

Rejuvenating Bamboo

A Comprehensive Sectoral Approach

Brief II: National Bamboo Mission, Global Demand Patterns and
Comparative Look with China

Research Brief
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National Bamboo Mission in historical context

In 2003, exactly 20 years ago, the government of India took its first step towards making bamboo an agricultural product, a national policy priority. A draft report on the National Technology Mission of Bamboo and Trade Development (NTMBTD) was prepared and published in July 2003 to set priorities, key goals and formalize the primary institutional structure for developing the bamboo economy in India. It was a comprehensive report centered around bamboo as a source for employment and holistic rural development, especially in Northeastern India. The report was prepared and finalized with the full cooperation of various stakeholders, including regional NGOs and international organisations like UNIDO [18]

Subsequently, the Ministry of Agriculture was designated as the nodal ministry for the mission and laid down detailed project reports for financial allocation to be made in the upcoming general budget of 2004-2005. The prospects of setting up primary processing units near bamboo resource-rich regions already been ideated during the earlier meetings and documented in the DPRs. The mission's potential focus was generating employment for up to 9 million individuals with a significantly large share of women, mainly from North Eastern regions (NER). The report also provided projections on potential market size, estimated to be 25,000-30,000 crores by 2015.

The 'National Bamboo Mission' was first mentioned in the annual report of the Planning Commission in 2006 and 2007 during which its was formally launched as a centrally sponsored scheme by the Government of India. The estimate projections has provided a sense of economic rationale for the government investments (Baksy 2013). It also gave impetus to the growth of the industry, hence guiding the mission to a common goal of making bamboo as a vital resource for economic growth. The table i mentions the projected growth for various end use products as identified in the report.

Bamboo Finished Product	Market Size 2003 (in crores)	Projected Market Size 2015 (in crores)
Shoots	5	300
Timber Substitute	10,000	30,000
Plyboards	200	500
Matboards	NA	3908
Pulp	NA	2088
Furniture	380	3265
Agarbatti	NA	NA

Table 1: Projections made in NTMBTD report Source: Baksy 2013

The intent of this analysis is inspired by the Douglas C North Book titled "Institutions, Institutional Change and Economic Performance" to get deeper insights into the institutional structure, operations, and outcomes of the National Bamboo Mission in order to get a preliminary understanding of the way NBM functioned, identify potential issues and challenges for reforms. The analysis utilises secondary sources, including publicly available NBM documents, academic literature, and reports (refer to reference section). Since the analysis requires primary data in the form of interviews, the synthesise presented in brief is preliminary and may change after the initiation of the detailed study/project and final publication of the report. The brief also looked at the global demand and consumption patterns of USA and EU 28 along with Chinese exports to identify potential and prospective industrial sectors.

National Bamboo Mission

Globally, the bamboo industry has been growing at a Compound Annual Growth Rate (CAGR) of 4.5% (2022-2030) and currently has a market size of 59.3 billion USD (GVR 2021). It indicates that over the year, the industry has made significant strides in terms of producing finished goods and creating markets around it. Despite the rapid progress made by the industry globally, the NBM or the Indian bamboo industry has not undergone a commensurate transformation as per the planning commission's projections, indicating a much slower growth.

The National Bamboo Mission established as a centrally sponsored scheme, has been institutionally positioned and structurally changed across different government hierarchies. Earlier, it was established under the Ministry of Agriculture. It was subsumed under the Mission for Integrated Development of Horticulture during 2014-2016 and then shifted to the National Mission of Sustainable Agriculture as a sub-scheme, one of the eight missions under the National Action Plan for Climate Change (NAPCC). The successive changes, with regard to its parent body, in the composition of NBM have led to instability in its institutional priorities in accordance. The same is represented in the figure below [3].

Even with the government's vision to grow and utilise bamboo as a crop, it remained in the categorisation of timber until the Forest's conservation act amendment in 2017. The amendment recategorised bamboo as grass, removing it from the restrictions of various timber regulations. The delayed decision to exempt bamboo from various regulations impacted the industry's prospects for growth.



Figure ii, Institutional Challenges, Author's Analysis

The positionality of NBM under three different sectoral government departments/schemes has not drastically changed the institution's goals with respect to its activities. For most individual years, the primary focus on the plantation and cultivation of bamboo has been driven by our need to shift from a net importer to a net exporter. Whatever focus was invested in other segments has not equitably reflected and translated into the domestic or international bamboo economy.

Between 2015-2017 the export of bamboo & bamboo products was Rs. 0.11 crore and Rs. 0.32 crore, respectively, while the import was Rs 148.63 crore and Rs 213.65 crore (NBM 2019). The recent data suggest that our net exports are higher than our net imports, indicating a trade surplus. However, it also presents a unique dichotomy for the Indian bamboo industry (NEF 2023). Even with increased exports of finished goods (mostly low-value added daily use articles), our import share of bamboo raw material has increased to 88% of our total bamboo imports, indicating Chinese dependence. (NEF 2023)

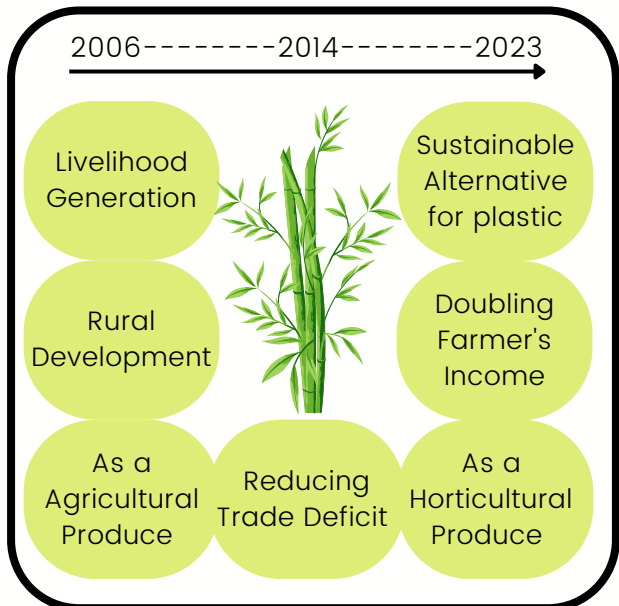


Figure i: Evolving Nature of Bamboo as a Product, Author's Analysis

Additionally, ITC reported that after 2019, its domestic bamboo raw material utilisation has fallen to 5% for its agarbatti manufacturing operations [2]. Increasing reliance on imported Chinese bamboo for various purposes requires immediate government interventions. Indian bamboo industry cannot cater to the growing demand with manual, outdated production methods.

Apart from positionality, the legal ambiguities on the governance of upstream segments across states have yielded inefficiencies. The challenges associated with accountability and capacity impede the progress of NBM and respective SBMs and SBDAs. The figure below provides a thematic understanding of the various institutional challenges the NBM faces.

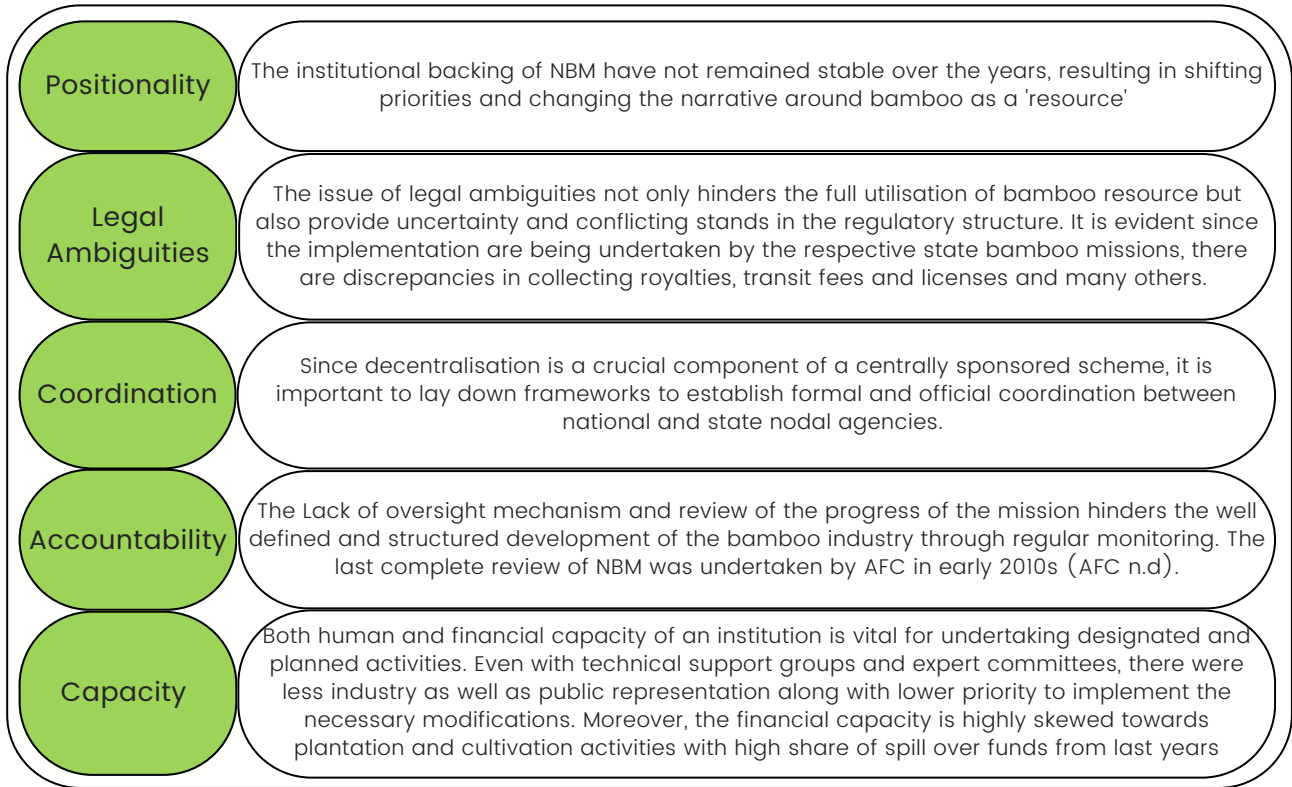


Figure III: Identification and description of Institutional Challenges, Author's Analysis

With a renewed focus on value chain development and waste management of restructured NBM (RNBM), the bamboo economy's commercialisation has been undertaken through a series of integrative steps. We looked at data to understand the comparative progress made by NBM before 2018 and after (the critical juncture for its overhaul now referred to as RNBM). The table presents the progress across a range of physical parameters. Although the restructuring did provide a shift in NBM's objective approach to reforms, it had mixed outcomes regarding its achievements. For example, the average plantation per year has gone down to half; during NBM, the average plantation area before 2018 is 10,417, down to 5,939 during RNBM (from 2018-2022) [13]

Physical progress NBM and RNBM		
Item	After 2018 till 2022	Before 2006-2018
Plantation on non-forest area	23,666 ha	1,25,000 ha
No. Bamboo Nurseries	367	1466
No. infrastructure for bamboo market	96	108
No. Product development and Processing Units	372	-
No. tools, equipments and machinery	1,801	-
No. Individuals trained	11,958	61126

Table 2: Source: MoA&FW Annual Reports, NBM Operational Guidelines 2019

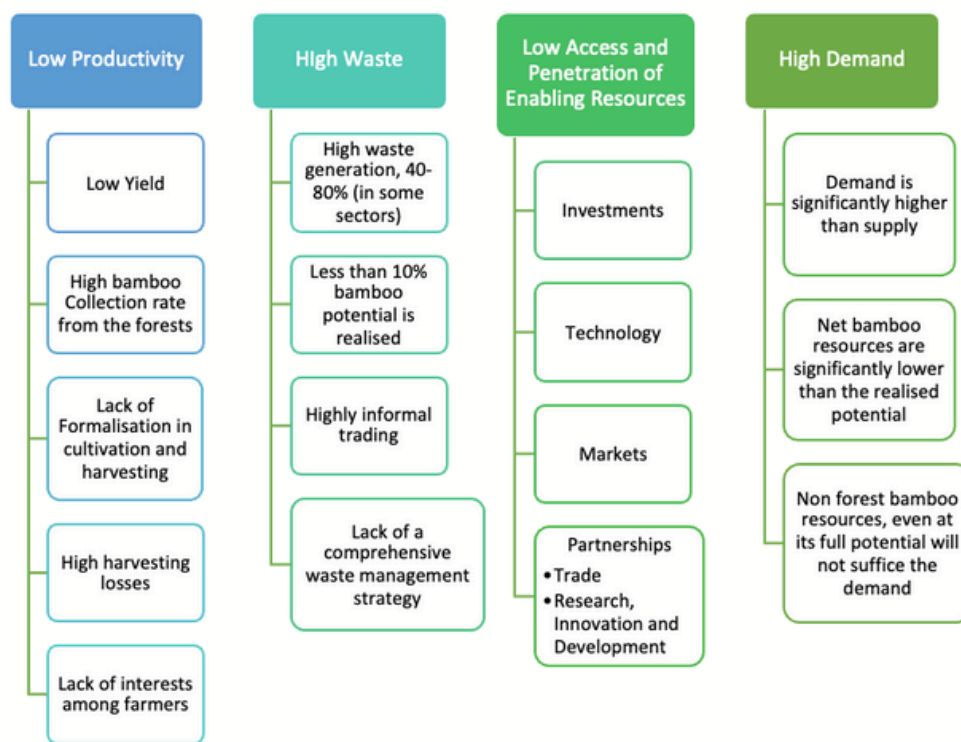


Figure iv: Characterisation of the Dichotomy, Author's Analysis

In line with its intended objectives, over 40 Bamboo based FPOs (under the central sector scheme) and 23 clusters across nine states (under RNBM) have been formed to drive the economy through the viable business model [3]. Although their progress is a different matter and outside the scope of this article. Additionally, the impact of covid has also been one of the reasons for the lagging progress of the mission. The diagram illustrates the characterisation of the dichotomy and identifies factors for the limited performance of the national bamboo mission.

We analysed the annual action plans submitted by 17 states for the year 2020–2021 as a means to illustrate state priorities in various segments of the bamboo value chain. The indicator of financial allocation (proposed) has been used as a proxy for depicting the priorities from a bird eye view and segment-specific details (refer to the figures below). Most of the spill over funds share (more than 55%) are from Madhya Pradesh, Arunachal Pradesh, and Kerala alone. States like Sikkim, Gujarat, and Bihar are also unable to utilise at least 1/3rd of designated funds for bamboo activities.

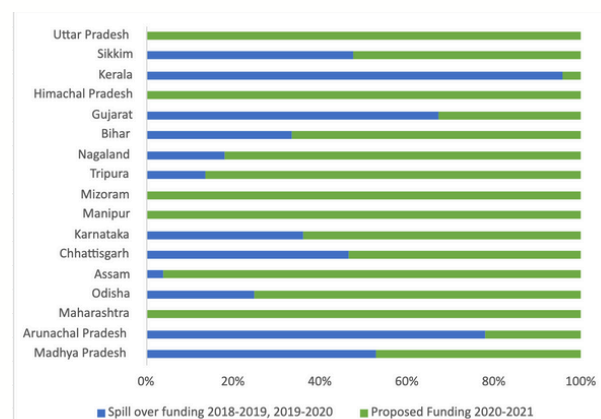


Figure v: Stacked graph for spill over vs proposed funding, Author's Analysis

Additionally, the total spill over funding is more than double the proposed funding for FY21. Moreover, 55% of the funds are allocated for propagation and cultivation, with 18% for product development and processing. Less than 6% of the funds are proposed to be allocated for promotion, bamboo treatment, infrastructure for markets, etc. Even so, increased funding for plantation and cultivation activities does not correspond to its respective physical progress as explained earlier.



Figure vi: Stacked graph for spill over vs proposed funding, Author's Analysis

In the proposed total funding of 55.5 INR crores for FY 21, 47% of funds have been allocated for propagation and cultivation. This is in addition to the spill over fund of 68.5 crores remaining in the state's accounts which they have not used for that purpose. It represents a dismal situation of the state's missions' capacity to effectively allocate and utilise those funds. Apart from the financial capacity of the institution, the importance of building strategies and roadmaps for end-use sectors is critical for boosting the supply of bamboo. Even with NBM's significant spending on plantation and cultivation, the problem of lower yield persists, with just 3.23 million metric tonnes of annual production for 2021-2022 [3]. As explained in the previous section, the delay in exempting bamboo from timber regulations also exacerbated the situation.

Value chain parameters as per NBM monitoring guidelines	In INR Crores		
	Proposed FY21	Spill over FY19, FY20	Total
Propagation and Cultivation	25.8	68.5	94.3
Promotion of Bamboo Treatment and preservation	5.5	4.3	9.8
Product Development and Processing	12.3	19.6	31.9
Promotion and development of Infrastructure for Bamboo Markets	3.6	5.1	8.8
Development of tools, equipment, and machinery	2.9	5.4	8.4
Skill development and awareness campaigns	1.2	3.2	4.3
Research and Development	1.9	6.7	8.6
Project Management	2.0	4.5	6.5
Total	55.2	117.4	172.6

Table 4: Annual Action Plans submitted to the MoA&FW

Let's delve deeper into these potential and prospective industries for bamboo in India. These sectors will lay the foundational strategy for India to push for the manufacturing of highly demanded products in the next 5-10 years and provide the necessary pull for its supply through high productivity, high yield, and low waste.

NEF Research Prospects

The National Bamboo Mission has been instrumental in curating and crafting the bamboo industry in India since its inception in 2006. Though several factors have influenced the positionality and nature of imaging bamboo as a product, the central goal of reducing import dependence remains consistent. Through data and literature review, It is found that India's bamboo industry could not grow at par with Chinese or global development. There were and are challenges associated with productivity, waste, and demand for bamboo. Even with restructuring and renewed outlook for the NBM, the activities implemented by respective SBMs were met with various challenges. Every ministerial-level draft, conference, and workshop since 2018 elucidates the importance of sustainable development of the bamboo economy, doubling farmer's income, and reducing imports. However, the status quo is maintained with a lack of national-level comprehensive strategy/roadmap for individual sectors [12].

The research at the National Economic Forum on the bamboo industry intends to fill this gap by providing a strategic vision for the National Bamboo Mission. The proposed study will conduct (i) comprehensive mapping of the complete value chain (a) for select states, (b) and for select prioritised end-use sectors, and (ii) evaluate existing business models, including FPOs and clusters, (iii) techno-economic feasibility for prospective industries and (iv) innovative financing avenues, incentive mechanisms and opportunities for synergy across existing schemes to finally prepare sector-specific policy recommendations to the NBM for its implementation.

Global Demand patterns

The imports reflect demand, especially when the domestic industry is non-existent, as in the case of bamboo. The times series import data for the last five years (2017–2021) has been used as a proxy to understand high and low-demand sectors for 14 classes of bamboo products as identified through their HSN. The analysis has been done primarily for the developed countries, USA and European Union-28, as represented in Table 5. The data suggests certain product classes where the demand is significantly higher. There are certain products where the demand contrasts between the EU and USA. A time series analysis revealed the products' increasing and decreasing demand over the years.

The demand for (i) tableware & kitchenware, (ii) furniture, and (iii) daily-use articles are increasing and highest in 2021 in both the EU and USA. Regarding percentage growth (2017–2021), Bamboo Pulp and Bamboo Seats have shown a whooping increase of 518% and 111% in the European Union -28. In the United States, the highest increase has been shown by bamboo pulp and paper products, with an increasing percentage of 159% and 285%, respectively. The demand for bamboo pulp has increased rapidly in both the US and EU, indicating a sector with the potential to generate revenue. Indian pulp industry is heavily dependent on wood and timber produce for the manufacturing of various goods (Tambe et al, 2020).

The international trade for bamboo is worth around 70 billion USD (INBAR 2019). Within it, the bamboo trade potential in the US is significant. More than 50% of import share is with Tableware & Kitchenware, articles of daily use, and raw materials. Apart from pulp and paper, a focus on charcoal, daily use articles, and table & kitchenware through sectoral strategies can be undertaken to boost India's bamboo industry. Other than high-growth sectors, focusing on sectors with high current exports can provide a necessary impetus for the Indian industry. The analysis identified targeted product classes across US and EU (in red) for guiding the development of India's value chain for potential bamboo exports.

Bamboo products and their HSN	European Union	United States
Bamboo Raw Materials (140110)	77572	21057
Bamboo Shoot (200591)	43583	33483
Bamboo Mats/Screens (460121)	32161	2164
Bamboo Plaits & Plaiting Materials (460192)	10692	6655
Bamboo Basketwork (460211)	75625	43240
Bamboo Charcoal (440210)	14377	1185
Bamboo Flooring (440921)	22674	207
Bamboo Plywood (441210)	25813	40547
Bamboo Pulp (470630)	8396	313
Bamboo Paper Product (482361)	20169	13658
Bamboo Seats (940152)	29083	7171
Bamboo Furniture (940382)	73025	45114
Bamboo Articles of daily Use (442191)	161137	239292
Tableware and Kitchenware (441919)	157209	107555

Table 5: Imports by EU and USA for the year 2021 in Thousand USD (Source: INBAR)

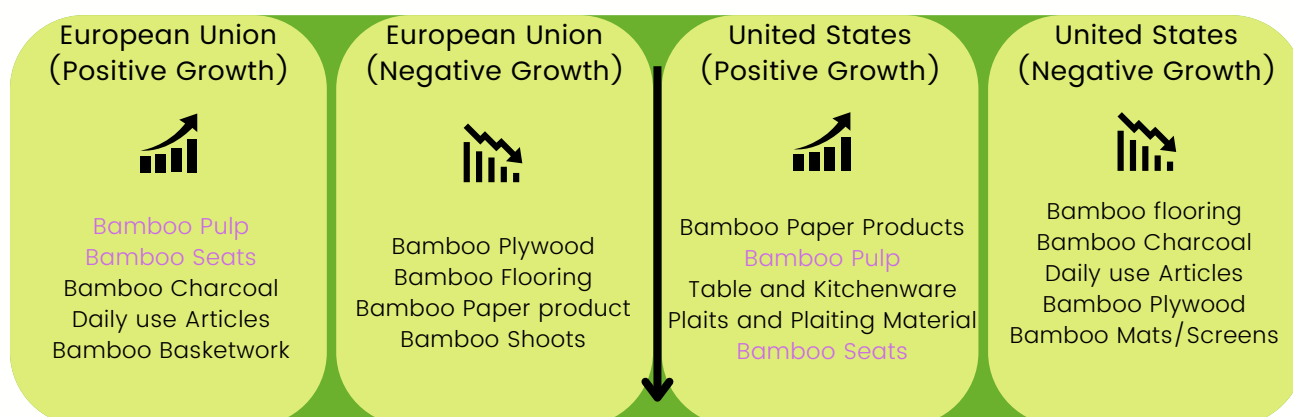


Figure vii: Top 5 product classes with positive and negative growth (% increase) over last five years, Source: INBAR

Chinese Bamboo Industry: A comparative trade look

China has been a pioneer in the bamboo sector since the 1980s, when it initiated the industrialisation of its bamboo economy and began scaling up certain product classes. It led to the integrating of new technologies, driven by product innovation and economies at scale for industrial use cases from the 1990s till the early 2000s. The country's bamboo sector is well-developed, efficient, and modernised to cater to the world's demand [4]. It is vital to understand how China capitalised on its bamboo resource and effectively channeled it into exports. What kind of policy lessons can India gather from it? The compendium of good practices/policy learnings across the value chain will be part of the following research brief.

Since the 1990s, the area of bamboo forests in China has been increasing to 50,000 hectares (500 sq km) per year. In comparison to India, the average rate after 2018 (RNBM) is 6000 hectares (60 sq km) per year (Lobovikov et al., 2007; Mera & Xu, 2014). These differences are restricted to bamboo cultivations and for every value chain segment. The Chinese government has started industrialising the processing industry in the 1980s. For all practical purposes, china effectively utilise every part of the bamboo, hence minimising the waste generation to almost 0-5% [11]. The Chinese industry is the only bamboo industry among resource-rich nations that have managed to develop an industrial value chain at scale, as a result of this creating as well as catering to a vast market

The Chinese bamboo industry dominates the international trade of raw materials and finished value-added goods. It occupies 70% of the world trade, with its leading exporters for EU (~25%), USA (~19%), and Japan (~14%). Figure viii presents a graph of the Chinese exports to the EU, USA, and Japan for the top 5 exported product classes for the year 2022 (INBAR).

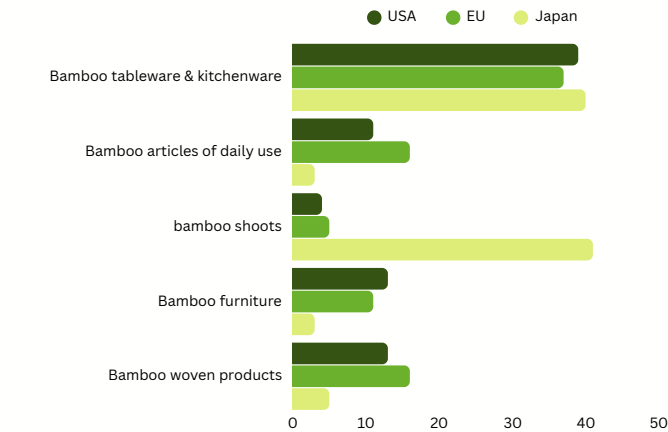


Figure viii: China's exports to USA, EU 28 and Japan in top five product classes in million USD, Source: INBAR 2021

As we can observe, Bamboo tableware and kitchenware are the largest segments exported to these developed countries, with more than 30% share. Apart from that, Bamboo shoots turned out to be the most exported to Japan, while its share is less than 5% in other countries. Bamboo woven products are gaining popularity across the world indicating growth prospects for Indian textiles industry.

Commodity with HSN	Import Value in Million USD 2021
Bamboo Raw Materials (140110)	58.4
Bamboo Articles of daily Use (442191)	2.2
Bamboo Flooring (440921)	1.5
Bamboo Tableware and Kitchenware (441919)	0.7
Bamboo Charcoal (440210)	0.5
Total Bamboo Imports from China	64.2
Total Bamboo Imports	76

Table vi: Import value as per commodities, Source: INBAR 2021, Values have been rounded off

As far as India is concerned with its largest bamboo resource base, the country has yet to be able to utilise its supply stocks successfully. Even with a positive trade balance, India's import share with China is nearly 65 million USD, of which 88% are bamboo raw materials.

India exports are mostly low-valued added daily use articles exported to countries like the US. Table vi represents India's trade with China for the top 5 commodities in 2021. The total imports were close to 64 million USD, while exports were 47 thousand USD. The comparison provides a bird eye view of the extent and nature of India's dependence on China.

Figure ix above showcases each commodity's exports and percentage growth for 2021 (INBAR). The data revealed distinct dynamics between the percentage growth of exports over five years vs. exports. A point of saturation is observed with high trading commodities showing low or negative growth over the past five years, such as daily use articles, tableware, furniture, etc.

Whereas the less/least exported products, such as plywood and charcoal, have recorded high percentage growth of up to 229% over the last five years. There are two sets of categorisation, one with high export value, such as daily use articles, tableware & Kitchenware, and Shoots, where the potential to capture the market is high through targeted policy interventions like trade agreements, capping on imports and others. Secondly, prospective segments like plywood, charcoal, and paper with high growth potential in the coming years. These sets of products offer India an opportunity to strategically intervene and become competitive with Chinese products, thereby capturing the international market.

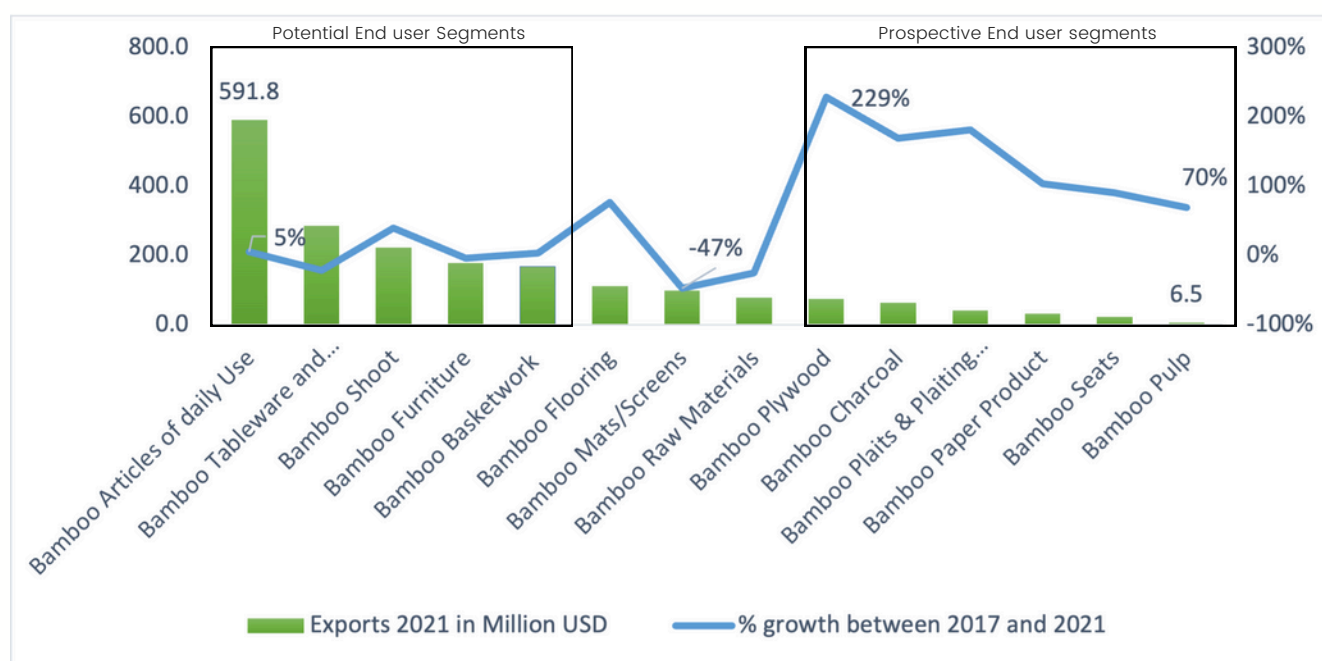


Figure ix: Bamboo exports of China for different commodities and its % growth between 2017 and 2021, Source: INBAR

The bamboo sector in China has been the policy priority for the PRC government from the 1980s onwards. Bamboo is classified as a tree and timber under various commercial forestry regulations. Given its vast bamboo diversity, strong domestic demand base, and early industrialisation, the industry grew exponentially with the government's strategic policy and investment support. Private entrepreneurs played a crucial role in liberalising the landscape, alongside land tenure reforms which turned bamboo into a commodity, the backbone of its economy. Whereas in India, there is high level of disinterest among farmers to cultivate bamboo even with direct subsidies for farming, with only 5,428 beneficiaries between 2014-2023 under NBM [8]. Early development of technical capacities, domestic presence, complex supply chain, high productivity with almost negligible waste, and economies of scale are some of the reasons behind the high competitiveness of the bamboo sector in China (Smith and Mestre, 2007).

Business and Financial Models

The bamboo industry in India must be export-driven to become self-reliant and contribute to India's economy through its high-value-added products. A sustainable business and financial model is necessary to provide a fertile ground for developing the value chain and fostering the growth of high-potential end-user segments [17]. Here, we briefly discussing a few case studies to illustrate this point.

Gadchiroli Agarbatti Project-“A Viable Women Based Rural Enterprise Model

The project aimed to generate livelihood opportunities in the district, especially for women, and provide a case for developing a viable rural enterprise model. GAP currently has 32 agarbatti-producing centers, employing nearly 1,100 people, 90 percent of whom are women. The employees/women earn around 5000 rupees monthly and are flexible depending on their output. The project procured funding from the forest and district department and Maharastra Bamboo Development Board to build physical assets and provide soft skills to women. The Producer's group (a social institution) has been created to formalise the value chain process and its employees with proper rules, regulations, and a code of conduct [5]

Assam refineries Pvt Ltd Bioethanol plant- As a financial model


Assam Biorefineries is a joint venture between Numaligarh Refinery Limited (PSU under MoPNG), Chempolis, and Fortrum 3BV (Europe-based companies) is the first refinery plant in the world to produce 2nd generation bioethanol from bamboo as a primary feedstock [19].

It will be based in the NER, where bamboo is abundantly present, and will operate through an LLE (Local level entrepreneur) model to establish bamboo chipping units for direct procurement. The project is funded through the equity-debt model with 5-10% of funding through Viability Funding, illustrating the importance of public funding investments to create new avenues for product and industry development.

Inference

The brief aims to analyse, describe and explain the potential growth avenues for Indian Bamboo Industry. The brief highlights the potential fault lines that have delayed the development and timely exploitation of bamboo supplies. The high demand, even with a potential increase in the plantation areas, needed help to cater to global needs. China's dominance of global exports highlights a pressing situation for India to undertake an evidence-based approach in developing policy and regulatory practices by taking (i) lessons from the leading exporter (ii) and catering to emerging and prospective demand sectors. It will ensure that a demand-centric model for the bamboo industry will make India export ready for potential as well as prospective bamboo products, as identified in this brief

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