent areas of Ramnagar Wildlife Sanctuary, Sambha, Hariachak, Kathua and adjacent area of Jasrota Wildlife Sanctuary, Akhnoor and adjacent area, Nandini Wildlife Sanctuary and adjacent area, Udampur, Uttar Behni of Jammu and Kashmir; Morni hills, Saraswati Wildlife Sanctuary of Haryana; Swarghat Range, Nainadevi Range, Kaulawala Tauba, Kangoo Forest, Mandi and adjoining area, Jaisinghpur, Sher Jung National Park of Himachal Pradesh; Devprayag, Thano, Corbett National Park, Rajaji National Park, Shivaliks of Uttarakhand; Pilibhit Tiger Reserve, Dudhwa National Park of Uttar Pradesh; Valmiki Tiger Reserve, Kanwar Lake Bird Sanctuary of Bihar; Bura Chapori Wildlife Sanctuary of Assam; Teesta valley of West Bengal; Daying Ering Wildlife Sanctuary, Parashuram Kund, Lai Nala riverside of Arunachal Pradesh. The regeneration of this species is average to high in different parts of the country (see Annexure 1A).

Dalbergia sissoo is abundantly found in different parts of Jammu, Doda, Samba districts of Jammu and Kashmir in unevenly to more or less evenly distributed subpopulations and it is moderately common in Kathua, Udampur districts with unevenly distributed subpopulations. In Himachal Pradesh, the species is abundantly found in Una, Kangra, Hamirpur districts with unevenly to more or less evenly distributed subpopulations; whereas in parts of Chamba, Solan, Sirmaur and Mandi districts it is common with unevenly distributed subpopulations. The medium to small, scattered, unevenly distributed wild subpopulations of *D. sissoo* is found in Nainital, Saharanpur, Tehri Garhwal, Dehradun districts of Uttarakhand. In Uttar Pradesh, this species is abundant to common in Pilibhit, Kheri and Rampur districts with unevenly distributed subpopulations; whereas in Gorakhpur, Sravasti, Balrampur districts it is moderately common with unevenly distributed subpopulations. In Bihar, it is found in Aurangabad, Begusarai, Darbhanga, Gaya, Jamui, Khagaria, Munger, Nawada, West Champaran districts the in small, scattered subpopulations along the rivers. The species is found in small, fragmented subpopulations along the Teesta river in Darjeeling district of West Bengal and East district of Sikkim. In Assam, the species is common in Sontipur district with small, unevenly distributed subpopulations and also found in Nagaon and Kamrup districts in small, fragmented subpopulations. In Arunachal Pradesh, this species is abundant to common mostly near the rivers/ streams in Lohit, Upper Siang, Dibang, Namsai districts with small to large unevenly distributed subpopulations.



Dalbergia sissoo at Kathua, Jammu & Kashmir



Dalbergia sissoo in Nandini Wildlife Sanctuary, Jammu & Kashmir



Dalbergia sissoo at Kangoo Forest,
Himachal Pradesh



Dalbergia sissoo at Naina Devi Range,
Himachal Pradesh



Dalbergia sissoo at Swarghat Range,
Himachal Pradesh



Dalbergia sissoo in Mandi District,
Himachal Pradesh



Dalbergia sissoo at Simra Beat,
Uttar Pradesh



Dalbergia sissoo at Sitabani (Corbett National
Park), Uttarakhand



Dalbergia sissoo near Ramnagar, Uttarakhand



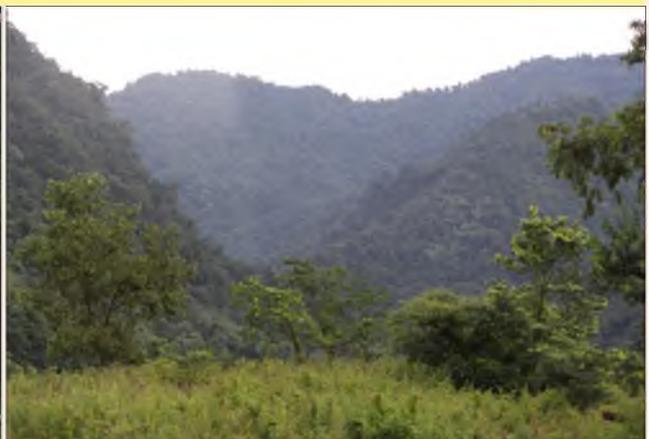
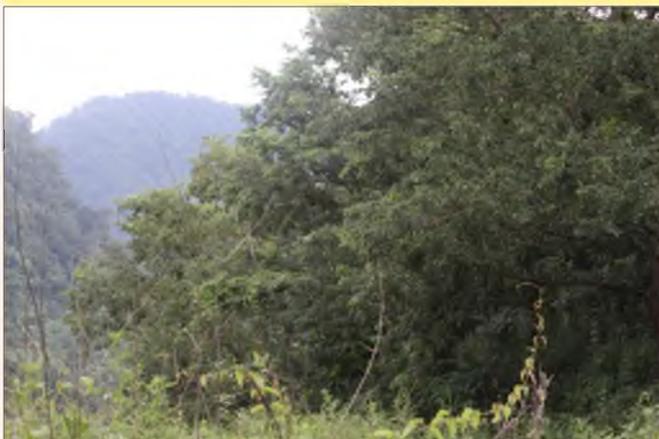
Dalbergia sissoo growing in Valmiki Tiger Reserve, Bihar



Natural regeneration from a fallen tree in Bura Chapori Wildlife Sanctuary, Assam



Dalbergia sissoo growing in Bura Chapori Wildlife Sanctuary, Assam



Population of *D. sissoo* in Lai Nala riverside, Arunachal Pradesh

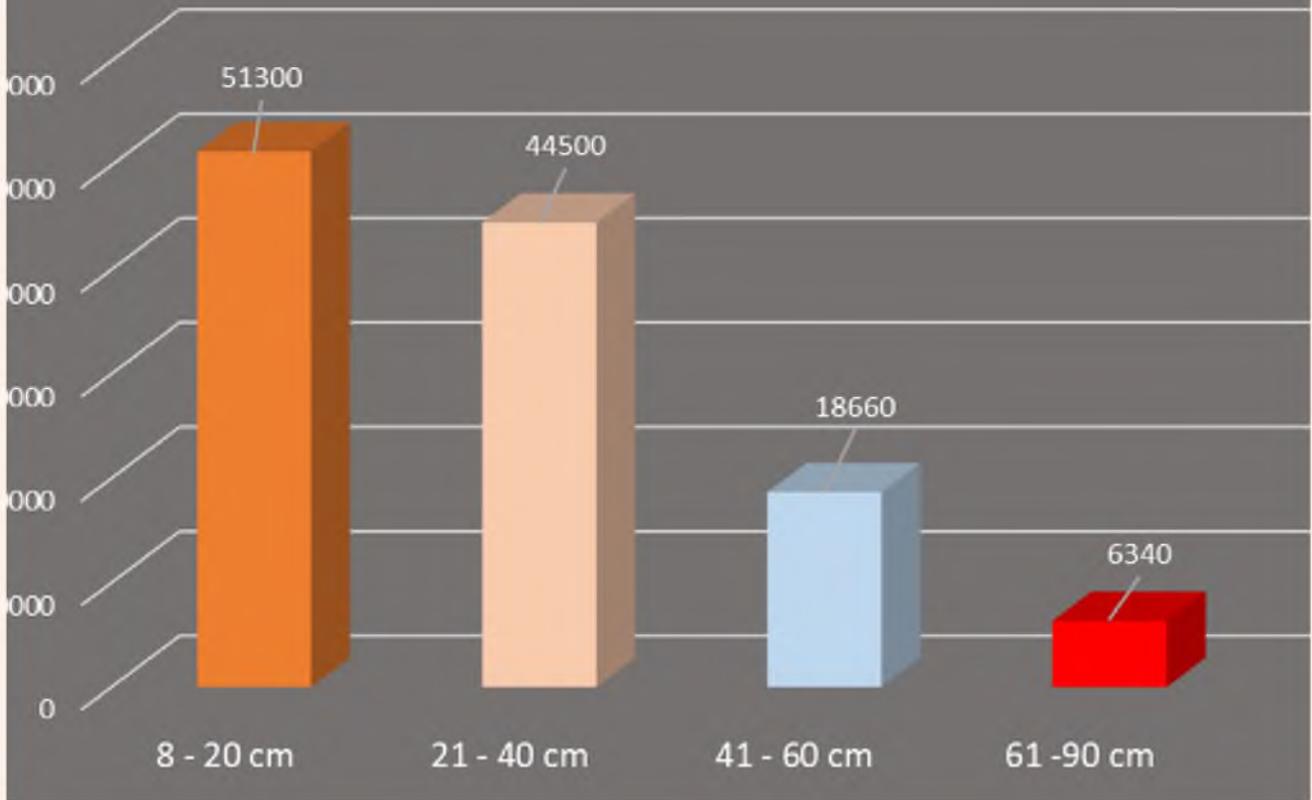


Population of *D. sissoo* in Parshuram Kund Riverside, Arunachal Pradesh

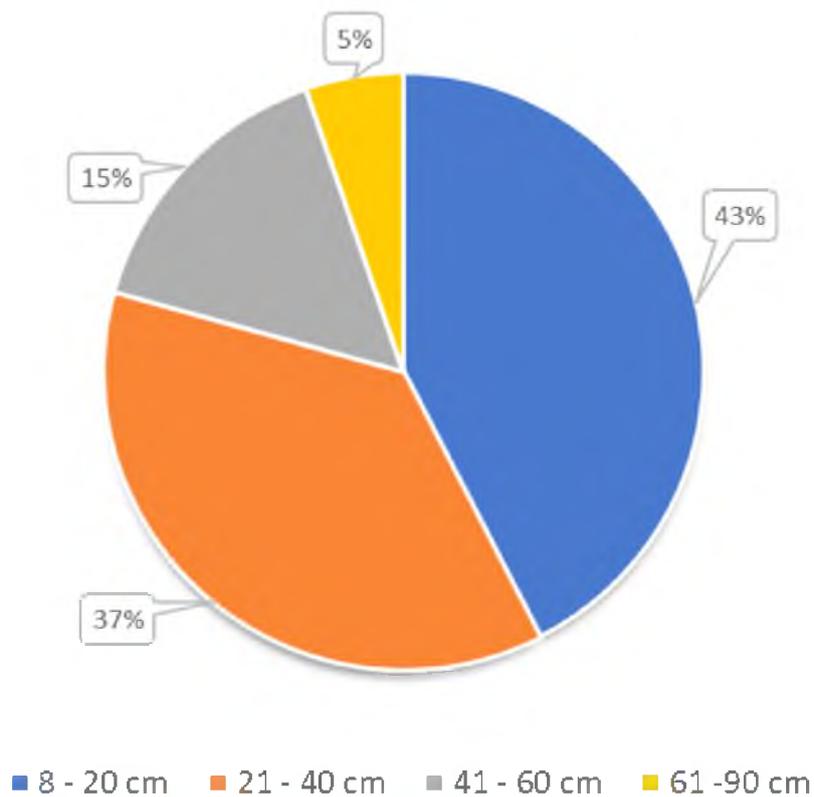


D. sissoo growing in riverbeds at Daying Ering Wildlife Sanctuary, Arunachal Pradesh

DBH classes of *D. sissoo*
(based on surveyed locations of wild occurrence)



DBH classes of *D. sissoo*
(based on surveyed locations of wild occurrence)



Due to certain limitations it has not been possible to undertake field survey in all locations/ area of the country from where the species could be found in wild; however, during the field surveys in some locations of Jammu and Kashmir, Punjab, Haryana, Himachal Pradesh, Uttarakhand, Uttar Pradesh, Bihar, West Bengal, Assam, Arunachal Pradesh more than 120000 trees with DBH \geq 8 cm have been found as wild. The risk severity of National population size and abundance is determined based on its wild population (excluding naturalized population). Data on the population density of trees and seedlings of *D. sissoo* along with rate of regeneration at some randomly surveyed areas are provided in **Annexure 1A**.

The population size of *D. sissoo* on cultivation/ plantation in India is very high and almost impossible to determine at present (in absence of inventories) as the species is extensively available on cultivation/plantation in almost every parts of the country. However, the population density of more than 172000 cultivated/ planted trees measured in some part of the country during the present study is provided in **Annexure 1B**.

5. Habitat specificity and vulnerability

Risk severity: Low

The species is adapted to a wide range of ecological habitats. The species naturally grows porous soils containing sand, pebbles and boulders and found gregariously in river beds on alluvial soil, shingle boulders, along water channels occupying 500–900 m elevation belt but exceptionally ascending to 1500 m with 4–45°C mean annual temperature, 500–4500 mm mean annual rainfall. It is a gregarious colonizer of landslips, hillsides, roadsides, new embankments, grasslands and other places where mineral soil is exposed, and when stream and rivers alter their courses or add fresh deposits of sand, shingle and boulders (Troup, 1921; Parker, 1956; Streets, 1962). *Dalbergia sissoo* is a characteristic species of the ‘Khair-sissoo’ primary seral-type forest, and tropical dry mixed deciduous and dry deciduous scrub forest types, occurring in open and low forest formations composed entirely of deciduous trees and some trees of the thorn forest type, with a predominantly deciduous shrub layer, and are limited to Himalayan foothills and adjoining Siwaliks, and recent alluvial deposits (Champion & Seth, 1968). It usually grows in association with *Acacia catechu* (L.f.) Willd., *Albizia procera* (Roxb.) Benth., *Bombax ceiba* L., etc. It regenerates naturally in soil with good drainage and sufficient aeration on fresh embankment, riverine slopes, exposed soil, laid down terraces, road cutting, etc. The species is considered as pioneer species in riverine succession of sub-Himalayan tracts and outer Himalayan valleys. Further, it is found naturalised outside its wild occurrence, extending up to South India. The species is fairly drought-resistant and frost-hardy (CSIR, 1952).

6. Regeneration

Risk severity: Low

The species is naturally propagated by seeds, root suckers and it also coppices vigorously. In wild condition, the regeneration from seeds and root suckers is very common. *Dalbergia sissoo* is fast growing and in nine months it can start producing flowers. Seed germination takes place during monsoon. Availability of adequate amount of overhead light and protection against grazing and fire are vital factors determining the success or failure of natural regeneration obtained through seeds. Artificial regeneration is possible through almost all common practices such as direct sowings, entire transplanting, planting stumps and root sections and stem cuttings, cloning, etc. In direct sowings, seedlings attain a height of 15–23 cm at the end of the first rains and 91–122 cm after the second rains (CSIR, 1952). Stump planting (planting c. 5 cm of stem and 20 cm of root) is known to be the best method of artificial regeneration (Lodhiyal & al., 2001). The rate of regeneration (RR) is moderate to high in different parts of country, ranging from 136% to 1218% (Annexure 1A).

7. Reproduction

Risk severity: Low

The sexual reproduction of *D. sissoo* is carried out by seeds and the vegetative propagation is by root suckers. The species usually flowers between February to June (rarely in September in some parts of South India) in India and the fruiting period of the species is usually between end of March to December (- February). The species is open-pollinated and the seed raised plants show wide genetic variability. The tree sheds pods during December–April and seeds germinate at the commencement of rains. Pods are disseminated by wind. Due to growing near streams/rivers, the pods are also dispersed by water along streams/rivers. Root suckers are produced from long, horizontal, superficial root branches.

In a study conducted by Tiwari and Dhuria (2017) in Chhattisgarh a significant variation in germination traits was observed across the different provenances of *D. sissoo*. Maximum germination percentage was recorded by Bastar (67 %) provenance, while minimum by Korba (48 %) provenance, However the germination percentage of Sarguja (65%) and Raigarh (60%) were also better than Korba and Bilaspur (54%). The germination value of seeds of *D. sissoo* varied from 42.60 (Bastar provenance) to 21.2 (Korba provenance), The seeds of Bastar and Sarguja provenance recorded highest germination speed (12.5 each) and least germination speed was obtained by the seeds of Korba (6.5) provenance. The Highest survival percent (100%) was recorded by the seedling obtained from the seeds of Bilaspur and Sarguja provenance (100% each), however minimum survival percent (85%) was recorded by Korba provenance (Tiwari and Dhuria, 2017).

8. Role of the species in its ecosystem

Risk severity: Low

The species is planted as a shade tree in tea and coffee plantations and on roadsides. It is a nitrogen fixer and also improve the soil fertility with its leaf litter which decomposes slowly and releasing nutrients gradually. The honey is dark amber and strong-flavoured and serves as important food source for honeybees, beetles, wasps, bumble bees, butterflies and other insects. Leaves are used as a source food for mammals. The tree serves as host of other plants such as epiphytic orchids, ferns, and fungi, lichens, etc. and also for birds and other insects. Based on available records there are no dependent species for *D. sissoo*.

STEP 6: EVALUATION OF IMPACTS OF WILD HARVEST

6. What is the severity of harvest impact on individual plants, target populations, the national population, and on other species?

1. Impact of harvest on individual plants for the exports requested

Harvest impact severity: High

The species is primarily harvested for timber and thus the harvest is lethal.



A whole tree of *D. sissoo* harvested for timber

2. Impact of harvest on target populations for the exports requested

Harvest impact severity: Low

The species is found in wild condition in several Protected Areas of the country namely Ramnagar Wildlife Sanctuary, Jasrota Wildlife Sanctuary and Nandini Wildlife Sanctuary in Jammu and Kashmir, Saraswati Plantation Wildlife Sanctuary in Haryana, Nangal Wildlife Sanctuary in Punjab, Sher Jung National Park in Himachal Pradesh, Corbett National Park, Rajaji National Park in Uttarakhand, Pilibhit Tiger Reserve and Dudhwa National Park in Uttar Pradesh, Valmiki Tiger Reserve, Kanwar Lake Bird Sanctuary in Bihar, Daying Ering Wildlife Sanctuary in Arunachal Pradesh, Bura Chapori Wildlife Sanctuary in Assam and in many other Protected Areas. As the harvest is permitted only outside the Protected Areas, a major part of the wild subpopulations are free from harvesting. Apart from the Protected Areas, the species is found in wild subpopulations in sub-Himalayan tracts and outer Himalayan valleys (extending from Assam to Jammu and Kashmir), especially along the streams and rivers. The species is also found naturalised outside its wild occurrence, extending up to South India. *Dalbergia sissoo* is listed as ‘restricted species’ in the states of Jharkhand, West Bengal and permission is required for harvesting, transportation and marketing of this species. In Assam, *D. sissoo* is ‘reserved tree’ and therefore, felling and transit of the species is regulated.

In Haryana, only dead, diseased and drying ‘Shisham’ trees are being harvested and the Working plans do not prescribe for green felling of ‘Shisham’ trees. However, sometimes green trees are harvested only in case of emergency felling when forest area is diverted for non-forestry activities. As per the data received from Haryana Forest Department, the district wise available growing stock of ‘Shisham’ in forest area (as per working plans) is as follows.

Name of District	Total volume (in m ³)	Name of District	Total volume (in m ³)
Yamunanagar	84,624.88	Faridabad	1,450.94
Fatehabad	3,805.25	Panipat	3,646.58
Gurugram	7,77.99	Rothak	1,235.11
Hisar	8,100.52	Kaithal	13,446.2
Mahendergarh	1,027.25	Rewari	2,576.72
Bhiwani	7,254.86	Palwal	852.37
Sonepat	15,143.24	Ambala	15,170
Karnal	8,336.15	Kurukshetra	12,788.0
Jhajjur	6,802.11	Mewat	2,246.93
Sirsa	54,891.0	Jind	9,341.73
Total			2,53,517.83 m³

Due to enormous availability of harvestable trees in plantation/cultivation, the major harvesting is done from the trees under plantation/cultivation and some harvesting is also done from the dead and fallen trees outside the Protected Areas. At present, the export of *D. sissoo* wood and wood products from India is mainly sourced from the timber harvested from North India, largely from Punjab, Haryana, Rajasthan, Gujarat, Uttar Pradesh. However, cultivated stocks of other parts of India also contribute a significant part to the export.



Logs of *Dalbergia sissoo* stored in forest yard

The harvest impact severity of target wild populations for the exports is low.

3. Impact of harvest on national population for the exports requested

Harvest impact severity: Low

The wild subpopulations are found in sub-Himalayan tracts and outer Himalayan valleys, mostly along riverine tracts of Jammu and Kashmir, Punjab, Haryana, Himachal Pradesh, Uttarakhand, Uttar Pradesh, Bihar, West Bengal, Assam, Arunachal Pradesh, whereas the cultivated plants of *D. sissoo* are found almost throughout the country. The wild population is insignificantly affected by harvest at present as the harvest is infrequent from wild mainly due to enormous availability of harvestable trees in plantation/ cultivation. Therefore, the severity of impact of wild harvest on national population for the exports is low.

4. Impact of harvest on other species for the exports requested

Harvest impact severity: Low

Dalbergia sissoo is easy to identify, unlikely to be confused with other species. The harvest is mainly done from planted/ cultivated trees and the harvest practices have a minimal effect on non-target species and the environment.

STEP 7: EVALUATION OF IMPACTS OF TRADE

7. What is the impact of legal and illegal trade on national population of the species concerned?

1. Magnitude and trend of legal trade:

Trade impact severity: Low

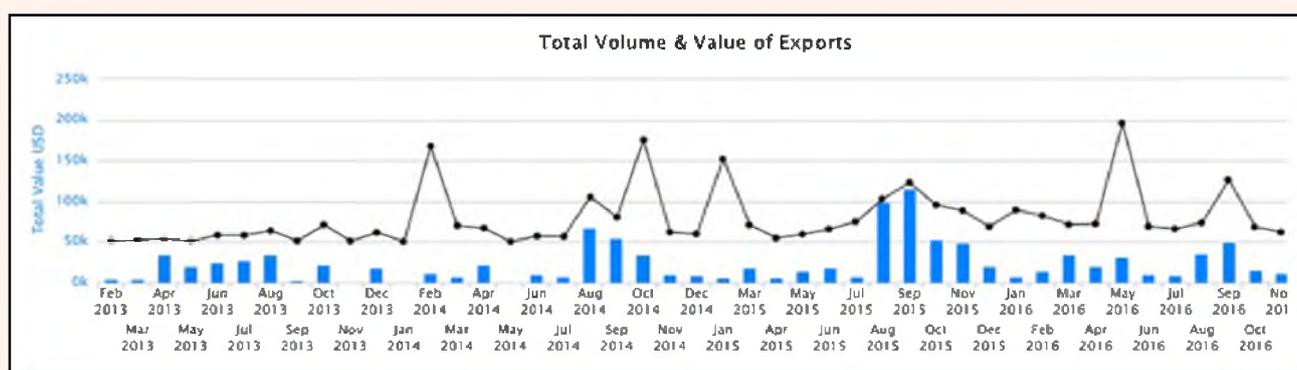
Dalbergia sissoo is one of the most useful timber species of India which is used in making of handicraft items, boat, carts, carriages, gun handles, rail-sleeper, cabinet, furniture, decorative veneer, ornamental turnery, plywood, musical instruments, skis, carvings, boats, tool handles, floorings, etc. The leaves of *D. sissoo* are used as medicine, fodder, whereas the wood is also used as fuel wood, especially in villages of India. The total monetary gains estimated for *D. sissoo* was Rs. 13.4 million per hectare (Jalota & Sangha, 2000). The price of the *D. sissoo* wood in domestic market is Rs. 400/- to Rs. 750/- per CFT (cubic feet), depending on the quality and distance to source (Sinha & Pasha, s.d.).

Report on Non-Detriment Findings (NDFs) of *Dalbergia sissoo* DC. in India



Furniture/ artifices made from *Dalbergia sissoo*

During February 2013 to November 2016, total 4739 shipments (Quantity: 260347) of *D. sissoo* worth \$ 1,079,870 (<https://www.zauba.com>) with \$4.15 average price per unit and \$228 value per shipment were exported from India. The export was from nineteen ports (port of loading) viz., Jawaharlal Nehru Port/Nhava Sheva port (INNSA1), Delhi Air Cargo (INDEL4), Tughlakabad (INTKD6), Bombay Air Cargo (INBOM4), Piyala/Ballabgarh ICD (IN BFR 6), Faridabad (INFBD6), Noida-Dadri ICD (INDER6), Patparganj (INPPG6), Dadri-ACPL CFS (INAPL6), Pakwara (INMBD6), Mundra (INMUN1), Dadri-CGML (INCPL6), Bhagat ki Kothi (INBGK6), Sabarmati ICD (INSBI6), Bangalore (INBLR5), Trivendrun Air Cargo (INTRV4), Kanakpura (INKKU6), Dadri STTPL (INSTT6), Jaipur (INJAI4) to Netherland, Sweden, United Arab Emirates, China, Australia, Switzerland, Italy, France, Qatar, Hong Kong, Romania, Uruguay, Columbia, Argentina, Peru, Austria, Island, Poland.



The export data of *D. sissoo* from India available at the CITES Trade Database during the year 2017 is as follows.

Term	Importer	Importer reported quantity	Unit
Carvings	BE	843	Not specified
Carvings	CZ	1880	Not specified
Carvings	CZ	186	Not specified
Carvings	DE	787551.1155	kg
Carvings	DE	4899162.261	kg
Carvings	DE	2324.84	kg

Term	Importer	Importer reported quantity	Unit
Derivatives	DE	7958	kg
Timber	DE	33152.27	kg
Carvings	DK	300	kg
Carvings	DK	214	Not specified
Carvings	ES	5164	Not specified
Carvings	ES	23577.5	kg
Carvings	ES	16115	kg
Carvings	ES	2660	Not specified
Wood product	FR	9747.473	kg
Wood product	FR	6540	kg
Wood product	FR	17705	Not specified
Wood product	FR	34615	Not specified
Wood product	GB	8020	Not specified
Wood product	GB	8020	Not specified
Wood product	GB	9930.2	Not specified
Wood product	GB	240	Not specified
Carvings	IT	750	Not specified
Wood product	MT	999	Not specified
Wood product	PL	765	Not specified
Wood product	PL	3530.5	kg
Wood product	PL	18476	Not specified
Wood product	PL	29994	Not specified
Wood product	SI	52.8	m ³
Wood product	SI	94	Not specified
Carvings	SK	350	Not specified

The volume of specimens in trade from wild subpopulations is very small in relation to abundance of the species, and the major part of the traded material is sourced from planted/ cultivated subpopulations. However, due to felling of trees (mainly for timber, fodder, fuel wood), increased occurrence of diseases and also due to legal restrictions including listing of the genus *Dalbergia* in CITES Appendix II, there is a decline in supply of *D. sissoo* wood in many craft making industries of India. This has resulted in a rise of demand for *D. sissoo* wood and therefore, trees are now being cut down from planted/ cultivated subpopulations much earlier mainly in private lands, even as young as 15 years, to fulfil this increasing demand.

2. Magnitude of illegal trade

Trade impact severity: Low

Dalbergia sissoo is the second most important cultivated timber tree in India. Due to its extensive availability in cultivation/ plantation, the illegal trade of the species from its wild population is very rarely reported at present.

STEP 8: EVALUATION OF EFFECTIVENESS OF MANAGEMENT MEASURES

8.1. What management measures are in place for the target species?

1. Management of wild harvest impacts: Moderate

According to the 'India State of Forest Report 2017', the total forest cover of the country is 708273 km² which is 21.54% of the geographic area of the country (FSI, 2017). As per the report, during the two assessments periods of 2015 and 2017, increase of 6778 km² forest cover at the national level was recorded. Three states, namely Andhra Pradesh, Karnataka and Kerala had contributed to an increase of 2141 km², 1101 km² and 1043 km², respectively, much of which could be attributed to plantation and conservation activities both within and outside the Recorded Forest areas as well as improvement in interpretation due to better radiometric resolution of the recent satellite data. Other states contributing significant increase were Odisha (885 km²), Assam (567 km²), Telangana (565 km²), Rajasthan (466 km²), Himachal Pradesh (393 km²), Uttar Pradesh (278 km²), Jammu and Kashmir (253 km²) and Manipur (263 km²). The states which showed reduction in forest cover primarily include Mizoram (531 km²), Nagaland (450 km²) and Arunachal Pradesh (190 km²).

The wild subpopulations of *D. sissoo* are reported from several Protected Areas of the country, viz. Nandini Wildlife Sanctuary of Jammu and Kashmir, Corbett National Park, Rajaji National Park of Uttarakhand, Sher Jung National Park of Himachal Pradesh, Pilibhit Tiger Reserve, Dudhwa National Park of Uttar Pradesh, Valmiki National Park, Kanwar Lake Bird Sanctuary of Bihar, Daying Ering Wildlife Sanctuary of Arunachal Pradesh, Bura Chapori Wildlife Sanctuary of Assam etc. and the Wild Life (Protection) Act, 1972 prevents removal of any tree from any Protected Area. The harvest of *D. sissoo* outside the Protected Areas is also regulated by rules/ Acts of different States/ Union Territories. However, there are variations in the rules and regulations related to felling of trees, transportation of felled timber across various States/ Union Territories and their management. The species is listed as 'restricted species' in Jharkhand, West Bengal and permission is required for harvesting (in private lands), transportation and marketing of this species. As per the 'Jharkhand Timber and Other Forest Produce (Transit and Regulation) Rules, 2004' (with amendments proposed in 2010), 'Shisham' tree can be removed only after obtaining permission from DFO or authorized ACF. In West Bengal, the 'West Bengal Private Forest Act, 1948', 'West Bengal Forest Produce Transit Rules, 1959' and 'West Bengal Trees (Protection and Conservation in Non Forest Areas) Act, 2006' are in forces which regulate permission for felling and transit of trees grown on private lands and permission is mandatory for 11 species, including *D. sissoo*. Assam (Control of felling and removal of Trees from Non Forest land) Rules, 2002 vide Notification No. FRM-88/2001/77 dated 7th May, 2002 regulates felling permission and transit of timber derived from non-forest areas of Assam and 48 tree species have been declared as 'Reserve tree' in Assam including *D. sissoo*. The timber of *D. sissoo* sourced from Bihar was considered to be the best quality. However, due to decrease in its plantation in Bihar for increased occurrence of diseases, its sourcing from Bihar to other states has been banned. In Haryana only dead, diseased and drying 'Shisham' trees are being harvested. Working plans of the state do not prescribe for green felling of 'Shisham' trees. However, green trees are harvested only in case of emergency felling when forest area is diverted for non-forestry activities. *D. sissoo* is the state tree of Punjab and no green tree of this species has been marked for felling as per the Working Plan of the state. As the major part of harvest is from planted/ cultivated plants, the wild subpopulations are less affected by the harvest.

2. Management of trade impacts: Basic

As the genus *Dalbergia* is listed under Appendix II of CITES since 2nd January 2017, CITES permit is now required to export/import for any material of *D. sissoo*. The national authority responsible for implementing CITES is called the CITES Management Authority. The Additional Director General (Wildlife), Ministry of Environment, Forest and Climate Change, Government of India, is designated CITES Management Authority of India and the Regional Deputy Directors of Wildlife Crime Control Bureau (WCCB) are designated as CITES Assistant Management Authorities. To obtain CITES export permit, copy of the valid export order/irrevocable letter of Credit from the foreign buyer, Legal Procurement Certificate (LPC), copy of Certificate of Physical Verification from the Regional Deputy Director (Wildlife) or from the DCF/DFO of the concerned division, etc. are to be submitted to CITES Assistant Management Authority along with CITES permit application. At the time of import, the CITES Import Certificate is to be surrendered to CITES Assistant Management Authority. However, if a species or specimen has to be re-exported, the CITES Re-export Permit application should be accompanied by a copy of CITES Import Permit/Certificate (for imports outside Customs notified area), in addition to LPC from State Wildlife Authority.

The Export Promotion Council for Handicrafts (EPCH) is also authorised for verification of legality and legal origin of wood and wood products in India and EPCH has developed the "Vriksh standard Timber Legality Assessment and Verification Scheme". The EPCH is entitled to issue 'Vriksh Shipment Certificate' for exporting goods containing *D. sissoo* by verifying Forest auction note/ sales invoice of forest department, social forestry sales invoice, cutting permit issued by the forest department, attested Khasra/field details indicating the location from where the tree was removed, Mandi Samiti (Agricultural Produce Marketing Committee) receipt and Gate Pass, invoice of sawmills, License and sawmill record (register) attested by the forest department, transit permit, weighment bridge slip, sales Invoice of immediate supplier, Vat or Sales Tax document, etc.

Other management measures

Cultivation/plantation

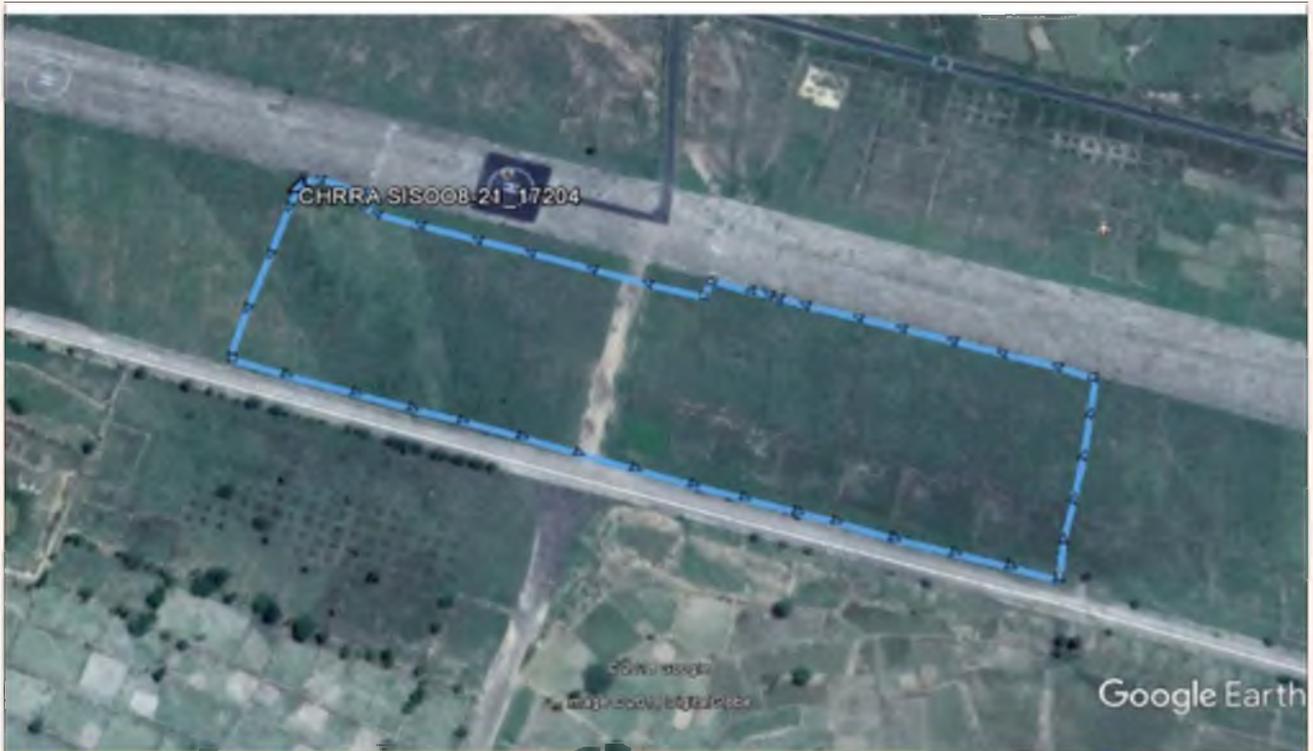
Dalbergia sissoo is the second most important cultivated timber tree in India and it is the state tree of Punjab. The species can be found in plantation/cultivation and/or agroforestry system in almost every parts of the country and it is very common in the northern, north-western, central, eastern parts of country mainly along highways, roads, riverbeds,



Pure plantation of *D. sissoo* at Charrah, West Bengal

water bodies, railway tracks, lands for cultivation and also found in villages, cities, forest area. In Bihar, Chhattisgarh, Gujarat, Haryana, Jharkhand, Odisha, Madhya Pradesh, Punjab, Rajasthan, Uttar Pradesh, Uttarakhand, West Bengal, *D. sissoo* can be found almost in every villages/town/cities.

The population size of *D. sissoo* under cultivation/plantation in India is almost impossible to determine as the species is extensively available in cultivation/plantation almost throughout the country. More than 1,72,000 mature trees have been observed under plantation/cultivation during random sampling in different parts of the county, which are not more than 10% of the total predicted mature individuals growing under plantation/ cultivation in India.



Satellite image (Google Earth) of a monospecific plantation of *D. sissoo* at Charrah, West Bengal
(Area 4.133 hectare; 1600 plants per hectare)

Range: Hura Extension Forestry Range and Head Hura Extension FMU

Division: Purulia Extension Forestry Division & Head Purulia Extension DMU



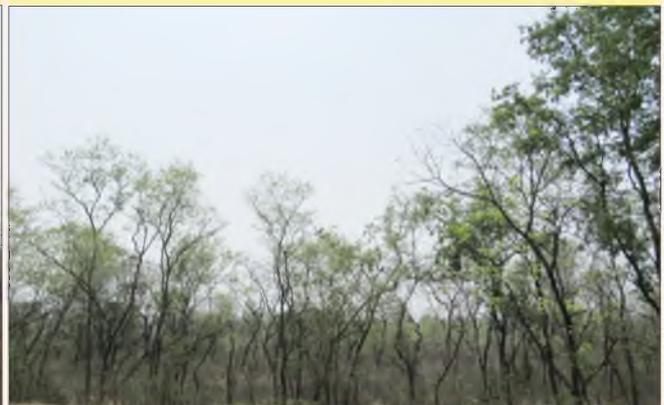
Dalbergia sissoo plantation in Rajadighi beat,
West, Bengal



Dalbergia sissoo plantation near Kopai river,
Bolpur, West, Bengal



Dalbergia sissoo plantation near Raipur,
Uttarakhand



Dalbergia sissoo plantation near Doiwala,
Uttarakhand



Dalbergia sissoo plantation at State Forest Research Institute, Yamuna Nagar, Haryana



Dalbergia sissoo plantation in Bilaspur Forest Division, Yamuna Nagar, Haryana



Dalbergia sissoo plantation near National Hydal Canal (RT 166), Punjab

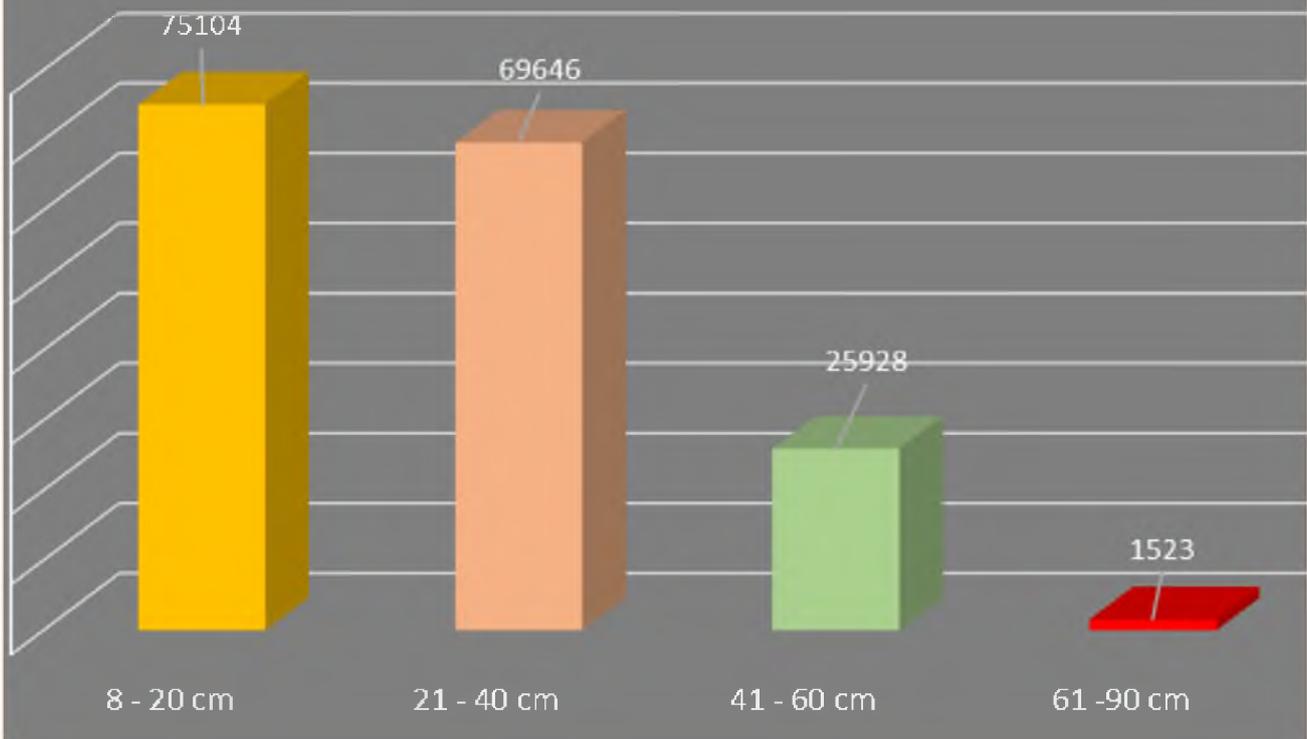
Dalbergia sissoo plantation at Chaibasa graveyard, Jharkhand



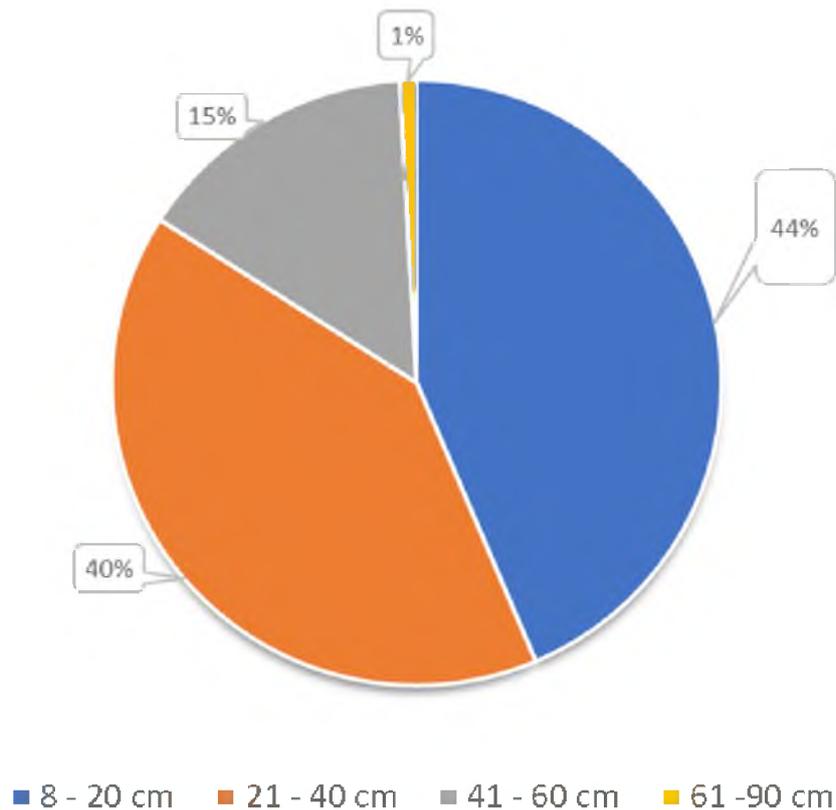
Dalbergia sissoo plantation at Pithabata Range, Odisha

Dalbergia sissoo plantation near Bhinder, Rajasthan

DBH classes of *D. sissoo*
(based on surveyed locations of cultivated/ planted populations,
excluding monospecific and pure plantations)



DBH classes of *D. sissoo*
(based on surveyed locations of cultivated/ planted population,
excluding monospecific and pure plantations)

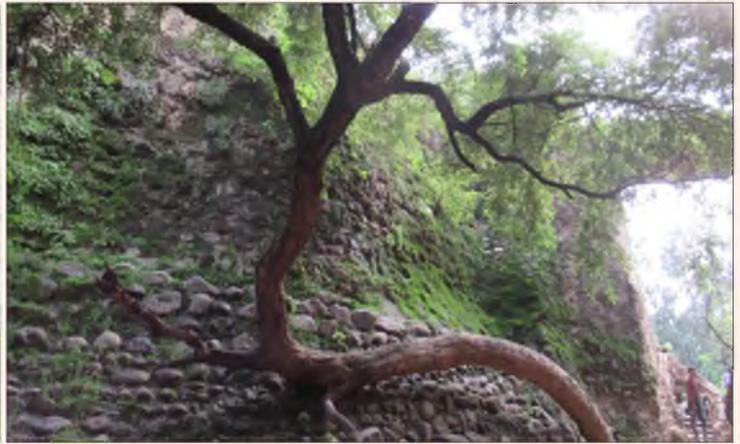




Dalbergia sissoo, one of the timber-yielding trees generally preferred for plantation/cultivation in all possible habitats/localities throughout India



Dalbergia sissoo, one of the timber-yielding trees generally preferred for plantation/cultivation in all possible habitats/localities throughout India



Nursery Stock: The species is found growing in several Government and private nurseries for *ex-situ* conservation, plantation, afforestation, reforestation and also for distribution/sale. Information on stocks of some nurseries are given below which have been recorded either by visiting the nurseries or from the record/inventory of these nurseries. There are many other nurseries present in different parts of the country where *D. sissoo* are being grown, but information on their stock could not be retrieved during the present study.

Nursery	Number of seedlings/ saplings/stumps/plants	State
Lanka Nursery, Guwahati	8 seedlings/saplings	Assam
Nursery of State Forest Department at Bathnaha (Horticulture nursery), Araria	c. 4000 seedlings	Bihar
Permanent nursery of State Forest Department at Bathnaha, Araria	c. 4000 seedlings, c. 3500 stumps	Bihar
Nursery of State Forest Department at Narpatganj, Araria	c. 4000 seedlings	Bihar
Nursery of State Forest Department at Kariat, Araria	c. 5000 seedlings	Bihar
Nursery of State Forest Department, Kishanganj	c. 4000 seedlings	Bihar
Nursery of State Forest Department at Pothia, Kishanganj	c. 2000 seedlings	Bihar
Nursery of State Forest Department at Simaraha (Permanent nursery), Araria	c. 3000 seedlings	Bihar
Nursery of State Forest Department, Kishanganj (Permanent Nursery)	c. 1000 seedlings, c. 10,000 stumps	Bihar
Nursery of State Forest Department at Bahadurganj, Kishanganj	c. 2000 seedlings	Bihar
Nursery of State Forest Department at Kochadhaman, Kishanganj	c. 2000 seedlings	Bihar
Nursery of State Forest Department at Karpi, Arwal	c. 3000 seedlings	Bihar
Nursery of State Forest Department at Laridhi, Kurtha, Arwal Range, Arwal	c. 7000 seedlings	Bihar
Nursery of State Forest Department at Manghiyawa, Aurangabad	13,601 seedlings	Bihar
Umaga Permanent Nursery of State Forest Department at Madanpur, Aurangabad	c. 18,000 seedlings	Bihar
Arwal Range Office Nursery extra of State Forest Department, Aurangabad	c. 9000 seedlings	Bihar
Adri Nadi Permanent Nursery of State Forest Department, Aurangabad	c. 780 seedlings	Bihar
Nursery of State Forest Department at Umaga, Aurangabad	c. 9480 seedlings	Bihar
Udyan Nursery of State Forest Department at Katoria, Banka	c. 1603 seedlings	Bihar
Udyan Nursery of State Forest Department at Amarpur, Banka	c. 2924 seedlings	Bihar
Nursery of State Forest Department at Katoria, Banka	c. 7309 seedlings	Bihar

Report on Non-Detriment Findings (NDFs) of *Dalbergia sissoo* DC. in India

Nursery	Number of seedlings/ saplings/stumps/plants	State
Supaha Van Vigyan Kendra Nursery of State Forest Department, Rajpur, Banka	c. 7389 seedlings	Bihar
Nursery of State Forest Department at Cheria Bariarpur Block Campus, Begusarai	c. 3700 stumps	Bihar
Nursery of State Forest Department at H.F.C Barauni Fertilizer Campus, Barauni, Begusarai	c. 4350 stumps	Bihar
Nursery of State Forest Department at Alauli Block Campus, Khagaria	c. 1190 seedlings	Bihar
Nursery of State Forest Department at Khagaria Block Campus, Khagaria	c. 6000 seedlings	Bihar
Nursery of State Forest Department at Madanpur (Pachrukha) Block – Bagaha – 2, West Champaran	c. 4383 seedlings	Bihar
Nursery of State Forest Department at Harnatand (Matraji) Block – Bagaha – 2, West Champaran	c. 5060 seedlings	Bihar
Udaipur Permanent Nursery of State Forest Department at Udaipur, West Champaran	c. 36 seedlings, 15,220 stumps	Bihar
Chainpur Permanent Nursery of State Forest Department, Kaimur	c. 5000 seedlings	Bihar
Adhaura Permanent Nursery of State Forest Department, Kaimur	c. 4000 seedlings	Bihar
Mundeshwari Permanent Nursery of State Forest Department, Kaimur	c. 1500 seedlings, c. 12,200 stumps	Bihar
Nursery of Munna Singh Patel at Mohanpur, Kaimur	c. 5380 seedlings	Bihar
Nursery of State Forest Department at Naugachia, Bhagalpur	c. 1806 seedlings	Bihar
Nursery of State Forest Department at Baghaut (near Dharhara Pull), Bhojpur	c. 7556 seedlings, c. 4000 stumps	Bihar
Nursery of State Forest Department at Brahampur, Buxar	c. 10,415 seedlings	Bihar
Horticulture Nursery of State Forest Department at Wazirganj, Gaya	c. 3191 seedlings	Bihar
Horticulture Nursery of State Forest Department at Atri, Gaya	c. 840 seedlings	Bihar
Horticulture Nursery of State Forest Department at Belaganj, Gaya	c. 1724 seedlings	Bihar
Horticulture Nursery of State Forest Department at Maranpur (Khatachak), Gaya	9040 seedlings	Bihar
Horticulture Nursery of State Forest Department at Gurua, Gaya	c. 1000 seedlings	Bihar
Horticulture Nursery of State Forest Department at Sherghati, Gaya	c. 4000 seedlings	Bihar
Paraya Permanent Nursery of State Forest Department, Gaya	c. 10,011 seedlings	Bihar
Piparghatti (Dobhi) Permanent Nursery of State Forest Department, Gaya	c. 24,628 seedlings	Bihar

Report on Non-Detriment Findings (NDFs) of *Dalbergia sissoo* DC. in India

Nursery	Number of seedlings/ saplings/stumps/plants	State
Horticulture Nursery of State Forest Department, Jehanabad	c. 2740 seedlings	Bihar
Permanent Nursery of State Forest Department, Jehanabad	c. 3739 seedlings	Bihar
Permanent Nursery of State Forest Department at Bhore, Gopalganj	c. 5478 seedlings	Bihar
Permanent Nursery of State Forest Department at Kuchaikot, Gopalganj	c. 2544 seedlings	Bihar
Permanent Nursery of State Forest Department at Maharajganj, Siwan	c. 15,660 seedlings	Bihar
Permanent Nursery of State Forest Department at Darauli, Siwan	c. 17,500 seedlings	Bihar
Udyan Nursery of State Forest Department at Chakai, Jamui	c. 490 seedlings	Bihar
Udyan Nursery of State Forest Department at Sono, Jamui	c. 5700 seedlings	Bihar
Block Udyan Nursery of State Forest Department, Jamui	c. 1130 seedlings	Bihar
Permanent Nursery of State Forest Department at Sono, Jamui	c. 10,300 seedlings	Bihar
Udyan Nursery of State Forest Department at Baheri, Madhubani	c. 874 seedlings	Bihar
Permanent Nursery of State Forest Department at Pandaul, Madhubani	c. 18,543 stumps	Bihar
Permanent Nursery of State Forest Department at Benipatti, Madhubani	c. 8000 stumps	Bihar
Permanent Nursery of State Forest Department at Jhanjharpur, Madhubani	c. 7400 stumps	Bihar
Permanent Nursery of State Forest Department at Madhepur, Madhubani	c. 7000 stumps	Bihar
Nursery of State Forest Department at Chawrodano, Purbi Champaran	c. 500 seedlings	Bihar
Nursery of State Forest Department at Piprakothi, Purbi Champaran	c. 1750 stumps	Bihar
Nursery of State Forest Department at Lakshmipur, Jamui	c. 6225 seedlings	Bihar
Permanent Nursery of State Forest Department at Dharhara, Munger	c. 2000 seedlings	Bihar
Permanent Nursery of State Forest Department at Shampur, Munger	c. 17,100 seedlings	Bihar
Permanent Nursery of State Forest Department at Sonbhandar, Rajgir, Nalanda	c. 478 seedlings	Bihar
Nursery of State Forest Department at ITI, Nawada	c. 10,000 seedlings	Bihar

Report on Non-Detriment Findings (NDFs) of *Dalbergia sissoo* DC. in India

Nursery	Number of seedlings/ saplings/stumps/plants	State
Horticulture Nursery of State Forest Department at Dhanarua, Patna	c. 792 seedlings	Bihar
Temp. Nursery of State Forest Department at Dhanarua, Patna	c. 1268 seedlings	Bihar
Horticulture Nursery of Van Vikash Kendra, Katihar	c. 12,487 seedlings	Bihar
Permanent Nursery of Van Vikash Kendra, Katihar	c. 1935 seedlings	Bihar
Nursery of State Forest Department at Kadwa Block, Kumrhi, Katihar	c. 7440 seedlings	Bihar
Nursery of State Forest Department at Manihari, Purnia	c. 5669 seedlings	Bihar
Nursery of State Forest Department at Azamnagar, Purnia	c. 2510 seedlings	Bihar
Nursery of State Forest Department at Amour, Purnia	c. 4500 stumps	Bihar
Horticulture Nursery of State Forest Department at Banmankhi, Purnia	c. 2500 seedlings	Bihar
Nursery of State Forest Department at Chethariapir, Purnia	c. 11,790 seedlings	Bihar
Nursery of State Forest Department at Mahendapur, Purnia	c. 7000 Stumps	Bihar
Permanent Nursery of State Forest Department at Banmankhi, Purnia	c. 18,000 seedlings	Bihar
Nursery of State Forest Department at Sheosagar, Rohtas	c. 7717 seedlings	Bihar
Nursery of State Forest Department at Chausa, Madhepura	c. 1850 seedlings	Bihar
Nursery of State Forest Department at Udakisunganj, Madhepura	c. 1600 seedlings	Bihar
Nursery of State Forest Department, Madhepura	c. 2300 seedlings	Bihar
Nursery of State Forest Department at Saur Bazar, Saharsa	c. 4000 seedlings	Bihar
Hawaiadda Sthai Paudhshala of State Forest Department, Saharsa	c. 4000 seedlings	Bihar
Nursery of State Forest Department at Hasanpur, Samastipur	c. 100,00 stumps	Bihar
Nursery of State Forest Department at Vidyapati Nagar, Samastipur	c. 500 stumps	Bihar
Nursery of State Forest Department at Sonwar Chak, Samastipur	c. 8400 stumps	Bihar
Permanent Nursery of State Forest Department at Sonawarchok, Samastipur	c. 3300 stumps	Bihar
Nursery of State Forest Department at Krishi Form Parisar, Manjhi, Saran	c. 694 seedlings	Bihar

Report on Non-Detriment Findings (NDFs) of *Dalbergia sissoo* DC. in India

Nursery	Number of seedlings/ saplings/stumps/plants	State
Nursery of State Forest Department at Prakhand Parisar, Ekma, Saran	c. 3000 stumps	Bihar
Nursery of State Forest Department at Prakhand Parisar, Dighwara, Saran	c. 2765 seedlings	Bihar
Nursery of State Forest Department at Sahebganj, Muzaffarpur	c. 2590 seedlings	Bihar
Nursery of State Forest Department at Mahbal-Motipur, Muzaffarpur	c. 1800 seedlings	Bihar
Nursery of State Forest Department at Ramchandrapur, Muzaffarpur	c. 2460 seedlings, c. 2500 Stumps	Bihar
Nursery of State Forest Department at Dokra, Muzaffarpur	3815 seedlings, c. 1000 Stumps	Bihar
Horticulture Nursery of State Forest Department at Lalganj, Vaishali	c. 3000 seedlings	Bihar
Horticulture Nursery of State Forest Department at Mahua, Vaishali	c. 2920 seedlings	Bihar
Permanent Nursery of State Forest Department at Bidupur Block Campus, Vaishali	c. 19,264 seedlings	Bihar
Permanent Nursery of State Forest Department at Goraul, Vaishali	c. 1000 seedlings, c. 2000 stumps	Bihar
Manakpur Government Nursery, Haryana	c. 45,000 seedlings/saplings	Haryana
Yamunanagar Government Nursery, Haryana	c. 35,000 seedlings/saplings	Haryana
Bilaspur Government Nursery, Bilaspur	c. 15,000 seedlings/saplings	Haryana
Khanpur Forest Department Nursery, Rampur	c. 2000 seedlings/saplings	Haryana
Hinauta Forest Department Nursery, Rampur	c. 30,000 seedlings/saplings	Haryana
Sidhara Model Nursery, State Forest Research Institute, Jammu	c. 1,00,000 seedlings/ saplings	Jammu and Kashmir
Sh. Giridharilal Dogra Model Nursery of State Forest Department, Harya Chak	c. 20485 seedlings/saplings	Jammu and Kashmir
Kathua Government Nursery, Kathua	c. 50,000 seedlings/saplings	Jammu and Kashmir
Forest Research Institute Nursery, Hariachak	c. 25,000 seedlings/saplings	Jammu and Kashmir
Forest Nursery of Simariya Range, Chhatra	c. 25,000 seedlings/saplings	Jharkhand
Nursery of State Forest Department at Khargone, Khandwa	c. 53,074 seedlings/saplings	Madhya Pradesh
Nursery of State Forest Department at Katni, Jabalpur	c. 20,383 seedlings/ saplings	Madhya Pradesh
Nursery of State Forest Department at Bhopal	c. 23,672 seedlings/saplings	Madhya Pradesh
Nursery of State Forest Department at Sehore, Bhopal	c. 65,420 seedlings/saplings	Madhya Pradesh
Nursery of State Forest Department at Raisen, Bhopal	c. 25,428 seedlings/saplings	Madhya Pradesh

Report on Non-Detriment Findings (NDFs) of *Dalbergia sissoo* DC. in India

Nursery	Number of seedlings/ saplings/stumps/plants	State
Nursery of State Forest Department, Jabalpur	c. 1,87,377 seedlings/ saplings	Madhya Pradesh
Nursery of State Forest Department at Mandla, Jabalpur	c. 3,70,482 seedlings/ saplings	Madhya Pradesh
Nursery of State Forest Department at Dindori, Jabalpur	c. 72,624 seedlings/saplings	Madhya Pradesh
Nursery of State Forest Department at Narsimpur, Shivni	c. 1,005,19 seedlings/ saplings	Madhya Pradesh
Nursery of State Forest Department at Chhindwara, Shivni	c. 95,569 seedlings/saplings	Madhya Pradesh
Nursery of State Forest Department at Seoni, Shivni	c. 1,11,646 seedlings/ saplings	Madhya Pradesh
Nursery of State Forest Department at Balaghat, Shivni	c. 21,050 seedlings/saplings	Madhya Pradesh
Nursery of State Forest Department, Jhabua	c. 1,77,672 seedlings/ saplings	Madhya Pradesh
Nursery of State Forest Department at Dhar, Shivni	c. 1,01,241 seedlings/ saplings	Madhya Pradesh
Nursery of State Forest Department at Alirajpur, Jhabua	c. 25,654 seedlings/saplings	Madhya Pradesh
Nursery of State Forest Department at Ujjain, Ratlum	c. 46,676 seedlings/saplings	Madhya Pradesh
Nursery of State Forest Department at Mansor, Ratlum	c. 1848 seedlings/saplings	Madhya Pradesh
Nursery of State Forest Department at Ratlum, Ratlum	c. 39,122 seedlings/saplings	Madhya Pradesh
Nursery of State Forest Department at Datia, Gwalior	c. 44,143 seedlings/saplings	Madhya Pradesh
Nursery of State Forest Department at Murena, Gwalior	c. 12,757 seedlings/saplings	Madhya Pradesh
Nursery of State Forest Department at Shivpuri, Gwalior	c. 2,09,208 seedlings/ saplings	Madhya Pradesh
Nursery of State Forest Department at Housangabad, Betul	c. 8013 seedlings/saplings	Madhya Pradesh
Nursery of State Forest Department, Betul	c. 2,89,586 seedlings/ saplings	Madhya Pradesh
Bori Nursery at Harda, Betul	c. 99,633 seedlings/saplings	Madhya Pradesh
Nursery of State Forest Department at Debas, Indore	c. 2,65,353 seedlings/ saplings	Madhya Pradesh
Nursery of State Forest Department, Indore	c. 2,83,186 seedlings/ saplings	Madhya Pradesh
Nursery of State Forest Department, Khandwa	c. 88,078 seedlings/saplings	Madhya Pradesh
Nursery of State Forest Department at Barwani, Khandwa	c. 55,676 seedlings/saplings	Madhya Pradesh

Report on Non-Detriment Findings (NDFs) of *Dalbergia sissoo* DC. in India

Nursery	Number of seedlings/ saplings/stumps/plants	State
Nursery of State Forest Department at Burhanpur, Khandwa	c. 37,430 seedlings/saplings	Madhya Pradesh
Nursery of State Forest Department at Satna, Riva	c. 19,819 seedlings/ saplings	Madhya Pradesh
Nursery of State Forest Department at Riva, Riva	c. 25,004 seedlings/saplings	Madhya Pradesh
Nursery of State Forest Department at Anuppur, Riva	c. 9134 seedlings/saplings	Madhya Pradesh
Nursery of State Forest Department at Umaria, Riva	c. 37,742 seedlings/saplings	Madhya Pradesh
Nursery of State Forest Department at Singrauli, Riva	c. 60,766 seedlings/saplings	Madhya Pradesh
Nursery of State Forest Department at Sadol, Riva	c. 55,159 seedlings/saplings	Madhya Pradesh
Hitech Nursery Seminary Hills Social Forestry, Nagpur	c. 1000 seedlings/saplings	Maharashtra
Government Nursery, Parshivni Range, Nagpur	c. 5000 seedlings/saplings	Maharashtra
Morchondi nursery, Nashik	c. 7000 seedlings/saplings	Maharashtra
Junnar nursery of State Forest Department, Pune	c. 7000 seedlings/saplings	Maharashtra
Dimbha nursery of State Forest Department, Pune	c. 3500 seedlings/saplings	Maharashtra
Kuarmunda Forest Nursery, Sundargarh	c. 5000 seedlings/saplings	Odhisia
All nurseries of State Forest Department, Ropar district	c. 1,28,682 seedlings/ saplings	Punjab
All nurseries of State Forest Department, Garhshankar district	c. 1,96,983 seedlings/ saplings	Punjab
All nurseries of State Forest Department, S.A.S. Nagar district	c. 1,34,957 seedlings/ saplings	Punjab
All nurseries of State Forest Department, Hoshiarpur district	c. 2,15,930 seedlings/ saplings	Punjab
All nurseries of State Forest Department, Dasua district	c. 56,002 seedlings/saplings	Punjab
All nurseries of State Forest Department, Pathankot district	c. 49,327 seedlings/saplings	Punjab
All nurseries of State Forest Department, Patiala district	c. 69,959 seedlings/saplings	Punjab
All nurseries of State Forest Department, Sangrur district	c. 1000 seedlings/saplings	Punjab
All nurseries of State Forest Department, Mansa district	c. 27,600 seedlings/saplings	Punjab
All nurseries of State Forest Department, Ludhiana district	c. 1,39,454 seedlings/ saplings	Punjab
All nurseries of State Forest Department, Amritsar district	c. 88,121 seedlings/saplings	Punjab

Report on Non-Detriment Findings (NDFs) of *Dalbergia sissoo* DC. in India

Nursery	Number of seedlings/saplings/stumps/plants	State
All Nurseries of State Forest Department of Gurdaspur district	c. 74,490 seedlings/saplings	Punjab
All Nurseries of State Forest Department of Jalandhar district	c. 1,19,334 seedlings/saplings	Punjab
All Nurseries of State Forest Department of Ferozepur district	c. 62,395 seedlings/saplings	Punjab
All Nurseries of State Forest Department of Mukatsar district	c. 70,508 seedlings/saplings	Punjab
All nurseries of State Forest Department of Bathinda district	c. 18,277 seedlings/saplings	Punjab
Nursery of State Forest Department, Bhinder	c. 3000 saplings	Rajasthan
Nursery of Forest Genetics, Lahi road	8 seedlings/saplings	Tamil Nadu
Shree Balaji Roja Nursery, Coimbatore	50 seedlings/saplings	Tamil Nadu
Latifshah Government Nursery, Chakia, Chandauli	c. 30,000 seedlings/saplings	Uttar Pradesh
Bigha Government Nursery, Nauragh, Chandauli	c. 30,000 seedlings/saplings	Uttar Pradesh
Kauaghat Government Nursery, Nauragh, Chandauli	c. 50,000 seedlings/saplings	Uttar Pradesh
Obra Government Nursery, Robertsganj	c. 12,000 seedlings/saplings	Uttar Pradesh
Babhani Govt. Nursery, Robertsganj	c. 3000 seedlings/saplings	Uttar Pradesh
Bagharu Govt. Nursery, Robertsganj	c. 5000 seedlings/saplings	Uttar Pradesh
Danga Forest Nursery, Balurghat	c. 70,000 seedlings/saplings	West Bengal
Kumarganj Nursery, Kumarganj	c. 2000 seedlings/saplings	West Bengal
Nursery of state forest department at Kantadih, Purulia	c. 800 saplings	West Bengal
Central nursery of state forest department at Balarampur, Purulia	c. 8000 saplings	West Bengal

As per the data received from the Haryana forest department, 15–16 lakh ‘Shisham’ seedlings are raised in different nurseries by the department every year for plantation and for distribution to the farmers to promote cultivation of *D. sissoo*.



Seedlings of *D. sissoo* at Sidhara Model Nursery, Jammu, Jammu & Kashmir



Seedlings of *D. sissoo* at Sh. Giridharilal Dogra Model Nursery, Harya Chak, Jammu & Kashmir



Seedlings of *D. sissoo* at Hinauta Forest Nursery, Rampur, Haryana



Seedlings of *D. sissoo* at Manakpur Government Nursery, Haryana



Seedlings of *D. sissoo* at nursery of forest department, Bhinder Nursery, Rajasthan



Seedlings of *D. sissoo* at Latifshah Govt. Nursery, Chakia, Uttar Pradesh



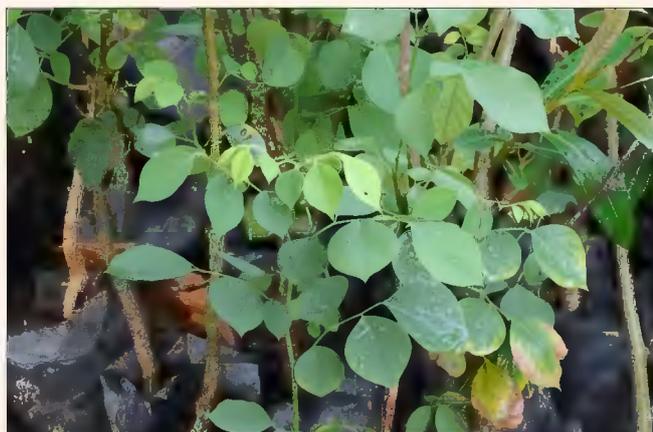
Seedlings of *D. sissoo* at Nursery of State Forest Department at Bhopal



Seedlings of *D. sissoo* at Junnar Nursery of State Forest Department at Pune, Maharashtra



Seedlings of *D. sissoo* at Dimbha Nursery of State Forest Department at Pune, Maharashtra



Seedlings of *D. sissoo* at Shree Balaji Roja Nursery, Coimbatore



Seedlings of *D. sissoo* at nursery of State Forest Department at Kumarganj, West Bengal



Seedlings of *D. sissoo* at Danga Forest Nursery, Balurghat, West Bengal



Seedlings of *D. sissoo* at nursery of State Forest Department at Balarampur, West Bengal

The major threat for the ‘Shisham’ cultivation in Haryana is drying and dying of trees caused by *Fusarium solani* and *Ganoderma lucidum* fungal infestation. These fungi are causing mass mortality both in forests and in farmer’s field; 40–50% of the trees have dried up during last 30 years. To address this problem in ‘Shisham’, the following protocol is being followed by the Forest Department of Haryana.

- a. As a precautionary measure, Forest Department raises good quality seedlings through root-shoot cuttings which are free from diseases.
- b. As a control measure, Bordeaux mixture (Copper sulphate + lime) treatment is given to plants to minimize the problem.
- c. In block plantation, trenches are being dug up between rows to prevent the movement of pathogen from plant to plant.
- d. To identify disease tolerant/resistant clones/ varieties, multi- locational trails are being taken up. The resistant done released by the FRI, Dehradun (FRI-Ds-14) is under observation. Under ongoing field trial clone No. 219 brought from Haldwani is showing some tolerance to the disease.

The Genetics and Tree Propagation Division of the Forest Research Institute (FRI), Dehradun is involved in developing different clones of *D. sissoo* which are now planted in different parts of Northern India and Gangetic plain.



Clones of *D. sissoo* developed by the scientists at Forest Research Institute, Dehradun

STEP 9: NON-DETRIMENT FINDING AND RELATED ADVICE

Decision 9.8.

The harvest of *D. sissoo* is being done mostly from planted/cultivated trees outside the locations of its wild occurrence. The impacts of both harvest and trade are low as harvest and trade do not pose to threats to the existing wild population of *D. sissoo* in India. The existing management procedures (also supported by laws to regulate harvest of the natural population) are appropriate and effective to mitigate (= reduce the severity of) the identified wild harvest impacts and trade impacts of *D. sissoo*.

Positive NDF with advice to export timber/wood products sourced from planted/cultivated population.

OTHER ADVICE

- ◆ The major threat to *D. sissoo* both in wild, naturalised and planted/cultivated population is not harvest and trade, but diseases. Further, majority of the harvest is from planted/cultivated trees and there is no correlation between harvest as well as trade of planted/cultivated trees and diseases in wild population of *D. sissoo*. However, an effective disease management protocol is warranted for both wild/ naturalised and planted/cultivated plants and effort of developing disease tolerant/resistant clones/cultivars should be accelerated.
- ◆ The wild subpopulations of *D. sissoo* are widely distributed in the sub-Himalayan tracts and outer Himalayan valleys of India and the species is also found naturalised outside its wild occurrence (extending up to southern India). The wild population of *D. sissoo* is insignificantly affected by harvest and trade. However, increasing manifestation of diseases in many parts of country in wild, naturalised and planted/cultivated subpopulations during the last three decades causing drying and dying of *D. sissoo*, is the most serious threat to the species at present. Therefore, it is suggested to export *D. sissoo* wood and wood products, which are sourced from legally harvested healthy planted/cultivated trees to minimize the overall pressure on the wild population of the species in India till the establishment of a national export quota and implementation of effective phytosanitary management as well as disease management of the infected trees.
- ◆ Preparing inventories of standing stocks (wild and cultivated separately) of *D. sissoo* for every state/union territory, is essential for better management and establishing national export quota of the species (when necessary).

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Annexure 1A

Wild population data of *Dalbergia sissoo* DC. based on hectare wise randomly surveyed locations

State	Location	No. of trees (DBH ≥ 8 cm) per hectare (average based on minimum 3 plots of 100 x 100 m)	No. of seedlings/saplings/plantlets per hectare (average based on minimum 3 plots of 100 x 100 m)	#Regeneration rate (RR) = No. of individuals reproduced or regenerated (Nr)/ No. of individuals at the age of reproduction (Ns) x 100
Arunachal Pradesh	Tezunala river side	17	85	500
Arunachal Pradesh	Lai Nala river side	44.3	540	1218
Arunachal Pradesh	Dying Ering Wildlife Sanctuary	19.6	232	1183
Arunachal Pradesh	Near Parshuram Kund along river side	33.3	70	210
Assam	Bura Chapori Wildlife Sanctuary	31.6	90	284
Bihar	Valmiki Tiger Reserve	18	70	388
Bihar	Kanwar Lake Bird Sanctuary	11	24	218
Himachal Pradesh	Swarghat Range	34.6	125	361
Himachal Pradesh	Naina Devi Range	32	96	300
Himachal Pradesh	Kaula Wala Toba	27	97	359
Himachal Pradesh	Kangoo forest	31	62	213
Himachal Pradesh	Sundarnagar	9	50	555
Himachal Pradesh	Tandu Forest Division	17	85	500
Himachal Pradesh	Narla	16.3	29	177
Himachal Pradesh	Gwali	14	21	150
Himachal Pradesh	Jaisinghpur	29	145	517
Jammu and Kashmir	Nagrauta	27	84	311
Jammu and Kashmir	Jagti	21	57	271
Jammu and Kashmir	Tanda	31	67	109
Jammu and Kashmir	Samba	25	102	408
Jammu and Kashmir	Hariachak	27	79	292
Jammu and Kashmir	Jasrota Wildlife Sanctuary	21	67	319

Trees ≤ 5 = Rare; 6-10 = Scarce; 11-20 = Common; >20 = Abundant

Report on Non-Detriment Findings (NDFs) of *Dalbergia sissoo* DC. in India

State	Location	No. of trees (DBH ≥ 8 cm) per hectare (average based on minimum 3 plots of 100 x 100 m)	No. of seedlings/saplings/plantlets per hectare (average based on minimum 3 plots of 100 x 100 m)	#Regeneration rate (RR) = No. of individuals reproduced or regenerated (Nr)/ No. of individuals at the age of reproduction (Ns) x 100
Jammu and Kashmir	Kathua	30	79	263
Jammu and Kashmir	Akhnoor	17	85	500
Jammu and Kashmir	Nandini Wildlife Sanctuary	29	120	413
Jammu and Kashmir	Udhampur	31	62	200
Jammu and Kashmir	Jaganoo	29	87	300
Jammu and Kashmir	Markana	22	55	250
Jammu and Kashmir	Forest area nearby Jammu	15.3	65	424
Jammu and Kashmir	Ramnagar Wildlife Sanctuary	35	148	422
Jammu and Kashmir	Udhampur	32	78	243
Sikkim	After crossing Rongpoo along Teesta river	16	45	281
Uttar Pradesh	Barahi Range	13	65	500
Uttar Pradesh	Bankati Range	9	36	400
Uttar Pradesh	Haripur Range	16.3	51	312
Uttar Pradesh	Faizullagange Beat	37	74	200
Uttar Pradesh	Mahof Range	12	48	400
Uttar Pradesh	Simra Beat	33	45	136
Uttarakhand	Along riverbeds near Doiwala	38	410	1078
Uttarakhand	Near Ramnagar along riverbeds	22	110	500
Uttarakhand	Sitabani, Corbett National Park	15	56	373
Uttarakhand	Kayri	8	12	150
West Bengal	Along Teesta river at c. 4 and 7 km before Rangpo	15	68	453

Trees ≤ 5 = Rare; 6–10 = Scarce; 11–20 = Common; >20 = Abundant

RR = 0–100 = low; 100–1000 = Average; > 1000% = High (Anon. 2013. *Evaluation écologique des bois précieux, provision de données taxonomiques, validation et mise au point de méthodes de quantification pour la gestion durable des bois précieux de Madagascar*. Department of Biology and Plant Ecology of the Faculty of Science of the University of Antananarivo, Final report ITTO--CITES)

Report on Non-Detriment Findings (NDFs) of *Dalbergia sissoo* DC. in India

Annexure 1B		
Cultivated population (excepting pure and monospecific plantations) data of <i>Dalbergia sissoo</i> DC. based on hectare wise randomly surveyed locations		
State	Location	No. of trees (DBH ≥ 8 cm) per hectare (average based on minimum 3 plots of 1 hectare each)
Arunachal Pradesh	Tinsukia to Tezu	15
Andhra Pradesh	Pulla village, West Godavari District to Visakhapatnam via Rajmundhry	10.6
Andhra Pradesh	Atmakur to Nandyal road	37
Andhra Pradesh	Nandyal to Mahanandi	29
Andhra Pradesh	Anantapur to Kadiri highway	36
Andhra Pradesh	Dharmavaram to Pulivendula	8.6
Andhra Pradesh	Dharmavaram to Gorantla	31.3
Andhra Pradesh	Gorantla to Kadiri	12
Arunachal Pradesh	Tezu Nala adjacent areas	7
Arunachal Pradesh	Deopani river side	6
Arunachal Pradesh	Paya, Lohit	35
Arunachal Pradesh	Digaru near Haju river, Lohit	24
Assam	Bamunigaon roadside, West Kamrup	8
Assam	Guwahati roadside	9
Assam	Digholi Pukhri roadside, Kamrup metro	20
Assam	North Kamrup (Rangia)	25
Assam	Tulsibari Reserve Forest	7
Assam	Tulsibari roadside	30
Assam	Navodaya Vidyalaya	15
Assam	Vasishta on highway, East Kamrup	35
Assam	Sadiya	13
Assam	Rupai siding	17
Assam	Hansara	19
Assam	Doomdooma	17
Assam	Makum roadsides	30
Bihar	On the way to Betiah to Govardhana, West Champaran	39
Bihar	Govardhana to Valmiki Nagar	32
Bihar	Valmiki Nagar to Betiah	29
Bihar	Bhagalpur to Banka State highway	20
Bihar	on the way to Chausa to Uda Kishanganj	27
Bihar	Arrar Nahar area (both sides of road)	26
Bihar	On the way Binpur Railway Station to Tulsipur Jamunia, Bhagalpur	34

Trees ≤ 5 = Rare; 6–10 = Scarce; 11–20 = Common; >20 = Abundant

Report on Non-Detriment Findings (NDFs) of *Dalbergia sissoo* DC. in India

State	Location	No. of trees (DBH ≥ 8 cm) per hectare (average based on minimum 3 plots of 1 hectare each)
Bihar	Narayanpur Block	10
Bihar	On the way to Haveli Kharagpur to Jamui, Munger	12
Bihar	Munger to Sultanganj	18
Bihar	On the way to Narayanpur to Purnea, Purnea	21
Bihar	Maheshkhunt to Beldaur bazar, Khagaria	32
Chhattisgarh	Raipur	15
Chhattisgarh	Dhamtari to Bilaspur	12
Chhattisgarh	Bilaspur	17.3
Chhattisgarh	Takhtpur Range, Bilaspur	31.3
Dadra and Nagar Haveli	Athal	17
Dadra and Nagar Haveli	Morkhal	16
Dadra and Nagar Haveli	Dudhani	18.3
Dadra and Nagar Haveli	Silvassa	12
Dadra and Nagar Haveli	Randha	15
Haryana	Khazirabad road, Yamunanagar	32
Haryana	Nature Camp, Jagdhari, Yamunanagar	13.3
Haryana	Jaggadhari	32.3
Haryana	Bilaspur, Yamunanagar	34
Haryana	Khazirabad to Bilaspur	31
Haryana	Yamunanagar to Kurukshetra	29
Haryana	Kurukshetra to Ladwa	22
Haryana	Khanpur	29
Haryana	Hinauta	25
Haryana	Chandigarh along roadsides	26
Himachal Pradesh	Sundarnagar to Mandi, Kangoo Forest	19
Jammu and Kashmir	Jammu town	20
Jammu and Kashmir	Nagrauta	22
Jammu and Kashmir	Tanda	19.3
Jammu and Kashmir	Sambha	18
Jammu and Kashmir	Hariachak	12
Jammu and Kashmir	Udhampur	11.3
Jammu and Kashmir	Jaganoo	22
Jammu and Kashmir	Jasrauta	19
Jammu and Kashmir	Jagti	25
Jammu and Kashmir	Markanaand adjacent areas	9

Trees ≤ 5 = Rare; 6–10 = Scarce; 11–20 = Common; >20 = Abundant

Report on Non-Detriment Findings (NDFs) of *Dalbergia sissoo* DC. in India

State	Location	No. of trees (DBH ≥ 8 cm) per hectare (average based on minimum 3 plots of 1 hectare each)
Jammu and Kashmir	Jammu to Udampur	31
Jharkhand	Jamshedpur	11
Jharkhand	Chaibasa, West Singhbhum	26.3
Jharkhand	Ranchi town	14
Jharkhand	Ranchi to Patratu	13
Jharkhand	Ranchi to Khunti	8
Jharkhand	Ranchi to Lohardaga	22
Jharkhand	Khunti town	9
Jharkhand	Khunti to Korra	15
Jharkhand	Lohardaga to Chandwa	31
Jharkhand	Chandwa to Latehar	23
Jharkhand	Latehar to Betla	31
Jharkhand	Betla to Gumla	21
Jharkhand	Palkot road	19
Jharkhand	Chandwa to Balumath	18
Jharkhand	Balumath to Bariyatu	19.6
Jharkhand	Bariyatu to Chatra District	10.6
Jharkhand	Chatra to Hazaribagh road	27
Jharkhand	Hazaribagh town and Canary Hills area	15.3
Jharkhand	Giridih road	29
Jharkhand	Giridih to Sariya Bagodar road	27
Jharkhand	Hazaribagh to Ramagarh	16.3
Karnataka	Shivamogga	8
Karnataka	Chitradurga	9.6
Karnataka	Chikmangluru and its adjacent area	11
Karnataka	Thammenahalli, Bangaluru	10.6
Karnataka	Bangaluru to Tumkuru	14.6
Karnataka	Mysuru to Chamrajnagar	19.6
Karnataka	Way to Chamundi hills	8.3
Karnataka	Mysuru to Bangaluru	23
Karnataka	On the way Chikmangluru to Hassan	9
Karnataka	Sankeshwar and Nipani	25
Karnataka	Satpura Bhawan surrounding area	13

Trees ≤ 5 = Rare; 6–10 = Scarce; 11–20 = Common; >20 = Abundant

Report on Non-Detriment Findings (NDFs) of *Dalbergia sissoo* DC. in India

State	Location	No. of trees (DBH ≥ 8 cm) per hectare (average based on minimum 3 plots of 1 hectare each)
Madhya Pradesh	Satpura Bhawan to Bhadbhada Nursery	25
Madhya Pradesh	Bhabbhada Nursery and adjacent areas	15
Madhya Pradesh	Biodiversity Learning and Demo Centre, Surajnagar, Bhopal	32
Madhya Pradesh	Surajnagar to Sehore	14
Madhya Pradesh	Sehore and adjacent areas	23
Madhya Pradesh	Sehore to Crescent roadside	24
Madhya Pradesh	Indore Naka Road	10
Madhya Pradesh	Indore Highway	37
Madhya Pradesh	Hoshangabad roadside	21
Madhya Pradesh	Bori Gaon	14
Madhya Pradesh	Budhani roadside	15
Maharashtra	Anjaneri hills, Nashik	30.3
Maharashtra	Tata Radio Station Campus	21
Maharashtra	Wadaj Dam	9
Maharashtra	Satara to Karad	15
Maharashtra	Karad to Kolhapur	25
Maharashtra	Gorewada Rescue Centre, Nagpur and adjacent areas	19
Maharashtra	Gorewada Safari Gate No. 1	26
Maharashtra	Nature Trail and adjacent areas	17
Maharashtra	Katol road side, Nagpur	15
Maharashtra	Banpaoni, Silari	11
Maharashtra	Ramtek	9
Maharashtra	Parshivani and adjacent areas	12
Odisha	North Simlipal National Park, Mayurbhanj	32
Odisha	South Simlipal	26
Odisha	Baripada and adjoining area	24
Odisha	Keonjhar	14
Odisha	Hilly areas of Keonjhar	11.3
Odisha	Rairangpur District	32.6
Odisha	Rourkela, Sundargarh District	31
Odisha	Rourkela to Kuarmunda	23
Punjab	Ludhiana	24
Punjab	Ludhiana to Mulanpur	19

Trees ≤ 5 = Rare; 6–10 = Scarce; 11–20 = Common; >20 = Abundant

Report on Non-Detriment Findings (NDFs) of *Dalbergia sissoo* DC. in India

State	Location	No. of trees (DBH ≥ 8 cm) per hectare (average based on minimum 3 plots of 1 hectare each)
Punjab	Jalandhar	17
Punjab	Kapurthalla	32
Punjab	Kapurthalla to Amritsar	21
Punjab	Amritsar to Atari border	14
Punjab	Bajawa Range, Hoshiarpur	33
Punjab	Hoshiarpur to Ropar	17
Punjab	Kadai Canal	33
Punjab	Ropar to Chandi	10
Punjab	Rock Garden, Chandigarh	6
Rajasthan	Near Abu Road	16
Rajasthan	Pindwara	14
Rajasthan	Bhinder	28
Rajasthan	Banswara	12.3
Rajasthan	Baansi	14
Rajasthan	Sajjagarh	15
Rajasthan	Gogunda	13
Rajasthan	Bhatewar	13.6
Rajasthan	Iswal	14.3
Rajasthan	Kanore	11.6
Rajasthan	Mangalwar	11.3
Rajasthan	Todgarh	13
Rajasthan	Swaroopganj	10
Rajasthan	Pindwara	12
Tamil Nadu	Kovipalayam, Pollachi	8
Tamil Nadu	Kovai Nursery, Pollachi	9.6
Tamil Nadu	Mettupalayam, R.S. Puram, Coimbatore	18
Tamil Nadu	Coimbatore to Gudalur (K. Vadamadurai, MTP road, Coimbatore)	20
Tamil Nadu	Amnankovil and Munukattur, Telengupalayam to Mettupalayam road	30
Tamil Nadu	Azhakiapandyapuram Range Forest Office compound, Kanyakumari	9
Tamil Nadu	Near Bhavani Sagar Range	31
Tamil Nadu	Sathyamangalam, Erode	6
Tamil Nadu	On the way to Bhavani Sagar Range	5
Telangana	Hyderabad to Narsapur highway	32.3

Trees ≤ 5 = Rare; 6-10 = Scarce; 11-20 = Common; >20 = Abundant

Report on Non-Detriment Findings (NDFs) of *Dalbergia sissoo* DC. in India

State	Location	No. of trees (DBH ≥ 8 cm) per hectare (average based on minimum 3 plots of 1 hectare each)
Telangana	Dullapally Forest Research Institute	36.6
Telangana	Hyderabad to Jadcherla highway	39
Telangana	Jadcherla to Wanaparty road	9
Telangana	Wanaparty to Manajipet road	34.3
Telangana	Warangal to Pakhal road	36
Telangana	Ashoknagar	13
Tripura	Agartala	10
Uttar Pradesh	Roadside of adjacent area of Pilibhit Tiger Reserve	32.6
Uttar Pradesh	Sampurnanagar Range, Dudhwa National Park	31.3
Uttar Pradesh	Sidia Beat, Dudhwa National Park	24
Uttar Pradesh	South Sonaripur Range, Dudhwa National Park	28
Uttar Pradesh	Dudhwa Range, Dudhwa National Park	26
Uttar Pradesh	Etawa to Kanpur roadside	31
Uttar Pradesh	Varanasi roadside	15
Uttar Pradesh	Ramanagar	22
Uttar Pradesh	Varanasi	16.6
Uttar Pradesh	Chakia and adjacent areas	27
Uttar Pradesh	Ahrora, Robertsganj and adjacent areas	23
Uttar Pradesh	Robertsganj DFO Office	10.3
Uttar Pradesh	Robertsganj	9
Uttar Pradesh	Robertsganj Railway yard	25
Uttar Pradesh	Robretsganj Obra Forest and adjacent areas	18
Uttar Pradesh	Vijaygarh adjacent areas	19.3
Uttar Pradesh	Babani Range and adjacent areas	29.3
Uttar Pradesh	Bagharu Range, Renukoot	10
Uttar Pradesh	Renukoot to Mirzapur and adjacent area	31
West Bengal	Adina Forest, Malda	16.3
West Bengal	Adra and nearby area	11
West Bengal	Sonajhuri village, Jharpukuria, Malda	22
West Bengal	Halna Forest, Malda	7
West Bengal	Rajadighi Beat, Malda Range	10.6
West Bengal	Rajadighi to Alampur, Malda	19
West Bengal	Abdul Ghata Forest, Raiganj	12

Trees ≤ 5 = Rare; 6–10 = Scarce; 11–20 = Common; >20 = Abundant

Report on Non-Detriment Findings (NDFs) of *Dalbergia sissoo* DC. in India

State	Location	No. of trees (DBH ≥ 8 cm) per hectare (average based on minimum 3 plots of 1 hectare each)	Trees ≤ 5 = Rare; 6–10 = Scarce; 11–20 = Common; >20 = Abundant
West Bengal	Mukundapur, Raiganj	7	
West Bengal	Pindol to Vatol towards Panchvhaya, North Dinajpur	17	
West Bengal	Panchvhaya, Raiganj	24	
West Bengal	Near Kopai, Bolpur	7	
West Bengal	Bishnupur	3	
West Bengal	Chainagarh	9.3	
West Bengal	Kalikamora	9	
West Bengal	Kashmukti to Buniayadpur	31	
West Bengal	Danga Forest, Balurghat	25	
West Bengal	Gobindpur to Udol	12	
West Bengal	Kumarganj Beat	21	
West Bengal	Khapur hilly road, Balurghat	25.3	

