

Analysis on different types of bamboo available with reference to the edible products in ne India

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Abstract

Eastern conditions of India harbors a high decent variety of bamboo. The greatest convergence of species is found in the deciduous and semi evergreen locales of North-east and the tropical soggy deciduous timberlands of North and South India. The North-eastern uneven States of India harbour almost 90 types of bamboos, 41 of which are endemic to that area. The state-wise conveyance of bamboos in India isn't totally known. Preservation through network-based methodology and by creating Bambusetum. Reinforcing inventories of bamboo hereditary assets in the area. Creating suitable bamboo-based agroforestry framework. The high potential can be improved by reasonable logical mediation and neighbourhood limit building, which will have incredible ramifications in improving the financial status of the whole locale.

Keywords: bamboo shoot, medicinal uses, food products, locally available resources, agroforestry

Introduction

Bamboos represent around 12.8% of the all-out woods spread and are one of the biggest bamboo assets on the planet. Bamboo timberlands involve a region around 14 million hectares in India. India is second just to China in bamboo creation with 3.23 million tons for each year. Bamboo is a significant non-wood backwoods asset found in woodland just as non-timberland territories in the nation. The 'bamboo' likewise called poor man's timber, is one of the most significant ranger service species having wide circulation all through the nation and can possibly make significant commitment to the rustic economy of India. Bamboos additionally assume a significant job in carbon sequestration and biodiversity protection. On a normal, living and litter biomass of bamboos has fundamentally higher convergence of potassium than trees [Raizada *et al.*, 2002]. It is the quickest developing plant on earth. Bamboo has a place with the grass family Poaceae. Around 75 genera and 1250 types of bamboo are known to exist all through the world [Yang *et al.*, 2004].

Furthermore, in India there are around 125 bamboo species under 23 genera (Tewari, 1992). About 66% of the developing stock is gathered in the North Eastern conditions of the nation (Adkoli, 2002). In India, there are 125 indigenous and 11 outlandish types of bamboos having a place with 23 genera. The foremost bamboo genera happening in India are *Arundinaria*, *Bambusa*, *Chimonobambusa*, *Dendrocalamus*, *Dinochloa*, *Gigantochloa* and so on. North-East India has incredible assorted variety of bamboo assets. Bamboo is one of the significant minor woods creates that aids means salary of innate society to a more noteworthy degree (Sundriyal *et al.*, 2002). High decent variety of bamboo asset assumes a huge job in the nourishment and wholesome security of the ancestral populace of North-Eastern locale of the nation. Over half of the bamboo species happen in North Eastern piece of India - Arunachal Pradesh, Assam, Manipur, Mizoram, Nagaland, Sikkim, Tripura [Solanki *et al.*, 2003].

1. In Arunachal Pradesh, about 46 species of Bamboo can be found

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* [Raizada *et al.*, 2002].

2. In Assam, about 25 species of bamboo can be found

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 longispatus*, *Dendrocalamus strictus*, *Dinochloa Compactiflora*, *Dinochloa gracilis*, *Dinochloa india*, *Dinochloa mclellandii*, *Gigantochloa macrostachys*, *Melocanna baccifera*, *Phyllostachys assamica*, *Schizostachyum dullooa*, *Schizostachyum griffithii*, *Schizostachyum pergracile*, *Schizostachyum polymorphum* [Yang *et al.*, 2004].

3. Bamboo species found in Mizoram

Bambusa balcooa, *Bambusa bambos*, *Bambusa dampiena*, *Bambusa mizoramiana*, *Bambusa multiplex*, *Bambusa nagalandiana*, *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 longispatus*, *Dendrocalamus manipureanus*, *Dendrocalamus sikkimensis*, *Dendrocalamus strictus*, *Melocalamus compactiflorus*, *Melocanna baccifera*, *Neomicrocalamus manni*, *Phyllostachys edulis*, *Phyllostachys manni*, *Schizostachyum dullooa*, *Schizostachyum fuchianum*, *Schizostachyum manni*, *Schizostachyum munroii*, *Schizostachyum pergracile*, *Schizostachyum polymorphum*, *Sinarundinaria falcata*, *Sinarundinaria griffithiana*, *Sinarundinaria longispiculata*, *Thyrsostachys oliveri* [Sundriyal et al., 2002].

4. In Meghalaya, about 14 genera of Bamboo can be found

Arundinaria hirsute, *Arundinaria manni*, *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 fuchianum*, *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 manni*, *Pseudostachyum polymorphum*, *Teinostachyum griffithii*, *Thamnocalamus prainii* [Solanki et al., 2003].

5. Bamboo species found in Sikkim

Arundinaria mailing, *Arundinaria suberecta*, *Bambusa nutans*, *Bambusa pallida*, *Bambusa tulda*, *Bambusa vulgaris*, *Cephalostachyum capitatum*, *Cephalostachyum fuchianum*, *Cephalostachyum hookeriana*, *Cephalostachyum intermedia*, *Cephalostachyum latiflorum*, *Cephalostachyum polystachya*, *Chimnobambusa quadrangularis*, *Dendrocalamus hamiltonii*, *Dendrocalamus hookeri*, *Dendrocalamus Patellaries*, *Dendrocalamus Sikkimensis*, *Neohouzeoua dullooa*, *Phyllostachys edulis*, *Pseudostachyum polymorphum*, *Semiarundinaria patingli*, *Teinostachyum falconeri*, *Thamocalmus aristatus* [Sharma et al., 1992].

6. Bamboo species found in Nagaland

Bambusa affinis, *Bambusa balcooa*, *Bambusa cacharensis*, *Bambusa nutans*, *Bambusa pallida*, *Bambusa polymorpha*, *Bambusa teres*, *Bambusa tulda*, *Bambusa vulgaris*, *Dendrocalamus hamiltonii*, *Dendrocalamus longispatus*, *Dendrocalamus strictus*, *Gigantochloa rostrata*, *Melocanna baccifera*, *Melocalamus compactiflorus*, *Schizostachyum dullooa*, *Thyrsostachys oliver* [Yang et al., 2004].

7. Bamboo genera 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 nutans*, *Bambusa oliveriana*, *Bambusa pallida*, *Bambusa polymorpha*, *Bambusa schzostachyoides*, *Bambusa tulda*, *Bambusa vulgaris*, *Cephalostachyum capitatum*, *Cephalostachyum fuschinum*, *Cephalostachyum latifolium*, *Cephalostachyum pallidum*, *Cephalostachyum pergracile*, *Dendrocalamus brandisii*, *Dendrocalamus flagellifer*, *Dendrocalamus giganteus*, *Dendrocalamus hamiltonii*, *Dendrocalamus hookeri*, *Dendrocalamus longifimbriatus*, *Dendrocalamus longispatus*, *Dendrocalamus membranaceus*, *Dendrocalamus sericeus*, *Dendrocalamus strictus*, *Gigantochloa macrostachya*, *Melocalamus indicus*, *Melocanna bambusoides*, *Oxytenanthera abaciliata*, *Phyllostachys bambusoides*, *Pseudostachyum polymorphum*, *Teinostachyum dullooa*, *Teinostachyum wightii*, *Thyrsostachys oliveri* [Tomar et al., 2009].

Bamboo is nourishment to numerous creatures. A few animal categories, similar to monster panda, red panda and brilliant bamboo lemur only live on bamboo diet, while bamboo shoots are occasional.

Bamboo shoots have additionally been nourishment for the North-East Indian individuals since days of yore, which may have gained from creatures to utilize just the youthful delicate goes for nourishment, as portrayed in the society stories of the Mizo (individuals of Mizoram state).

Presently individuals are too attempting to utilize bamboo shoots in different structures like powder, glue, fiber separate, matured shoots and planning diverse nourishment things like chapatti, bread kitchen and steamed items and different vegetables, soups and sweet meats.

It has been seen that shoots of practically all the species are devoured by the individuals of North-East India, be that as it may, there are a few animal varieties or assortments which are favored most by a few regions or locale. Like the Khasi and Jaintia, the individuals of Meghalaya incline toward the youthful shoots of *Dendrocalamus hamiltonii*, *D. calostachys*, *D. hookeri*, *D. sikkimensis*, *Gigantochloa albociliata* and *G. apus* the most. The shoots are huge and awesome for maturation

also, long haul stockpiling in plain water. The shoots are severe in taste when crude and have high sums of cyanogenic glucosides which are expelled by putting away the shoots in plain water or by lowering them in water for a couple of hours. The Mizo individuals of Mizoram essentially incline toward the little and youthful shoots of *Melocanna baccifera* (Mautak) and *Phyllostachys manni* (privately called Naga bamboo), which are sweet in taste and have next to no cyanogenic glucoside. In the Manipur express, the Meetei individuals incline toward the rhizomatous shoots of *Melocanna baccifera*, *Bambusa nutans*, *Dendrocalamus sikkimensis* and apical shoots of *Chimnobambusa callosa*. Utilization of explicit species or assortments chiefly relies upon their accessibility and taste [Tomar et al., 2009].

Table 1: Chart of Different Bamboos, Their Availability, Food Products and Medicinal Uses

Sl. No	Species	Bamboo Name	Availability	Food Products	Medicinal Uses
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1.	<i>Bambusa Burmanica</i>	Guada Bamboo	Assam	Beer, Wine	Used against mycobacterium tuberculosis
2.	<i>Melocanna Baccifera</i>	Muli Bamboo (Berry Bamboo)	Meghalaya	Used as preservative, used as famine food brewing liquor	Used as a tonic in treating respiratory diseases
3.	<i>D.hamiltonii</i>	Hamilton's bamboo	Arunachal pradesh	Papad, Nuggets	Hypertension
4.	<i>D.hookeri</i>	Tama bamboo, Tufted bamboo	Sikkim	Tama bamboo shoot curry, fried food stuff	Tauna bamboo shoot decoction taken along with honey to treat respiratory disorders
5.	<i>B.polymorpha</i>	Burmese bamboo	Tripura	Cannot be eaten, it has bitter in taste	This bamboo does not have medicinal uses but it has adverse effect
6.	<i>Dendrocalamus</i>	Worra, Maipoo Bhao Bans	Mizoram	Fermented shoots, shoots pickle, shoots curry	Often used for cleaning wounds and healing infection

Studies on Bamboo Resources

Bamboo has gotten extending thought over the span of the latest two decades for its money related and biological worth. In Africa, Asia and Latin America, it is solidly associated with indigenous culture and data and is comprehensively used for housing, officer administration, agroforestry, country activities and utensils. In countries encountering monetary new development, customary bamboo culture bit by bit evaporates. The physical and normal properties of bamboo make it an extraordinary money related resource for a wide extent of jobs and for dejection decline. It grows quickly and can be assembled yearly without depletion and disintegrating of the soil. Bamboo can create on fringe land, not suitable for cultivation or of course officer administration, or as an agro ranger service crop [Gui *et al.*, 2004].

Ecological Studies -Irrespective of the size of the gaps created, bamboo plants are an opportunist to successfully establish in forest gaps that will outcompete the growth of other successional species. Studies have shown that the diversity and species richness of other light-demanding pioneer species were reduced in forest areas where bamboo is dominant [Larpkern *et al.* 2011; Tabarelli and Mantovani 2000].

Molecular Studies- Bamboo has a basic chromosome number which is $x=12$. It consists of two polyploids, which are tetraploid and hexaploid. Usually, tetraploid can be found –in monopodial bamboo, whereas hexaploid can be found in caespitose bamboo [Gui *et al.* 2007].

Since bamboo can likewise develop outside woods on different terrains, the evaluation has attempted to incorporate these assets. This methodology doesn't repudiate the structure and technique of FAO's Global Forest Resources Assessment, wherein woodland assets are characterized as including backwoods, other lush land and trees outside timberlands [Linderman *et al.*, 2004].

The blueprint and rules all in all mirrored the revealing tables for FRA 2005, tending to explicit bamboo-related issues when fundamental. The accompanying tables were incorporated:

1. Degree of bamboo
2. Attributes of bamboo
3. Bamboo developing stock
4. Bamboo biomass and carbon stock
5. Assorted variety of bamboo species
6. Bamboo expulsions [poles and fuelwood]
7. Estimation of bamboo expulsions
8. Other bamboo items
9. Estimation of other bamboo item

1. International

A survey of bamboo asset insights shows that the data accessible is rare, divided and conflicting and can't be looked at inside or between districts. Past investigations have concentrated on three fundamental zones: bamboo woods degree, use and exchange, and species scientific classification. Ordered examinations have gotten the most consideration, while the initial two zones, especially bamboo degree, were seldom drawn closer methodically and the outcomes are for the most part dependent on harsh master gauges. This can be credited to the idea of bamboo, which frequently develops intermixed with different species as backwoods understorey or outside woodlands on farmland. Just a couple of nations, which are the most progressive in bamboo handling, remember bamboo for their intermittent national woodland inventories. The remaining nations may depend on remote detecting (and the referenced master gauges). Bamboo items are moreover hard to follow and bring into national measurements since they are frequently intermixed with other, typically wooden, items when exchanged, or they are exchanged locally without entering official measurements. Bamboos are found in almost all continents of the world. Both common people and researchers have utilized bamboo in a variety of ways and have played an important role in today's life. At present, bamboos are considered as highly renewable resources. The development and exploration of bamboo eventually depends, not only on scientific community, but on urban and rural people who are largest utilizers (buyers, sellers and processors) of bamboo. Bamboo has played an important role in the lives of people in South and Southeast Asia. Being an essential natural resource, sustainable development is a critical concern of the bamboo economy. The development of bamboo is a concern of both enhancing the supply and ensuring productivity, which leads to development and needs of present and future. Presently nonprofit organizations like American Bamboo Society, International Network for Bamboo and Rattan (INBAR) Latin America, INBAR West Africa, European Bamboo Society, INBAR East Asia, INBAR West Asia and Bamboo Society of Australia have clear objectives to promote all aspects of bamboo interest in respective countries. These organizations promote opportunities for sharing information and education, and awareness among common people. The role of bamboo in plantations and sustainably have achieved forests in providing economically possible environmental services. Different resource inventory methods and technical manuals have been considered by these organizations to improve criteria and indicators for sustainable resource management along with income generation for local people, particularly for bottom billion people. [Bystriakova *et al.*, 2003, 2004].

- a. **China:** As far as bamboo region, potential and number of bamboo species, China is probably the most extravagant nation on the planet. The national woodland inventories (NFIs) gather data on bamboo backwoods pointers, for example, bamboo type, territory, number of culms, proprietorship, inception and overhang conclusion [Chihongo *et al.*, 2000].
- b. **Indonesia:** Bamboo data is available in the national timberland stock database and remembers the quantity of plots for which bamboo is available. The agrarian registration, which is done by the Central Board of Statistics, additionally records the quantity of bamboo bunches outside of backwoods on other land [Judziewicz *et al.*, 1999].
- c. **Japan:** The national backwoods stock incorporates a particular class for bamboo - woods that doesn't fall under woodland with standing trees and that is commanded by bamboo, barring bamboo grass. The information revealed in the bamboo nation report harmonize with the information in the FRA 2005 nation report [Kelbessa *et al.*, 2000].
- d. **Korea:** Bamboo backwoods are characterized as the zones wherein bamboo species establish over 75 percent of the vegetation. Bamboo stocked species incorporate *Phyllostachys bambusoides*, *P. heterocycla* var. *pubescens*, and *P. nigra* var. *henoni* [Ongugo *et al.*, 2000].
- e. **Nigeria:** The country report probably overestimates actual bamboo forest, as the reported 14.3 percent bamboo forest cover is well above regional and global levels [Chihongo *et al.*, 2000].
- f. **Bangladesh:** Different timberland units have been overviewed and stocked in various years utilizing various methodologies. The assorted degrees and timing present difficulties in organizing and masterminding the data and may have caused an overestimate of bamboo territory. Despite the fact that the degree of bamboo in backwoods has diminished because of overexploitation, it is accounted for that the degree of bamboo in and around towns has expanded because of the network ranger service exercises advanced by the Government and non-legislative associations in the course of the most recent two decades [Government of Bangladesh, 1993].
- g. **Uganda:** It is accounted for that the greater part of the bamboo assets are situated in the northwestern area of Arua and the western and southwestern regions of Hoima and Kabale Esegu, Ssentenza and Sekatuba. Critical parts of the asset are additionally found in the eastern region of Mbale. Little investigation has been done of the utilization of bamboo assets in these regions. The greater part of the assets are situated in secured regions under government [Chihongo *et al.*, 2000].

2. National (India)

The examination was begun at seven unmistakable zones in the country. Seven unmistakable centres were perceived at different territories for coordinating multilocation primer. Different spotlights were recognized dependent on the environment, soil, system, field workplaces and willness to share. A run of the mill framework for multilocational starter was followed at all the concentrations with two close by and six fundamental species viz., *Bambusa bambos*, *B.*

balcooa, *B. nutans*, *B. tulda*, *Dendroca/amus asper* and *D. hamiltonii*. Agroforestry Research Center (AFRC) GBPUAT, Pantnagar under its sub-head Bamboo

Coordinating Center was given the obligation to sort out the multi-territory starter over the seven networks. The examination was begun during 2005. Standard planting material was given to all the concentrations from the ordinary source through arranging network under Agroforestry Research Center, Pantnagar. The assessment included eight prescriptions (species) in Randomized Block Design (RBD) with three replications. Each treatment included 16 plants isolated at 5 x 5 m in square bequest. Inside and out there were 24 plots (8 species x 3 replications) which made sure about zone of 9600 sq m. Pits of 60 cm* were tunneled and were filled with 10 regardless of area, the endurance was most extreme (86.9%) in *B. ba/cooa*, and *B. nutans* firmly followed by *B. tulda* (85%). Least endurance (72.2%) was recorded in *O. hamiltonii* [Shi and Yang 1992; Nirmala and others 2007].

1. Forest-cover mapping in india- The centre for indian bamboo resource and technology [CIBART] has carried out bamboo development planning using remote sensing and GIS in northeast india, including the tamenglong district in mapur state and two districts in tripura staten [Bharadwaj *et al*;2003].

3. Northeast

*Bamboo is one of the most unlimited and biological welcoming and achievable resources available in North East Region, which isn't being used to its greatest limit. North Eastern Himalayan locale of India has unprecedented arranged assortment of bamboo resources. Most of the species run over in our country are indigenous. Of them are two basic species dendrocalamus strictus and the bambusa arundinacea. Thick bamboos are found by and large in Arunachal Pradesh followed by Mizoram and Manipur. Mizoram includes the greatest forest area region under different bamboo species, trailed by Meghalaya. As this region is the greatest archive of bamboo resource in India, screening is required to recognize the most delicate bamboo species the improvement of heap of practices for their mass expansion. Four States of Northeast for instance Tripura, Assam, Mizoram and Nagaland have nitty gritty their own techniques for headway of Bamboo and insurance of Bamboo forests [Nirmala *et al* 2011,2014; Chandramawli and vishwanath 2012].*

Conclusion

North Eastern local of India is the biggest repository of *Bamboo* asset in the nation (India), screening is required to the most sensitive *Bamboo* species, improvement of bundle of practices for their mass duplication. 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 [Sharma *et al.*, 1992]. 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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