



Bamboo- the green gold of Tripura: An Overview

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Abstract: Tripura is called the 'home' of bamboo. The wonder plant is intimately interwoven in the socio-cultural fabric of the State. Bamboo based economic activities are an intrinsic part of life; the importance of the resource in the State's predominantly agrarian economy is well recognized. Bamboo enriches the socio-economic condition of the common people of Tripura. It is estimated that 2.46 lakh families in the State are engaged in bamboo related vocations. Tripura Bamboo Mission (TBM) has a large focus on generating non-muli high value adding bamboo plantations especially as private plantations and homestead plantations. The present study is undertaken to evaluate the different bamboo species with their local name, habitat and with their socio-cultural and medicinal uses. The following species are taken for their evaluation: *Bambusa balcooa* Roxb.(Barak), *Bambusa polymorpha* Munro. (Bari), *Bambusa tulda* Roxb.(Mirtinga), *Dendrocalamus hamiltonii* (Ruphai), *Melocanna bambusoides* (Trin Muli), *Neohouzeaua dullooia* A.(Dalu), *Bambusa bambos* (Behor bans), *Bambusa nutans* (Makla), *Bambusa pallid* (Makal), *Bambusa vulgaris* (Basini bans), *Dendrocalamus brandisii* (Bulka), *Dendrocalamus giganteus* (Bhalo bans), *Dendrocalamus strictus* (Karal), *Thyrostachys oliveri* (Kanak Kai). The above species are used in various medicinal purposes like treatment of asthma, cough, ring worm etc. The tribal and non-tribal people of Tripura are use these bamboo species in preparation of various delicious dishes by their traditional methods.

Key Words: TBM, bamboo species, green gold

Introduction

Bamboo is a precious gift of nature to human kind which is also known as river cane [1]. It is a woody grass belonging to the sub-family bambusoideae of family poaceae. In most bamboo-growing regions of the world, bamboo provide ecological, economical and livelihood security to a large number of rural people, in particular tribes. There are about 1250 species of bamboos all over the world and only 130 species are found in India with more than half produced in North-eastern region. Bamboo forests occupied 16.7% of total forest of the country. It has different traditional uses like construction material, furniture, utensil, fodder, fuelwood, carbines, musical instruments as well as food and medicines for tribal people, that's why it is also known as 'poor man's timber'. Bamboo is a versatile, renewable and sustainable resource which grows very fast atleast 10 cm per day. Bamboo extremely retains carbon and it has strong natural fibres which allow developing industrialized products such as laminates, floors, panels, mattings, pulp and paper. Various species of bamboo found in Tripura are:

Barak (*Bambusa balcooa*), Bari (*Bambusa polymorpha*), Mirtinga (*Bambusa tulda*), Muli (*Melocanna baccifera*), Kai (*Bambusa nutans*), Paora (*Bambusa teres*), Rupai (*Dendrocalamus longispathus*), Dolu (*Neohouzeaua dullooia*), Makal (*Bambusa pallida*), Pecha (*Dendrocalamus hamiltonii*), Kailiyai (*Oxytenanthera nigrociliata*), Kanak kaich (*Bambusa offinis*), Lanthi bans (*Dendrocalamus strictus*), Tetua (*Bambusa spp.*), Ish (*Bambusa spp.*), Jai (*Bambusa spp.*), Bombash (*Bambusa spp.*), Sairil/Wadu

bamboo (*Melocalamus compactiflorus*), Bosai (*bambusa spp.*)

Area under bamboo forests

Area in the State under bamboo forests is 2397 sq. km (as per SFAP). Though considerable bamboo exists under farm sector and on homesteads, no authentic data exists about its extent. In the farm and homestead segments, the bamboo cultivated is predominantly Bari, Barak and Muli.

Tripura Bamboo Mission (TBM) has a large focus on generating non-muli high value adding bamboo plantations especially as private plantations and homestead plantations. The mission has conducted extensive cluster requirements analysis. Based on results of that analysis, TBM has come out with the following species vs product matrix to arrive at a mix of bamboo species for future plantations.

Different bamboo species found in Tripura [3]

Bambusa balcooa

Local name: Assam- Bhaluka; West Bengal- Balku bans; North Bengal- Boro bans; Meghalaya- Wannah; Tripura- Barak

Habitat & distribution: Occurs at altitudes of up to 600 m.

Prefers heavy textured soil with good drainage. A common homestead bamboo in North East India and West Bengal. Also occurs in Bihar, Jharkhand and Uttaranchal.

Culm: The culm is up to 30 m tall, dark green and thick-walled.

Flowering: Gregarious. The clump/plant dies after flowering without setting any seed. The flowering cycle is 35-45 years.

Uses: The most common use of this sturdy and strong bamboo is in house construction. It is a good bamboo for scaffolding and ladders.

Growing stock of bamboo in the state - (FSI report, 1993)

	<i>Clump forming bamboo</i>		<i>Non-clump forming bamboo</i>	
	Nos.	Weight	Nos.	Weight
Average/ha	58.954	94.931	1058.36	1255.08 kg
Total for the State	37093 m	59415.98MT	665.92 m	789695.77 MT

The Yield of Bamboos in the State (Source: FSI report, 1993)

<i>Category</i>	<i>Yield in weight (MT)</i>	<i>Yield in Number (million)</i>
Clump forming	14853	9.27
Non-clump forming	197424	166.50
Total	212277	175.32

Bamboo Species vs. Product Matrix

<i>Local name</i>	<i>Botanical name</i>	<i>Incense</i>	<i>Handicrafts</i>	<i>Mats</i>	<i>Furniture</i>
Kanakaich	<i>Thyrsostachys oliveri</i>		X		X
Barak	<i>Bambusa balcooa</i>				X
Bom	<i>Bambusa cacharensis</i>		X	X	X
Mal/Makhla	<i>Bambusa pallida</i>		X	X	
Paura	<i>Bambusa polymorpha</i>	X	X		
Mirtinga	<i>Bambusa tulda</i>		X	X	
Bari/Jai	<i>Bambusa vulgaris</i>		X		X
Rupai	<i>Dendrocalamus longispatus</i>		X	X	X
Lathi Baans	<i>Dendrocalamus strictus</i>		X		X
Muli	<i>Melocanna baccifera</i>	X		X	
Dolu	<i>Schizostachyum dullooa</i>		X	X	

Bambusa teres

Local name: Tripura- Parua

Habitat & distribution: They prefer soil having high moisture content. They are well grown in shadow. They also used to grow near ponds. It is found mostly in Tripura.

Culm: The culm is up to 17 m tall, young culm is blue in color and when they matured the color is turns green.

Uses: Young culm is used as vegetable. They are used to prepare incense stick and housing equipment.

Dendrocalamus longispatus

Local name: Tripura- Rupai

Habitat & distribution: Dried river or pond side is best for their growth. It is found mostly in Tripura.

Culm: The culm is up to 15 m tall, young culm is green in color and when they matured the color is turns yellowish green.

Uses: Used as fuel and in preparation of housing material.

Neohuzeaua dullooa

Local name: Tripura- Dolu

Habitat & distribution: They prefer humid environment. They also used to grow near river side or pond side. It is found mostly in Tripura.

Culm: The culm is up to 15 m tall, thick-walled, brownish-green.

Uses: Threads are prepared from this type of bamboo.

Bambusa nutans

Local name: Assam- Bidhuli, Mukia; Uttar Pradesh- Malla; Sikkim- Mahi bans; Orissa- Badia bansa; Beng- Kali; Tripura- Makla

Habitat & distribution: Grows best at altitudes of between 500-1500 m. Thrives on moist hill slopes and flat uplands, and well-drained sandy loam to clayey loam soils. Commonly found and cultivated in the North East, Orissa and Bengal.

Culm: The culm is up to 20 m tall, dark green, loosely clumped, straight and smooth.

Flowering: Gregarious, at an interval of 35 years. Sporadic flowering is also observed.

Uses: House construction, basketry and craft.

Bambusa pallida

Local name: Assam- Bijuli; Meghalaya- Seskien, Skhen, Tneng, Usken; Nagaland- Watoi; Sikkim- Pushee; Tripura- Makal

Habitat & distribution: Grows best in high rainfall and humidity areas with moderately high temperature. Naturally found and cultivated in the North East.

Culm: The culm is up to 20 m tall, olive green and smooth.

Flowering: Sporadic. Flowering cycle is 40 years

Uses: Mainly used in for making baskets, and mats.

Bambusa polymorpha

Local name: Assam- Jama betwa, Betwa; Madhya Pradesh- Narangi bans; Tripura- Bari

Habitat & distribution: Prefers deep, fertile, well-drained loam and riverine alluvial soil. Commonly found in Arunachal Pradesh, Meghalaya and Tripura. Also occurs in other parts of the North East.

Culm: The culm is up to 25 m tall, light green or white grey to greyish-green.

Flowering: Gregarious as well as sporadic. Flowering cycle is 55-60 years.

Uses: It is a bamboo with many uses - as edible shoot, in woven form for handicrafts, and for house construction. It is also used for pulping.

Bambusa tulda

Local names Assam- Jati; Bengal- Kiranti; Meghalaya- Wati;

Kerala- Makar; Tripura- Mirtinga; Mizoram- Rawthing; Sikkim- Ying; Bihar- Deobans

Habitat & distribution: Occurs at altitudes of 1500 metres and thrives along water courses. Found extensively in the North East and West Bengal.

Culm: The culm is up to 15 m tall, thick walled, strong and upright, smooth and greyish-green.

Flowering: Green flowers. Gregarious. The flowering cycle is 30-60 years.

Uses: Traditionally favored for basketry and woven applications.

Melocanna bambusoides

Local name: Mizoram- Mautak; Assam- Tarai; Assam- Arten; Bengal- Muli, Meghalaya- Watrai; Manipur- Moubi; Nagaland- Turiah

Habitat & distribution: Found chiefly in the north - eastern part of the country. It grows best on low hills and in undulating countryside.

Culm: Culms arise singly from the rhizome at a distance.

Flowering : Gregarious. Flowering cycle is about 40-44years.

Uses: Used in the construction of houses and for making woven products. An important source for paper pulp.

Thyrostachys oliveri / Bambusa offinis

Local name: Tripura- Kanak Kai

Habitat & distribution: Introduced into Tripura

Culm: Solid, upto 7 m in height.

Uses: Fishing rods, javelins, pole vault poles. Shoots are edible. Suited for sports good applications because of its dimensions, solid nature, flexibility and other mechanical properties.

Dendrocalamus hamiltonii

Local names: Tripura- Pecha

Habitat & distribution: They grown in hilly area, soil should contain moisture. They can't tolerate acidic soil. Except Tripura they also grow in Myanmar.

Culm: The culm is up to 15 m tall, bent shape, green colored.

Uses: Young shoots are used as food. They are also used to prepare kitchen utensil.

Oxytenanthera nigrociliata/ Gigantochloa rostrata

Local name: Tripura- Kailyai

Habitat & distribution: They grown in hilly area, moisture content in the soil should be less. Except Tripura they are also found in Western Ghat, Assam, Orissa, South India.

Culm: The culm is up to 6-7 m tall, deep green in color.

Uses: They are used to prepare pages.

Dendrocalamus strictus

Local name: Tripura and Kolkata- Lanthi bans

Habitat & distribution: It can grown at a altitude of 1000 m. Cley soil is not suitable for it's growth. It can grow in a soil contains less amount of minerals.

Culm: The culm is up to 15 m tall, greenish coloured.

Uses: Young shoots are used to prepare food. Mature bamboos are used to prepare housing equipment, farmer's equipment, arrow etc.

Some of the edible bamboo found in Tripura [4]

The shoots of most of the bamboo species found in Tripura are edible. They are brittle, contains huge amount of minerals, vitamins. The Tribal people of Tripura are taken the bamboo shoots traditionally and they prepare various delicious foods from them without knowing their nutritive value.

Some of the common edible species are

- a. *Bambusa nutans*
- b. *Bambusa tulda*
- c. *Bambusa balcoca*
- d. *Bambusa pallid*
- e. *Bambusa polymorpha*
- f. *Dendrocalamus hamiltonii*
- g. *Dendrocalamus longispatus*
- h. *Melocanna baccifera*

Food value of bamboo shoots [5]

Food value of different bamboo shoots are depends on the percentage of edible portion. This value is about 27%. Although average food value of various edible bamboos are given below:

Content	Percentage
Moisture	87.10%
Protein	3.90%
Carbohydrate	7.50%
Minerals	1.40%
Calcium	20.00
Phosphorous (mg/100 g)	90.00
Iron (mg/100 g)	0.10
Niacin (mg/100 g)	200.00

When we consume any bamboo preparation we have to consider their toxic effect also. E.g. *Dendrocalamus hamiltonii* contains bitter or acidic poisonous substances, taxiphyllin, and hydrocyanic acid. These toxic substances can be removed by boiling with water or macerated with salt water (2%) for several hours.

Uses of bamboo [6]

Effect on environment

1. Its biological characteristics make it a perfect tool for reducing carbon dioxide levels in the atmosphere. It generates more oxygen than equivalent strands of trees, lowers light intensity, protects against ultraviolet rays and is an atmospheric and soil purifier.
2. Bamboo prevents soil erosion. Its anti-erosion properties create an effective watershed, stitching the soil together along fragile river banks, deforested

areas, and in places prone to earthquakes and mud slides. The sum of stem flow rate and canopy intercept of bamboo is 25% which means that bamboo greatly reduces rain run-off, preventing massive soil erosion. Thus, bamboos help control landslides, keep flooded rivers along their natural course and slow the speed of the water flow.

3. Bamboo is foremost in biomass production, with up to 40 tonnes per hectare per year in terms of culms only in managed stands. An estimated one-quarter of the biomass in tropical regions and one-fifth in subtropical regions comes from bamboo.
4. Bamboo is an enduring and versatile natural resource. The great diversity of species makes bamboo adaptable to many environments. It tolerates extreme precipitation from 30 to 250 inches of annual rainfall. A dense bamboo cover also offers stakes to trees, fodder to animals and food to humans.
5. By planting bamboos we can able to control the unwanted plants grown in the ponds etc.

Use as medicine

1. In Ayurveda, the stem and leaves are used in cough, diseases of blood, leucoderma, wounds, piles and in inflammatory conditions.
2. *Bambusa arundinacea* (Retz.) Roxb, *Bambusa vulgaris* Schard ex Wendl, *Melocana baccifera* (Roxb.) Kurz contains Fe, Ca, minerals which help to fight against bronchitis.
3. A thick transparent liquid are obtained from the internodes of the female bamboo known 'Wakthwi' in kokbarak, which is largely used as cooling tonic and as aphrodisiac. It is also useful in cough and paralytic complications.
4. According to indigenous system of medicine, the burn roots are used in ring worm, bleeding gums and in painful joints.
5. The leaves are good as eye-wash and in fever.

As Foods and beverage

1. The reang, Noatia, Jamatia tribes of Tripura prepare muia godak, muia chakki, muia Andhra etc from bamboo shoots.
2. Bamboo shoots contain proteins, fat, minerals and vitamins which helps to fight against cancer, duodenal ulcer. They also increase appetite.
3. Seeds are used to prepare wine.

Use as construction material

1. Bamboo is a viable replacement for wood. Its qualities of strength, light weight and flexibility make it a viable alternative to tropical timber that is used in the building materials industries.
2. Rural Housing: posts, walls, roof structure, roofing material, scaffolding, fencing and gates (Bari, Barak, Muli, Makal)

In Kutir Silpa (handloom)

1. Pen stand, tiffin box, match box, arrow, badminton racket, kitchen utensils and different bamboo based products are prepared by the tribes and non-tribal people of Tripura which is not only very much popular in our country but also in abroad also.
2. Agricultural implements, baskets, food grain containers rain shields, head gear and other functional products
3. Handicraft items: toys, 'morra', winnowing trays, handfans, mats (Muli, Paora and Mritinga), wall panels, screens (Mritinga, makal), umbrella handles (Muli), fishing rods (Kanak kaich)

In research work

1. Powder like substances found in the young shoots are used to separate the sex hormones.

In industry

1. Bamboo is being used as an input or raw material in certain industries. It has been primarily been used in the paper industry in bulk quantities as a raw material for paper pulp. Bamboo is also used in manufacturing wood substitutes, composites, utility products including Venetian *Agarbatti* (incense sticks).

2. Bamboo is also a source of energy. Gasifiers can produce electricity using bamboo as fuel. These can also be used for thermal applications replacing furnace and diesel oil. Charcoal and its processed form in powder and briquettes can also be manufactured. It is superior to other sources of charcoal in terms of calorific value. Bamboo charcoal can also be used as a raw material for activated carbon manufacturing which is used as adsorbent in different industries like vegetable oil, beverage, pharmaceuticals etc. Goldsmiths prefer bamboo charcoal in making jewels.
3. Bamboos are used in production of paper.
4. Bamboo is a renewable resource for agro-forestry products. Bamboo is a high-yield renewable natural resource. Ply bamboo is now being used for wall paneling, floor tiles, for paper making, briquettes for fuel, raw material for housing construction, and rebar for reinforced concrete beams. It can be used to produce many items of daily use that are currently made out of plastic or other less eco-friendly materials.

In devotional works

1. Different utensils are prepared by Noatia, Reang, Rupini, Jamatia tribe in their traditional festival named 'Garia puja' and Bengali people are also produce bamboo based structures in their different pujas.

Bamboo based Products

The products that can be made from Bamboo can be broadly be categorized into:

1. Wood Substitutes and Composites,
2. Industrial Use and Products,
3. Food Products,
4. Construction and Structural Applications.

Wood Substitutes and Composites

The products are including:

- a. Bamboo Based Panels
- b. Bamboo Flooring
- c. Bamboo Sticks for Blinds and Incense Industry
- d. Bamboo Furniture

Industrial Products

- a. Bamboo for Paper and Pulp
- b. Bamboo Charcoal for Fuel
- c. Bamboo Based Gasifies for Electricity
- d. Bamboo based fibre and fabric

Food Products

- a. Bamboo shoots

Construction and Structural Applications

- a. Bamboo housing

Economy of bamboo

According to Tripura Forest Department data income from bamboo based products in the economic year 1998-99 is 49,07,340.65 Rs and in the year 1999-2000 it was 84,11,612.25. The prices of bamboo are increasing day by day due to increase in population and their demands.

Causes of bamboo forest destruction

The following reasons are responsible for bamboo forest destruction;

1. Due to 'Jum cultivation' and rubber plantation forests are destructed.
2. Though plantation is less due to over demand of bamboo the forests are destructed.
3. Fire in the bamboo forest is another one reason for at least 20% FOREST destruction.
4. Due to increase in population, people are captured the forests.

Conclusion

This "Green Gold" have a great significance in the daily life of the people of Tripura. They are important in the conservation of the priority species. This economically and medicinally important plant must be conserved not only for their own intrinsic value, but also as a generic backup in support of related cultivated bamboos.

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