

BAMBOO- A POTENTIAL ECONOMIC RESOURCE OF ARUNACHAL PRADESH

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A B S T R A C T

Bamboo, the fastest growing grass, highly versatile, renewable, strong and low cost eco-friendly natural resource has the potential to improve livelihood security in both rural and urban areas. Today bamboo is the substitute of wood based industries and replaces wood timber very effectively. Bamboo as a plant mitigates climate change as an efficient carbon sink, embodies high energy and enhances environmental amelioration. Bamboo has been a means of life for food, firewood, shelter, medicine, agricultural tools and daily household items. This inherent legacy has become a secondary source of income augmenting the capabilities of the artisans and craftsmen. It provides economic sustenance and growth to people of Arunachal Pradesh. This is one of the most important resources of Arunachal Pradesh which has to be put to proper utility in the present day context for the economic benefit, growth and development of the State.

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Introduction

Forests are the mainstay for the people of Arunachal Pradesh due to dependence of population over forest products which constitute 62% of the land area and have survived through centuries with the diverse and varied uses of bamboo and its products. Bamboo is light, strong, stiff and elastic material and has multipurpose applications. All the parts of bamboo are used in different value added forms. From the cutting of the umbilical cord to the mats that have wrapped the dead for burial, bamboo has been integral to the life of the tribal people of Arunachal Pradesh. It continues to play a predominant role in the life of the people even today in every walk of life that ranges from agricultural tools and implements to shelter, food and livelihood. Bamboo is known as poor man's timber only by ignorance whereas bamboo has multipurpose uses. Bamboo, the fastest growing and renewable natural resource and found extensively all over the State, constitutes one of the most important economic resources of Arunachal Pradesh which has to be put to proper multipurpose use in the present day context for the economic benefit, growth and development of the State.

Denudation of forest cover, degradation of environment and fast deteriorating ecology threatens the very existence of humans and animals. The development of the natural bamboo resources of Arunachal Pradesh will greatly add to the environment and the ecological balance of the land consequently having great impact on the quality of life of the people. A planned, scientific and holistic approach to the cultivation, management, and application of

bamboos on a sustainable basis can be an inexhaustible source of goods and services and play a significant role in building rural economy and overall economic development of the State.

With increasing demand of timber and wood, which is becoming a scarce commodity in the world, bamboo can serve as an alternative to many of the forest products. Its wide range of uses and great versatility qualifies it to be a multiple use alternative to timber capable of immensely boosting economy of the rural poor in particular. Through the processing of such bamboo goods and products and incorporating many other economic uses, bamboo can boost the economy of the State making a landmark.

Diversity & Resources

There are 1250 different bamboo species spread over a total area of 22 million hectares in the world. India has 139 species with 8.96 million hectares of land under bamboo forests, out of which 98 species over 2.31 million hectares in North East India and Arunachal Pradesh having more than 75 species (50% of total bamboo diversity in India) with 16,083 sq. km under mixed bamboo forests (FSI, 2011) and 325.74 Sq.km under pure patches (SFRI-NESAC, 2007). About 5 lakh population of the State are directly dependent on bamboo out of 13,82,611 population (2011 census). On an average more than `30 crore is involved both in domestic and International trade (mostly from private sector) with total consumption of 0.5 million tons annually (Taj, 2011).

Types and forms

Depending on the growth of rhizome and development of culm from the rhizome, generally two types of bamboo are found – Monopodial (non clump forming/ single) viz. *Phyllostachys mannii* (Tabu/ Bije), *Melocanna baccifera* (Muli) and Sympodial (clump forming) viz. *Bambusa balcooa* (Bholuka), *Bambusa tulda* (Jati). In case some bamboos like *Schizostachyum polymorphum*, *Schizostachyum griffithiana* both types of character i.e. single and clump formation is seen which is known as Amphipodial type.

Bamboos are divided into four forms depending on their growth i.e. Tree (*Bambusa balcooa*), Reed (*Ochlandra scriptoria*), Straggler (*Bambusa mastersii*) and shrub (*Arundinaria racemosa*).

Flowering of Bamboo

Bamboo belongs to grass family, Poaceae and it is character of all poaceae plants that it flowers once in its lifetime, produce fruits and then die. In case of bamboo, it flowers in a cycle and flowering cycle is different for different species. Some bamboo flowers every year like *Ochlandra spp.*, some bamboos flower at a certain interval of time in a specific area and most of the clumps die after flowering, (gregarious flowering); and some bamboo flowers occasionally in an isolated clump or a part of clump (sporadic flowering). In some species, though flowering occurs, but do not form seeds e.g. *Bambusa balcooa*, *Bambusa nutans*, *Bambusa vulgaris*. However, some bamboo species produce huge amount of seeds like *Bambusa bambos*, *Dendrocalamus hamiltonii*.

Bamboo in socio-cultural activities:

Bamboos play a great role in socio-cultural activities of the people of Arunachal Pradesh. They use bamboo for construction of traditional house and use mostly bamboo made materials in their day to day life like baskets for rice storage (Thaitho), conical carrying basket (Egin), flat bottom basket (Signoi), lidded basket (Kabol), rain shield (Yatti/ Hoptang), tray (Wan), mug (Pholow), spoon (Chowra), mat (Kharrang), tongs (Migee/Megap/Kingcup), fishing trap (Soilang), rat trap (Giire/ Etku), knee band (Lhyuhu/ Ali taring), comb (Ading/ Akhii), hair clip (Paggee akhii), beer filter (O Sadir), smoking pipe (Muku sudu), tobacco carrier (Duhii yachu), fan (Meyap), Bow-arrow (Iyi-epuk/ Apu ayi), bamboo culm/ tube for preservation of shoots, salt, dry vegetables, tobacco (Edung/ Sudu/ Udu), basket for man (Nara/ Tali), cap (Byopia), Winning tray (Oph/ Epo/ Kula), net (Jare/ salni), bamboo garland (Jampu), hen coup (Petil/ Wo thao) etc.

Such bamboo products have very good market and all these materials are used during festivals, worships and rituals. Small scale industries may be set up using modern technology and design to produce such items and it may develop the rural economy.

Bamboo shoot

The bamboo shoot is a young culm that is harvested at the time it appears above the soil surface and attains a height of 1-1.5 ft, or shortly after 10-25 days. The shoots are covered with fully black or brown hairy, hard, protective sheath. The bamboo shoot has high nutritional value and low fat content, and is a good source of fibre. Most bamboo species produce shoots that can be consumed fresh or in processed form. In Arunachal Pradesh, all people widely use bamboo shoots as vegetable, pickle and as food. It has a very large market in all city/ towns of Arunachal and modern techniques have developed the products with high value addition and may be a source of good income in rural areas.

The most common edible species in Arunachal Pradesh include –*Bambusa balcooa*, *Bambusa pallida*, *Dendrocalamus asper*, *Dendrocalamus hamiltonii*, *Dendrocalamus sikkimensis*, *Phyllostachys mannii* etc.

Present scenario

India, China and Myanmar have the highest bamboo reserves in the world with 19.8 million hectares of bamboo forests. Out of this, India shares 45 percent with only 4% of its global market. The Govt. of India has the vision to see bamboo industries concentrated in the North Eastern part of the country and aims at creation of 8 million jobs in bamboo based industries lifting 5 million families out of poverty. The Govt. also targets to slow down migration of rural workers to urban areas. With these in background the Planning Commission of India had launched National Bamboo Mission.

The major objectives of National Bamboo Mission are to commercialize bamboo at farmers' level. The focus is on comprehensive development of bamboo resources as a marketable commodity with more emphasis on farm lands. A linkage of bamboo farmers with bamboo artisans will also be made, besides promoting bamboo projects for development of degraded forest lands wherever feasible. The approach would broaden intervention business opportunities significantly as there is huge untapped potential for growth and development. National Bank for Rural Development (NABARD) has also initiated a few activities in development of bamboo sector.

Initiatives by the State Government

Govt. of Arunachal Pradesh has established Arunachal Pradesh Bamboo Resources & Development Agency as independent body to look after the growth of bamboo sector in the State. The agency proposes to set up its office complex at Lekhi village, Naharlagun over an area of four hectares. The complex will have (i) World Class Craft Heritage Museum, (ii) Urban Craft Haat, (iii) Bamboo Technology Park, (iv) Bamboo Based Traditional Housing, (v) Bamboo Bridge, (vi) Common Facility Centre (CFC) etc. The agency has already constructed a small unit of CFC with the support of Ministry of Textile, Govt. of India.

Department of Environment & Forests has set up one of the best bambusetums in the country at Van Vigyan Kendra, Chessa. State Forest Research Institute has set up World's best wood timber substitute bamboo species, Chinese Moso (*Phyllostachys pubescens*) demonstration plot at Yachuli for training and demonstration purpose. Poma Bamboo Processing Centre has been established at Poma village, which is 7 km. away from State capital and subsequently handed over to a society. Pitchola Sawmill and Plywood Industry has been converted into bamboo based industry through Arunachal Pradesh Forest Corporation Limited (APFCL) and would be run on PPP mode.

More than 1000 unemployed youth have been trained on skill development programmes namely Bamboo Trade and Technology Development, Bamboo Resource Management, Bamboo Housing, Marketing and Marketing Linkage, Flowering Management and Rodent Control etc. Further about 10,000 farmers, NGOs and artisans have already been given short term training on bamboo development by State Forest Research Institute and Arunachal Pradesh Bamboo Resources and Development Agency.

APBRDA has entered into a Memorandum of Understanding with Numaligarh Refinery Ltd. (NRL) paving way for sourcing 3.00 lakh tons of bamboo per year. NRL is likely to start a bio refinery project in Assam to produce bio-ethanol from bio-mass feedstock of bamboo within a couple of years. This would offer a permanent source of revenue for bamboo farmers and communities owning vast bamboo groves. NRL would also set up bamboo processing clusters in the state, which would ultimately promote bamboo plantation and processing for value addition along with providing large scale sustainable employment opportunities for people in bamboo plantations and bamboo semi-processing units. The people at large will be made aware of the scientific knowhow on regeneration of bamboo and encouraged to take up bamboo plantation as their sustainable source of income.

People's participation

Under the support of National Bamboo Mission various schemes on Bamboo resource development activities like, Plantation, Improvement of existing stock, Kissan nursery, Mahila nursery, Centralized nursery, Retail outlet, etc. have been taken up by involving, FDAs, NGOs, Civil Societies, Farmers and individuals by Department of Environment & Forests, Horticulture and Panchayati Raj. The total bamboo plantation taken up in forest and non-forest areas are to the extent of 11560 ha. and 18556 ha. respectively.

The people are highly motivated in bamboo development sector in State and accepted it as one of the best source of income generation. The State Govt. had also planned to promote bamboo market on cooperative system within the village level so that every member of the village can sell their bamboos through organized market.

Various community based welfare programmes such as organized bamboo bazaar, bamboo whole sale market, bamboo treatment plant, retail outlet, SSI units, etc. have been initiated.

The world's best bamboo species, Chinese Moso (*Phyllostachys pubescens*) has also been introduced at various pockets of subtropical to temperate region of the State through individual and community participation on trial basis and the experimental results are encouraging. It is expected that Arunachal Pradesh will be the highest bamboo producing State in the country after 15 years or so.

Bamboo based industries set up in Arunachal Pradesh

Individuals and industries have been encouraged to set up bamboo based ventures as a result of which some bamboo based industries have been set up in the State.

Sl. No.	Name of Industries	Annual consumption	Types of products	Annual production	Annual turnover (₹)
1	Arunachal Plywood Industries Ltd., Namsai	1,80,000 bamboos	Bamboo Mat Board	45.90 lakh sq.ft bamboo mat	6-7 crore
2	Patkai Bamboo Pvt. Ltd, Chowkham	1,00,000 bamboos	Bamboo board, shuttering	NA	1-2 crore
3	Arunachal Agro-product Ltd., Naharlagun	1000 tons	Agarbatti stick, furniture, etc.	1200 quintals	10-20 lakh
4	Poma Bamboo Processing Centre, Poma	400 tons	Handicraft, Agarbatti sticks	---	5-6 lakh
5	Bamboo Charcoal Unit, Kimin	1000 tons	Bamboo charcoal Briquette charcoal	NA	NA
6	Siang Bamboo Pvt. Ltd., Pasighat	1800 tons	Charcoal	NA	4-5 lakh
7	Zingnu Industry Ltd. Namsai	NA	Splint, Mat Board	NA	NA

Most of them are not functioning regularly and suffer from some constraint or the other. Still the State has the highest number of bamboo based industries in North East Region

Current issues

- As per requirement of the factory raw materials are not available near industrial buffer zones.
- Most of the bamboo occurrences are in inaccessible hilly terrains and difficult for extraction.
- Transportation of bamboo is another bottleneck in growth of bamboo based industries.
- The cultivated and superior quality bamboos are generally procured from local people of that particular areas and cost per bamboo is higher.

- The labour wages are generally higher as compared to other parts of the country which blocks the growth of bamboo industry in the State.

Challenges

- Bamboo as a substitute to timber is yet to be realized by the people in India due to availability of wood timber.
- Lack of man power development specially in highly skilled jobs in bamboo technology
- High cost of bamboo culms, which leads to higher production cost of handicraft and bamboo furniture.

Problems in Export-Import Marketing of value added products

- Most of the bamboo based industries are still on experimental trial, making product quality inferior as compared to other advanced places
- Machineries and equipments used in bamboo industries are of poor quality
- Quality of products are not up to the mark and hence the products are not in position to compete in outside open market
- Human resource and skill development activities are still lagging behind

Way forward

Keeping in view the ecological significance and vast economic potential of bamboo in the State, the following points deserve priority attention:

- Setting up of mini paper mill(s) within the bamboo buffer zones of Assam- Arunachal border areas for easy supply of bamboo from both the States. Preferable locations could be Doimukh, Kimin, Likabali, Bhalukpong, Changlang etc.
- Promotion of economic development through bamboo plantation and proper utilization with view to maximize ecological and economic benefit
- Development of high quality bamboo resources through scientific/ technical interventions on sustainable basis
- Promotion of bamboo based industries on PPP mode for utilizing the available resources for generating income and employment
- Revitalisation and augmentation of local traditional bamboo art & craft with improved technologies, innovative design and value addition for export through industrialized mode of production
- Promotion of bamboo as wood substitute by increasing bamboo production to reduce pressure on forests
- Setting up of bamboo shoot processing unit within the buffer zones of Capital complex

- Establishment of bamboo charcoal and activated charcoal (carbon) units and gasifiers at selected bamboo buffer zone areas
- Promotion of awareness and understanding of bamboo as “Green Gold” among farmers, traders, industries and the people in the State with a view to utilize its full potential and to boost the rural and industrial economy in the State

Key recommendations

- Detailed Bamboo Resource mapping and stocktaking
- Strengthening of Research & Development.
- Human Resource Development/ Skill Development Training and Capacity Building.
- Development of nurseries and Vegetative Propagation Centers (VPC)
- Development of plantations both in forests and Non-forest areas
- Development of Bamboo based Industries, Common Facility Centre (CFC), Technology Park, Craft Museum, Bamboo Shoot Processing units, Bamboo Depot, Bamboo whole sale market, Bamboo Tourism, Retail outlet, etc.
- Renovation and revival of all the existing bamboo based industries with latest technical equipments and tools
- Development of bamboo extraction road in selected high concentration bamboo belts
- Relaxation from transit regulation for bamboo under provisions of Assam Forest Regulation, 1891 under which bamboo is treated as tree and forest produce. Bamboo collected from outside notified forests needs exemption from Transit pass to facilitate private growers. Recently the Indian Forest (Amendment) Ordinance, 2017 has amended clause (7) under section 2 of the Indian Forest Act, 1927 omitting “bamboos” from the definition of forest produce.
- Establishment of marketing linkages
- Subsidy on transportation of bamboo in difficult and hilly areas
- Providing of subsidized tool kits to rural artisan and craftsman with modern technologies
- Promoting of best quality bamboo species such as *Phyllostachys pubescens*, *Dendrocalamus asper*, *Phyllostachys mannii* and *Bambusa tulda* as per suitability of the Agro-Climatic condition
- Special financial package for development of bamboo based value addition industries

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EXTENDED ABSTRACT

Arunachal Pradesh is bestowed with abundant resources of bamboo which is the fastest growing grass, highly versatile and multipurpose having economic potential to provide and boost livelihood security of the people in the State. Bamboo is a viable alternative of wood and is known as poor man's timber. The Govt. of India has the vision to see bamboo industries concentrated in the North Eastern part of the country and aims at creation of 8 million jobs in bamboo based industries lifting 5 million families out of poverty. The Govt. also targets to slow down migration of rural workers to urban areas. With these in background the Planning Commission of India had launched National Bamboo Mission.

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The State Govt. has taken several initiatives including establishment of Arunachal Pradesh Bamboo Resources and Development Agency (APBRDA). The agency proposes to set up its office complex at Lekhi village, Naharlagun over an area of four hectares. The complex will have (i) World Class Craft Heritage Museum, (ii) Urban Craft Haat, (iii) Bamboo Technology Park, (iv) Bamboo Based Traditional Housing, (v) Bamboo Bridge, (vi) Common Facility Centre (CFC) etc. APBRDA has entered into a Memorandum of Understanding with Numaligarh Refinery Ltd. (NRL) paving way for sourcing 3.00 lakh tons of bamboo per year. NRL is likely to start a bio refinery project in Assam to produce bio-ethanol from bio-mass feedstock of bamboo within a couple of years. This would offer a permanent source of revenue for bamboo farmers and communities owning vast bamboo groves.

Under the support of National Bamboo Mission various schemes on Bamboo resource development activities like, Plantation, Improvement of existing stock, Kissan nursery, Mahila nursery, Centralized nursery, Retail outlet, etc. have been taken up by involving, FDAs, NGOs, Civil Societies, Farmers and individuals by Department of Environment & Forests, Horticulture and Panchayati Raj. The total bamboo plantation taken up in forest and non-forest areas are to the extent of 11560 ha. and 18556 ha. respectively.

Individuals and industries have been encouraged to set up bamboo based ventures as a result of which some bamboo based industries have been set up in the State. Arunachal Plywood Industries Ltd., Namsai; Patkai Bamboo Pvt. Ltd, Chowkham; Arunachal Agro-product Ltd., Naharlagun; Poma Bamboo Processing Centre, Poma; Bamboo Charcoal Unit, Kimin; Siang Bamboo Pvt. Ltd., Pasighat, Zingnu Industry Ltd. Namsai are worth mentioning, producing wide range of products like Bamboo mat, Board, Splint, Charcoal, Furniture and Handicraft items. Most of them are not functioning regularly and suffer from some constraint or the other. Still the State has the highest number of bamboo based industries in North East Region.

There are several issues and challenges which need to be addressed to do away with the current bottlenecks in commercial growth of bamboo based industries in the State. Keeping in view the ecological significance and vast economic potential of bamboo in the State, the following points deserve priority attention:

- Setting up of mini paper mill(s) within the bamboo buffer zones of Assam- Arunachal border areas
- Development of high quality bamboo resources through scientific/ technical interventions on sustainable basis
- Promotion of bamboo based industries on PPP mode for utilizing the available resources for generating income and employment
- Revitalisation and augmentation of local traditional bamboo art & craft with improved technologies, innovative design and value addition for export through industrialized mode of production
- Setting up of bamboo shoot processing unit within the buffer zones of Capital complex
- Promotion of awareness and understanding of bamboo as “Green Gold” among farmers, traders, industries and the people in the State with a view to utilize its full potential and to boost the rural and industrial economy in the State

For proper growth and utilisation of bamboo which is a potential economic resource of the State on a sustainable basis the following recommendations are worth consideration of the Government:

- Detailed Bamboo Resource mapping and stocktaking
- Strengthening of Research & Development on propagation and utilization of bamboo
- Human Resource Development/ Skill Development Training and Capacity Building
- Development of plantations both in forests and Non-forest areas with people’s participation
- Development of Bamboo based Industries, Common Facility Centre (CFC), Technology Park, Craft Museum, Bamboo Shoot Processing units, Bamboo Depot, Bamboo whole sale market, Bamboo Tourism, Retail outlet, etc.
- Development of bamboo extraction road in selected high concentration bamboo belts
- Subsidy on transportation of bamboo in difficult and hilly areas and establishment of marketing linkages
- Relaxation from transit regulation for bamboo under provisions of Assam Forest Regulation, 1891 under which bamboo is treated as tree and forest produce. Bamboo collected from outside notified forests needs exemption from Transit pass to facilitate private growers. Recently the Indian Forest (Amendment) Ordinance, 2017 has amended clause (7) under section 2 of the Indian Forest Act, 1927 omitting “bamboos” from the definition of forest produce.

