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Bamboo in North East India

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ABSTRACT

Eastern states of India harbours a high diversity of bamboo. The maximum concentration of species is found in the deciduous and semi evergreen regions of North-east and the tropical moist deciduous forests of North and South India. The North-eastern hilly States of India harbour nearly 90 species of bamboos, 41 of which are endemic to that region. The state–wise distribution of bamboos in India is not completely known. Conservation through community based approach and by developing Bambusetum. Strengthening inventories of bamboo genetic resources in the region. Developing appropriate bamboo based agroforestry system. The high potential can be improved by suitable scientific intervention and local capacity building, which will have great implications in improving the socio-economic status of the entire region.

1. Introduction

In India, bamboos account for around 12.8% of the total forest cover and are one of the largest bamboo resources in the world. Bamboo forests occupy an area about 14 million hectares in India (FSI, 2011). India is second only to China in bamboo production with 3.23 million tonnes per year (Tewari, 1992). Bamboo is an important non-wood forest resource found in forest as well as non-forest areas in the country. The 'bamboo' also called poor man's timber, is one of the most important forestry species having wide distribution throughout the country and has potential to make major contribution to the rural economy of India. Bamboo also play an important role in carbon sequestration and biodiversity conservation. On an average, living and litter biomass of bamboos has significantly higher concentration of potassium than trees (Raizada *et al*., 2002). It is the fastest growing plant on this planet. Bamboo belongs to the grass family Poaceae (Gramineae). Around 75 genera and 1250 species of bamboo are known to exist throughout the world (Yang *et al.,* 2004).

And in India there are around 125 bamboo species under 23 genera (Tewari, 1992). About 66% of the growing stock is concentrated in the North Eastern states of the country (Adkoli, 2002). Bamboo occurs between the latitudinal range of 46° N and 47° S and altitudinal range of 0- 4000 m from the mean sea level covering tropical, subtropical, temperate and alpine regions (Dransfield, 1992). In India, there are 125 indigenous and 11 exotic species of bamboos belonging to 23 genera. As per the FAO report on world forest resources, India is the second richest country of the world after China in terms of bamboo genetic resources. The principal bamboo genera occurring in India are *Arundinaria, Bambusa, Chimonobambusa, Dendrocalamus, Dinochola, Gigantochloa etc.* North-East India has great diversity of bamboo resources. Bamboo is one of the important minor forest produces that assists in subsistence income of tribal folk to a greater extent (Sundriyal *et al*., 2002). High diversity of bamboo resource plays a significant role in the food and nutritional security of the tribal population of North-Eastern region of the country (Solanki *et al*., 2003). More than 50% of the bamboo species occur in North Eastern part of India, *viz.* Arunachal Pradesh, Assam, Manipur, Meghalaya,

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Mizoram, Nagaland, Sikkim and Tripura and in the Western Ghats (Rai and Chauhan 1998). According to a later report by INBAR (2005), a total of 145 species belonging to 23 genera were reported to be found in India, although no list of species was provided. According to Naithani (2008), a total of 20 genera and 115 species of bamboos are present in India. The maximum concentration of species is found in the deciduous and semi-evergreen regions of the North-east and the tropical moist deciduous forests of North and South India. The Northeastern hilly States of India harbour nearly 90 species of bamboos, 41 of which are endemic to that region.

1.1 Bamboo in Arunachal Pradesh

Arunachal Pradesh is the largest state in the North-Eastern region of the country, sharing international boundaries with Bhutan, china, Tibet and Myanmar. Its geographical area is 83,743 km^2 which constitutes 2.54% of the total area of the country. The recorded forest area in the state is 51,407 km^2 which works out to be 61.39% of its geographical area (FSI, 2015). The extent of bamboo bearing area in the forests of the state is 16, 083km^2 (FSI, 2011). Bamboo forms a major constituent of the forest vegetation of Arunachal Pradesh. Tropical, subtropical and temperate species are found well distributed in the State. Important bamboo species in the state are *Dendrocalamus giganteus, D. hamiltonii, D. hookerii, Melocanna baccifera, Phyllostachys bambusoides.* In Arunachal Pradesh, which has about 46 bamboo species

Arundinaria gracilis, Arundinaria maling, Arundinaria racemosa, Bambusa balcooa, Bambusa longispiculata, Bambusa multiplex, Bambusa nutans, Bambusa pallida, Bambusa polymorpha, Bambusa tulda, Bambusa vulgaris, Bambusa wamin, Chimonobambusa callosa, Dendrocalamus giganteus, Dendrocalamus hamiltonii, Dendrocalamus hookerii, Dendrocalamus patellaris, Dendrocalamus sahnii, Dendrocalamus sikkimensis, Gigantochloa albociliata, Melocanna baccifera, Phyllostachys baccifera, Phyllostachys assamica, Phyllostachys manii, Pleioblastus simonii, Schizostachyum arunachalensis, Schizostachyum fuchsianum, Schizostachyum helferii, Schizostachyum latifolium, Schizostachyum pallidum, Schizostachyum pergracile, Schizostachyum polymorphum, Sinarundinaria elegans, Schizostachyum griffithiana, Schizostachyum hirsute, Schizostachyum hookeriana, Schizostachyum intermedia, Schizostachyum pantlingii, Schizostachyum suberecta, Thamnocalamus aristatus, Thyrostachys oliverii, Thyrostachys regia

(NMBA, Arunachal Pradesh)

1.2 Bamboo in Assam

Assam is situated in the middle of the north – eastern part of India and is gateway to this region sharing borders with West Bengal and six northern states as well as with Bangladesh and Bhutan. Its geographical area is 78,438 km^2 which constitutes 2.39% of the total area of the country. The recorded forest area in the state is 26,832 km^2 which works out to be 34.21% of its geographical area (FSI, 2015). The extent of bamboo bearing area in the forests of the state is 7, 238km^2 (FSI, 2011).

Bambusa auriculata, Bambusa balcooa, Bambusa bambos, Bambusa cacharensis, Bambusa jaintiana, Bambusa mastersii, Bambusa nutans, Bambusa pallida, Bambusa polymorpha Bambusa pseudopallida, Bambusa teres, Bambusa tulda, Bambusa vulgaris Dendrocalamus giganteus, Dendrocalamus hamiltonii, Dendrocalamus longispathus, Dendrocalamus strictus, Dinochloa Compactiflora, Dinochloa gracilis, Dinochloa india, Dinochloa mclellandii, Gigantochloa macrostachys, Melocanna baccifera, Phyllostachys assamica, Schizostachyum dullooa, Schizostachyum griffithii, Schizostachyum pergracile Schizostachyum polymorphum

(NMBA, Assam)

1.3 Bamboo in Mizoram

Mizoram is situated in the north eastern part of India, shares international borders with Bangladesh in the west and Myanmar in east and south. The geographical area of the state is 21,081 km^2 which constitutes 0.64% of the total area of the country. The recorded forest area in the state is 19,283 km^2 which works out to be 91.47% of its geographical area (FSI, 2015). The extent of bamboo bearing area in the forests of the state is 9, 245km^2 (FSI, 2011). Bamboo cover found at heights ranging from 400m – 1500m above mean sea level. The State possesses the maximum percentage of its geographical area under bamboo forests as compared to other States of the country.

Bambusa balcooa, Bambusa bambos, Bambusa dampaena, Bambusa mizorameana, Bambusa multiplex, Bambusa nagalandeana, Bambusa nutans, Bambusa tulda, Bambusa vulgaris, Bambusa vulgaris var. vittata, Bambusa vulgaris f.waminii, Dendrocalamus asper, Dendrocalamus giganteus, Dendrocalamus hamiltonii, Dendrocalamus hookeri, Dendrocalamus laetiflorus, Dendrocalamus longispathus, Dendrocalamus manipureanus, Dendrocalamus sikkimensis, Dendrocalamus strictus, Melocalamus compactiflorus, Melocanna baccifera, Neomicrocalamus mannii, Phyllostachys edulis, Phyllostachys mannii, Schizostachyum dullooa, Schizostachyum fuchsianum, Schizostachyum mannii, Schizostachyum munroii, Schizostachyum pergracile, Schizostachyum polymorphmum, Sinarundinaria falcate Sinarundinaria griffithiana, Sinarundinaria longispiculata, Thrysostachys oliveri,

(Source: Bamboos of Mizoram, Published by E & F Dept. Govt. of Mizoram, Aizawl**)**

1.4 Bamboo in Meghalaya

The geographical area of the state is 22,429 km^2 which constitutes 0.64% of the total area of the country. The forest cover in the state is 17,927 km^2 which works out to be 79.93% of its geographical area (FSI, 2015). The extent of bamboo bearing area in the forests of the state is 4,793 km^2 (FSI, 2011). Meghalaya is richly endowed with the bamboo forests. Bamboo forests in the state have diverse species base which include clump forming as well as non-clump forming types. It has been reported that 36 species of bamboo from 14 genera are found in Meghalaya (Biswas, 1988). The important clump forming species include *Dendrocalamus strictus, Dendrocalamus hamiltonii, Bambusa arundinacea*, *Bambusa pallida, Bambusa tulda,* whereas *Melocanna bambusoides* is the important non-clump forming species.

Arundinaria hirsute, Arundinaria mannii, Arundinaria microphylla, Arundinaria suberecta, Bambusa arundinacea,Bambusa balcooa, Bambusa glauscescens, Bambusa khasiana, Bambusa longispiculata, Bambusa nutans, Bambusa pallida, Bambusa tulda, Bambusa vulgaris, Cephalostachyum capitatum, Cephalostachyum fuchsianum, Cephalostachyum pallidum, Cephalostachyum griffithiana, Cephalostachyum hookeriana, Cephalostachyum khasiana, Cephalostachyum polystachya, Dendrocalamus calostachys, Dendrocalamus hamiltonii, Dendrocalamus hookeri, Dendrocalamus sikkimensis, Dendrocalamus strictus, Dinochloa compactiflora, Gigantochloa macrostachya, Gigantochloa takeserah, Melocanna baccifera, Neohouzeoua dullooa, Neohouzeoua helferi, Oxytenanthera albociliata, Oxytenanthera nigrociliata, Phyllostachys mannii, Pseudostachyum polymorphum, Teinostachyum griffithii, Thamnocalamus prainii

(Source: Bamboos in Meghalaya, Published by F & E Dept. Govt. of Meghalaya**)**

1.5 Bamboo in Nagaland

Nagaland is situated in the north eastern part of India, shares international borders with Myanmar. It lies between the latitudes of 25°10´N- 27°304´N and the longitudes of 93°15´E-95°06´E and has geographical area of 16,579 km^2. The recorded forest area in the state is 13, 347 km^2 which is 80.50 % of its geographical area (FSI, 2015). The extent of bamboo bearing area in the forests of the state is 4, 902km^2 (FSI, 2011). Bamboo is found extensively in Nagaland.

Bambusa balcooa, Bambusa pallida, Bambusa tulda, Chimonobambusa callosa, Dendrocalamus calostachys, Dendrocalamus giganteus, Dendrocalamus hamiltonii, Dendrocalamus hookeri, Melocanna baccifera, Neomicrocalamus prainii, Schizostachyum fuchsianum, Schizostachyum polymorphum, Sinarundinaria elegans, Sinarundinaria griffithiana, Sinarundinaria nagalandiana, Sinarundinaria rolloana

(NMBA, Nagaland)

1.6 Bamboo in Sikkim

The state of Sikkim lies in north-east of India bordering West Bengal on its south. The geographical area of the state is 7,096 km^2 which constitutes 0.22% of the total area of the country. The recorded forest area in the state is 3,392 km^2 which works out to be 47.80% of its geographical area (FSI, 2015). The extent of bamboo bearing area in the forests of the state is 1, 181 km^2 (FSI, 2011). Bamboo is one of the most important forest resources in Sikkim. Its wide range of uses and its great versatility qualifies it to be a multiple use alternative to timber, food to the rural poor and tribal in particular. The main genera found in the State are *Arundinaria, Bambusa, Cephalostachyum, Dendrocalamus, Phyllostachys etc.* Some important Bamboo species occurring in the State are as under

Arundinaria mailing, Arundinaria suberects, Bambusa nutans, Bambusa pallida, Bambusa tulda, Bambusa vulgaris, Cephalostachyum capitatum, Cephalostachyum fuchsianum, Cephalostachyum hookernia, Cephalostachyum intermedia, Cephalostachyum latifornum, Cephalostachyum polystachya, Chimnobambusa quadrangularis, Dendrocalamus hamlintoniii, Dendrocalamus hookery, Dendrocalamus Patellaries, Dendrocalamus Sikkimensia, Neohouzeous dullooa, Phyllostanchys edulis, Pseudostachyum polymorophum, Semiarundinaria patingli, Teinostychyum falconeri, Thanocalmus aristatus

(NMBA, Sikkim)

1.7 Bamboo in Tripura

Tripura is situated in the north – eastern part of India and shares international borders with Bangladesh from three sides. .The area of the state is 10,491 km^2 which forms 0.32% of country's geographical area. The recorded forest area in the state is 8, 044 km^2 which constitutes 76.71% of its geographical area (FSI, 2015). The extent of bamboo bearing area in the forests of the state is 3, 246km^2 (FSI, 2011). Species of bamboo found in Tripura:

Bambusa affinis, Bambusa balcooa, Bambusa cacharensis, Bambusa nutans, Bambusa pallida, Bambusa polymorpha, Bambusa teres, Bambusa tulda, Bambusa vulgaris, Dendrocalamus hamiltonii, Dendrocalamus longispathus, Dendrocalamus strictus, Gigantochloa rostrata, Melocanna baccifera, Melocalamus compactiflorus, Schizostachyum dullooa, Thyrsostachys oliver

(NMBA, Tripura)

1.8 Bamboo in Manipur

Manipur is one of the hilly states of the north eastern part of the country with an area of 22, 327 km^2 which is 0.68% of country's geographical area. It shares international border with Myanmar and lies between the latitudes of 23°50′N- 25°42′N and the longitudes of 92°59′E-94°46′E. Its geographical area is. The recorded forest area in the state is 17, 237 km^2 which works out to be 77.20% of the state geographical area (FSI, 2015). The extent of bamboo bearing area in the forests of the state is 9, 303km^2 (FSI, 2011). Bamboo species found in Manipur:

Arundinaria callosa, *Arundinaria clarkei*, *Arundinaria debilis*, *Arundinaria falconeri, Arundinaria kurzii*, *Arundinaria prainii, Arundinaria racemosa, Arundinaria rolloana*, *Bambusa auriculata*, *Bambusa balcoona*, *Bambusa binghami*, *Bambusa burmanica, Bambusa khasiana*, *Bambusa kingiana*, *Bambusa nana*, *Bambusa natans, Bambusa oliveriana, Bambusa pallida, Bambusa polymorpha*, *Bambusa schzostachyoides*, *Bambusa tulda*, *Bambusa vulgaris, Cephalostachyum capitatum*, *Cephalostachyum fuschisnum*, *Cephalostachyum latifolium*, *Cephalostachyum pallidum*, *Cephalostachyum pergracile, Dendrocalamus brandisii, Dendrocalamus flagellifer*, *Dendrocalamus giganteus*, *Dendrocalamus hamiltonii, Dendrocalamus hookere*, *Dendrocalamus longifimbriatus*, *Dendrocalamus longispathus*, *Dendrocalamus membranaceus*, *Dendrocalamus sericeus*, *Dendrocalamus strictus*, *Gigantocloa macrostachya*, *Melocalamus indicus, Melocanna bambusoides, Oxytenanthera abaciliata*, *Phylloatachys bambusoides, Pseudostachyum polymorphum*, *Teinostachyum dullooa*, *Teinostachyum wightii*, *Thyrsostachys oliveri*

(ENVIS, Manipur)

Conclusion

North-Eastern region of the country is the largest reservoir of bamboo resource in the country, screening is required to identify the most delicate bamboo species, development of package of practices for their mass multiplication. Scientific mode of utilization of the bamboo resources (Tomar *et al*., 2009). Fast depletion of bamboo gene pools in the entire region is mainly due to the shifting cultivation and other anthropogenic effects resulted by population explosion. Shrinking of bamboo resources in this region should careful determination and consistently framed programme for plantation under farm and forest sector is urgently needed in this region. Bamboo based agroforestry system should highlight the capacity of bamboo in increasing the soil moisture, nutrients, reducing water run off and soil erosion after shifting cultivation (Sharma *et al.,* 1992). Development of Bambusetum in suitable places for different species is an alternative approach for *ex-situ* conservation. Declaring of National Bamboo Reserve area for maintaining natural habitats, representing the local bamboo flora. With an aim to harness the potential of bamboo crop in the country, a "National Bamboo Mission" (NBM) was set up by Govt. of India in 2006, under the Ministry of Agriculture, New Delhi. Among others, one of the several objectives of the Mission was to increase the coverage of area, both in forest and non-forest areas with appropriate varieties.

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