

## Employment Generation by Bamboo Resource Development and its impact on rural Communities.

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### Abstract:

Bamboo is an important resource in our socio-economic and cultural context. It is a fast growing, widespread, renewable, versatile and environment-enhancing resource. Apart from its traditional uses, bamboo has new applications as an alternative to depleting wood resources and as an option to expensive construction and furnishing materials. Bamboo resource development will help employment generation, and sustainable livelihoods in rural communities.

Bamboo stands as an ideal species capable of achieving conservation of soil and moisture, restoration of degraded land, livelihood and economic security because of its manifold uses and industrial applications. Policy initiatives are required in all inter-related fields of plantation, research and extension, technology, industry, trade and financing. Bamboos occupy 8.90 million ha of forest lands in India. Sporadic clumps are available in agricultural lands, homesteads etc. Though 135 species of bamboos, including some exotics are available, only three species constitute 78% of the natural growing stock. *Dendrocalamus strictus* accounts for 45% of the growing stock and occupies deciduous zones throughout India. *Melocanna bambusoides* is 20% of the total stock and is limited to North-eastern states. *Bambusa bambos* is the large thorny bamboo of the moist deciduous forests and accounts for 13% of the stock

### BACKGROUND

Bamboo deserves to be developed as an economic and environment resource. Other species of commercial importance are *Ochlandra travancorica* of the wet Western ghats, *Dendrocalamus hamiltonii*, *Bambusa tulda*, *B.pallida*, *B.nutans* in the northeastern parts and *Oxytenathra species* in western

India. Bamboos have rural, domestic and industrial uses enabling it to play a vital role in economy and manpower generation. Various aspects of manpower generation in raising bamboos, their maintenance, harvest, transport, storage and end uses have been studied and quantified. It is possible to increase bamboo production and enhance its uses for higher economic returns to the country.

Bamboo has a long and well established tradition for being used as a construction material throughout the tropical and sub-tropical regions of the world. With rising global concern, bamboo is a critical resource which is efficient in sequestering carbon and reduction of Green House gas emissions. With forest cover fast depleting and availability of wood becoming scarce, the research and development undertaken in the past few decades have established and amply demonstrated that bamboo could be a viable substitute for wood and other traditional materials for the housing and building construction sector and several infrastructure works. Its uses through industrial processing have shown a high potential for production of composite materials and components which are cost-effective and can be successfully utilised for structural and non-structural applications. It has a high tensile strength and very good weight to strength ratio. The strength-weight ratio of bamboo also supports its use as a highly resilient material against forces created by high velocity winds and earthquakes. Above all, bamboo is a renewable raw material resource from agro-forestry and if properly treated and industrially processed, components made by bamboo can have a life of 30 to 40 years though natural durability varies according to species and types of treatments.

Applications in building construction have established bamboo as an environment-friendly, energy-efficient and cost-effective material. The commonly used species in construction are *Bambusa balcooa*, *Bambusa bambos*, *Bambusa tulda*, *Dendrocalamus giganteus*, *Dendrocalamus hamiltonii* and *Dendrocalamus asper*. A number of small and medium sized demonstration structures have already been constructed in the last few years. These have shown very good performance in different climates. To extend this, awareness and confidence building amongst professionals and householders is required. This calls for organized actions on prototyping, demonstration and standardization aimed at improving acceptance levels and promoting appropriate construction practices.

#### **Distribution of Species**

Clump-forming bamboos are 67.3% of the total growing stock. *Dendrocalamus strictus* comprise 45%, *Bambusa bambos* 13% *D.hamiltonii* 7%, *B.tulda* 5%, *B.pallida* 4% and all other species 6% of the total growing stock. *Melcocanna bambusoides*, the non-clump forming bamboo, accounts for 20% and is found mostly in North Eastern states. Two species of *Phyllostachys* are the other non-clump forming bamboos of India. *Dendrocalamus strictus* is the most widely distributed occurring in about eleven states and *B.bambos* is distributed widely in moist deciduous forests. *Arundinaria* and *Chimonobambusa* are two genera found in high altitudes in the hills of Western ghats and outer Himalayas. *Ochlandra travancorica* in Kerala, *Oxytenanathra sp.* in coastal Karnataka, Goa and Maharashtra are the other commercially important species. A total of 135 species are reported in India.

#### **Harvests and Yields**

The total growing stock as assessed in the forest areas by the Forest Survey of India is 80.42 million tonnes. The share of clump forming bamboos is 67.3%. The average growing stock is nearly 10 tonnes per ha. Being tall and larger in diameter, a *Bambusa bambos* has higher growing stock per unit

area and higher yield. There are moist valleys which contain over 100 clumps of this species per ha and the total green weight of each clump is in excess of one tonne. The estimated annual harvest from recorded sources is 4.5 million tonne, about 5.9% of the growing stock. There are removals from unrecorded sources estimated at half the quantity of removals by recorded sources. The current yield of about 0.5 tonne per ha is too low due to improper management.

Bamboos receive protection only in national parks and core zones of wildlife sanctuaries. Out of 70 national parks and sanctuaries covering about 34,700 sq. kms, 31 protected areas covering 13,400 Sq.kms contain bamboos. There is good protection for them in national parks and sanctuaries, though some fire and damage by wildlife is natural. There are 417 wildlife sanctuaries in India covering about 1,09,500 sq.kms. Approximately 50% of this area is bamboo forest and the core areas get legal protection. The total area receiving protection comes to about 4% of geographical area i.e. about 20% of the forest area. These protected areas should be of immense value for future conservation of bamboos in terms of bamboo biodiversity.

#### **Utilization**

**Non-Industrial uses:-** Bamboos occupy pride of place in the life of villagers in India literally from "cradle to coffin". They are a readily available material for fencing of agricultural lands, compounds and homesteads. Different kinds to protect fields from cattle are in use. Thorny bamboos, cut together with their long branches and twigs, are carefully laid along boundaries, or the culms are split and woven or tied to bamboo posts in different shapes and styles to make effective fencing. Bamboos are used for making agricultural implements like tool handles, ladders, etc. Whole or split bamboos are used as posts, beams, rafters and scaffolding in housing. Bamboo splits or slivers are woven into baskets and used for grain silos, walling, partitions, ceiling, bridges and railings. They are used to make hand-fans, spears, bows, arrows, core of incense sticks, umbrellas, kites, toys and a

large number of handicraft items. Woven bamboo, in different shapes and forms, is put to extensive use in sericulture. It is employed in fishing, cages for poultry, packaging, transport and drying of grains, fruits and seeds. Flutes and other musical instruments made from bamboos are quite common in India. Hindus carry their dead for cremation on a bamboo bier. Soil and water conservation efforts also find bamboo a useful ally..

**Industrial uses:** - The bulk use of bamboo in industry is for the manufacture of paper pulp and rayon-grade pulp. Slivers of bamboo are woven into mats for use in the manufacture of bamboo mat boards. The woven bamboo is also employed as dunnage in storage of food grains, and drying of grains, sugar etc. in rice and sugar mills. Mat boards, strip boards, corrugated roofing sheets etc are increasingly being manufactured for use in housing and joinery.

#### **Significance of Bamboo as a Resource**

- There are 1250 known species of bamboo, with 1500 possible uses.
- 2.5 billion people worldwide use bamboo, of which 1 billion people use it for housing
- Trade in bamboo generates US \$ 4.5 billion.
- Bamboo provides livelihoods and ecological and food security as well as eco-friendly products.

#### **Bamboo Resources Development**

- Inventory of resource
- Development of plant propagation facility
- Development and conservation of resources
- Capacity building and technology transfer
- Research and Extension
- Institutional development
- Policy intervention
- Funding

#### **Bamboo as Building Material**

- Civil Eng. material for construction of houses as per BIS/ISI

specification for building code, CPWD/PWD designs

- Extraction and preservation of bamboo
- Display of engineering materials.
- Preservation techniques standardized
- Improved design of houses to be adopted, encouraged and promoted

#### **Bamboo marketing**

- To fill critical gaps and forge linkages
- To organize markets for farm bamboos
- To standardize CFCs of varying models
- To form an agency for feedback and information about markets
- Develop proactive market strategies for market penetration, identify value chain, costing and pricing, development of marketing alternatives
- Review of sales and distribution practices
- Scope of value addition

#### **Bamboo Handicrafts - Proposed Interventions - New/ Innovative uses of Bamboo**

- Industrial Products like Bamboo Ply, Bamboo Corrugated Sheets, Bamboo Tiles, Other Laminated Bamboo Products, Paper pulp etc.
- Food Products like Bamboo Shoots, Bamboo Beer, Charcoal, etc.
- Bamboo Based Power generating units

#### **Employment Generation**

**General:-**There is great scope to increase productivity from existing bamboo forests by regular silvi-cultural practices, such as water conservation, soil working and maintenance of health and hygiene of clumps. There is potential to raise bamboo plantations as a business venture in forests and farms. It is unfortunate that bamboo production has not received adequate attention either in the forestry or the farm sector, in spite of increasing shortages in its availability. Most processing activities can employ a semi-

skilled rural labor force. The Union government has embarked on two National Bamboo Missions with the object of increasing bamboo production and encouraging their utilization. The National Bamboo Mission in the 11th Five year plan has a target of raising 80,000 Ha of bamboo plantations each in forest and non-forest areas.

**Workforce for silvi-culture:-** The process of thinning existing clumps, soil working and water conservation measures requirement at 10 man days per hectare totals 75 million workdays. The required investment will become economically acceptable, since it leads to a two-fold increase in bamboo output and improvement in the quality of harvested culms.

**Bamboo plantations:** - Hardly 50,000 ha per annum of bamboo plantations are established while there is a need and potential for about two million to be planted in eight years. The combined annual bamboo plantation targets in farm and forestry sectors for all states should aim at 2, 50 000 ha per annum. Raising one hectare of bamboo plantation, including nursery seedlings, generates about 120 workdays. Plantation maintenance from the second to fifth year takes about 40 workdays. Thus, every hectare of bamboo plantation generates about 160 workdays, and so 2, 50 000 ha of plantation raised annually can create 40 million man-days of rural employment over five years.

**Bamboo harvesting:** - Bamboo is harvested by (a) tribals, (b) landless rural labor, (c) marginal farmers during lean agricultural seasons and (d) migratory, landless forest laborers. This workforce constitutes the lowest income groups in rural India. The entire operation of cleaning the branches around the clumps, cutting intertwining branches, cutting the culm, dragging the culm free of the clump, cutting the branches flush to the culm, smoothening at the nodes, etc. are all done manually with a bill-hook, before sorting and stacking the culms. An average of 8-10 workdays is needed to harvest one tonne of bamboo. In India, on an average, six million tonnes of

bamboo are harvested for commercial use, which means that 60 million workdays are generated by commercial harvesting. The remaining four million tonnes are harvested by users during their spare time, either for their own use or for conversion into saleable products.

**Transport and handling:** - Loading, unloading, stacking and handling generate downstream employment after harvest. Five workdays per tonne are generated by this kind of work. Thus the employment generation for six million tonnes comes to 30 million workdays.

**Weaving into usable products:-** There are several thousand families all over India whose children learn the art of splitting, taking out slivers or strips and weaving them into mats and baskets or fans as traditional means of livelihood. Most tribals and landless laborers know the art of weaving and use it to supplement their income by making saleable products. Bamboos brought from nearby forest areas or the local market are stored in water, split and slivered using a sharp knife. The slivers themselves, or bamboo splits and slivers together, are used for weaving into finished products. There are large seasonal demands for certain items like fruit baskets and sericulture trays. The slivers or splits are not treated and the life of these products depends on usage and method of storage. One weaver can split, clean, sliver and weave an average of three bamboos per day. On the basis of an average of 120 bamboos per tonne, 80 workdays are required for processing one tonne of bamboo. Considering that an average of three million tonnes of bamboo are used for weaving and other forms of end-use, the employment generation in bamboo processing is roughly 240 million man-days engaged in part-time bamboo processing account for an equal number of workdays for putting bamboos to housing, fencing, domestic and agricultural uses.

**Industrial labor:** - Two major industrial uses are the manufacture of pulp and mat boards. The installed capacity of all pulp mills is approximately 4.0 million tonnes. The average utilization of bamboos in pulp making is 33.5%, the other raw materials

being wood, recycled waste paper, rags, kenaf, grass and straw. Pulp mills account for about seven million workdays. The share of bamboos (at 33.5% utilization) is 2.33 million workdays. There are six factories engaged in the manufacture of bamboo mat boards. Other panel wood industrial units also manufacture bamboo mat boards. The total average consumption of bamboos for mat boards is about 100,000 tonnes. At an average of fifty workdays per tonne of bamboo, the annual employment potential of the industry is five million workdays (downstream workforce requirement for marketing of boards, support services, etc. are not taken into account here).

**Cottage industries:** - Bamboos are used in the manufacture of incense sticks, and for sericulture, handicrafts, etc. Being labor-intensive the employment potential of these industries is high. About 600 workdays are required per tonne of bamboo in the primary processing. The average consumption of bamboos in the incense stick industry is 15000 tonnes per annum, and another 25000 tonnes goes for other cottage industrial uses. The employment potential is 24.0 million workdays. Although there is good scope for bamboos in furniture, nothing much is done so far in this direction. The potential is large because of the scarcity in rattan supply and the high cost of wood.

## 1. Summary of Employment Potential of Bamboo

Use	Quantity (Per annum)	mandays (million)
Silviculture	25000 ha	75.00
Bamboo plantations	6 million tonnes	40.00
Harvesting	6 million tonnes	100.00
Transport/storage/handling	6 million tonnes	30.00
Weaving into products	3 million tonnes	240.00
Industrial labour	3.3 million tones	7.33
Cottage industries	40 000 tonnes	24.0
<b>Total</b>		<b>516.33</b> <b>i.e. 516 million man-days</b>

In terms of income generation, at an average wage of US \$ 2 per day, the annual wage bill will come to US\$ 1,032 million per annum.

### Scope for Bamboo Plantations

Bamboo plantations are easy to establish. Saleable culms can be produced in 4-7 years depending on species, inputs and after care. The plantations can be annually harvested by carefully cutting culms of the previous year. Bamboo plantations can be economically viable, if proper species and technology are adopted. Many species can co-exist with important tree species like Teak, Rosewood, Laurel, Gumkino, Benteak, Yellow teak etc. (Teak-Tectona grandis, Rosewood-Dalbergia latifolia, Laurel-Terminalia tomentosa, Gumkino - Pterocarpus marsupium, Benteak-Lagestroemia lanceolata, Yellow teak- Adina cordifolia). Many state forest departments have raised bamboo plantations. Andhra

Pradesh Forest Development Corporation raised large blocks of bamboo plantations successfully and derived good revenues. It is regrettable that bamboos have not been given due importance by forest departments and forest development corporations. Developers of Teak can use bamboo as an intercrop with Teak.

### Conclusion

If enough emphasis is given to Bamboo Resource Development, we can help the below-poverty-line families in rural communities. Bamboo and bamboo-based secondary product trading is a profitable business in rural regions and a potential sector of employment generation. Bamboo is used extensively by local communities

and plays an important role in subsistence strategies for many rural populations. Bamboo enterprises are continuously sustaining the national economy through providing employment opportunities for rural people, including raw material collection, processing and marketing. The analysis reported here indicates that small-scale bamboo-based enterprises could be developed more widely throughout the rural areas for socioeconomic development.

Natural bamboo stocks must be utilized on a sustainable basis. Their cultivation on encroached forest land and revenue land should be expanded. Government and NGOs can work with enterprises by encouraging them to manufacture secondary products and promote them in urban markets. The present loan approval procedure, conditions and interest rates also need to be revised and made more flexible to support entrepreneurs.

The forest administration can play a vital role in improving existing growing stock and yields and expanding the area under bamboo by planting higher yielding commercially important species. Establishment of good germ-plasm banks and multiplication facilities of elite stocks for use both in forests and farms can augment supplies to increase the uses of bamboo. Better management, harvesting, grading and preservative practices can lead to higher returns. Bamboo can play a major role in

increasing employment potential and improving the rural economy.

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