

**THE BAMBOO INDUSTRY IN INDIA  
SUPPLY CHAIN STRUCTURE, CHALLENGES AND  
RECOMMENDATIONS**



**By**

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## Table of Contents

Acknowledgements.....	3
Abstract.....	4
Introduction .....	5
The Bamboo Industry.....	6
Definition of the Bamboo Industry .....	6
The Supply Side: Bamboo Resources of India .....	7
The Demand Side .....	9
Qualities and Applications of the Bamboo Plant .....	9
Product Diversity.....	11
The Potential for the Bamboo Industry in India .....	12
The Bamboo Industry: Processing and value Chains .....	16
The Bamboo Processing Chain.....	16
The Bamboo value Chain .....	18
The Generalised Indian value Chain.....	18
The Informal value Chain .....	22
The Import value Chain.....	23
Challenges In The value Chain .....	24
Challenges in the Production System .....	25
Challenges in the Transformation System .....	27
Challenges in the Consumption System.....	28
Proposals for the Bamboo Sector .....	30
The Bamboo Industry in China: An Instructive Study and Key Takeaways.....	30
Proposals for the Bamboo Sector .....	33
Proposals by Section of the value Chain .....	35
Proposals by Implementing Agency.....	40
Study of the Impacts of the Above Policy Framework on Incentives of Stakeholders in the value Chain .....	43
Conclusions and Directions for the Future .....	45
References .....	46

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## **Abstract**

This paper attempts to assess the commercial potential for Bamboo products in India, based upon a compilation of secondary review of data and personal communications with various stakeholders involved. It also attempts to present an account of the value chain for Bamboo products in India, and presents the challenges in the sector within the framework of the Production-to-Consumption System. It is discovered that Bamboo products possess a large potential domestic market base; further, an even larger export market currently dominated by China exists, which may be tapped through industrialisation of the sector. A wide multitude of challenges exist at each stage in the Production-to-Consumption System, many of them being legislative and regulatory in nature, while many others relate to improper and insufficient implementation of existing programmes. A framework of proposals is laid out in the paper for taking care of each challenge individually, and also identifying the competent authority to deal with the issue.

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## Introduction

Being one of India's most valuable resources<sup>1</sup> and given the vast diversity in its applicability<sup>2</sup> and the enormous scope for improvement of rural and tribal livelihoods<sup>3</sup> and for the environment<sup>4</sup>, Bamboo is among the most important resources to be leveraged towards the alleviation of rural poverty, empowerment of women and environmental rejuvenation. Marsh and Smith (2007) claim that the presence of near-source value addition in modern value chains implies that the industrial component of the Bamboo sector has an excellent potential in terms of its pro-poor impact in poverty alleviation. The industrialisation of the Bamboo sector is, thus, an essential task for Bamboo to have any true effect on the lives of the millions who depend upon it.

The domestic Bamboo industry has been held back owing to a wide variety of issues in its value chains, including regulatory and legislative barriers to cultivation and harvesting of Bamboo, challenges in its procurement, lack of technical know-how among the primary users of Bamboo, lack of market linkages and insufficient market demand. As a result, Bamboo in India remains a material for personal usage in homes; the only products produced industrially are produced by small firms lacking in sufficient capital to pursue value addition or quality enhancement. The study of the Bamboo industry is woefully deficient in India, as is any data on Bamboo trade and commerce in general. The association of Bamboo with livelihood promotion remains confined to handicrafts promotion (A U Khan<sup>5</sup>, personal communication), as a result of which even government programmes fail to appreciate its industrial potential. In addition, archaic and confusing regulatory regimes as well as conflicting legislation prevent Bamboo from reaching its true potential.

Within the situation as described, this paper attempts to answer the following questions:

1. What is the commercial potential for Bamboo-based industries in India?
2. What is the structure of the value chain for Bamboo-based products in India, and what are the challenges in the same?
3. What is the cost structure involved in utilising imported Bamboo for industrial products?
4. What regulatory reforms may be proposed to make domestic Bamboo more competitive?

This paper initially provides an assessment of the potential of the Bamboo industry (defined herein as the set of all enterprises engaged in value addition to Bamboo poles) on the basis of extensive secondary research and personal interviews with stakeholders including industry heads, officials in the Ministry of Environment and Forests, and traders. It then attempts to describe the structure of the value Chain for Bamboo products made of domestically sourced and imported Bamboo, and discusses the challenges within the value chain. The Paper concludes with proposing a framework of regulatory reforms, be they legislative or implementation related, for developing an industrialised Bamboo sector in India, drawing upon lessons from China, a success story in the Bamboo industry, as well as from other literature on policies adopted abroad.

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<sup>1</sup> India has the World's second largest Bamboo resource and the largest area under bamboo plants, with 136 species, 23 genera covering 13.96 million hectares (FSI, 2011).

<sup>2</sup> Bamboo has over 1,500 documented uses (Khan et al, 2007)

<sup>3</sup> According to the Planning Commission's 10<sup>th</sup> plan document, an estimated 8.6 million Indians depend upon Bamboo for their livelihoods already.

<sup>4</sup> Refer to the section on properties of Bamboo for an assessment of the environmental benefits of Bamboo plantation, utilising Bamboo in industrial applications and as a timber replacements

<sup>5</sup> Amir Ullah Khan is an Economist with the India Development Fund, which collaborated with CII to bring out a comprehensive report on the industrialization of the Bamboo sector in India. See Khan et al., 2007.

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# The Bamboo Industry

## Definition of the Bamboo Industry

For the purpose of this paper, an industry is defined as the aggregate of manufacturing or technically productive enterprises working in a specific field<sup>6</sup>. The Bamboo industry, for the purpose of this study, is defined as the set of all firms engaged in the addition of value to Bamboo through production of High value Products. As a result, the scope of the industry in terms of Product diversity can be classified into the following sub-sectors<sup>7</sup>:

1. Handicrafts: Characterised by manual processing and high value addition to limited quantities of Bamboo
2. Bamboo Shoots: High value Agricultural food crops that can be grown in parallel with the production of Culms
3. Bamboo utilised in Construction purposes, including Bamboo utilised for traditional construction, Bahareque construction and in newer prefabricated housing.
4. Industrial Production<sup>8</sup>: This involves the mechanised and semi mechanised processing of larger volumes of culms, which offers among the largest opportunities for major growth and pro-poor impacts on rural farming communities. This sub-sector may be further subdivided into the following classes:
  - 1) Premium Processing, which includes industries involving high value products and requiring facilities for primary and secondary processing as well as higher levels of finishing. Includes Bamboo flooring, laminated furniture etc.
  - 2) Medium value processing, which requires less capital intensive processing than above. Includes chopsticks, mat boards, etc.
  - 3) Low value processing, for products involving greatly limited value addition to Bamboo culms, including Charcoal and Paper and pulp industries
  - 4) Unprocessed Culms, utilised in traditional applications such as Scaffolding and Traditional construction

For the purposes of the current study, 3 and 4 under Industrial Production are excluded from the definition of the Bamboo industry, due to the low scope for value addition to Bamboo. This includes the utilisation of Bamboo for Paper and pulp, Charcoal and Bamboo Scaffolding, despite these being extensive consumers of Bamboo in India (20% and 24% of Bamboo harvested are allocated respectively to the paper and pulp industries, and scaffolding, according to the National Bamboo Mission (NBM). )

This Section of the study deals with the potential for the industry within the following framework: it initially discusses the extent of India's Bamboo resources, and then goes on to discuss the qualities and applications of the Bamboo plant. This is followed up with a discussion of the domestic and export potential for Bamboo products.

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<sup>6</sup> Definition from Dictionary.com, available at <http://dictionary.reference.com/browse/industry>.

<sup>7</sup> The classification scheme is from Marsh and Smith, 2007.

<sup>8</sup> Premium Processing utilises the middle portion of large culms, typically the highest value part of the bamboo, while upper and residue parts (the mid-value parts) are utilised in lower quality applications. Modern value Chains can minimise wastage of Bamboo through this form of differentiation (Marsh and Smith, 2007). Due to the absence of Bamboo processing industries in India, Manufacturers usually process Bamboo themselves and waste the portions they do not require.

## The Supply Side: Bamboo Resources of India

The most recent, reliable data on the extent of India's bamboo resources can be obtained from the State of Forest Report, 2011, brought out by the Forest Survey of India. The following major points summarise the extent of Bamboo resources as estimated by the FSI.

1. Total area under Bamboo: 13.96 million Hectares (estimated) (up from 8.96 million Ha estimated in ISFR 2001)
2. Biodiversity: India is the second richest country in the world in terms of Bamboo genetic resources, after China. Indian Bamboo forests contain:
  - a. 23 genera; 19 indigenous
  - b. 136 species, with 125 indigenous and 11 exotic
3. More than 50% of the principal genera of Bamboo are found in Eastern India.
4. At the national level, the report estimates the existence of 23,297 million Bamboo culms, out of which the percentages of green sound, dry sound and decayed are respectively estimated as 79%, 16% and 5%.
5. The total Green Weight<sup>9</sup> at the national level is estimated to be 169 million Tonnes of which Green sound bamboos and Dry Sound Bamboos respectively contribute 73% and 27%.
6. Analysis of forest area according to bamboo density shows that Pure Bamboo brakes are found in less than 1% of the country. They are found most commonly in Mizoram (226 sq km). Dense Bamboos are found in 7% of the total area, and 8% is occupied by scattered bamboos. Dense bamboos are found mostly in Arunachal Pradesh (8681 sq km) followed by Mizoram (6116 sq km) and Manipur (5825 sq km).
7. Results indicate that the maximum number of green sound bamboos is found in Arunachal Pradesh (2666 million), followed by Assam (2046 million), Manipur (2035 million) and Mizoram (1953 million). The green sound weight is also maximum in Arunachal Pradesh (12. 4 million T), followed by Manipur, Mizoram and Karnataka.

These data indicate the following:

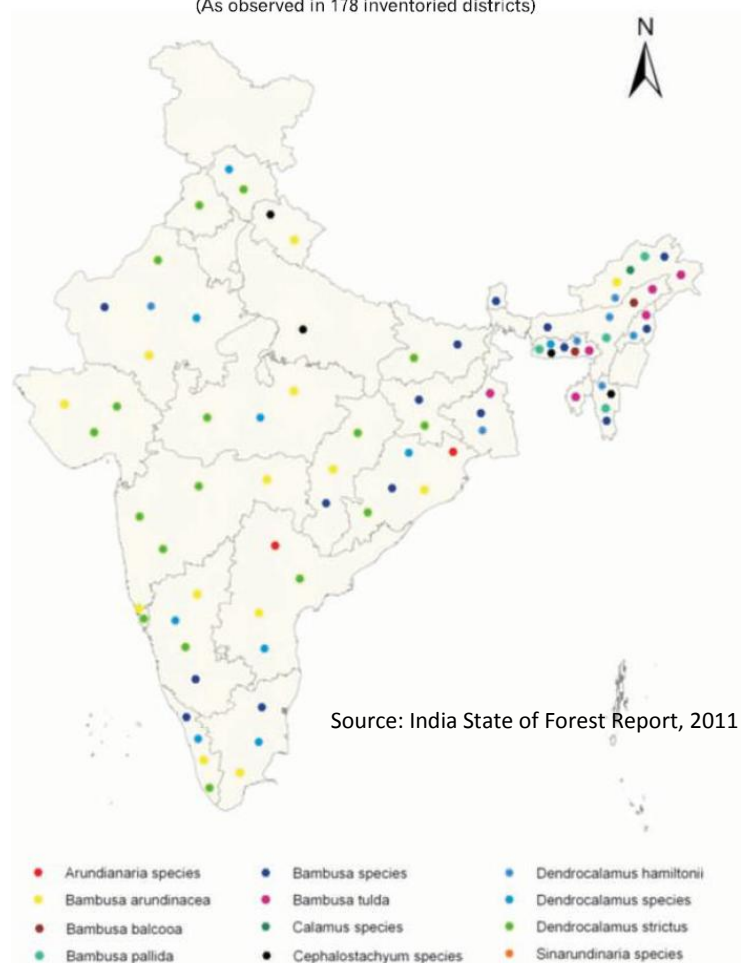
1. The extent of Bamboo resources, the second largest in the world, indicates the presence of a vast pool of untapped resources, due to regulation barring access to these forests resources<sup>10</sup>. It is estimated that only about 15.4% of the total Bamboo resources of India lie on private lands;

<sup>9</sup> Green Weight is defined as the weight of plant materials at the time of harvest (definition from NRCS glossary for the National Range and Pasture Handbook. Accessed on 21<sup>st</sup> July at [http://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/stelprdb1043074.pdf](http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1043074.pdf)).

<sup>10</sup> The regulatory constraints surrounding Bamboo are described in some more detail in the section on problems in the value Chain in Bamboo.

## Distribution of Bamboo species in India

(As observed in 178 inventoried districts)



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as a result, 84.6% of the resources are unavailable for utilisation in industrial purposes without excessive regulation getting in the way (FAO, 2005).

2. The large proportion of Green Bamboos in the total Green Weight of the country's Bamboo resources is indicative of the potential for utilisation in industry. Green bamboo culms are required for most industrial processing applications, as well as for artisans.
3. Over 39% of the total area under Bamboo is available in the North East Region, which is also the leader in availability of dense bamboo brakes, in green sound weight and number of green sound culms. This points towards the clear comparative advantage the region possesses towards leveraging Bamboo as a tool for development of local livelihoods, purely on the basis of ease of availability of raw materials. The fact that the NER is closer to the strong potential export markets of Bangladesh, Myanmar and Tibet adds to this advantage.<sup>11</sup>
4. The fact that Bamboo species are distributed across the country (refer diagram) reflects the enormous potential Bamboo has for the development of a pan-Indian industry based on local sourcing of raw materials, and towards the potential for the Bamboo sector to achieve near-source value addition. It also indicates the need for a uniform National Bamboo Policy Framework, towards promotion of Bamboo industries across State boundaries. The National Mission on Bamboo Applications (NMBA) documents 16 species of commercial importance and has compiled data on their availability and qualities, and it is found that they are widely dispersed across the country.
5. The extent of these Bamboo resources shows clearly that resources are available for a vibrant domestic industry in the same, and raises questions as to why firms nonetheless must import Bamboo for their products.<sup>12</sup> It is estimated that the quantity of Indian imports of Bamboo Poles in 2012 was approximately 6.1 Million kg, valued at US\$ 5.62 Million<sup>13</sup>.

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<sup>11</sup> The proximity to the East Asian nations is considered a great opportunity in the Tripura Bamboo Mission Documentation. See IL&FS, 2006.

<sup>12</sup> An attempt is made to provide an answer to this question in the section on the import value chain, though data on the issue is scant.

<sup>13</sup> COMTRADE data, accessed from the INBAR Bamboo and Rattan Trade Database on July 19 2013.



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## The Demand Side

### *Qualities of the Bamboo Plant*

The Bamboo plant has long been regarded as almost sacred in the Southern parts of the country, owing to the immense diversity in its applications. The suitability of Bamboo for this wide variety of applications is now described.

#### **1. Suitability for Agriculture:**

Bamboo is among the most suitable crops for commercial forestry, due to the following properties of the plant:

- 1) Adaptability to a variety of climatic conditions and rainfall conditions, due to a wide variety in species. Bamboo can be grown in rainfall varying from 30 to 250 cm per annum.
- 2) Very fast growth and a short growth cycle imply that Bamboo grows faster than comparable wood species, while consuming less water in the process.<sup>14</sup> Commercially important species mature within four to five years, subsequent to which annual harvests are possible.
- 3) It is among the foremost plant types in terms of biomass generation. Bamboo accounts for as much as 25% of the total biomass in tropical regions.

#### **2. Viability as a Construction material:**

- 1) Bamboo has a tensile strength of 28,000 lb per square inch, versus 23,000 lb per square inch for mild steel, making it among the world's best natural engineering materials, and an essential component of earthquake resistant construction. This strength and flexibility make it a potential alternative to steel (which requires more energy in production and manufacturing) in many applications.
- 2) Lightness and flexibility make the Bamboo plant an excellent material for the construction of pre-fabricated housing and structures.

#### **3. Nutrition and Health:**

- 1) Bamboo shoots provide nutrition to millions worldwide regularly. The nutritional properties of Bamboo shoots are extensively documented, and studies show that Bamboo shoots are rich in nutrients, a high fibre content, low calories, and low fat.
- 2) Traditionally utilised in local medicinal systems in South Asia, Bamboo shoots have been proven to function as natural medicines, with qualities including the ability to lower cholesterol, antioxidant and anti-inflammatory properties. A detailed appraisal of the nutritive and medicinal properties of the Bamboo shoot may be found in the article by Chongtham, Bisht and Haorongbam, 2011.

#### **4. Environmental Benefits**

- 1) Generates almost 35% more oxygen than equivalent stands of trees
- 2) Acts as a Sequestration agent: Certain Bamboo species have been known to sequester as much as 12 T of CO<sub>2</sub> per hectare.
- 3) Lowers light intensity
- 4) Protects against UV rays: Bamboo fibre has been proven to shield against UV rays almost 60% better than comparable cotton fibres.
- 5) Prevents Soil Erosion due to extensive net-like root systems and rhizomes, which bind soil together. The sum of the stem flow rate and canopy intercept rate<sup>15</sup> for Bamboos is 0.25, implying a large reduction in run-off and a consequent reduction in erosion. Bamboos create large watershed areas as a result, keeping flooded rivers along their natural courses and

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<sup>14</sup> Certain species have been documented to grow at 2 inches per hour, while many others can grow up to 1.5 metres in a single day (<http://www.Bamboocentral.org/whybamboo.html>).

<sup>15</sup> This sum is indicative of the proportion of rainwater falling on the canopy of the tree which actually reaches the ground.

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slowing the speed of water flow, in addition to stitching the soil together along riverbanks and in deforested areas.

- 6) Due to properties of hardness, lightness, flexibility, desirable appearance and tensile strength, Bamboo can prove a suitable substitute for timber and wood in many applications including furniture and construction industries. Timber substitution is an effective strategy for biomass renewal and afforestation, since Bamboo plants, growing faster than Timber plants can regenerate felled biomass much more quickly than trees can.

**5. Energy Resources:**

- 1) Bamboo can be used in gasifiers as a source of fuel, and also in thermal applications, replacing furnace and diesel oils.
- 2) Bamboo can be used in the manufacture of charcoal briquettes, which are superior to charcoal from other sources in terms of calorific value.

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## ***Product Diversity***

Bamboo presents a bewildering variety of applications (nearly 1,500 documented (Khan et al, 2007)); however, for the purposes of the present discussion the Bamboo industry will be defined as the set of all firms involved in production of products in which value addition occurs to Bamboo poles in India. Khan et al (2007) classify the varied applications of bamboo according to the following scheme.

- A. Wood Substitutes and Composites:** These include:
- 1) **Bamboo based Panels:** Bamboo panels present significant advantages over wooden boards owing to their strength, rigidity and flexibility. At present, there exist more than 20 different types of panels produced in Asia, which are broadly classifiable into:
    - a. Veneers
    - b. Strip Boards
    - c. Mat Boards
    - d. Fibre boards
    - e. Particle boards
    - f. Medium density boards
    - g. Combinations of the above
    - h. Composites of the above with wood and jute
  - 2) **Bamboo flooring:** Bamboo flooring is a high value product (as high as Rs 180 per sq ft. in domestic markets<sup>16</sup>) with a large domestic and international market. Bamboo flooring has advantages over wooden floors in terms of smoothness, brightness, hardness, insulation qualities and flexibility.
  - 3) **Bamboo Sticks for Blinds and Incense sticks**
  - 4) **Bamboo furniture:** As a category it includes traditional products made of round or split bamboo, and also newer 'pack-flat, knockdown' furniture, which retains physical, environmental and aesthetic qualities of bamboo while addressing shortcomings of variable quality, low productivity and high labour and transport costs.
- B. Food Products:** This category essentially includes Bamboo shoots which are consumed after cooking. It is estimated that 200 species can provide edible and palatable shoots. Bamboo shoots can provide further entrepreneurial opportunities to communities in the form of cultivation, processing and packaging as value added economic activities.
- C. Construction and Structural Applications:** Bamboo housing can be classified into 3 types:
  - 1) Traditional houses using culms as the primary building material
  - 2) Traditional Bahareque bamboo houses using a bamboo frame plastered with cement or clay
  - 3) Prefabricated houses made of bamboo laminated boards, veneers and panels.These buildings are cheaper than traditional wooden houses, and are light, strong and earthquake resistant. They can be packed flat, transported, and are environmentally friendly.
- D. Bamboo based Fibres and Fabrics:** Bamboo fibres have been adapted for the manufacture of fibre for yarn and into fabrics, which are naturally anti-microbial, and absorb thrice the moisture absorbed by cotton due to the presence of micro-pores in the fabric.
- E. Bamboo charcoal as a fuel:** Bamboo charcoal is a fuel traditionally utilised as a replacement for wood charcoal or mineral charcoal, and can be used as a fuel, an adsorbent and a conductor.

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<sup>16</sup>Xylos Arteriors, Personal Communication

## The Potential for the Bamboo Industry in India

### Domestic Demand

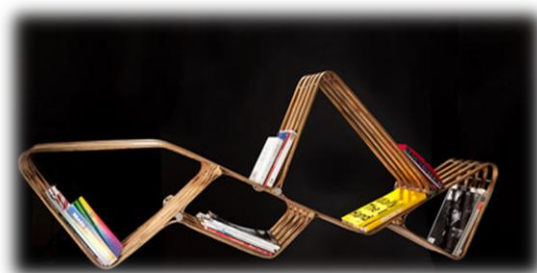
The Planning Commission's 2003 report which detailed the creation of the National Mission on Bamboo Technology and Trade Development focuses on harnessing the potential of Bamboo as a crop in a multi-disciplinary fashion (NBM Operational Guidelines, 2003). The Report lays out a roadmap for the future of the Bamboo plant's development, providing one of the few existing comprehensive analyses of the potential growth of the Bamboo sector domestically. Some salient features of this report include the following:

1. The identification of certain major product lines in Bamboo products and the estimation of their future growth until 2015 based on optimistic scenarios. This is summarised in the Table at Left.
2. The estimation of a Market Size of approximately Rs 20.43 billion.
3. The estimation of a CAGR of 15-20% for the overall Bamboo industry.
4. The estimation of the potential size of the industry by 2015 at Rs 260 billion<sup>17</sup>.

Bamboo Item	Market Size, 2003 (Rupees Crore)	Expected Market Size, 2015 (Rupees Crore)
Shoots	5	300
Timber Substitution	10,000 (Import Substitution)	30,000 (in 20 years)
Plyboard	200	500
Plyboard for Trucks/Railways	1000	3400
Bamboo Matboards	NA	3908
Bamboo Flooring	100 for Exports, 100 for Domestic Cons.	1950
Pulp	100	2088
Furniture	380	3265
Scaffolding	NA	861
Housing	NA	1163
Roads	NA	274
Miscellaneous (Pencils, Matches, etc.)	394	600

In addition to the NMBTTD study, several subsectors in the Market for Bamboo products in respect of important Product lines have been studied and their potential estimated. A 2009 report published by the International Network for Bamboo And Rattan (INBAR) on the *Agarbatti* Manufacturing industry in Tripura describes the Indian Market valued at over Rs 41.63 billion, with an annual growth rate exceeding 20%. The Indian *agarbatti* sector, the world's largest, produces close to 208 billion sticks a year (Rao et al, 2009). Round Bamboo furniture in India represents a significant opportunity for the Bamboo sectors particularly in the North East, which is traditionally proficient in furniture production. The outlooks for the Bamboo Furniture sector are significantly positive, owing to the dramatic rise in urbanisation in India, the growth in the number of urban neo-rich due to the IT and ITES booms, and the development of formal retail channels for the sale of furniture (IL&FS 2006). Further, design development is strong in this sector, with work being conducted at both the IIT-M's Industrial Design Centre and the

Source: NMBTTD Report, Planning Commission, 2003



The above piece was designed at NID's Centre for Bamboo Initiatives. Bamboo furniture is a sector which can grow immensely given appropriate assimilation of technology and design, and has a large market waiting to be tapped.

<sup>17</sup> This estimate appears to require critique. Amir Ullah Khan estimates that the true size of the Bamboo industry currently might be as small as USD 0.5 billion, i.e. Rs 27.50 billion. However, the NMBA insists that significant growth has been achieved in the sector, though no actual estimate was forthcoming. (NMBA, personal interviews)

National Institute of Design's Centre for Bamboo Initiatives.

The outlooks for Bamboo construction appear strong as well. The popularisation of Bamboo as a construction material has been initiated with the construction of the Golden Jubilee Park, being constructed on the banks of the Yamuna. Further, Bamboo has enormous potential as an input in Rural Housing development<sup>18</sup> due to its low cost nature and the inherent durability and sustainability of its raw material. The Indira Awaas Yojana, aimed at guaranteeing housing to the rural poor, envisions the utilisation of low cost materials in building construction,<sup>19</sup> and places the responsibility for procuring



Bamboo Shoots are a specific high value food item with enormous potential. Studies identify the shoot's crunchiness with acceptability in taste. A report on Bamboo Shoots as a food item prepared samples of 12 dishes from the shoots, including Bamboo bajji and Bamboo Manchurian; almost 70% of the panel said they "extremely liked" Bamboo bajji. (ERG 2000)



Bamboo Matboards find a wide range of applications from panelling and roofing to interleaving with wood and veneers to create Bamboo veneer. Matboards in India are available at present at anywhere between Rs 27-Rs 65 depending on thickness (indiabambooinall.org)

these on local communities; Bamboo, available in abundance around rural homesteads, presents an attractive resource to be leveraged for the same. The fact that Bamboo houses can be pre-fabricated points at the suitability for industrial production of housing components remote from the actual site of construction, which could provide enormous opportunities for development in the NER.



Bamboo Flooring is among the highest value added applications of Bamboo, requiring rigorous levels of processing to attain perfection in finish and fit. It is harder than traditional wooden flooring, and treatments can make it termite and water resistant. Bamboo flooring is a sector currently dominated by Chinese Firms (95% of Bamboo floors consumed in the EU coming from China) in the export market and the import market in India, due to a dearth of quality domestic products.

<sup>18</sup> The Draft National Rural Housing and Habitat Mission, available at [http://nhb.org.in/Rural\\_Hosing/Draft\\_RHP.php](http://nhb.org.in/Rural_Hosing/Draft_RHP.php), envisions the provision of affordable, low cost housing to all vulnerable BPL and the poorest of the poor in rural areas by 2018, with the leveraging of sustainable materials and local livelihoods in construction. Bamboo is an excellent resource which may be leveraged towards this purpose. The demand for rural housing may be as high as 60 million units, according to a recent article concerning Vaibhav Kaley's Wonder Grass Initiatives.

(<http://business.outlookindia.com/printarticle.aspx?282022>) This demand is expected to grow at 11% p.a. (Credit Suisse, in Livemint, 11/4/2013)

<sup>19</sup> "There is a felt need for standardizing, popularizing and replicating cost-effective, disaster resistant and environment-friendly housing construction technologies, designs and materials and also developing ideal sustainable rural human settlements consistent with geo-climatic variations and natural disaster proneness. There is also a need for skill upgradation of rural artisans and other functionaries engaged in the field of rural housing and Habitat Development for adoption of cost effective technologies, materials etc. For adoption of such technologies, necessary low cost material is also required to be reduced." )Indira Awas Yojana Guidelines, 2010.

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## Global Demand

The Global Bamboo product market is classified into two major sectors<sup>20</sup>:

1. Traditional Markets, wherein Demand remains strong. This sector includes handicrafts, Bamboo shoots and Chopsticks, wherein margins remain profitable despite slowing growth. On the other hand, certain product lines (e.g. chopsticks) are commoditised and present low growth and low margin opportunities.<sup>21</sup> (Smith et al, 2006a)
2. Emerging products present the most positive outlook for the industry given the enormous growth potential for such product lines, given their recent emergence on the product scene<sup>22</sup>. These include high value timber replacement products, Bamboo flooring and prefabricated construction. The potential for higher value addition, the existence of higher margins and enhanced profitability and the possibility of transcending bamboo's image as a low quality input. (Van Der Lugt and Lobovikov, 2008.)

The estimated size of the Global Market in just ten major product lines of Bamboo<sup>23</sup> was USD 7 billion per annum in 2006, with the potential to grow to USD 17 billion by 2016 under favourable Market Conditions. (Smith et al, 2006b)

Studies of the international Markets for Bamboo products (Van Der Lugt and Lobovikov, 2008; CORPEI, 2005 (quoted in *ibid*)) identify the following major trends:

1. Bamboo flooring enjoys a strong demand in the European Union due to high levels of affluence and environmental consciousness, and in the US as well.<sup>24</sup> This demand is expected to grow due to demand by premier retail chains such as IKEA and the DIY sector.
2. Bamboo Boards, panels and similar products enjoy a strong demand within the west. Bamboo veneer is likely to enjoy the highest growth, demand for which is expected to grow by several million square metres annually (*ibid*).
3. The implementation of stricter standards for wood regulation and the growing preference for wood certification<sup>25</sup> as a result of NGOs, governments and public organizations lobbying for environmental controls has led to enormous shortages in timber supply, with demand for round hardwood exceeding supply by as much as 10 million m<sup>3</sup> in 2005 (FSC, 2005). This gap has led to rising Timber prices, which thus presents an opportunity for Bamboo products, widely seen as more eco-friendly due to the quick regeneration of Bamboo as compared to timber.<sup>26</sup>

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<sup>20</sup> Classification from Smith et al, 2006

<sup>21</sup> This commoditization can be seen as the result of the minimal cost per unit at which these products are sold in global markets.

<sup>22</sup> Such products have only emerged on a commercial scale in markets in the past 10 years. (NICCEP, 2006)

<sup>23</sup> World bamboo markets: Preliminary analysis of selected bamboo product markets, N Smith, K Key and J Marsh, 2006. The ten product lines chosen are Handicrafts, Blinds, Bamboo Shoots, Chopsticks, Furniture, Panels and Boards, Flooring, Carpentry, Charcoal and Activated Carbon.

<sup>24</sup> According to Van Der Lugt and Lobovikov, 2008, the EU consumed an estimated 0.67 million square metres of bamboo flooring in 2003 (ZAAL, 2006 (quoted in *ibid*) claim that the consumption was 0.9 million square metres in 2005). Germany is identified as the largest consumer (50% of the market share). The US demand is estimated at as much as 6 times the above (4.2 million square metres consumed in 2005) (*ibid*).

<sup>25</sup> Wood certifications include PEFC and FSC.

<sup>26</sup> Van Der Lugt and Lobovikov, 2008 note that the inherent perception of renewability of the Bamboo resource (as a result of its rapid growth and abundant availability) contributes to its acceptability. They provide the example of the Governmental Construction Organization in the Netherlands (*Rijks Gebouwen Dienst*) which accepts non-certified bamboo along with certified wood in its constructions (Van Der Lugt, Otten, 2007).

Thus, overall trends in the export market for Bamboo products appear favourable for the expansion of efficient industrial units into the sector. While China possesses a significant first mover advantage, as well as several comparative advantages<sup>27</sup>, it is envisioned that Indian industries producing Bamboo products can eventually capture a significant portion of this market owing to the provision of indigenous designs, capitalising on the exoticism associated with tribal crafts<sup>28</sup> and eventually on reputations for best practices and high quality. This is of course contingent on the development of Brand Names, which requires the establishment of a strong industrial structure capable of creating value added products of high quality at competitive prices.



Ibuku, in Bali, is a Team of Designers, Artists and local artisans who collaboratively design luxury Bamboo homes, which are popular with leading entrepreneurs globally. The use of sustainable production practices and of hiring artisans as labourers gives Ibuku access to local expertise, imagination and raw material. The idea of "Sustainable luxury" such as the fully customised houses in Ibuku's Green Village, Bali has the potential to change people's conceptions of Bamboo and also promote rural livelihoods, while conserving the forests and maintaining a balance with nature. Enterprises such as Ibuku would, in India, have the potential to leverage on indigenous talent and promote responsible luxury among the vast pool of urban neo-rich dwellers in India, while raising thousands of people out of poverty. A similar model has already proven successful in other handicraft sectors as seen in the success of FabIndia.

<sup>27</sup> The reasons for the competitiveness of the Chinese Bamboo industry are dealt with in a later section.

<sup>28</sup> Van Der Lugt and Otten, 2006 note that first associations with Bamboo reflect a mindset of an oriental and consequently lower value theme, with "Asian", "Panda", "Natural" and "Cheap" being among the dominant associations. While this is a problem in marketing products through established high value European retailers, similar associations may be utilized for promoting products through novelty arising out of a socio-cultural theme, as has been achieved in handicraft lines.

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# The Bamboo Industry: Processing and Value Chains

## The Bamboo Processing Chain

True benefits accrue to manufacturers of industrial products out of Bamboo only when the appropriate techniques of processing are utilised in the Production process, for it is this processing which adds longevity, preservation and extra strength, as well as finishing necessary for a high-value product (A U Khan, personal communication; Sunil Joshi, personal communication). Being a large plant with an immense diversity of uses, and a plant whose every part may be utilised productively, the Bamboo Processing Chain is a complicated procedure involving multiple stages.

Studies on mapping the chain and studying methods of further optimising and enhancing the efficacy of Processing have been conducted, both for the general Bamboo product (Belcher, 1995) and for individual industries (Janssen, 2000). A Detailed description of the Processing Chain for Bamboo products is available in Gnanaharan and Mosteiro, 1997, from which the following discussion of the Processing Chain is adapted.

The Bamboo Processing Chain follows the following major processes:

1. **Cultivation:** There exists significant literature on the exact processes and methods to be adopted in cultivation of Bamboo on a commercial plantation scale (NBM, 2005; Ahlawat et al , 2002; Kigomo, 2007)
2. **Harvesting:** Procedures for harvesting Bamboo in India include the restrictions on cutting culms less than 3 years old, prohibition of cutting culms in their flowering year prior to seed shedding, prohibition of digging rhizomes, etc. Felling may be achieved using simple sharp edged blades and machetes.
3. **De-limbing:** This involves the removal of branches from the main culm, and can be achieved using a knife.
4. **Primary Preparation:** Involves the following activities:
  - a. Cross cutting of the Culm to desired lengths. In India, the use of knives for primary processing leads to lack of uniformity in results, leading to wastage and uneven cut ends.
  - b. Removal of excess material at joints, using curved blades as opposed to Indian methods of using heavy knives
5. **Secondary Preparation:** Involve the extraction of starch from the culm, to reduce attacks by fungi and insects, and removal of gummy substances, to provide a uniform colour to the culm. Achieved using Chemical Means.
6. **Primary Processing:** Involves splitting of the Culm to form strips, splits and slivers, and also the straightening, bending of the Culm. While splitting the culm into strips, several types of knives (straight edged, radial or cross shaped) may be utilised. In straightening and bending of the culm, heat is applied to bend the culm and mechanical implements are utilised in straightening further.
7. **Secondary Processing:** Involves chemical treatment of the Culm, through:
  - a. Bleaching, to remove all blemishes and colourations due to oils, gums or resins.
  - b. Dyeing, to provide a product or processed bamboo with colour. Usually achieved using local vegetable dyes or through standard chemical dyeing.
  - c. Carbonization, involving introduction of the bamboo into a furnace at 150° C for 20-30 minutes to produce a uniform brown colour.
  - d. Acid Colouring, involving treatment of the Bamboo with brushed HCl and then heating in an oven to obtain a brown colour.
8. **Manufacturing:** Methods of manufacturing vary considerably across the product line being studied and across regions. The extent of value addition varies greatly across the range of final



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products and across regions, due to variations in productive capacity, efficiency and product quality.

9. **Finishing:** Bamboo products often require final finishing to grant them their renowned soft texture and feel; this is usually achieved through:
  - a. Smoking, by placing the finished product in an oven to achieve a uniform dark brown texture
  - b. Lacquering, to ensure durability and resistance to attack by moisture, etc.
  - c. Painting and application of Varnish

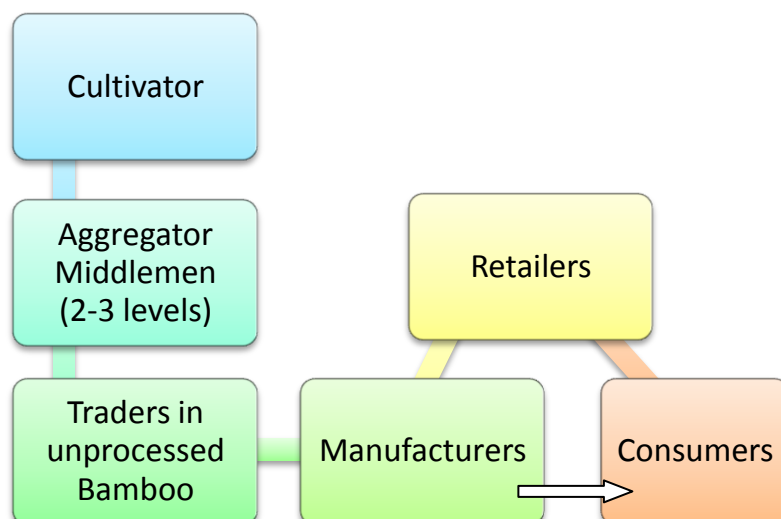
## The Bamboo Value Chain in India

### *The Generalised Indian Value Chain*

There exists considerable variation in the length and size of the value Chain for Indian Bamboo based product industries, occurring primarily due to the different structure of the processing chain for different products. The generalised Indian value chain is as shown below.

The value chain usually follows the following structure:

1. At the initial stage is the Cultivator, who is responsible for growing bamboo or procuring it directly from the forests. This sector is dominated by tribals who either cut Bamboo grown in forests in contravention of existing legislation, or by small farmers who grow bamboo plants alongside their regular crops (Dilli Haat traders, personal communication; A U Khan, personal communication) The



- extent of commercial forestry in India is low, with few interested in cultivation of Bamboo on an industrial scale owing to regulatory hurdles; nonetheless, recent success stories in this area do exist.<sup>29</sup>
2. The Cultivator provides the Bamboo produced to Aggregator Middlemen, who are responsible for the collection of Bamboo and sorting of this Bamboo depending on its grade in terms of quality. In some cases, very basic levels of processing are performed at this stage too. The cultivator provides only between 10-12 culms to the middlemen, who in turn aggregate this up to the level of several hundred culms (A U Khan, personal communication; Sunil Joshi, personal communication). This level may be characterised by the existence of informal contracts, which are enforced through fear of retribution. (Rao et al , 2009; Dilli Haat Traders, Personal communication)
3. The Aggregator Middlemen provide Bamboo to traders, who are involved in transportation of Bamboo to bazaars in large urban centres, where manufacturers are willing to purchase them. These traders possess personal contacts with manufacturers. (Sunil Joshi, personal communication; Mr. Kannappan<sup>30</sup>, personal communication)
4. Manufacturers purchase the Bamboo at up to 400% of the price received by the cultivator (Khan et al, 2007). The bamboo they receive is, in general, poorly sorted, unprocessed and variable in quality (leading to wastage rates of up to 50%) (Sunil Joshi, personal communication; Mr. Kannappan, personal communication). Manufacturers are required to look after most aspects of the Processing Chain from Primary Preparation until finishing.

<sup>29</sup> The efforts of industrial units such as Merino Industries, Garhmukteshwar, UP and Growmore Biotech, Hosur are noteworthy. The National Bamboo Mission reports among its achievements an increase in Non-forest plantation area by 70,423 Ha between 2006-07 and 2010-11. (nbm.nic.in, accessed 26<sup>th</sup> June 2013)

<sup>30</sup> Mr Kannappan is the CEO and MD of the JKN Group, a leading *Agarbatti* producer which utilizes imported Bamboo.

5. Retail in Bamboo products is minimal and largely administered through Government owned product promotion showrooms, such as PURBASHA in the case of Tripura. In many cases, manufacturers are required to directly contact buyers (Anonymous source, Native Konbac, personal communication); in other cases, they own their own retail outlets (Sunil Joshi, personal communication; Mr. Kannappan, Personal Communication).

*An Example of the value Chain: Agarbattis, Tripura*

The Chart at right describes the value chain in the production of *agarbattis* in Tripura, among the best documented production processes and value chains in the industry. The features of this value chain which stand out include:

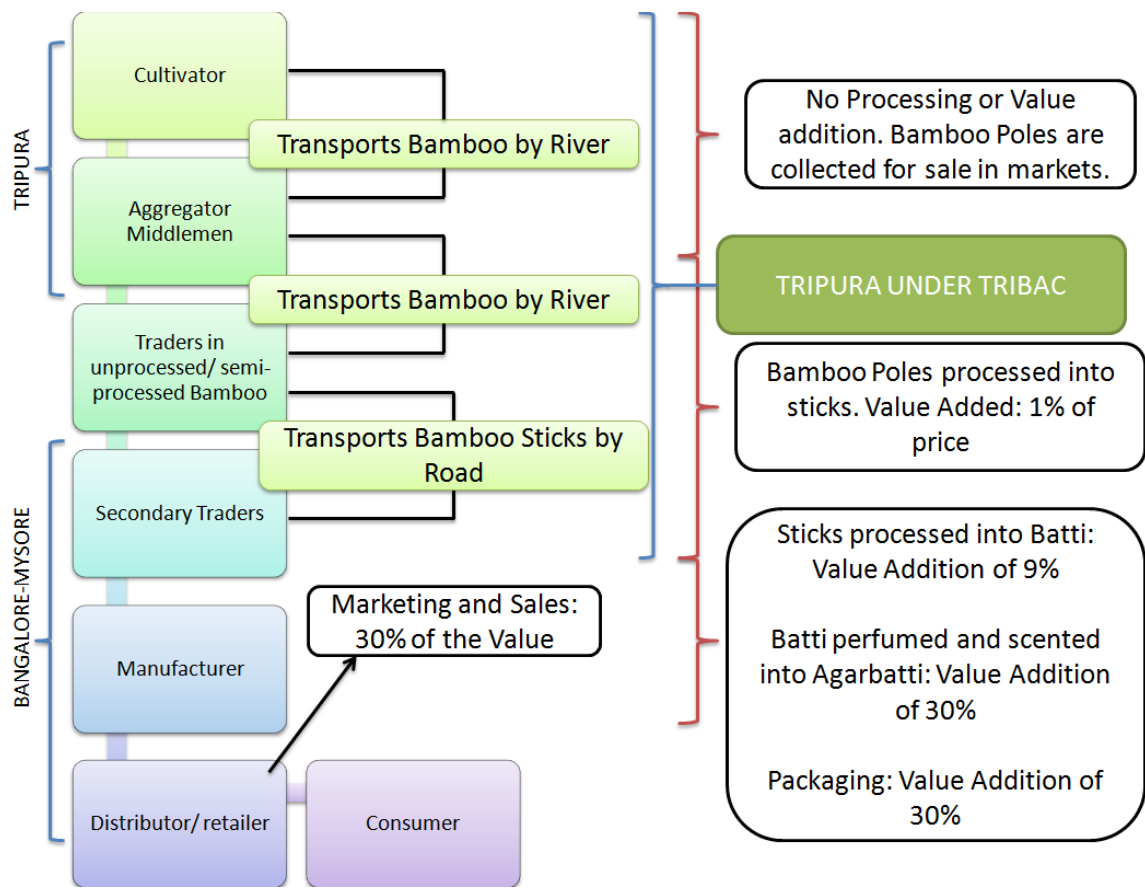
1. The low percentage of final benefit accruing to bamboo producers. Rao et al, 2009 notes that the cost of the Bamboo stick is only about 1% of that of the finished *agarbatti*.<sup>31</sup> The Centre for Science and Environment, quoted in the same report, claims that the tribal receives only about Rs 0.5 per Bamboo pole, which sells for Rs 5. 00 in the Agartala Market (the prices have risen since to Rs 8-10 per pole owing to shortages caused by gregarious flowering.) (ibid)
2. The majority of the supply chain in Tripura adds very little value to the product; rather, it is merely a case of multiple middlemen involved in transportation.<sup>32</sup> The product produced at the site of bamboo cultivation is limited only to the Bamboo stick which contributes to a maximum of 10% of the final value of the Incense Stick (ibid). The potential for value addition due to addition of incense mixtures, *jigat* etc. which is captured by Manufacturers and Distributors pushes the prices of *agarbattis* to almost 4-5 times the cost of production. The manufacturers and distributors concentrate their production activities in the Bangalore-Mysore region; as a result, the majority of value addition fails to reach the Bamboo cultivator, who is most dependent on it for a livelihood.

Agent in the value Chain	Function	Price at which raw material is purchased	Price at which product is sold
Community	Bamboo cultivation	-	Rs 4-5 per kg
Collectors	Aggregation	Rs 4-5 per kg	Rs 4.25-6 per kg
Local Raw Stick Trader	Aggregation, grading, segregation, primary preparation	Rs 4.25-6 per kg	Rs 6-7 per kg
Secondary Raw Stick Trader	Transportation, further aggregation	Rs 6-7 per kg	Rs 13-14 per kg
Manufacturer	Production process 1: Primary processing	Rs 13-14 per kg	Rs 15-16 per kg
Roller Community (through multiple levels of traders)	Rolls <i>agarbatti</i> incense mixture, using <i>jigat</i> and charcoal, along with commissions and transport costs	Rs 15-16 per kg	Rs 28 per kg
Manufacturer	Production Process 2: Packaging, perfuming, etc.	Rs 28 per kg	Rs 60 per kg
Distributor and Retailer	Branding of products, marketing	Rs 60 per kg	Rs 250-400 per kg

Source: IL&FS, 2006

<sup>31</sup> For comparison, in the Tea industry, a smallholder, the individual or organization growing the Tea plants, receives 30% of the final value of the product. (IIFT, 2000) It is estimated that 55% of the total costs of a smallholder are spent on labor. (Van Der Wal, 2008)

<sup>32</sup> This points to the failure to adopt more modern value chains which promote near-source value addition (Marsh and Smith, 2007).



The value chain for *Agarbattis* in Tripura. Note that about 1% of value is added locally; however, under TRIBAC's intervention, this rises to 10% of the final value of the good.

### Case Study: TRIBAC's Intervention in Tripura's *Agarbatti* Sector

TRIBAC (Tripura Bamboo and Cane Development Centre) was a daughter agency of INBAR (the International Network for Bamboo And Rattan) and its Indian Partner, CIBART (the Centre for Indian Bamboo Research and Technology), which in 2003 attempted to solve problems of increasing costs of production for local artisans due to shortages of Bamboo caused due to flowering in 2002. The TRIBAC Centre attempted to generate employment, redress Bamboo resource losses and increase returns to women in the Bamboo sector.

The success of TRIBAC is attributed to its Village Extension System, wherein a network of 71 young men and women reached out to 4,600 households and 331 Self Help Groups, through projects including *batti* rolling. While the traditional value chain features only the stick being manufactured in Tripura, with the remaining 99% of the value accruing to agencies and companies near production centres in South India (Bangalore and Mysore), TRIBAC helped to extend the local chain to *batti* manufacture, as a result of which 10% of the value would now accrue to Tripura's villagers. Further projects include the extension of the Chain to perfuming and similar processes as well, and to develop local expertise in marketing to ensure that communities receive the majority of the value added. This is being attempted through the institution of 3 brands of locally manufactured *Agarbattis*.

Results are a staggering vindication of the model of Cluster based quasi-industrialisation. Until July 2008, TRIBAC had provided *agarbatti* enterprise and livelihood training to over 3,200 men and women. In 2008, TRIBAC's operations covered 25 villages, benefiting 1,387 people, of whom almost 95% are women. TRIBAC's intervention has raised incomes in the *agarbatti* sector by 86-88%. TRIBAC has also initiated training in processes contributing further in value addition (scenting and packaging) which together add 60% to the value of the product (the final 30% accruing from marketing), so as to ensure that locals are able to capitalise on more of the gains from value addition. The extension of the value chain to *batti* rolling generates 11 jobs for every stick maker, hence the immense employment opportunity of cluster development in Tripura.

In addition to the *Agarbatti* sector, TRIBAC has contributed significantly towards the Bamboo sector in Tripura. Under TRIBAC, over 150,000 new Bamboo plants have been raised, with 27,000 seedlings planted in 1,045 households with a view to meet raw material shortages. As an established technical agency in Tripura, TRIBAC also provides livelihood based training to individuals on behalf of other agencies.

The Experience of TRIBAC indicates the success of near-source value addition in significantly helping poor people earn better livelihoods, and also shows that minor interventions can solve age-old problems in the value Chain. It points further at the potential levels of employment and income an industrial Bamboo sector based on decentralised production and value chains, accompanied by appropriate marketing channels, can help achieve. Also, TRIBAC's Village Extension System, emphasising community participation in economic activity, is to be commended for the inclusive nature of growth and the interest in Bamboo generated.

Source: Rao et al, 2009

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### ***The Informal value Chain***

Reliable data is unavailable, yet it is suspected that the vast majority of bamboo utilisation in the production of value added goods occurs in the informal and the unorganised sectors lacking in industrial organisation (AU Khan, personal communication). In these sectors, it is observed that despite promotion of handicrafts through programmes such as the establishment of dedicated handicrafts markets, the formalisation and establishment of appropriate marketing channels in the sector is vastly limited.

The value Chains for Bamboo products sold through such channels is as follows.

1. Bamboo is usually obtained directly from the forest, or is cultivated on a micro scale (1-2 clumps per field) on farmland as a subsidiary crop to rice and wheat on their privately owned homesteads (NCDPD and BCDI, 2010; Dilli Haat Traders, personal communication). Bamboo culms are harvested annually during the dry season. Techniques of cultivation are, in general, unscientific in nature; as many as 62% of tribals in the NER lack knowledge of the appropriate rules for felling of Bamboo.
2. Production occurs at a family level (64.5% of artisans surveyed in the NER produce at the individual or household level (NCDPD and BCDI, 2010). Knowledge regarding concepts of value addition to products is low; the largest concern for most individual producers in choosing an appropriate bamboo species is the availability of the species as opposed to its suitability for the purpose.<sup>33</sup> Although in some cases tribal knowledge is utilised in finishing of products, many products are seen to lack any forms of processing. In 2010, almost 93.5% of artisans surveyed by the BCDI and the NCDPD in the NER had never seen a primary processing machine (92% used traditional hand tools), while 49.25% of respondents did not apply secondary processing to their products, 27.25% never applied any chemical treatment to Bamboo they used, 37.5% did not apply any finishing on their products. (NCDPD and BCDI, 2010)
3. Artisans themselves engage family members to transport finished products to Markets across the country, incurring costs on transportation. The transportation mode utilised is usually railways, owing to the minimal level of checking and transit pass requirement (Dilli Haat Traders, personal communication). Artisans then sell products through informal hawking on the streets or through established handicrafts markets such as Dilli Haat<sup>34</sup>.

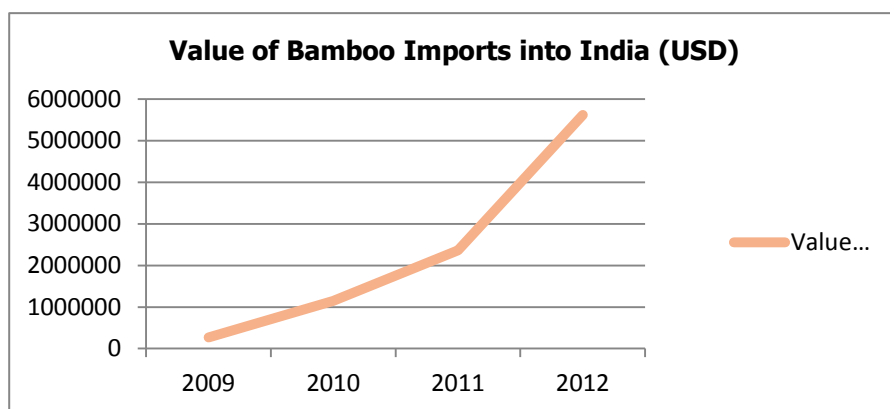
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<sup>33</sup> Availability was cited as the most important consideration for choosing a species by 42.5% of interviewed artisans in the NER (NCDPD and BCDI, 2010). This may also be a reflection of the scarcity of Bamboo available to artisans (ibid notes that 25% respondents considered supply deficits to be the largest hurdle in Bamboo procurement).

<sup>34</sup> To earn a place at Dilli Haat, the artisan must be registered with the office of the Development Commissioner, Handicrafts and participate in a lottery, which allots the place to the artisan for a period not exceeding 15 days at a nominal payment varying between Rs 300 and Rs 400 depending on the season. Refer DTTDCL, 2006. *Dilli Haat Operation and Management Rules, 2006*

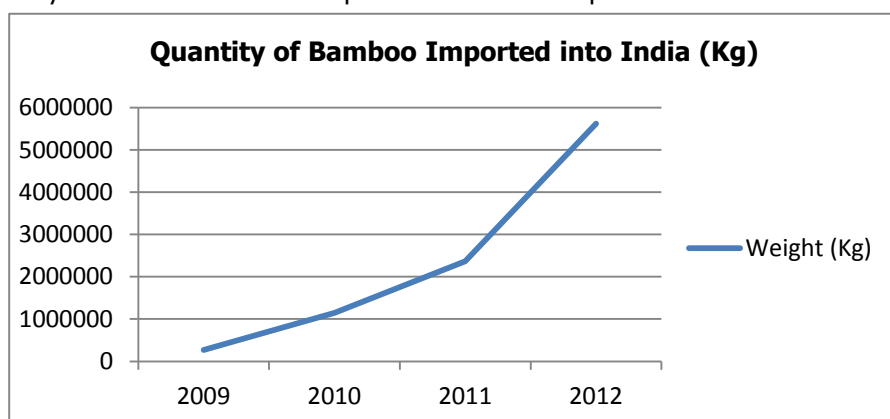
## The Import value Chain

Extensive quantities of Bamboo products and raw and semi-processed bamboo poles are imported into India very year, although data on the exact volume is scant. Bamboo was, until recently, classified along with Wood products in Global Trade statistics.<sup>35</sup> Even within India, Bamboo products are grouped into categories based on their final usage (furniture, food items, etc.) or composition, and in general is grouped along with wood in National Statistics on transport. (Khan et al, 2007.) Data on Bamboo imports is available from the INBAR Website, which uses COMTRADE Data<sup>36</sup>. Data on the Import of Bamboo as per this database is shown at right.



The Rapidly increasing level of Imports of Bamboo into India indicates a significant gap in India's harvesting and procurement capabilities, given that India possesses the World's largest area under Bamboo plants. Although a quantitative analysis of the issue was not possible due to multiple constraints, including the unhelpful

attitude of the Directorate General for Commercial Information and Statistics in gathering data, qualitative analysis through interviews with firms involved in Imported Bamboo products revealed that this Bamboo was usually sourced from China (Kannappan, Personal Communication). Further, Bamboo was sourced via a chain of middlemen; contacting these middlemen for further information was impossible due to unwillingness of respondents to



Source: INBAR Trade Database, Accessed July 20<sup>th</sup> 2013

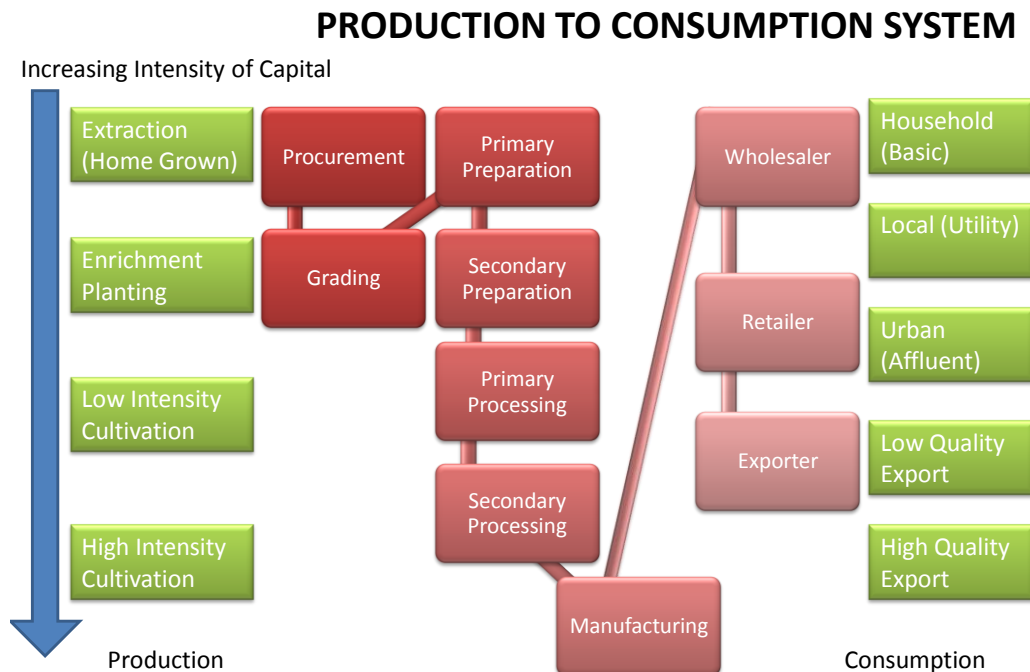
reveal the identities of these middlemen. However, it was concluded that Bamboo is obtained by industries dealing in imported Bamboo at around Rs 75-80 a Kilogram, as opposed to Rs 50-56 for domestic Bamboo (Sunil Joshi, personal communication; Kannappan, personal communication). This price gradient was observed to exist due to differences in quality. The Manufacturers utilising imported Bamboo received semi-processed Bamboo Sticks, allowing them to focus on their production rather than on processing of the Bamboo Culm itself, whereas manufacturers utilising Domestic Bamboo were forced to utilise unsorted Bamboo Poles featuring wastage rates as high as 50% due to poor quality, and then perform processing, which adds around Rs 14-15 per kg. It may hence be concluded that significant Value Chain hurdles contribute towards the rising popularity of utilising Bamboo grown domestically; these challenges are now described.

<sup>35</sup> Van Der Lugt and Lobovikov, 2008 describe how the HS 1401 Code is applicable to "Bamboos or other woody materials primarily used for plaiting", which may also include Rattan, Straw, Willow, Rushes, Reeds etc. The HS Code 4602 group includes Wood and Plant Products which may or may not include Bamboo.

<sup>36</sup> The limitations of COMTRADE data include that it relies upon individual countries reporting their Trade Volumes, and as a result informal trade is not captured in the COMTRADE statistics.

## Challenges in the value Chain

The Bamboo value Chain in India suffers from challenges at all stages in the chain, starting at the level of production. For the purpose of presentation of these challenges, the Value Chain is understood in terms of the Production to Consumption system framework developed in Belcher, 1995.



Source: INBAR Working Paper 9: Production to Consumption Systems

In the INBAR Framework, a Production to Consumption system is presented in a 2 dimensional plane. Movements along the horizontal axis from left to right indicate a decrease in the distance from the final consumer or, equivalently, an increase in value Addition; vertically downward movements indicate a rise in Capital Intensity of the process and, in general, an increase in value Addition. Any production chain must necessarily proceed from left to right along the Production to Consumption system; a downward shift in this chain indicates a rise in capital intensity, efficiency and value addition, as well as a usual rise in product pricing.

The Framework has three major components:

1. The Production System, which deals with Raw Material Sourcing. The Bamboo value Chain may choose to locate its sourcing from any form of cultivation lying along the continuum of production possibilities, depending upon convenience and the structure of the Production system itself in terms of concentration of growers.
2. The Transformation System, which deals with the conversion of Bamboo from raw poles into value added products. A downward shift in the value chain henceforth leads to a rise in the level of mechanisation and industrialisation necessary for the operation of the same. This stage includes all the preparatory and processing stages as well as manufacturing and finishing.
3. The Consumption System, which deals with the actual end user of the product. A downward movement of this end of the value chain along the Production to Consumption System depicts a rise in the price and in the quality of the final product produced.



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## ***Challenges in the Production System***

Currently we observe that the majority of the Production of Bamboo in India occurs in the unorganised sector; further, we observe that existing Bamboo plantations fail to achieve optimal yields in line with what is achieved in China. The major challenges identified in the Production System are:

1. **Inconsistencies in Legislation and Regulation:** Bamboo is subject to bewildering variety of legislative structures which create multiple regulatory regimes surrounding it; further, this regime varies across states due to the inclusion of Forestry on the Concurrent List of the Indian Constitution.<sup>37</sup> The Indian Forest Act, 1927 classifies Bamboo as a tree<sup>38</sup>; the rationale behind this being that the classification “tree” was applied to all forest products which had a high potential of being stolen from forests for illegal usage (S K Khanduri, personal Communication). Under the regime created by the IFA, felling of Bamboo in forests is strictly a monopoly of the local Forest Department, whereas felling and transportation of Bamboo grown on private land requires a Certificate of Origin and a transit pass, which must be obtained for each individual shipment and obtaining which may take up to 6 months (Khan et al, 2007). However, when recognised as an important facet of local livelihoods, the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 defines Bamboo as a Minor Forest Produce, over which STs have full rights of ownership and transportation without a Transit Pass. However, resistance of Forest officials to modify existing regimes in States implies that tribals still suffer from Transit pass requirements.<sup>39</sup> The Planning Commission’s 2011 report on NTFPs contains an annexure on the regulatory regime governing all aspects of production, growing, harvesting, value addition etc. in the NTFP sector and provides a list of legislations in the area<sup>40</sup>.
2. **Exploitation and Poor Regeneration in Bamboo forests:** While Forest Rights are guaranteed to Forest dwelling communities under the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, the process for the vesting of these community rights involves significant procedural hurdles, including a 3-tier system of registration.<sup>41</sup> For the majority of villages which have yet to be vested with these rights, Bamboo is still considered a publicly owned resource<sup>42</sup> which is to be exploited at the risk of being caught and harassed by Forest Officials. As a result, a “tragedy of the commons” scenario ensues whereby the Tribals have incentives to deplete the resources within the limited windows when enforcement is weak; as a result, Bamboo clumps in the vicinity of villages are depleted rapidly

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<sup>37</sup> Planning Commission, 2011 notes that the absence of a comprehensive national NTFP policy leads to contradictory legal provisions still prevailing and differential state regimes create some of the biggest limitations, constraining the healthy growth of the NTFP sector.

<sup>38</sup> This defies its taxonomical classification as a grass. Further, States have the option of defining Bamboo as an MFP if they so see fit. There exist 10 states in India which adopt the IFA’s definitional pattern.

<sup>39</sup> The FRA 2006 provides for transferring the responsibility for Transit Pass issue to Gram Sabhas; yet, as late as 2011, only Mendha Lekha in Gadchiroli, Maharashtra had received this right.

<sup>40</sup> These include the Panchayats (Extension to Scheduled Areas) Act, 1996; the Wildlife Protection Act, 1972 with amendments, JFM Directives, the Forest .

<sup>41</sup> Under the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Rules, 2007, every village is required to form a Gram Sabha, which in turn must elect a Forest Rights Committee from amongst its members, which, after assessing claims from all village members, is required to apply for the vesting of forest rights to a Sub Divisional Level Committee. The Sub-Divisional Committee is then required to forward the claims after assessment and adjudication of conflicts to the District Level Committee, who is responsible for final approval of the Forest Rights. This author was unable to collect data on the duration of the period involved in going through with the entire process.

<sup>42</sup> Bamboo on Public Forest lands is usually managed by unskilled Forest dwellers who do not work in collaboration with local villagers. The Bamboo on forest lands is not provided to local villagers for their consumption; thus, locals have no incentive in proper management.

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(Dilli Haat traders, personal communication; S K Khanduri, personal communication). The lack of awareness regarding rules for felling<sup>43</sup> contributes further to this degradation.

3. **Poor Yields:** The Average yield for Bamboo grown in India is 2-3 MT<sup>44</sup> per hectare (Khan et al, 2007). This low yield explains why India, despite having the largest absolute area under Bamboo, has the second largest Bamboo resource. In China, well managed plantations can give up to 50 T/Ha. In India, the maximal yields obtained from plantations are still in the range of approximately 10-15 T/Ha.
4. **Lack of attention to Variety Management and Biodiversity Conservation:** In situ and ex situ conservation, identification of genotypes and gene bank, application of biotechnology and genetic engineering of Bamboo are accorded minimal importance (Planning Commission, 2011).
5. **Volatility in Market prices:** It is observed in the NTFP sector in general that prices are highly volatile, fluctuating quite frequently. These fluctuations contribute further to the lack of information discussed below. Volatility in Market prices has discouraged Private Forestry in the sector (Planning Commission, 2011), and contributed to the proliferation of middlemen contributing little value and reducing the remuneration to the grower. Further, policies to correct this have included centralised procurement, as seen in Maharashtra and Andhra Pradesh, which leads to governments fixing prices advantageous to the Forest Department and disadvantageous to growers, leading to the shortages associated with price ceilings<sup>45</sup>.
6. **Low Interest in Commercial Forestry:** Outmoded policy frameworks, Transit Pass Regimes, and Price uncertainties and fluctuations have led to strong disincentives for private farming and cultivation of Bamboo Homesteads on an industrial and commercial scale, although as previously noted, this scenario is changing.
7. **Lack of Market Information:** Bamboo farmers are usually unaware of prevailing market prices and rely upon the traders to determine their prices for them (Rao et al, 2009.) This is in contrast to farmers for many other crops including rice and wheat, whose prices are available continuously and are continually updated. Systems leveraged in many parts of India for information regarding crop prices through SMS services are not available for the Bamboo sector. The government run portal Agmarknet.nic.in, which updates prices of commodities daily across over 1000 markets, curiously fails to analyse Bamboo prices over a wide range of days; data on Bamboo prices is sporadic at best, and the dissemination is minimal. This is reflected even in the Tripura value Chain, where the tribal harvester receives only 25% of the price of the Bamboo Pole in Agartala (Rao et al, 2009.)
8. **Insufficient Baseline Data:** The Planning Commission remarks that the lack of data regarding resources and usage patterns for Bamboo is usually unavailable, and if available, outdated. This leads to difficulties in adopting concrete plans for Management and Planning for Resource Allocation. In particular, data for the usage pattern of Bamboo is deficient; this critical parameter being unstudied has led to improper resource allocation practices<sup>46</sup>.

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<sup>43</sup> NCDPD and BCDI, 2010 note that almost 62% of tribal artisans in the NER are unaware of the rules for felling of Bamboo.

<sup>44</sup> MT: Metric Tonnes

<sup>45</sup> NC Saxena claims that Forest Departments procure the majority of their Bamboo for sale to industrialists in the Paper and pulp sector, while neglecting legitimate needs of the local tribals and villagers. He cites the example of the Orient Paper mill being guaranteed 100,000 T of Bamboo a year, to meet which all the Bamboo surrounding four villages in MH had to be cleared, and also several others involving the compromise of local livelihoods in the interest of industrialists. This scenario has led to a decline in Bamboo based handicrafts.

<sup>46</sup> It is observed that much of the literature on the Bamboo usage pattern in India is taken from Tewari, 1992; the problems with Tewari's pattern of usage include under-reporting of the usage by Paper Mills and non-inclusion of Bamboo usage for housing (Khan et al, 2007).

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## ***Challenges in the Transformation System***

The Transformation System deals with the Processing Chain, which is largely confined to single Firms in India. The Challenges faced by institutions in the Transformation System are now described.

1. **Poor Quality of Bamboo Supplied:** Bamboo reaches the Manufacturer through a system of aggregator middlemen, who collect bamboo harvested by cultivators and sell them in bulk to the Manufacturer. Tribals who harvest bamboos tend to do so from nearby forests,<sup>47</sup> and are, in general, not mindful of the quality and quantity of Bamboo they sell to the trader. Aggregator middlemen perform a crucial function of grading and sorting Bamboo (A U Khan, personal communication); however, their lack of education and expertise implies that manufacturers still receive unsorted Bamboo poles of varying quality.
2. **Low Volumes of Bamboo Supply:** Bamboo is supplied through a value chain featuring an informal harvester at the top of the Production System (i.e. The least intensive Bamboo production possibility). Thus, Bamboo supply depends on the yield of the smallholding owned by the Tribal; on an average, this yield is about 2-3 Tonnes per hectare. Another contributor to the low Bamboo supply is the diversion of much of the Bamboo produced to low value adding sectors. It is estimated that 44% of the Total Bamboo cultivated is utilised in the Paper and pulp industry<sup>48</sup> and in scaffolding for construction, wherein there is, at best, highly limited scope for value addition. The limited availability of Bamboo, especially Bamboo of certain grade or species, is repeatedly cited by industry members as the primary concern they face in the functioning of their industrial units. (Sunil Joshi, personal communication, NMBA, personal communication)
3. **Lack of Availability of Trained Labour:** Bamboo processing is a technical activity which requires a certain degree of technical proficiency. Further, while Indian artisans are naturally trained at working with Handicrafts, their skills are insufficient to allow them to cope up with the requirements of an industrial process, including efficiency and speed (Sunil Joshi<sup>49</sup>, personal communication).
4. **Lack of access to Inputs in Production:** Bamboo production processes are intensive consumers of electricity and water, as well as several chemicals for primary and secondary processing of the Culm. The majority of regions with otherwise tremendous potential for Bamboo industries, such as the NER, lack access to such basic industrial inputs<sup>50</sup>.
5. **Lack of Capital Intensity in Production:** The Production processes adopted in Indian industrial units lack the Capital Intensity necessary for large scale production at low costs. This is primarily due to the high costs of machinery in the sector<sup>51</sup>, as a result of which starting a small-scale Bamboo industry faces significant hurdles. The Bamboo value Chain thus remains at the higher end of the Transformation System, featuring lower value addition.
6. **Fragmentation of the Industry:** Due to insufficient contact between manufacturers, the Bamboo sector is dominated by small firms, most of which have annual turnovers of less than Rs

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<sup>47</sup> NCDPD and BCDI, 2010 note that 54% of Bamboo artisans surveyed in the NER gather Bamboo from the local forest, and a further 21% obtain it from smallholdings and homestead plantations.

<sup>48</sup> In recent times, the Paper industry has begun to reduce its dependence on Bamboo pulp, switching to eucalyptus and similar plants which lack restricting regulatory regimes. While this has led to hardships for many small farmers, it presents an opportunity for diverting bamboo towards value Adding sectors (Planning Commission, 2011).

<sup>49</sup> Sunil Joshi is the founder and CEO of VEDHA India, one of the leading manufacturers of Bamboo furniture and handicrafts in the country, situated in Nagpur, Maharashtra.

<sup>50</sup> A project proposal by the World Bank on the power sector in the NER reports that installed capacity has not risen significantly between 2004 and 2011. The present installed capacity is 1560 MW, with a peak demand of 1930 MW.

<sup>51</sup> A quick search of [indiabambooinall.org](http://indiabambooinall.org) reveals that a cross-cut saw used in primary processing costs Rs 40,000/-, not inclusive of transportation. Other varieties of machinery can cost up to Rs 325,000/- a unit.

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20-30 million. A large number of the more visible manufacturers work on a not-for-profit model basis, whereby their aims are less of industrialisation and more on the lines of increasing employment and livelihood betterment.<sup>52</sup>

- 7. Concentration of the Value Chain:** Due to lack of Market linkages, Firms are required to handle most aspects of the processing chain themselves. Manufacturers are required to perform primary and secondary processing; an interview with Native KONBAC reveals that the cost of processing per Bamboo pole is as high as Rs 10. In addition, the processing cycle takes around 48 hours per bamboo pole (although certain processes may be carried out in bulk). This implies that Firms are unable to specialise in handling any one aspect of the value Chain, i.e. There are few dedicated manufacturers or dedicated processing industries in the Bamboo sector. Concentration of the value Chain and the Processing Chains, and the consequent fall in specialisation, has reduced the efficiency of the Bamboo industry. It is estimated that in Southern Asia, wastage rates for Bamboo products can be as high as 70% (Smith et al, 2006b).<sup>53</sup>
- 8. Production delocalised from Markets:** Transit Permit regimes surrounding the Bamboo sector imply that there exists impetus to not utilise Bamboo sourced from far away; rather, production occurs closer to the centre of Bamboo availability. This is visible in most industries which choose to set themselves up near forested areas<sup>54</sup>. However, since these regions are usually remote from major urban markets, the delocalisation of production from markets occurs, which implies that transportation is now required for finished products, which is inconvenient and expensive. This situation is particularly seen in the Furniture industry in the NER<sup>55</sup>.
- 9. Low Levels of Quality Assessment and absence of Standardisation:** The absence of Quality Standardisation in Bamboo products, as well as for Bamboo poles has created a significant problem for exports in India. The absence of dedicated certification for Bamboo products has led to variability in quality norms for products.

### *Challenges in the Consumption System*

The Bamboo value Chain in India ends somewhere towards the upper end of the Consumption System, between consumption for personal and household utilisation and consumption by rural markets and underdeveloped urban markets. The Issues faced in this end of the system are as follows.

- 1. Underdeveloped Markets:** A Market in a product can exist only if there exists adequate Demand for the Good being produced; however, in the Bamboo product sector, the demand for Bamboo products is low. This minimal demand is due primarily to the problems mentioned below; however, the delocalisation of production from consumption centres and the lack of targeted marketing are other possible factors. Underdeveloped Markets and production remote from marketplaces imply that Firms incur significant transportation costs (Sunil Joshi, personal communication) in moving their goods from their production units to markets across India.
- 2. Poor Quality Perceptions and Lack of Awareness:** Bamboo is correlated in Western Mindsets with an occidental point of view (Van Der Lugt and Otten, 2006); even in India, upper middle classes view Bamboo as an input in Tribal Handicraft industries alone<sup>56</sup>. Indian

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<sup>52</sup> Websites of VEDHA India; Bamboo House, Hyderabad.

<sup>53</sup> This situation is gradually changing. Though linkages are yet to be built, Bamboo processing firms which deal in processed Bamboo sticks are emerging (e. g. Raj Associates, Ahmedabad. )

<sup>54</sup> As an example, VEDHA has manufacturing facilities in Nagpur, and sources Bamboo from the forests of Gadchiroli District located to its South.

<sup>55</sup> A U Khan, Personal Communication

<sup>56</sup> To gauge the opinion of individual households in India, a brief online survey was conducted informally to develop an idea of awareness regarding Bamboo products. While the sample size was limited owing to

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consumers further possess perceptions of low quality as a result of the low value and quality products produced by manufacturers who fail to produce better quality products as a result of constraints faced as detailed above. This perception makes consumers initially unaware of Bamboo's properties reluctant to purchase Bamboo products instead of traditional wood products. (NMBA, personal communication; Tripura Bamboo Mission Reports, 2006).

3. **Poor Involvement of Retail Chains in the Consumption System:** Bamboo Products are usually not stocked by premier retail chains; indeed, even state handicrafts emporiums fail to promote Bamboo products at times.<sup>57</sup> Bamboo retail chains often make losses owing to deficient demand;<sup>58</sup> as a result of this, many Bamboo Manufacturers choose to advertise and find Buyers through online portals including [indiabambooinall.org](http://indiabambooinall.org), [indiamart.in](http://indiamart.in).

The Combination of the above challenges implies that the Bamboo Value Chain in India still lies at the upper end of the Production to Consumption System; the net result of this is a minimal level of value addition, minimal levels of capital intensive production and a generally low level of quality. It is imperative that the Value Chain be translated vertically downwards; such a movement would allow for increased levels of production at a higher level of productive efficiency, enabling higher levels of employment generation, sales and quality, allowing India to cater to a wider export audience.

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the limited number of respondents, the households in general viewed Bamboo products as Tribal Showpieces rather than functional objects.

<sup>57</sup> This Author made several visits to the Handicrafts Emporiums on Baba Kharak Singh Marg, Connaught Place, New Delhi, and found that the Emporiums of Manipur, Mizoram, Orissa and West Bengal did not stock Bamboo products. It must be noted that PURBASHA, the promotion emporium of Tripura, presents a refreshing change; a large variety of Bamboo handicrafts are stocked here.

<sup>58</sup> The NMBA used to run a high-end retail store, The Bamboo Store, in Greater Kailash Phase-II; even this store was forced to shut down owing to operational losses and low demand. (personal communication, NMBA)

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## Proposals for the Bamboo Sector

### The Bamboo Industry in China: An Instructive Study and Key Takeaways

The Chinese Bamboo industry is perhaps the only well studied Bamboo industry which has managed to develop industrial capacities in producing value Added products to cater to a vast export market (Khan et al, 2007). The sector provides employment to over 35 million people and generates annual revenues of over US\$ 10 billion<sup>59</sup>. While China faces significant comparative advantages in the Bamboo sector- it leads the world in Bamboo biodiversity, with close to 500 species, many of which are monopodial and consequently higher in yields- it is undeniable that government Policies promoting the growth of the industry at the grassroots level have had an enormous role to play in the success story. In China, policies designed towards encouragement of individual forest management rights and towards technical innovations (over 200 patents have been filed for machinery and other technical innovations in the utilisation of bamboo) as well as liberalisation of local markets have led to the creation of an environment greatly conducive to a free market in Bamboo and its products. Export promotion policies and encouragement of value addition have contributed further to the virtuous cycles in question.

The Chinese Government's policies towards Land Tenure arrangements are summarised in the flow diagram given on the next page. It is clear from the diagram that the Policy flows towards the strengthening of individual rights over forested lands and incentivisation of commercial forestry and proper land management practices. In parallel to Land Tenure Reform, the Chinese Government adopted a policy of deregulation of policies involved in procurement of Bamboo and Bamboo products<sup>60</sup>, leading to the emergence of a free market in Bamboo products. The most dramatic effects of this deregulation were visible in Anji County, where the number of small scale bamboo-based enterprises rose from 19 in 1975 to 527 in 1995, with 61% of these being private enterprises. Liberation of landholdings and the freedom to adopt best practices in intensive cultivation methods, coupled with the emergence of large domestic demand, provided farmers with enormous incentives for appropriate management of Bamboo holdings. As a result, Anji County saw its Bamboo forests expand in area by 26% between 1975 and 1994, while the number of standing Moso Bamboo Culms rose by nearly 80%, coupled with a 50% rise in the density of Bamboo forests due to adoption of intensive cultivation methods. Simultaneously, living standards have improved dramatically across the entire county, showing the potential for Bamboo based promotion of livelihoods. (Wang, 2006)

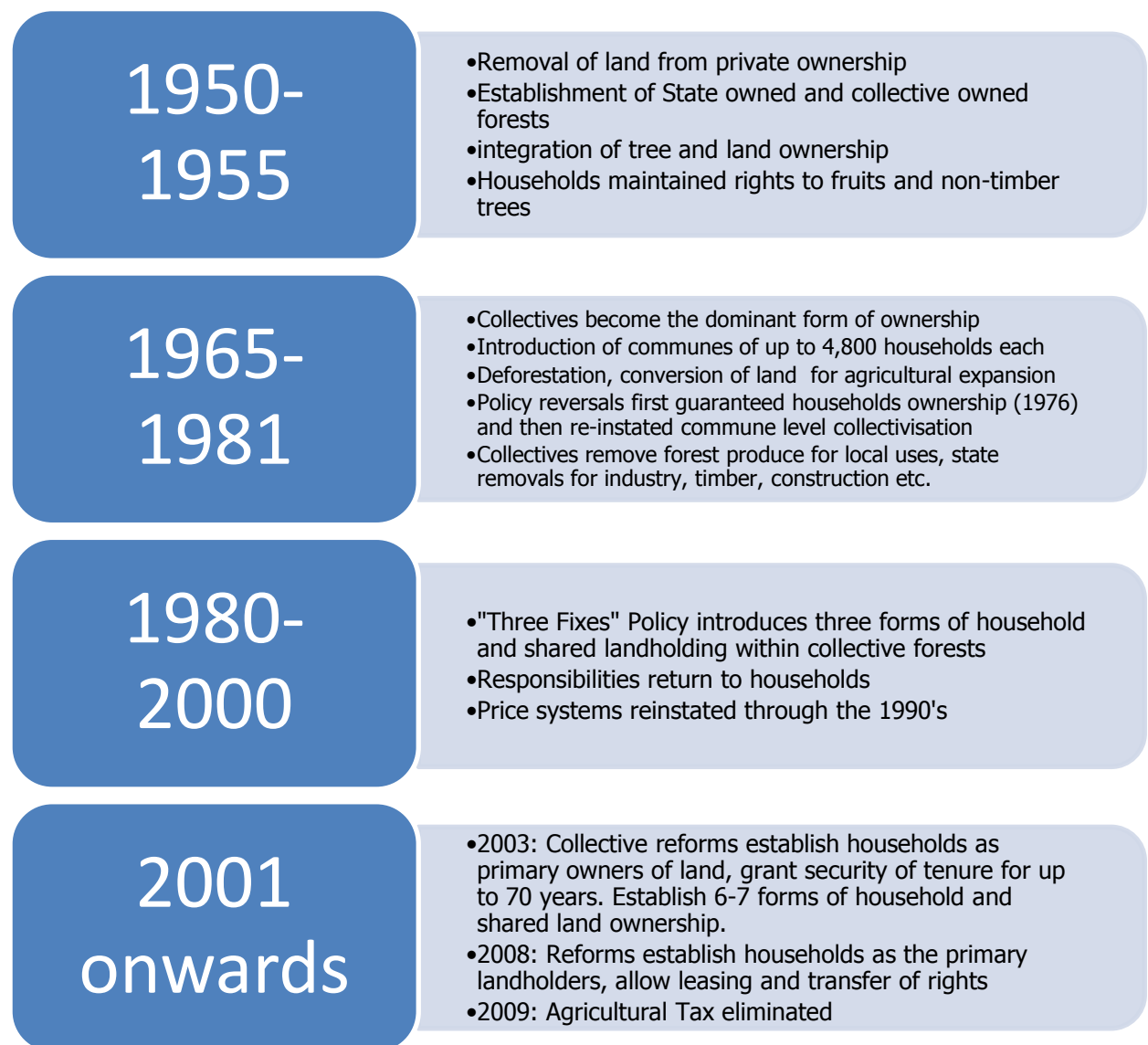
In addition to the above policies the Chinese Government follows a collaborative policy for Bamboo cultivation and dissemination of technical knowledge among its populace, where there is a joint effort by technical institutions, governments and Communities in developing local capacities for value addition in the Bamboo sector. The Chinese Government extends:

- a. Technical assistance, in the form of Capital accumulation. The Present industrial structure in China is said to be the result of almost 20 years of capital accumulation in the sector. At present, there are nearly 3,000 Bamboo processing companies in China.
- b. Education in the processing of Bamboo and training for farmers in collaboration with technical institutions and local Bamboo promotion boards.
- c. Financial Assistance, by facilitating credit availability. In the Fujian province, recent land reforms include provision of no interest loans to farmers against the collateral of their forest tenure certificates.

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<sup>59</sup> [http://www.china.org.cn/business/2010-07/18/content\\_20518853.htm](http://www.china.org.cn/business/2010-07/18/content_20518853.htm)

<sup>60</sup> These steps included the abolition of centralized procurement for Bamboo and the decontrol of Bamboo prices. See Wang, 2006



Studies of China's Bamboo sector (Smith and Mestre, 2007)<sup>61</sup> suggest the following as the primary reasons behind the immense competitiveness of the Chinese Bamboo sector. Source: Adapted from Robbins, 2012

- 1. Strong Domestic and Export Demand** for locally produced high value Bamboo products, as a result of which small scale and micro industrial units were able to cater to markets which already existed in Bamboo products. Further, the easy availability of credit and low individual capital investment requirements allowed the growth of these small firms up to the point where they could initiate production on an industrial scale.
- 2. Complexity of Supply Chains for Bamboo products** allows firms to define vertical boundaries in the value Chain more strictly in China. In China, individual producers supply Bamboo to intermediary firms specialising in bamboo processing; as a result, Bamboo product

<sup>61</sup> Establishing industrial Bamboo Enterprises through the value Chain Approach: Insights from recent experiences in South East Asia, Nigel Smith and Timothy De Mestre, Presented at World Bamboo Congress VIII. ([http://bambusc.org.br/wp-content/gallery/WBC2009/WBCVIII-Vol\\_02.pdf](http://bambusc.org.br/wp-content/gallery/WBC2009/WBCVIII-Vol_02.pdf))

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manufacturers can purchase processed bamboos and need not invest in primary processing technologies. This specialisation allows industrial outlets to produce quality Products to cater to domestic and export markets with acceptable rates of return on investment.

- 3. Development of Technical Capacities** and Relentless improvement in levels of technology through innovation in technologies and methods of production has led to the creation of low cost Capital technologies which can be adopted by local firms in China.
- 4. Extreme levels of Productive Efficiency** are achieved through the effective use of technology. China has developed expertise in utilising nearly every portion of the Bamboo plant, to the extent where raw material conversion rates are as high as 95% of the Bamboo plant. Individual industries are able to purchase only the portions of the plant they require for the purposes of their own industrial production, contributing to remarkably low marginal costs of production. Competition for raw material forces industries to innovate and continuously optimise on their production processes.
- 5. The presence of Economies of Scope and Scale** due to the above factors has lowered production costs further, coupled with the availability of a large pool of semi-skilled low cost labour. A major impact of these economies has been to decrease marginal costs of products to levels below those of competing industries in Asian nations, despite the higher cost of Raw Materials; as a result, Chinese Bamboo products have proven extremely difficult to compete against.

The policy recommendations provided in the next section will be geared to developing a similar industrial structure in India, while recognising the limited success replication of the said model in East Asian Nations has achieved (ibid). The conclusions from the Chinese experience in the Bamboo industry, particularly in Anji County, widely cited as among regions with the most intensive production methods and value chains (Maogong et al, 1998), are as follows.

1. Land Tenure Reform must be directed towards liberalisation of landholdings from collective ownership and must provide secure, long term ownership to individual economic units (households). This generates individual incentives towards proper management and yield optimisation through adoption of best practices in farming and agriculture.
2. Education and Technical support must be subsequent to existence of a secure land rights system; in the absence of security of tenure, farmers lack interest and initiative in adopting technologically intensive growing of Bamboo. Conversely, in the absence of technical knowledge, production and cultivation of Bamboo will not move beyond the subsistence production level.
3. There must exist an adequate market mechanism which decides Bamboo prices daily based on demand and supply. This mechanism must incorporate into its fold dissemination of information to farmers, who must be aware of the price of Bamboo regularly.
4. A large demand for Bamboo products must exist in the local markets; if not, such demand must be created through aggressive promotion and government interventions in the short run. The demand must allow for remunerative pricing to manufacturers in the Bamboo sector. This demand is essential to allow small manufacturers to move beyond the informal subsistence level of production towards the production of higher value products higher along the value chain, and to provide for capital investment by the same.
5. The emergence of small industrial units specialising in processing of Bamboo must be promoted, with the view to distribute activities along the value chain amidst small stakeholders with the aim of specialisation and consequently increased efficiency.
6. The Linkages between small processing houses and relatively larger industrial production houses must be strong enough to ensure that Firms are able to get their required orders delivered on schedule as per their orders. This also requires contract enforcement through stringent rule of law.



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## Proposals for the Bamboo Sector

The previous discussion indicates that the Bamboo Industry is at an infant stage, and that the creation of an Industrial Sector as desired will require an assessment of issues commonly faced by Infant Industries. Pack and Saggi, 2006 (quoted in Dahlman, 2009) describe four major kinds of challenges faced by an infant industry:

1. Acquisition of the knowledge for production involves costs, and this knowledge may not be available to the first firms entering the industry. This is clearly visible in the Bamboo Sector's lack of capital intensive production and mechanisation in production processes, and the lack of awareness regarding the importance of processing using technology.
2. Firms must incur costs on training of new workers and may have difficulty in retaining them; while retention is a small issue in the domestic Bamboo industry due to geographic separation between firms and the difficulty in obtaining the employment in the first place, costs on training new workers is significant. It is estimated that the average artisan takes as long as 3-4 months to achieve the level of proficiency required by firms (Sunil Joshi, personal communication; Native KONBAC, personal communication).
3. Firms who are successful in the industry provide information to other firms who are liable to increase competition in the sector, thereby reducing profit margins. While this is a major potential threat to producers in the Bamboo sector, who will be liable to see falls in margins, it is a long run viewpoint due to the immensity of the potential market which must be served by the limited number of firms in the sector.
4. Domestic industries may not be as efficient at production as foreign competitors. This is a serious problem in the Bamboo Industry, given the dominance of Chinese manufacturers which have achieved extreme levels of productive efficiency driven by specialisation, competition and technical innovations<sup>62</sup>.

The Author proposes the following regime as a roadmap towards industrialization of the Bamboo sector, to apply at the various stages in the value Chain for Bamboo product production. The roadmap indicates specific action to be taken at the earliest to ensure the development of a competitive Bamboo industry in India, which sets new standards for inclusion of locals, quality product development, innovative design and efficient production. For India to achieve its goals, it will require a broad based approach towards targeting the following major areas:

1. Increasing the degree of commercialising Bamboo cultivation through large scale contract farming and cooperative and commercial forestry
2. Establishing small enterprises for Processing of Bamboo and educating small enterprise owners and workers on best practices for efficiency
3. Establishing linkages between these enterprises and Manufacturers
4. Incentivising Manufacturers to add further value and incorporate the informal value chain within them. Ensure adequate attention is provided to quality of goods.

It is essential to note, however, that any of the recommendations implemented in isolation has a low chance of succeeding; rather, a concerted effort involving all the concerned regulatory bodies working in harmony is essential. This is seen in the fact that lack of interdepartmental cooperation in the Bamboo

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<sup>62</sup> In 2008, Bamboo prices in Anji and in Thanh Hoa province, Vietnam were USD 100 and 35 per ton respectively; Bamboo slats supplied to Bamboo flooring manufacturers were sold at 6.5 US Cents and 6.8 US Cents per slat respectively. Thus, despite farm gate prices almost thrice as high as Vietnam, Chinese firms were selling finished products at a lower price, pointing to the enormous efficiency of the industrial units. (Smith and De Mestre, 2009)

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sector has led to the failure of these schemes towards achieving their desired all- India impact (NMBA, personal communication; MoEF, personal communication; Sunil Joshi, personal communication)<sup>63</sup>.

It is also essential, when recommendations are made, that appropriate precedents (if any) be carefully analysed and studied. The experiences of several Mekong Countries (e.g. Thailand) has been that replication of successful practices in China need not guarantee success; rather, one needs to identify the structure of incentives any policy framework seeks to provide for all stakeholders in the value Chain, given the present socio-cultural framework in place<sup>64</sup>.

The recommended Policy Framework given herein is classified on two bases. It is presented initially in terms of Solutions to issues faced in the Bamboo sector value Chain, and then presented in terms of Courses of Action to be followed by specific Organisations.

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<sup>63</sup> The author recognises that this shall continue to remain an issue until such a time as and when a centralised planning authority for the Bamboo sector, a "Bamboo Board" on the lines of the Tea or Coffee Boards of India, is instituted and vested with the responsibility of policy formulation and execution of the same with regards to the same. In the absence of such a board, it is necessary that agencies such as the National Bamboo Mission take upon responsibilities of inter0agency co-ordination.

<sup>64</sup> For instance, a major factor in Anji County's success was proximity to thriving Markets, which fed the virtuous cycle of product development. The absence of this factor in India, where consumer awareness is low and in many cases negative (A U Khan, personal communication; NMBA, personal communication; Sunil Joshi, personal communication), could have significant consequences for mere replication of the earlier attempted schemes.

**Proposals by Section of the value Chain**

<b>PROBLEM</b>	<b>SOLUTION</b>	<b>INSTITUTION</b>
<b>PRODUCTION SYSTEM</b>		
Exploitation, Poor Regeneration Absence of Sustainable Forest Management Legislative and Regulatory Regimes	<ol style="list-style-type: none"> <li>1. Shifting onus of vesting of land rights on to Forest Department, i. e. requirements for Forest Officials to identify Forest Dependent Communities and aiding in vesting of Land rights with these communities. By so doing, expand communitisation of land rights.<sup>65</sup></li> <li>2. Strengthening of Forest Patrol and Guarding Mechanisms in joint cooperation with Forest Dwelling Communities. This may be accomplished by posting of Guards assisted by Members of the Forest Rights Committee set up under FRA 2006.<sup>66</sup></li> <li>3. Establishment of fixed routes along which Forest produce may be exported from Bamboo forests, and establishment of single point checkpoints at the extremities of these routes, wherein Forest produce must be checked for source and whether rights for felling exist.</li> </ol>	<ol style="list-style-type: none"> <li>1. Ministry of Tribal Affairs (MoTA), through amendments to the Forest Rights Act Implementation Rules, 2007.</li> <li>2. Ministry of Environment and Forests with State Forest Departments, collaboration with MoTA regarding the exact nature of the collaboration, and any necessary amendments to be made to the Forest Rights Act, 2006.</li> <li>3. State and Local Forest Departments.</li> </ol>
Lack of Biodiversity Management	Government funding of bio technological projects, establishment of Bamboo Research Institutions under existing institutions or independently, to develop better HYV Bamboo strains, as well as conserve existing Genetic material in Bamboo industries <sup>67</sup>	National Bamboo Mission at National Level, State Bamboo Missions at local levels
Market Price Volatility	Establishment of Markets in Bamboo Products which feature contract farming as an attractive hedging against price volatility. Promotion of Farmer Producer Organisations as an alternative model for industrial procurement of Bamboo	National Bamboo Mission, Department of Agriculture and Cooperation

<sup>65</sup> Inspired by China's policy, 1978 of granting individual communities in tribal areas powers to frame local rights to land. Generates Local interest in managing land and produce grown on it. Further, provides incentives to undertake scientific management of Bamboo Plantation on the land.

<sup>66</sup> Present Transit regimes punish private growers for the Forest Department's inability to police forests. Proposal aimed at transferring personnel from transit pass verification to joint forest monitoring in collaboration with local tribal residents. See recommendations in Wang, X. 2006

<sup>67</sup> Inspired by Planning Commission, 2011's identification of lack of conservation of biodiversity in NTFP's as a major bottleneck to their development

Low Private sector Interest in Commercial Forestry	<ol style="list-style-type: none"> <li>1. Single-time and Single-Window Registration of Commercial Forestry Institutions desirous of Growing Bamboo on Private Lands. Complete liberty of cultivation and harvesting to registered producers.</li> <li>2. Complete abolition of Transit Pass requirements for Bamboo grown on Private Lands registered as above. <sup>68</sup></li> <li>3. Support to Cooperative Farming of Bamboo on privately owned lands through easier credit terms for purchase of saplings, fertilisers etc. from agencies like NABARD<sup>69</sup></li> </ol>	<ol style="list-style-type: none"> <li>1. National Bamboo Mission<sup>70</sup></li> <li>2. Ministry of Environment and Forests</li> <li>3. NABARD and other Rural Banks</li> </ol>
Absence of Market Information	Provision of information on Bamboo prices to cultivators through services such as <a href="http://Agmarknet.nic.in">Agmarknet.nic.in</a> and SMSes.	National Bamboo Mission, Department of Agriculture and Cooperation, Ministry of Agriculture
Insufficient Baseline Data	Regular Surveying and Data Collection on Bamboo usage patterns, Bamboo resources, species, and area covered etc. Surveys should be conducted at least biannually.	State Bamboo Mission, through Private agencies
<b>TRANSFORMATION SYSTEM</b>		
Poor Quality of Bamboo Supplied	These are the result of the above issues; when the above are resolved, these issues will disappear due to increased Private Plantation utilising scientific management practices and establishment of linkages between manufacturers and plantations.	
Low Quantity of Bamboo Supplied		
Lack of Trained Labour	Establishment of dedicated Bamboo Technology Institutes, to teach methods of primary, secondary processing as well as mechanical processing to generate innovation in design and production processes <sup>71</sup>	National Mission on Bamboo Applications, TIFAC, State Bamboo Missions, UGC <sup>72</sup>
Lack of access to Inputs	Upgrading of industrial infrastructure on a War Footing across the	Ministry for the Development of the North east

<sup>68</sup> This recommendation derives inspiration from the MoEF's own letter (dated 14/5/13) to Principal Secretaries of States for the liberalisation of Bamboo grown on private lands from transport pass requirements. Resistance to this recommendation derives from the MoEF's assertion that liberalising TP requirements generates incentives to cut forest grown bamboo and mix it in plantation grown shipments (S. K. Khanduri, personal communication). The author rejects this assertion on the grounds that community monitoring of forest bamboo will make thievery of forest produce much more difficult; in addition, the rise in legal bamboo plantation as a result of TP liberalisation will more than offset any small short-term losses in forests.

<sup>69</sup> Framed with intent to develop a cooperative Farming sector leading to economies of scale due to productive size of landholdings suitable for intensive cropping, proven successful in China (Robbins, 2012)

<sup>70</sup> The National Bamboo Mission has the mandate to enhance plantation farming of Bamboo in India, hence should be the appropriate authority for the registration.

<sup>71</sup> The establishment of dedicated Bamboo Research Institutes to take up R&D in all aspects of the value Chain, if unjustifiable on grounds of cost, can be achieved through development of courses in Bamboo processing, manufacturing and technology which can be offered in major engineering institutions and smaller local engineering and skill development centres such as ITI's or Vocational Training Colleges. An instructive example is the establishment of a Post Graduate Diploma Course in Bamboo Cultivation & Resource Utilization by Tripura University in the academic year 2007-08.

<sup>72</sup> The UGC should be required to certify the course contents as useful and application oriented and also to ensure uniformity in the syllabus.

	country to ensure that such enterprises have access to adequate power and Water supplies. Allotment of existing capacity towards industrial utilisation.	Region, Ministry of Power
Lack of Capital Intensity	<ol style="list-style-type: none"> <li>1. Temporary subsidisation of technologies of processing as well as chemicals in secondary processing<sup>73</sup></li> <li>2. Temporary subsidisation of production of Technical implements as well as strengthening patent enforcement regimes in India for implement design.</li> </ol>	National Mission on Bamboo Applications
Fragmentation of the industry	<ol style="list-style-type: none"> <li>1. Establishment of industrial Clusters featuring firms specialising in any one aspect of the value Chain each, such that firms are able to obtain processed Bamboo of grades required from other processing firms in the same cluster.<sup>74</sup></li> <li>2. Promotion of Bamboo processing technologies and the capability to differentiate between different grades of Bamboo through local education schemes targeting the Aggregator Middlemen and Transporter Middlemen<sup>75</sup></li> </ol>	<ol style="list-style-type: none"> <li>1. Ministry of Micro, Small and Medium Enterprises, Khadi and Village Industries Commission, Ministry for the Development of the North East Region, Department of Industrial Policy and Promotion, Ministry of Commerce</li> <li>2. National Mission on Bamboo Applications</li> <li>3. National Mission on Bamboo Applications (through popularising <a href="http://indiabambooinall.org">indiabambooinall.org</a> and constructing improved portals on a PPP basis with IT Majors including Infosys, Wipro)</li> </ol>
Concentration of the value Chain	<ol style="list-style-type: none"> <li>3. Establishment of B2B portals and popularising of existing portals such as <a href="http://indianbambooinall.org">indianbambooinall.org</a> in order to facilitate contact between individual sellers and develop vertical linkages in the industry<sup>76</sup></li> </ol>	
Production Delocalised from markets	<ol style="list-style-type: none"> <li>1. Establish Markets Near Clusters, which cater to local individuals</li> <li>2. Improved transportation channels for semi-processed Bamboo products, through reduced excise duties, octroi etc. on transportation</li> </ol>	Ministry of Commerce, Ministry of Finance, Revenue Department, Local Authorities <sup>77</sup>

<sup>73</sup> While Subsidies destroy competitiveness in the long run by reducing efficiency, a temporary subsidy on certain aspects of the production process including provision of essential inputs such as power, water, chemicals, capital machinery etc. is essential for conversion of essentially a cottage industry lacking in any technical prowess into a well-endowed, efficient production powerhouse dominated by capital intensive production methods. The need for such subsidies and protection of the nascent industry is documented in Collier, 2007.

<sup>74</sup> Policy inspired by successes seen in the Chinese model where such Clusters developed automatically. In Anji County, the existence of natural clusters of producers specialising in a single aspect of the value chain reduces transport costs and increases efficiency in production processes.

<sup>75</sup> Policy aimed at decentralising the Processing Chain across all members in the value chain and providing middlemen with the opportunity to add value through preliminary processing. Policy will decrease costs of production at the firm level due to economies generated by specialisation of certain middlemen and small scale firms in processing of Bamboo alone, as well as through the direct supply of processed bamboo by firms. Inspired by development of the Chinese Bamboo sector in Anji County. (See Wang, 2006)

<sup>76</sup> In the Information Era, B2B sites are the best means of facilitating contact between consumers and producers of Bamboo products and intermediates. Governments must popularise and incentivise the enlistment of local small-scale enterprises on these sites. A pre-requisite to this is, of course, provision of electricity and internet access to Bamboo growing regions, which is limited in India today.

<sup>77</sup> Certain transportation-based taxes are administered by local authorities, such as Octroi.

	3. Establish Clusters near cities, which can take advantage of this supply.	
Absence of Quality Assessment, Certification	Institution of Quality standards in product quality, production process standard, etc. <sup>78</sup>	Bureau of Indian Standards
<b>CONSUMPTION SYSTEM</b>		
Underdeveloped Markets	<ol style="list-style-type: none"> <li>1. Temporary imposition of tariffs on imports of finished Bamboo products from abroad, to allow domestic industries to gain competitiveness and protect them from corrosive competition from foreign goods</li> <li>2. Increased Public sector demand for Bamboo products (through policies of government furniture procurement, for example) to generate and sustain demand at initial stages of firm development; generation of further demand through further promotional policies as recommended.<sup>79</sup></li> <li>3. Establishment of centralised Bamboo Bazaars in major Bamboo production centres, within proximity of industrial Bamboo clusters (described above) for facilitation of contact between producers, cultivators, traders and exporters.</li> </ol>	<ol style="list-style-type: none"> <li>1. Ministry of Commerce</li> <li>2. Requires a Government of India or a State government policy for Office supplies procurement</li> <li>3. State Bamboo Missions in partnership with the NMBA and private contractors for construction and popularisation</li> </ol>
Poor Quality Perceptions	1. Institution of Quality standards in product quality, production process standard, etc. <sup>80</sup> .	Bureau of Indian Standards, State Bamboo Missions

<sup>78</sup> Imposition of Quality Standardisation by agencies including the BIS (such as AGMARK for agricultural produce, FPO mark for Food processing, Hallmark for Gold and Silver etc) can lead to a better quality of produce delivered to the market, since certified products gain a third party quality verification through the attainment of the given standard. In fact, the BIS has already instituted several standards pertaining to the Bamboo sector, e. g. the IS: 13958 standards for Bamboo Mat Boards.

<sup>79</sup> The Indian Bamboo industry faces weak domestic demand due to lack of awareness, insufficient linkages to consumers, etc. As a result, to provide initial financial support and start-up capital for the industry, the Government can play a role by leading the way in procuring Bamboo products for its own use, for e. g. through policies requiring new Government buildings to be constructed out of Bamboo. Creating this demand will lead to increased awareness, improved perceptions and will sustain production until domestic markets develop. Precedents seen in the Philippines, where 25% desks in Public Schools are to be made of Bamboo (NICCEP, 2012)

<sup>80</sup> At the Retail Stage, a certification mark can act as a signal of quality, dispelling notions of poor quality.

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Poor Retail Involvement	<ol style="list-style-type: none"> <li>2. Marketing through upmarket outlets in partnership with notable Indian premium handicraft showrooms, including FabIndia<sup>81</sup>.</li> <li>3. Privatisation of Retail Chains which promote Bamboo products, through partnerships of government Agencies responsible for Bamboo promotion with private showroom space owners</li> </ol>	
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<sup>81</sup> FabIndia is a leading pioneer of the community owned company model, which emphasizes inclusive capitalism, wherein the company is an intermediary between craftspersons and consumers. Over 26% of FabIndia's Shares are held by craftspersons. Such company models could increase the pro-poor impact of an industrial Bamboo sector. In addition, FabIndia's Premium, upmarket image will ensure that Bamboo products slowly begin identifying with quality instead of novelty alone.

**Proposals by Implementing Agency**

<b>AGENCY</b>	<b>RECOMMENDATIONS</b>
Ministry of Environment and Forests	<ol style="list-style-type: none"> <li>1. Require all states (by directive) to immediately amend existing State forest laws and rules to recognise Bamboo as a Minor Forest Produce and abolish Transit Pass requirements levied on the same.</li> <li>2. Create, maintain and update regularly a register of all those desiring to perform commercial plantation of Bamboo. This register should be maintained at the State level.</li> <li>3. Permit all registered Commercial Bamboo Plantation owners to cultivate, harvest and transport Bamboo as they see fit<sup>82</sup></li> <li>4. Create a specialised set of Forest Border Patrols and Security Forces who would be required to partner with Committees set up by the Gram Sabha (Clause (e), Section 4 of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Rules, 2007) in monitoring and supervising the harvesting of Bamboo from forest lands.<sup>83</sup></li> <li>5. Mandate states to establish of fixed routes along which Forest produce may be exported from Bamboo forests, and establishment of single point checkpoints at the extremities of these routes, wherein Forest produce must be checked for source and whether rights for felling exist.</li> </ol>
Ministry of Tribal Affairs	<ol style="list-style-type: none"> <li>1. Shift onus of Vesting of Forest Rights onto Officials of the Sub-Divisional Committee constituted under Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Rules, 2007, as well as on the Gram Sabhas<sup>84</sup></li> <li>2. Privatisation of Retail Chains which promote Bamboo products, through partnerships of government Agencies responsible for Bamboo promotion with private showroom space owners</li> </ol>
Ministry for Micro, Small and Medium Enterprises	<ol style="list-style-type: none"> <li>1. Provision of Micro-Credit to entrepreneurs who desire to establish Bamboo processing firms specialising in parts of the Supply Chain</li> <li>2. Establishment of industrial Clusters featuring firms specialising in any one aspect of the value Chain each, such that firms are able to obtain processed Bamboo of grades required from other processing firms in the same cluster.</li> </ol>
Ministry for the Development of the NER	<ol style="list-style-type: none"> <li>1. Establishment of industrial Clusters featuring firms specialising in any one aspect of the value Chain each, such that firms are able to obtain processed Bamboo of grades required from other processing firms in the same</li> </ol>

<sup>82</sup> Currently, States adopting the IFA's definitional Pattern treat Bamboo as a tree, whose harvesting is a monopoly of the Forest Department irrespective of whether the Bamboo grows on private lands or not. This recommendation therefore is conjoint with recommendation 1.

<sup>83</sup> The onus of protecting locally owned resources then lies jointly with community bodies and the Forest Department.

<sup>84</sup> Onus of applying currently rests upon the Gram Sabha of the village; yet nowhere in the rules is it mentioned that Officers of the Sub-divisional Level committee inform ALL forest dwellers of the act, only that they are required to inform applying Gram Sabhas of the same. Recommendation that the Officers conduct regular field visits to known forest dwelling communities to aid in the process of Vesting of Rights.



	<p>cluster.</p> <ol style="list-style-type: none"> <li>Establishment of Infrastructure including regular water and power supply to Bamboo producing Centres<sup>85</sup></li> <li>Establishment of centralised Bamboo Bazaars in major Bamboo production centres, within proximity of industrial Bamboo clusters for facilitation of contact between producers, cultivators, traders and exporters.</li> <li>Organisation of large trade fairs and major publicity events for the Bamboo industry</li> </ol>
National Bamboo Mission, Ministry of Agriculture	<ol style="list-style-type: none"> <li>Promotion of cooperative and commercial plantation based Bamboo farming, through collaboration with MoEF and financial institutions such as NABARD<sup>86</sup></li> <li>Provision of information on Bamboo prices to cultivators through services such as <a href="http://Agmarknet.nic.in">Agmarknet. nic. in</a> and SMSes</li> <li>Temporary subsidisation of technical implements utilised in harvesting of Bamboo</li> <li>Provision, to all State Forest Departments, of scientific procedures for increasing yields from private plantations for dissemination within the populace</li> </ol>
State Bamboo Missions (SBM's) or Bamboo Development Authorities	<ol style="list-style-type: none"> <li>Actual provision of credit and other forms of aid to agencies engaging in Commercial Forestry of Bamboo<sup>87</sup></li> <li>Organisation of large Trade Fairs and major publicity events at the State Level</li> <li>Aid the NBM in provision of information on Bamboo prices to cultivators through services such as <a href="http://Agmarknet.nic.in">Agmarknet. nic. in</a> and SMSes</li> <li>Establishment of centralised Bamboo Bazaars in major Bamboo production centres, within proximity of industrial Bamboo clusters for facilitation of contact between producers, cultivators, traders and exporters.</li> <li>Coordination with State Level Handicraft promotion organisations to promote traditional handicraft products through State level ventures<sup>88</sup></li> </ol>
National Mission on Bamboo Applications, Department of Science and Technology	<ol style="list-style-type: none"> <li>Increased funding of projects at institutions for Biotechnology aimed at bettering the existing bamboo stock and genetic engineering of better varieties of Bamboo. Encouragement and invitation for research projects into the same.</li> <li>Design of a curriculum for a National Level course in Bamboo Applications to be taught in engineering courses across the country</li> </ol>

<sup>85</sup> Electric power is among the most important inputs required in primary processing at a capital intensive production level (Sunil Joshi, pers. Comm. , A U Khan, pers. Comm. ).

<sup>86</sup> The NBM is envisioned as a nodal agency at the National level for all requirements of financial and other assistance required for the establishment and functioning of Plantations. Framed with intent to develop a cooperative Farming sector leading to economies of scale due to productive size of landholdings suitable for intensive cropping, proven successful in China (Robbins, 2012)

<sup>87</sup> The SBM is envisioned as the state level agency for the coordination of the actions of the relevant ministries towards all implementational aspects. This is done in order to ensure a degree of decentralization in implementation in balance with single agency responsibility for action. The SBM is, however, envisioned as subordinate, in matters relating to policy, to the NBM. The SBM could, however, be financially independent in that it could be allowed to raise revenue from the sale of Bamboo products, providing incentives for the expansion and active implementation of the schemes, as well as for the SBM's to pressurize the Central ministries to take appropriate action.

<sup>88</sup> Tripura has been able to achieve success in this field through coordination between the Tripura Bamboo Mission and PURBASHA, its handicrafts promotion organization.

	<ol style="list-style-type: none"> <li>3. Establishment of dedicated Bamboo Technology Institutes, to teach methods of primary, secondary processing as well as mechanical processing to generate innovation in design and production processes<sup>89</sup></li> <li>4. Organisation of large trade fairs and major publicity events for the Bamboo industry even in non-traditional markets to promote awareness regarding the same<sup>90</sup></li> <li>5. Education of Cultivators and Processing agencies including aggregator middlemen, in primary processing methods and segregation of Bamboo into different grades based on culm qualities</li> <li>6. Temporary subsidisation of production of Technical implements and provision of chemicals required in secondary processing, as well as strengthening patent enforcement regimes in India for implement design.</li> <li>7. Organisation of large trade fairs and major publicity events for the Bamboo industry</li> </ol>
Centre for Indian Bamboo Resources and Technology	<ol style="list-style-type: none"> <li>1. Education of Cultivators and Processing agencies including aggregator middlemen, in primary processing methods and segregation of Bamboo into different grades based on culm qualities</li> <li>2. Privatisation of Retail Chains which promote Bamboo products, through partnerships of government Agencies responsible for Bamboo promotion with private showroom space owners</li> <li>3. Organisation of large trade fairs and major publicity events for the Bamboo industry</li> <li>4. Funding of Bio-Technology in Bamboo species improvement to create better quality varieties, and also preserve existing genetic variety in Bamboo.</li> </ol>
Ministry of Commerce and industry	<ol style="list-style-type: none"> <li>1. Temporary imposition of tariffs on imports of finished Bamboo products from abroad, to allow domestic industries to gain competitiveness and protect them from corrosive competition from foreign goods</li> <li>2. Leverage EPCH's Handicrafts Exhibitions and shows as well as expertise for Export Promotion in improving quality of Bamboo Handicrafts and for export promotion</li> </ol>
Ministry of Finance	<ol style="list-style-type: none"> <li>1. Temporary exemption of Bamboo products from CENVAT and related excise duties<sup>91</sup></li> </ol>
Bureau of Indian Standards	<ol style="list-style-type: none"> <li>1. Establish a standard of measurement for Bamboo Pole Quality on the lines of AGMARK for agricultural produce</li> <li>2. Establish a quality standard for Bamboo products on the basis of which awards may be given for contracts and other recognitions<sup>92</sup></li> </ol>
Central, State and other government Agencies	<ol style="list-style-type: none"> <li>1. Increased Public sector demand for Bamboo products (through policies of government furniture procurement, for example) to generate and sustain demand at initial stages of firm development; generation of further demand through further promotional policies as recommended.</li> </ol>

<sup>89</sup> The essential requirement for efficacy of this measure is dissemination of research conducted amongst cultivators, harvesters, middlemen, processing industries and manufacturers, which can be achieved through training camps for stakeholders.

<sup>90</sup> A Major reason for deficient demand for higher value Bamboo products is lack of consumer awareness regarding their existence, the qualities of Bamboo and its major social advantages. Identified by TBM Report Document, 2006.

<sup>91</sup> Administration of CENVAT and other central excises is conducted by the Central Board of Excise and Customs under the Department of Revenue, Ministry of Finance. CENVAT exemptions for higher value products are seen as a strategy to promote value addition (Planning Commission, 2011; A U Khan, pers. comm.)

### Study of the Impacts of the Above Policy Framework on Incentives of Stakeholders in the value Chain

<b>Stakeholder</b>	<b>Objectives</b>	<b>Incentives under Old Policy Framework</b>	<b>Incentives under Proposed Policy Framework</b>
<b>Tribals and Forest Dwellers</b>	<ol style="list-style-type: none"> <li>1. Utilise Bamboo for private uses, e. g. in making baskets, houses etc.</li> <li>2. Maximise income from sale of Raw Bamboo poles to industry</li> <li>3. Maximise earnings from sale of Bamboo products manufactured locally</li> </ol>	<ol style="list-style-type: none"> <li>1. Cut bamboo illegally from forests</li> <li>2. Bribe officials</li> <li>3. No incentive to add value, low processing in handicrafts produced</li> <li>4. Disincentive to grow bamboo on private homesteads</li> </ol>	<ol style="list-style-type: none"> <li>1. Participate in JFM schemes under FRA and preserve Bamboo forests due to enhanced vesting of rights, onus of protection resting with them jointly with Forest Department.</li> <li>2. Pursue scientific management, adopt agriculture best practices due to establishment of land rights</li> <li>3. Disincentives to illegal felling due to increased policing</li> <li>4. Undertake education programmes provided by government agencies due to potential of regular employment under government programmes and private sector firms</li> </ol>
<b>Private Plantation Owners</b>	<ol style="list-style-type: none"> <li>1. Maximise Revenue from Sale of Bamboo</li> <li>2. Minimise transaction costs and transport costs</li> </ol>	<ol style="list-style-type: none"> <li>1. Not enter the Bamboo sector as transportation of final produce is over regulated and licensed</li> <li>2. No incentives to undertake research into improvement of Bamboo varieties.</li> </ol>	<ol style="list-style-type: none"> <li>1. Increase production of Bamboo due to freedom of sale and transportation of cultivated bamboo</li> <li>2. Incentives to enter industry due to lucrative size of demand, market pricing of bamboo</li> <li>3. Incentives to undertake primary processing on site due to subsidised provision of processing technology</li> <li>4. Lucrative pricing of Bamboos and increased bargaining power incentivise membership with an organisation of producers, thus leading to promotion of Bamboo Interest Groups capable of petitioning and negotiating with government agencies and promoting individual needs</li> </ol>
<b>Middlemen</b>	<ol style="list-style-type: none"> <li>1. Maximise profits earned from the difference between price of procurement and price of sale to manufacturer</li> </ol>	<ol style="list-style-type: none"> <li>1. Buy in small quantities from individual farmers</li> <li>2. Transport illegally or via informal channels</li> <li>3. Sell in bulk without sorting or grading</li> </ol>	<ol style="list-style-type: none"> <li>1. Purchase from commercial plantations and sell to large firms on a contractual basis</li> <li>2. Perform functions of grading and segregation of Bamboos by quality</li> <li>3. Perform basic primary processing functions and eventually establish micro industrial units</li> </ol>
<b>Manufacturers</b>	<ol style="list-style-type: none"> <li>1. Maximise profits by minimising costs of inputs</li> </ol>	<ol style="list-style-type: none"> <li>1. Obtain Bamboo from middlemen at prices quoted by the middlemen, due to lack of channels for</li> </ol>	<ol style="list-style-type: none"> <li>1. Obtain Bamboo from plantation owners directly at prices determined by a market characterised by</li> </ol>

	<ol style="list-style-type: none"> <li>2. Minimise marginal costs of production</li> <li>3. Maximise sales</li> <li>4. Maximise Revenue</li> <li>5. Improve Brand Image as a Socially Responsible firm</li> </ol>	<p>commercial forestry sales</p> <ol style="list-style-type: none"> <li>2. Utilise low levels of technology, etc due to high costs of capital implements</li> <li>3. Train artisans to produce goods instead of hiring trained labourers (due to shortage of skilled labour)</li> </ol>	<p>information availability due to ease of transportation</p> <ol style="list-style-type: none"> <li>2. Engage in contract farming practices with tribals who can now be put in contact with them much more easily</li> <li>3. Specialise in developing productive capacity within defined vertical boundaries in the value chain due to ease in obtaining processed raw materials</li> <li>4. Hire trained labourers and artisans</li> <li>5. Utilise primary and secondary processing techniques due to subsidisation of technology and the potential of higher earnings from the sale of higher value products</li> <li>6. Incentives to enter the industry due to enormous potential market</li> <li>7. Image of Social Responsibility is bolstered by Bamboo usage, hence an incentive to enter exists.</li> </ol>
<b>Retailers/ Exporters</b>	<ol style="list-style-type: none"> <li>1. Maximise profits from sale of produce</li> </ol>	<ol style="list-style-type: none"> <li>1. Not deal in Bamboo products due to poor public perceptions of low quality and inferiority to wood products</li> </ol>	<ol style="list-style-type: none"> <li>1. Deal in high value products produced by newer manufacturers, utilising novel designs</li> <li>2. Cater to a larger export market awaiting novelty in design and in quality</li> </ol>

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## Conclusions and Directions for the Future

The Bamboo sector is under-industrialised in India owing to a wide variety of challenges accruing to each portion of the value Chain. Nonetheless, possessing immense potential for growth, the sector's pivotal importance has, in recent times, prompted welcome reform steps from the Government. A Bill to amend the Indian Forest Act, 1927 was introduced in Parliament by P D Rai, which seeks to remove Bamboo from the list of plants included under the classification "Tree" in the IFA. Similarly, the recent handing over of Transit permit Passbooks to certain villages in Orissa signifies a limited, yet welcome, step in the right direction.

While regulatory restrictions retain a stranglehold over the Bamboo sector in significant measures, it must be understood that the sector faces several other constraints as well. This research demonstrates that while easing restrictions on Bamboo availability is a necessary condition for developing the sector, it is not a sufficient condition. Bottlenecks in the sector occur even in terms of technical knowledge deficits and lack of adequate markets for the sale of produce.

Future efforts at upgrading the Indian Bamboo sector must include a comprehensive end-to-end set of reforms and proactive action to be taken at each level in the value chain. It must be ensured that each major challenge in the Value Chain and the Production to Consumption System must be tackled; the required action in each case would be a mix of policy reform, legislative amendments and affirmative action by the Government. The Policy Recommendations listed within this paper were compiled after careful discussion with a limited number of stakeholders and consideration of precedents either outside India or confined to smaller portions of the Nation; they must be reviewed with a larger number of individual stakeholders before they may be implemented. The Author is, nevertheless, of the optimistic opinion that a stronger level of political will and the active involvement of NGOs and similar Civil Society Organisations can take the Bamboo sector to new heights.

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## References

- Ahlawat, S. P. , Haridasan, K. , Hegde S. N. , 2002. *Field Manual for Propagation of bamboo in North East India*. Manual produced under UNDP- DC (H) Cane and Bamboo Project. Published by SFRI.
- Belcher, B. 1995. "Bamboo and Rattan Production-to-Consumption Systems: A Framework for Assessing Development Options". INBAR Working Paper no. 4
- BIS. "BIS standards relevant for utilisation of bamboo and bamboo composite material in structural application". Accessed online on July 16 2013 at <http://www.apilbambooprefab.com/download/BIS%20Standards.pdf>
- Buckingham, Kathleen; Jepson, Paul; Wu, Liangru; Ramanuja Rao, I. V. ; Jiang, Sannai; Liese, Walter; Lou, Yiping; Fu, Maoyi, 2011. "The Potential for Bamboo is constrained by Outmoded Policy Frames." Accessed online on 18 June 2013. doi: [10.1007/s13280-011-0138-4](https://doi.org/10.1007/s13280-011-0138-4)
- Chongtham, Nirmala; Bisht, Madho Singh; Haorongbam, Sheena. "Nutritional Properties of Bamboo Shoots: Potential and Prospects for Utilisation as a Health Food." *Comprehensive Reviews in Food Science and Food Safety*, 10: pp. 153–168. doi: 10.1111/j.1541-4337.2011.00147.x
- Collier, P. 2007. *The Bottom Billion: Why the Poorest Countries are Failing and What Can be done about it*. Oxford University. pp. 157-174.
- Dahlman, Carl J. 2009. "Growth and Development in China and India: The Role of Industrial and Innovation Policy in Rapid Catch-Up." in *Industrial Policy and Development*. Edited by Mario Cimoli, Giovanni Dosi and Joseph E Stiglitz. Oxford University Press, New York.
- Dilli Haat Operation and Management Rules, 2006*. DTTDCL, Government of the NCT of Delhi.
- Environmental Bamboo Foundation. "Why Bamboo? Here's Why..." Accessed 22 June 2013 at <http://www.bamboocentral.org/index1.htm>
- FAO, 2005. "World Bamboo Resources- A Thematic Study Prepared in the Framework of the Global Forest Resources Assessment, 2005". FAO.
- Forest Survey of India, 2011. *India State of Forest Report, 2011*. Published by the Ministry of Environment and Forests, Government of India.
- Economic Research Group, 2000. "Process, Marketing and Business Opportunity Report: Bamboo Shoots." Report Prepared by ERG in association with CPF, FRESH and Delphi
- FSC, 2005. FSC news. "Estimated size of FSC global market revised to US\$5 billion". April 25. Accessed on 14 July 2013 at [http://www.fsc.org/en/whats\\_new/news/news/40](http://www.fsc.org/en/whats_new/news/news/40). Bonn, Germany, FSC.
- Gnanaharan, R. , Mosteiro, A. P. , 1997. *Local Tools and Equipment Technologies for Processing Bamboo and Rattan: An Illustrated Manual* INBAR Technical Report No. 9
- Government of India, 2002. *Tenth Five Year Plan*. Planning Commission.
- Government of India, 2003. *National Mission on Bamboo Technology and Trade Development*. Planning Commission.
- Hanumappa, H. G. 1996. *Agarbatti: A Bamboo-Based Industry in India*. A report commissioned by INBAR and IFAD.
- IL&FS, 2006a. *Tripura Bamboo Mission Main Report*. A Report by Infrastructure Leasing and Financial Services, Limited, for the Tripura Bamboo Mission. Accessed 16 June 2013 at <http://www.tripurabamboo.com/Reports/web%20Final%20Main%20Report.pdf>

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II&FS, 2006b. *Tripura Bamboo Mission: Furniture Sub-Sector Report*. A report by Infrastructure Leasing and Financial Services Limited, for the Tripura Bamboo Mission. Accessed on 23 June, 2013 at <http://www.tripurabamboo.com/Reports/Furniture%20Sub-sector%20Report.pdf>

*Indian Forest Act, 1927*. Ministry of Environment and Forests, Government of India. Available online at <http://moef.nic.in/sites/default/files/Indian%20%20Forest.pdf>

Janssen, J. A. 2000. *Designing and Building with Bamboo*. INBAR Technical Report no. 20, published by INBAR, Beijing.

Khan, Amir Ullah; Hazra, A. 2007. "Industrialisation of the Bamboo Sector: Challenges and Opportunities". India Development Foundation, Publication 15. Published by Confederation of Indian Industry (CII).

Kigomo, Bernard N. 2007. *Guidelines for Growing Bamboo*. KEFRI Guidelines Series no. 4

Maogong, Zhong; Chen, Xie; Wei, Zheng; Maoyi, Fu; Jinzhong, Xie. 1998. "Bamboo in Anji, China: A Case Study of an Intensive Production-to-Consumption System." INBAR Working Paper no. 15. Published by INBAR, Beijing

Marsh, J. , Smith, N. 2007. "New Bamboo Industries and their Pro Poor Impacts: Lessons from China and potential for Mekong Countries". Feasibility Study by Oxfam Hong Kong and MPDF. Accessed 1 July, 2013 at <http://www.fao.org/docrep/010/ag131e/ag131e25.htm#fn2>.

National Bamboo Mission, 2003. *National Bamboo Mission: Operational Guidelines*. Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India. Accessed 17 June 2013 at <http://nbm.nic.in/guideline.html>

NCDPD (National Centre for Design and Product Development) and BCDI (Bamboo and Cane Development Institute), 2010. "Feasibility study for the identification and promotion of commercially viable technologies for product development of the value addition of Bamboo & Cane based products from North East Region of India". Study conducted under the R&D Scheme of the Development Commissioner (Handicrafts)

NICCEP, 2012. *Bamboo Industry Study*. Available at <http://www.niccep.dti.gov.ph/download.php>, accessed on July 18 2013.

Pack H. and K. Saggi, 2006. "Is there a case for Industrial Policy: A Critical Survey." *The World Bank Research Observer*.

Planning Commission, 2011. *Report of the sub-group-II on NTFP and their Sustainable Management in the 12th 5-year Plan*. Submitted under the Planning Commission's Working Group on Forests & Natural Resource Management

Rao, I. V. Ramanuja, Kumar, Arun, Reza, Selim, Motukuri, Bhargavi, 2009. "A Pathway Out of Poverty: Bamboo Incense Stick Production as a Livelihood Option for Rural Women in Tripura, India." INBAR Working Paper 55, published in 2009 by INBAR, Beijing and CIBART, New Delhi.

Robbins, Alicia. 2012. "China's Forest Sector in the Reform Era". CINTRAFOR News.

Van Der Wal, Sanne. 2008. "Sustainability Issues in the Tea Sector." A Report by SOMO. Accessed online on 22 July 2013 at [http://somo.nl/html/paginas/pdf/Sustainability\\_Issues\\_in\\_the\\_Tea\\_Sector\\_EN.pdf](http://somo.nl/html/paginas/pdf/Sustainability_Issues_in_the_Tea_Sector_EN.pdf)

Saxena, N.C. 2002. "Bamboo Workers and Forest Policy." Accessed at the Website of the Planning Commission on 23 June 2013 at <http://planningcommission.nic.in/reports/articles/ncsxna/index.php?repts=bamboo.htm>

---

*Scheduled Tribes and Other Forest Dwellers (Recognition of Forest Rights) Act*, 2006. Ministry of Tribal Affairs, Government of India.

Smith, N. , Marsh, J. , Key, K. , 2006. "The Bamboo Business and Poverty Reduction: Initial Insights into High Impact Industrial Development Strategies from the Mekong. " Paper presented at Bamboo for the Environment, Development and Trade- International Bamboo Workshop, Wuyishan City, Fujian, China, 23 October 2006.

Smith, N. , Key, K. , Marsh, J. , 2006. "World bamboo markets: Preliminary analysis of selected bamboo product markets". Paper presented at Bamboo for the Environment, Development and Trade- International Bamboo Workshop, Wuyishan City, Fujian, China, 23 October 2006.

Smith, N. , De Mestre, Timothy, 2009. *Establishing Industrial Bamboo Enterprises through the value Chain Approach: Insights from recent experiences in South East Asia*. Presented at World Bamboo Congress VIII. Available at [http://bambusc.org.br/wp-content/gallery/WBC2009/WBCVIII-Vol\\_02.pdf](http://bambusc.org.br/wp-content/gallery/WBC2009/WBCVIII-Vol_02.pdf)

Van Der Lugt, P, Otten, G. 2006. "Bamboo Product Commercialization in the European Union". INBAR Technical Report No. 29.

Van Der Lugt, P. Lobovikov, M. 2008. "Markets for Bamboo Products in the West". *Bois et forêts des tropiques*, 2008, n° 295 (1): pp. 81-90

Wang, X. 2006. "Comparative Analysis and Policy Recommendations on Developing Bamboo Resource Tenure Systems in Asia and Africa". Joint Project in cooperation between INBAR and WFI.

*Website of* Department of Civil Engineering, Indian Institute of Technology, Delhi. Accessed on 20 June 2013, at <http://www.bambootechnologies.org/>

*Website of* the National Bamboo Mission, nbm. nic. in

*Website of* the National Mission on Bamboo Applications, bambootech. org. in