



ISSN 2278 – 0211 (Online)

Bamboo and Its Connectivity to the Different Fields of Economics: A Potential Resource of Modern India

Visarg Mishra

Master Degree Student, Pt. Shambhu Nath Shukla,
Post Graduation Government Autonomous College, Shahdol, M.P., India

Abstract:

Bamboo is a very important forest product that is highly relevant as a livelihood option for forest-dependent people in India. This research paper will quantify the resource and make an objective assessment of bamboo, its contribution towards poverty alleviation and generating subsistence income for the rural poor. Employment generation from bamboo growing and its processing makes a significant contribution to people's incomes. The wide gap that exists between the demand and supply of bamboo owing to the growing National and International market identifies the huge opportunity available for development of bamboo resources both on public and private land and consequential improvement in the economic condition of the bamboo-dependent people. Use of Bamboo as resource can help the economy on many levels. On one hand it will create resource; also it will reduce the depletion of non-renewable resources.

It will contribute to Micro Economics, Macro Economics, Environment and Ecological Economics and Resource Economics.

Keywords: Bamboo, bio char, dendrocalamus strictus, shahdol, basod, nistri, CFC (Common Facility Centre).

1. Introduction

From time immemorial, bamboo has played a vital role in the lifestyle of rural Communities. Bamboo is an important Non Timber Forest Product (NTFP), which grows across the country. It is one of the fastest growing plant species, which occurs in the wide variety of climatic and edaphic conditions. It is an extremely versatile, strong, renewable and environment friendly plant species. It can be grown easily and quickly and substantially harvested in 3 to 5 years cycle. It grows on marginal and degraded lands, elevated grounds, around field bunds and river banks. It adapts to the most climatic conditions and soil types and acts as a stabilizer. It is an ancient medical plant, a food source, and is a critical element of the economy, intricately involved in arts and culture. It is an excellent alternative to wood and has the potential of being an effective carbon sink thus helping in countering the emission of green house gas, global warming, and climatic change.

India, China and Myanmar have around 20 million hectares of bamboo reserves which is nearly 80% of the World's bamboo forests; of this India's share is nearly 45%. India is second to China in bamboo resources with about 24 genera and 134 species. Bamboo forests occupy the area of nearly 15,000 sq km in Madhya Pradesh (M.P) and Chhattisgarh, which is second largest bamboo growing area in the country.

2. Objective of Study

- To promote the growth of the bamboo sector through an area based regionally differentiated strategy.
- To increase the coverage of area under bamboo in potential areas with suitable species to enhance yield.
- To promote marketing of bamboo and bamboo based handicrafts.
- To generate employment opportunities for skilled and un skilled persons, especially unemployed youths.
- To study the age groups, literacy rate of the labors involved in the bamboo cottage industry in Madhya Pradesh.

3. Role of Bamboo in Different Areas of Economics

The many characteristics of bamboo make it an enduring, versatile and highly renewable resource. Bamboo has more than 1,500 documented uses, ranging from fuel wood to light bulbs, medicine, poison and toys to aircraft manufacturing. Over 1,000 million people live in houses made of bamboo or with bamboo as the key structural, cladding or roofing element.

3.1. Bamboo and Environment Economics

- Biological characteristics of bamboo 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.
- 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.
- Bamboo grows very fast and has a short growth cycle. Bamboo not only grows much faster than wood, it also needs relatively little water. It is the fastest growing canopy, growing three times faster than most eucalyptus species. Commercially important species usually mature in four to five years (versus 10 to 25 years for most soft woods). Annual harvests are subsequently possible.
- 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.

3.2. Bamboo and Resource Economics

- Bamboo is one of the world's best natural engineering materials. Due to its high tensile strength, it is an essential structural material in earthquake architecture and is one of the strongest building materials. Its strength-to-weight ratio is better than that of teak wood and mild steel. Bamboo's tensile strength is 28,000 lb per square inch versus 23,000 for mild steel. This makes bamboo wood a potential alternative, at least in some applications, to steel which requires more energy for manufacturing/production. Its strength and flexibility make it a viable material for building shelters that offer protection against hurricanes and earthquakes. Bamboo based pre-fabricated houses also can be constructed quickly with new and emerging techniques and is thus an important post-disaster relief material. It is extensively being used in Tsunami rehabilitation in India. Bamboo reinforcement in concrete piles is used by the Indian Railways.
- 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 furniture and building materials industries.
- 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.
- 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).

3.3. Bamboo and Energy Economics

- 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.
- Bamboo is foremost in biomass production, with up to 40 tonnes per hectare per year in term 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.
- For any Industry setup, energy as resource is a major issue. We do not need to raise separate bamboo plantations to setup bio-energy industry in Madhya Pradesh. The state has sufficient amount of biomass, woody waste material and bamboo biomass. The bio-energy from bamboo waste from other industries can give self sustainability in the bio-energy sector and in the production of Electricity which is the major hurdle for any industry.
- Bamboo charcoal is made up of waste pieces of bamboo and burned inside an oven at temperatures over 120°C. It benefits environmental protection by reducing pollutant residue. It is an environmentally functional material that has excellent absorption properties. Bamboo charcoal can replace burning of wood as household fuel saving thousands of acres of forest and reducing pollution level substantially, since it burns without smoke. These industries give Bio Charas a byproduct, which is an excellent fertilizer for Agriculture. Bamboo Charcoal, bamboo biofuel, bamboo pyrolysis, bamboo firewood, bamboo gasification plant, bamboo briquettes, bamboo pellets etc.

4. Bamboo Industries in Madhya Pradesh: A Business Model

4.1. Brief data on Bamboo of Madhya Pradesh

1. Madhya Pradesh is located in the geographic heart of India, between latitude 21.2°N-26.87°N and longitude 74°02'-82°49' E.
2. Madhya Pradesh has a subtropical climate. The average rainfall is about 1,370 mm (53.9 in).

3. Madhya Pradesh (MP) is the second largest state of the country with 3,08,252sq km geographical area and 94,689 (36,560 sq mi) sq km forest area.
4. The "Reserved Forest" are (65.3%), "Protected Forest" are (32.84%) and "Unclassified Forest" (0.18%). Per capita forest area is 2,400 m² (0.59 acre) as against the national average of 700 m² (0.17 acre).
5. India holds the second place in the world with 134 species of bamboo belonging to 24 genera, next only to China (Tewari, 1994).
6. Madhya Pradesh has 20.3% of the area and 12% of the growing stock (Rai S N, 1998).
7. In Madhya Pradesh there are two main consumers of bamboo, namely, basod and nistari. Basods are the people belonging to community of bamboo craftsmen who are traditionally dependent on bamboo for their livelihood. The nistaris use bamboo for house repair and crop harvesting and other domestic uses. The Government of Madhya Pradesh has a policy to meet their demand for bamboo.
8. Bambusa vulgaris, Bambusabambos, DendrocalamusStrictus, D.Stocksii and Polymorpha are the main species of MP, known to be fast growing on better site conditions, can also be raised in the agro forestry and farm forestry sector.
9. Common Facility Centre: MP Govt has set up 12 CFCs across the state for the development of the sector in various districts. The following are the list of Common Facility centre:Balaghat – (North Division), Chhatarpur, Guna, Harda, Mandla – (West Division), Narsinghpur, Panna– (North Division), Satna, Seoni – (North Division), Shahdol, Sidhi – (East Division), Sidhi – (West Division)

The bamboo production figures for last 25 years show a variation from 24,554 tonne to 1, 93,771 tonne for commercial bamboo. 87,206 tonne to 3,46,668 tonne for industrial bamboo and 1, 13,167 tonne to 4, 00,621 tonne for total bamboo.

4.2. Estimated Market size

The current expected size of the market for some of the bamboo products are estimated as follows:

US \$ 10 Billion (approximately Rs. 50,000 cr.)

Product/Application	Current Market (Rs)	Expected market (Rs)
Bamboo as wood substitute	10,000 crores (import value)	30,000 crores (in next 20 years)
Bamboo Ply board	200 crores	500 crores
Bamboo Ply board for use	1000 crores	3408 crores (in 2015)
Bamboo flooring	100 crores (Domestic) 100 crores (Export)	1950 crores (2015)
Bamboo furniture	380 crores	3265 crores (2015)

Table 1

Scaffolding	-	861 crores (2015)
Housing	-	1163 crores (2015)
Roads	-	274 Crores

Table 2: Building and construction Material

4.2.1. Bamboo in Farming Products Industry

Bamboo farming is typically a very environmentally responsible, renewable and sustainable practice. Madhya Pradesh is the 2nd bamboo grower and resources of bamboo. However, like anywhere else, it depends on the individual circumstances, people and factories that are producing the goods. *Environmentally Responsible, Water Conserving, Renewable and Sustainable Resource, and Biodegradable*. Bamboo Baskets, bamboo fencing, bamboo greenhouses, bamboo fish traps, bamboo animal fodder, bamboo containers, bamboo water pipes, bamboo waterwheels, baskets for silk worm rearing.

4.2.2. Bamboo in Building Industry

Housing shortages in the world are mainly in the South eastern and tropical part of the world. The distribution of Bamboo belts of the world closely corresponds to the areas with the Housing shortages or quality housing shortages. One fifth of the world population even today lives in Bamboo houses. Once the quality of housing of these are improved, the popularity of Bamboo houses will increase and consequently more and more people, authorities and countries will adopt them. This will bring livelihood security, solve housing problems, and combat global warming all at the same time.

Bamboo and its usage are not new to India. For centuries, people and communities have used this resource in practical and sustainable ways. The country therefore possesses the advantages of a legacy of traditional skill and knowledge, an extremely valuable resource that can be built upon to utilize bamboo in newer and innovative modes. Bamboo is currently in the process of being 'rediscovered' in India, and its attributes and potential increasingly recognized and widespread is that bamboo can be an important vehicle for sustainable and widespread development, augmenting underdeveloped areas.

Madhya Pradesh with its vast bamboo resources and BPL population can use this resource for solving its housing problem by using Bamboo in various housing schemes like Indira Awas Yojna etc. Other sectors where it could be used are: Forest dept buildings, Tourism sector, Community facilities like schools, community halls, CFCs etc. Taking a conservative growth rate of 15 per cent annum, the total market for bamboo housing would be Rs 1163 crore in the year 2015. Bamboo House, bamboo bridges, bamboo

prefab structures, bamboo furniture, bamboo blinds, bamboo doors and window frames, bamboo bathtubs, bamboo screens, bamboo roads.

Bamboo is known to be one of the greenest building materials available today because of its following properties:

- Grows 3 times as fast & can be harvested times as often as eucalyptus yield 6 times more cellulose than fast growing trees found extensively in natural forests, suitable for a forestation of degraded lands and soil stabilization.
- 2.5 Billion People worldwide use Bamboo.
- Billion People live in Bamboo houses.
- Low Energy Architecture -- A bamboo house requires 1/7th amount of energy to build compared to a brick, cement and steel house. And hence is that many times more sustainable. (Author's sb05 paper)
- Have a very high MOE 9000-10000 n/mm² is thus very strong.
- Bamboo in panel form is well suited to substitute wood.
- Bamboo houses are much healthier to live than a house built with highly processed materials.
- Indian bamboo sector generates about 432 million workdays annually.

4.2.3. Bamboo in Wood Industry

The BMB Bamboo Mat Board and other value addition technologies are suitable for the production of eco-friendly alternative panel products to substitute for wood and ply industries and help conserve forest resources. The technology can serve as a basis for economic development in rural areas. It is 27 per cent harder than oak, 13 per cent than maple and 50 per cent more stable than common wood. These are one of the top rated exportable products of bamboo. The unit will also create employment opportunities for unskilled, semi-skilled and technically trained personnel who can be recruited locally. Particle Board, medium density fiberboard (MDF), bamboo mat board, bamboo mat corrugated roofing sheets, bamboo flooring, bamboo veneer, bamboo laminates, bamboo poles, bamboo lumber, bamboo beams, bamboo ply bamboo, and bamboo glulam.

4.2.4. Bamboo in Textile Industry

Bamboo makes a wonderful clothing material. It has unusual breathing capabilities due to its hollow fiber. The fiber is filled with micro gaps and micro holes, which allow for better moisture absorption and ventilation than other fibers. Bamboo cloth is better than cotton. Bamboo Textile has the properties of giving Comfort, Antibacterial, Thermal Regulating, Superior Wicking Capability, Hypoallergenic, Wrinkle Resistant, Colorfast, Easy Care and Energy Efficient. Bamboo textile offers a better alternative to cotton products for hotels and spas, since they resist bacteria-causing odors. Bamboo textile gives additional savings to commercial users through eliminating cost by not needing to wash as often. The use of bamboo textile will also contribute energy, water and labor savings.

4.2.5. Bamboo in Weaving Industry

Bamboo handicrafts industry is majorly dependent on the bamboo weaving industry. Our Bamboo artisans are one of the best in the world. Bamboo weaving products can be supplied to many other industries related to bamboo such as bamboo handicrafts, bamboo mat board, bamboo mat corrugated sheets and other big manufacturing industries.

Bamboo handicrafts with its unique traditions also open up new possibilities in 'design expression' with woven forms. India has 13 million Bamboo Craft person all over the country with ranging skills. Most of the craftsman earn very little from the practice of craft, often abandoning the profession. There is vast scope of 'reposition' Bamboo craft by 'design' to each urban and export markets by increasing the earnings of village craft persons. Products like Bamboo Caskets, Bamboo packaging, Light fixtures, Furniture, Decorative products, Bags etc.

5. Research Methodology

The study was carried out in Shahdol District under the Division of Shahdol, (Madhya Pradesh). This district consists of various villages among which three unions of the three villages were selected for the study. These were Gohparu, Jaisinghnagar and Beohari. Unions of these villages, there were 80 families involved in bamboo-based industry. Among these families, 22 were selected randomly for survey with the help of a semi-structured questionnaire.

6. Results and Discussion

6.1. Demographic Feature of the Study Area

The total population of the surveyed households was 129 of which 55 per cent were female and rest were male. Among the population, 34 per cent of the members were within the age group of 21-30 years (Table 2).

Table 2 shows that 64 per cent of the members were directly engaged in the bamboo based cottage industry. Rest of the villagers were mostly agricultural or casual laborers or engaged in other services. Of the former, 66 per cent were female and rest were male. The age was found much variable. It was found that 46 per cent of the members entered into this industry at an age ranging from 11-30 years and 10 percent entered into the industry at their childhood (<10 year age) (Table2). The probable reason for this early entry into the industry is poverty coupled with illiteracy (Table 3)

Sex	Age (year) Group						
	<10	11 – 20	21 – 30	31 – 40	41 - 50	51 – 60	>60
Male N = 58 (45)*	10	11	15	9	5	6	2
Female N = 71 (55)*	8	10	19	14	8	7	5
Total N = 129	18 (14)	21 (16)	34 (26)	24 (19)	13 (10)	12 (9)	7 (5)

Table 2: Family sizes of the households in the study are
*Figures in the parentheses indicate percentage value

Sex	Age (year) Group						
	<10	11 – 20	21 – 30	31 – 40	41 - 50	51 – 60	>60
Male N = 28 (34)*	3	10	8	5	-	1	1
Female N = 55 (66)*	7	11	17	12	5	3	-
Total N = 83	10 (12)	21 (25)	25 (30)	17 (20)	5 (6)	4 (5)	1 (1)

Table 3: Distribution of family members in the study area, engaged in bamboo-based cottage industry by age of entry into industry.
*Figures in the parentheses indicate percentage value

Level of Education	Number	Percentage
Illiterate	54	65
Primary	17	20
Secondary	9	11
Higher Secondary	2	2
Graduate	1	1
Total	83	100

Table 4: Educational status of family members involved in bamboo-based cottage industry in the study area

from small enterprise surveys in six countries in southern and eastern Africa indicate that an estimated 408,000 forest product enterprise activities provide employment for 763,000 persons at an average rate of 16 persons per thousand in the population (Arnold et al., 1994). In the present study also it was found that bamboo-based cottage industries provided employment opportunity for all age groups of people in India. About 77 percent of the households had holdings less than 20 cents. Thus the early entry into the industry could also be attributed to the lack of alternative jobs and poverty. About 73 percent of the respondents engaged in bamboo works in Shahdol region were illiterate. About 93 percent illiteracy in the same region within bamboo-based cottage industry.

7. Conclusion

One hectare of bamboo plantation can produce 200 man days of employment and 900 man days in cottage industry with the raw material from this plantation (Lakshman, 1999). From the total area 108,306 hectare plantation, 21.6 million man days equivalent to Rs. 1,080 million wage earning has already been generated. If corresponding cottage industry can develop, these plantations can generate 97.2 million man days equal to Rs.4,860 million wages earning in the cottage industry sector annually. Harvesting of bamboo from natural forests generate every year 2.25 million man days equal to Rs.112.5 million wage earning. This amply proves the importance of Bamboo not only as a produce to meet the demand of the consumers but also as a production process to provide employment opportunities to the impoverished rural poor. Hence, bamboo can be a great resource and help our economy on many levels.

8. References

1. Role of bamboo-based cottage industry in economic upliftment of rural poor of Chittagong, Bangladesh Mohammed Alamgirrr M. Mezbahuddin and M. Jashimuddin.
2. Arnold, J.E.M. 1994. Non-farm employment in small-scale forest – based enterprises: policy and environmental issues. Working Paper No.11, E PAT/MUCIA Research and Training. Madison, University of Wisconsin.
3. Arnold, J .E.M.,Liedholm, C ., Mead, D. and Townson, I .M. 1994. Structure and growth of small enterprises using forest products in southern and eastern Africa. OFI Occasional Papers No 47. Oxford, Oxford Forestry Institute.
4. Liedholm, C. and Mead, D. C. 1993. The structure and growth of micro enterprises in southern and eastern Africa. GEMINI Working Paper No. 36. Bethesda, Maryland, USA, Growth and Equity through Micro enterprise Investments and Institutions (GEMINI) Project.
5. National Sample Survey Office, (NSSO), India, 2011.
6. Wikipedia.
7. Anonymous, Bamboo Industry for Madhya Pradesh, India.
8. Industrialization of the Bamboo sector Arnab Hazra.
9. Bamboo : Its Distribution, Production, Habitat and Agro Forestry Potential, V. Nath, rajat S. Pal and S.K Banarjee. (Tropical Forest Institute, Jabalpur).