

A Review on Bamboo cultivation and its By Product

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ABSTRACT: *Bamboo is a naturally occurring construction material that grows in tropical and mild temperate climates. It has been utilized for its inherent strength and flexibility since ancient times. Today, India possesses the world's biggest bamboo acreage and second-largest bamboo reserve. The Planning Commission estimates the domestic bamboo economy to be worth approximately 2000 crores. This paper aims at the products constructed utilizing bamboo, its environmental impact, exports businesses including its demand. Bamboos are used in many sectors such as building constructions, roof construction, handicrafts, making ornaments, furniture, environmental benefits, medical uses, etc. Policies and regulations by the government are also discussed in this paper regarding bamboo production. The use of bamboo as an ecologically friendly building material that can be applied more rapidly and has added value in terms of cost and environmental sustainability is an area that should be researched further. Although there has been much research performed in this field, but there is a great potential for more research and construction of new marketing strategies in the future.*

KEYWORDS: *Bamboo, Culm, Export, India, Market,*

1. INTRODUCTION

Bamboo is used for everything from food and medicine to furniture and scaffolding all around the world. It grows in a "belt" around the world, in tropical, subtropical, and temperate climates, and at elevations of up to 3500 meters. Bamboo is divided into two "groups" i.e. herbaceous and woody. There are about 1000 species of bamboo in total. The former are small-diameter as well as resembled grasses, but the latter is more known as large-diameter ones that may be utilized for building and are the subject of this Technical Note Series. Clumping and running bamboos are the two types of woody bamboos. Clumping species send their new shoots as near to the base of the old culm as possible, but running species might send their shoots as far as Thirty meters away. Woody bamboo sizes range from 10mm to 200mm, with wall thicknesses ranging from ten to twenty percent of the exterior diameter. Culm heights can reach thirty-meter in diameter and are fully solid [1].

Bamboo is a grass that may reach a height of twenty-five meters in six months. Each culm emerges from the ground at its ultimate diameter i.e., its girth does not extend over time, narrowing as it climbs taller, and developing vertically by cell division "telescopically" among the nodes i.e., the distance between nodes increases as it grows. Culms require three to five years to mature to strong roots once completely grown, during which time they undergo silification and lignification. The culm's strength begins to diminish after around five to six years. Across 100 so-called "woody" species are appropriate for building around the world. Clumps of bigger woody species often attain peak output after seven years and may sustain consistent cropping of 20-25 percent throughout their productive lifetime [2].

Today, India possesses the world's biggest bamboo acreage and second-largest bamboo reserve. The Planning Commission estimates the domestic bamboo economy to be worth approximately 2000 crores. The government has considered bamboo as an easily controllable export commodity that produces large yields, has a wide range of applications, and can employ millions of people, preventing rural labourers from fleeing to India's sprawling cities. India, China, and Myanmar collectively own 19.8 million hectares of bamboo reserves, accounting for 80 percent of the world's bamboo forests. India has a 45 percent share of the global market, with almost 125 distinct species of the plant, but just 4% of the global market. During 2015, the bamboo economy in the country was increased by more than 15%.

According to the Planning Commission's National Mission on Bamboo Technology and Trade Development, if adequate support is provided to bamboo growing and usage, it can replace the anticipated import of timber to the tune of Rs 300,000 million in the next 20 years. Bamboo flooring materials are exported in the amount of Rs 1000 million, while another Rs 1000 million is used domestically. By 2025, the overall market size for bamboo flooring products is expected to reach Rs 19500 million. By 2025, the demand for bamboo scaffolding would have increased to Rs 8610 million, while the demand for houses will have increased to Rs 11630 million. The need for road construction is expected to increase to Rs 2740 million, while the demand for bamboo grids is expected to increase to Rs 1000 million. The demand for various industrial products such as ice cream sticks, firecrackers, bamboo lathis, and ladders is expected to increase [3]–[5].

Bamboo may be utilised to recover damaged land, save soil, enhance the ecology, and protect against drought. Bamboo plantations might be a key component of India's greening effort. Bamboo, which is mostly grown in India's rural areas, can survive drought and flood. Bamboo is grown over 15 million hectares in India, accounting for up to 13% of the total forest area. Every year, India produces around 5 million tonnes of bamboo, with a market worth of \$4.4 billion. People in Assam and Tripura utilize bamboo in their everyday lives and houses, with Madhya Pradesh being the main provider for commercial purposes. Bamboo species grown in India include *Arundinaria*, *Bambusa*, *Chimonobambusa*, and *Dinochola* [6].

2. USES OF BAMBOO

Bamboos have been utilised in a broad range of creative and diverse ways by people all over the world. Bamboos are utilised in ravines for the following purposes.

3.1. Building Construction:

More than a quarter of Indians live in poverty and cannot afford to live in brick-built dwellings. As a result, bamboo housing may become a low-cost option [7]. Bamboo has been utilised in the construction of houses in a variety of ways:

3.1.1. Roof Construction:

Bamboo trusses are an excellent alternative for bearing roof loads and transferring them to the foundations via columns. Culms with an outside diameter of 50-80 mm are used to make bamboo trusses. Selected culms are positioned, and connecting ends/faces are cut such that the space between any two members is as little as possible. Different devices are used to create web and chord connections.

3.1.2. Mud Wall with Bamboo Reinforcement:

The mud-wall provides insulation from the heat and cold. Nowadays, mud walls are reinforced with bamboo culms cut into quarters that have been carefully treated with hot bitumen. Layers of properly moistened mud, cinder, rice husk, water, and a little lime are conjoined step by step, with the bamboo grid in the center, which is afterward plastered and smoothed, then whitewashed.

3.1.3. Building Floor:

Bamboo is utilised for flooring in rural homes built on elevated platforms, with bamboo culms serving as floor joints and beams serving as structure. Covering sheathing of split bamboo, bamboo boards/mats, tiny complete culms, or flattened bamboo strips are fastened appropriately over this frame construction.

3.1.4. Constructing Doors:

In rural dwellings, bamboo mat shutters with a hardwood or bamboo frame are prevalent. To function as windows, small apertures framed with bamboo or wood are placed in the walls.

3.1.5. Constructing Scaffolding:

Bamboo culms can be used to replace wooden plank platforms. Bamboo poles that have been nailed together have also been utilised as scaffolding in high-rise constructions.

3.2. Handicrafts:

Bamboo is used as a raw material in a vast range of cottage businesses, including the production of tablemats, bamboo goods, and trays. Bamboo is used to make a variety of household items such as mats, baskets, toys, nets, wall plates, wall hangers, trays, and more. Bamboo strips are used to create attractive arrangements of flowers and fruits in a variety of sizes and forms. Bamboo is used to make the flute, a popular musical instrument in India. Deodorizing fish oils is done with dried and mature bamboo leaves.

3.3. Making Ornaments:

Hedges, groves, gardens, orchards, screens, mass plantings, solitary clumps, along avenues, roadsides, and canal banks, and landscaping are all examples of decorative and aesthetic applications for bamboo.

3.4. Furniture:

Bamboo furniture is gaining popularity since it is less expensive and lighter than wood-based furniture. Bamboos are increasingly being utilised for furniture due to the dramatic increase in the price of lumber. Bamboo-based furniture, elegant basket-ware, and high-value ornamental elements are all growing in popularity in the domestic and foreign markets. Bamboo furniture is inexpensive and may be found in many rural places. Indeed, it is gaining popularity in metropolitan areas as well.

3.5. Environmental Benefits:

The bamboo plant has several ecological advantages, including the ability to neutralize acidic soil, produce biomass, create vast rhizome networks, and bind the soil. Bamboos are cultivated in the

ravine's gullies and on the edges of terraces to prevent soil erosion from severe rain and wind damage. Bamboo absorbs 30% more CO₂ and generates 30% more O₃ than trees.

3.6. Medical Uses:

It also has therapeutic properties and is used in Ayurveda medicine for blood cleansing, leucoderma, and inflammation therapy. Asthma, cough, paralytic problems and other severe disorders can all be treated with it.

3. BAMBOO BUSINESSES

With China accounting for 16 percent of global bamboo exports, Peru and the Netherlands coming in second and third, respectively, India ranks thirteenth with only 2.4 percent. Bamboo's total export value is projected to be 2.69 billion dollars. The European market is thought to be the biggest buyer of bamboo. The demand for value-added bamboo goods has risen sharply among European households. Bamboos are mostly used to replace conventional lumber in the building industry. They're also utilised instead of plastic for outdoor decking. The quality of bamboo should meet the European Union Timber Regulation for such exports. The main bamboo importers, Germany, Belgium, France, and the Netherlands, follow country-specific restrictions.

4.1. Exports of Bamboo from India:

In the next years, India has pledged to increase its exports. The United States is the world's top importer of bamboo from India. Bamboo exports totaled 11.71 million US dollars in January 2020. The value was 45.07 million US dollars in the fiscal year 2019-20. The export rate of India has increased from 127 countries in 2014 to 153 countries in 2018. In 2018, the all-time high was set at 61.44 million US dollars [8].

The Indian government has made it easier for the bamboo sector to operate by enacting some rules and regulations. The first is the easing of the permission for the felling and transportation of bamboo for economic purposes. India has recognized that, with its vast climatic diversity and natural forest resources, it has the potential to become one of the world's major exporters of bamboo. The Indian government has organized a number of capacity-building and training initiatives in order to grab and use the opportunity so that the grass plant may function as an economic booster. India may also become Southeast Asia's research and training powerhouse, according to the proposal. A large number of price reductions for bamboo exports have been reported throughout the country [9].

The desire to preserve the earth's resources for man's well-being is stronger than it has ever been. It has a great potential market value, and it is past time for India to take creative steps, both for export and for local usage. Bamboo farming helps to minimize carbon emissions while also using less water. Bamboo cultivation, which is a cash crop that has been shown to give yields generation after generation, must be continued [10].

4. DISCUSSION

There is a paucity of data on current marketing channels, product quantities, pricing variations, and so on. Collectors cannot effectively negotiate for a greater percentage of the product price without this information. However, in addition to current product pricing information, information on future product supply and demand, processed product development, and future price forecasts

are required. This is the data required to convert the present selling system into a marketing system. The community, as well as economists, planners, and technologists involved in bamboo production and trade, do not have access to this information.

5.1. Bamboo's Contribution to Job Creation:

Simple and regular silvicultural techniques, including water conservation, soil working, and clump health and hygiene, have the potential to significantly enhance the productivity of existing bamboo forests in India. The majority of bamboo processing operations may be done by a low-skilled rural workforce. Depending on the quantity and form of clumps, reducing existing clumps, soil work, and certain water conservation techniques take 10 to 25 unskilled workdays per acre.

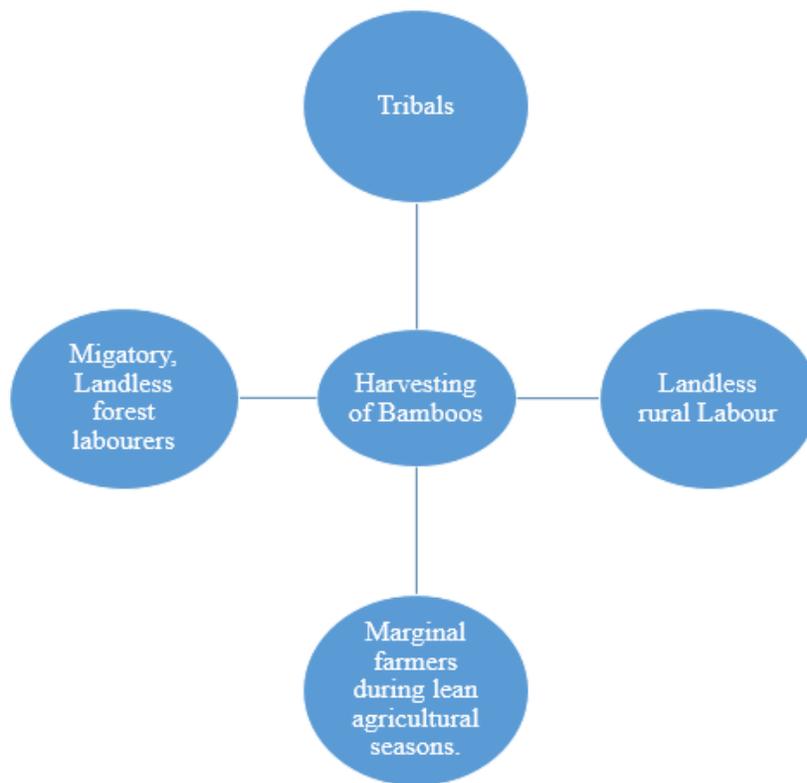


Figure 1: Illustrates the harvesting of bamboo carried out by tribals, rural labour, marginal farmers.

The needed expenditure will be justified since it will result in a two-fold increase in bamboo output as well as an improvement in the quality of collected culms. Raising one hectare of the bamboo plantation, including nursery seedlings, is expected to take around 120 workdays. Plantation maintenance requires around 40 days from the second to the fifth year. Harvesting of bamboo is done by tribals, landless rural labour, marginal farmers during lean agricultural session etc. as shown in Figure 1.

5.2. Policies and Regulations:

Tropical wood is the focus of international treaties and conventions (as well as NGOs and environmental campaigners). Policies aimed against the former, on the other hand, may have an influence on bamboo collecting on public lands. Rather than providing efficient incentives, natural resource laws and regulations typically create difficulties in implementing rules. Regulations based on stringent laws might make it difficult for manufacturers to sell their products effectively (and fairly). The following are required in order to establish marketing strategies that benefit the community and may contribute to bamboo conservation.

5.2.1. Bamboo manufacturing and marketing are managed locally:

Bamboo plantation management on a local or cooperative basis is a viable method. Policy and law must be modified to allow communities to have a larger role in bamboo cultivation, processing, and marketing in order for this to happen.

5.2.2. Good market information is provided to cooperatives and community organisations:

To get a better price, collectors can form an organisation, such as a cooperative or a community user group that will assemble the small amounts of bamboo collected by individual members. The goal of marketing system development should be to provide good market information to organisations, not just for current markets, but also for future markets. Government agencies should play an important role in the development of marketing systems by collecting and analyzing data and making it available to collectors.

5.2.3. Law's Removal:

The regulation of bamboo collections, pricing, transportation, and handling is one of the tasks that government bodies should avoid. In most cases, such engagement has not benefitted the collectors or aided in the protection of the resource.

5.2.4. Competitors:

The more people who buy, the better. If the producer/collector has access to pricing information, competition between intermediaries, government agencies, and companies will result in a lower price and better service.

5.2. Bamboo Marketing has a lot of issues:

Farmers only plant bamboo on marginal land and in private forests; they do not wish to plant it with agricultural crops in an agroforestry system because they feel the bamboo canopy reduces crop productivity. Their neighbours also forbid them from planting bamboo at the edge of their property. As a result, there is a pressing need to investigate the feasibility of growing bamboo in marginal or degraded parts of the country. The ravine area is one of these types of locations where bamboo may be cultivated not just to improve output but also to provide work to the region's underprivileged inhabitants. Figure 2 shows the key issue of bamboo marketing.



Figure 2: Shows the key issues in bamboo marketing such as no fixed price, lack of policies, etc.

5. CONCLUSION

Bamboo is a natural building material that thrives in tropical and mild temperate regions. Since ancient times, it has been used for its innate strength and flexibility. India now has the world's largest bamboo acreage and the world's second-largest bamboo reserve. The bamboo economy in India is estimated to be worth around 2000 crores, according to the Planning Commission. The goods made from bamboo, their environmental effect, export enterprises, and demand are all covered in this article. Bamboos are utilised in a variety of industries, including construction, roofing, handicrafts, decorations, furniture, environmental advantages, and medicinal applications. The government's policies and restrictions on bamboo production are also covered in this article. The use of bamboo as an environmentally friendly building material that can be installed more quickly and has added value in terms of cost and environmental sustainability should be investigated further. Despite the fact that considerable study has been done in this sector, there is still a lot of room for additional research and the development of new marketing techniques in the future.

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