Bamboo sector in Northeast India- Prospects and challenges

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BAMBOO RESOURCES

Introduction

- **Bamboo is the most diverse group in the grass family.**
- **Having a wide natural distribution, from approx. 46° N latitude to 47° S latitude and from sea level up to 4,300 m.**

	Genera	Species
World	**121**	**1662**
India	**29**	**148**
NE India	**21**	**99**

- **There are three groups: Tropical woody Bamboos, Herbaceous bamboos, Temperate Woody Bamboos.**
- **Centre of origin: Some of tropical woody bamboo species originated in Hindustan Centre (Assam and Burma)**

Diversity

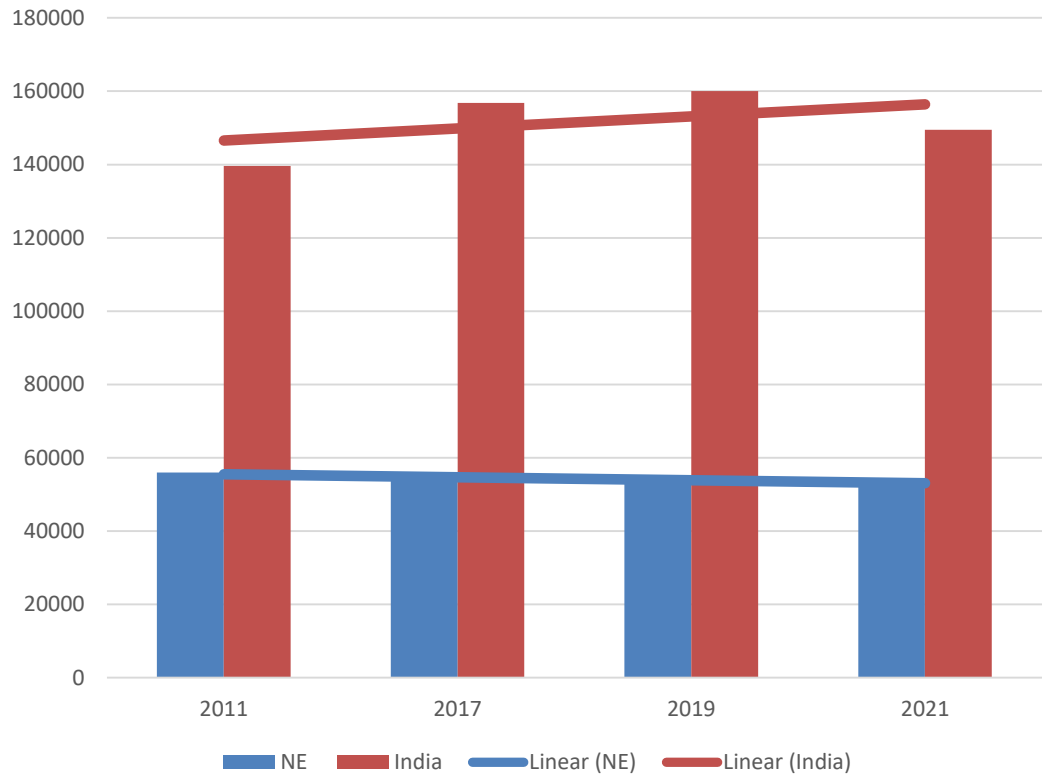
- Estimates of number of species is varying
- Latest estimate is 148 species in 29 genera (2015)
- Endemism is high- 71 species are endemic to India
- *Bambusa bambos*, *Dendrocalamus strictus* and *D. hamiltonii* - the most common species
- States rich in diversity
  - Meghalaya (46-50)
  - Arunachal Pradesh (47)
  - Manipur (40 + 1 var.)
  - Assam (38 + 2 var.)
  - Mizoram (33)
  - Sikkim (29-30)

Distribution

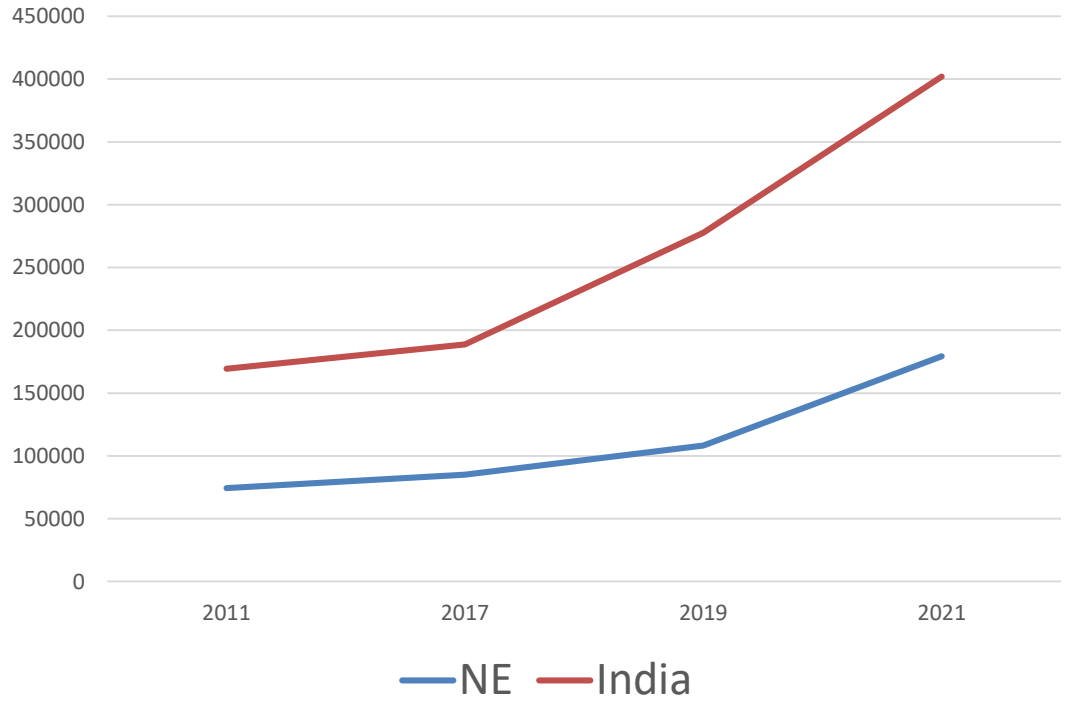
Bamboo covers 53,485 km^2 of area in the North East India and supports a total of 1792 lakh tonnes of growing stock which is 36% of the total area and 45% of the total growing stock of the country (FSI, 2021)

State	Bamboo Bearing Area (sq km)	Equivalent Green weight ('000 MT)
Arunachal Pradesh	15739	46546
Assam	10659	38600
Manipur	8377	11321
Meghalaya	5007	24745
Mizoram	4561	12585
Nagaland	3947	32402
Sikkim	994	624
Tripura	4201	12413

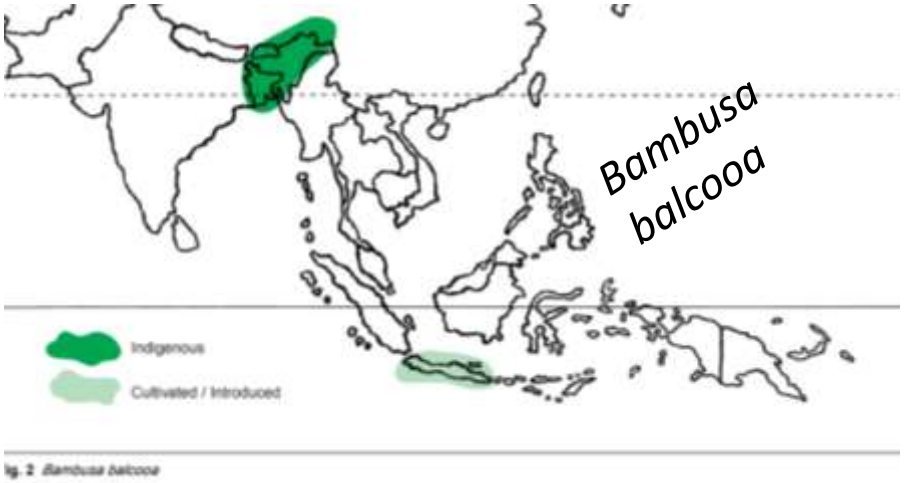
Trend of Bamboo bearing area (sq.km.)

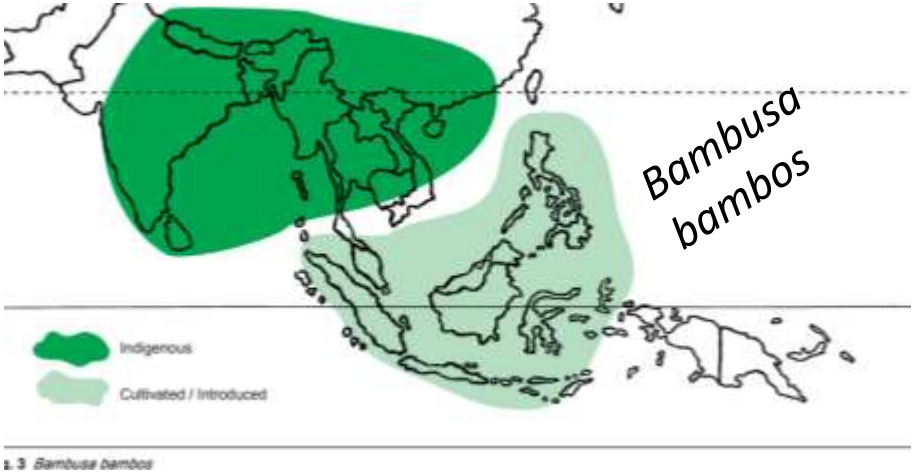


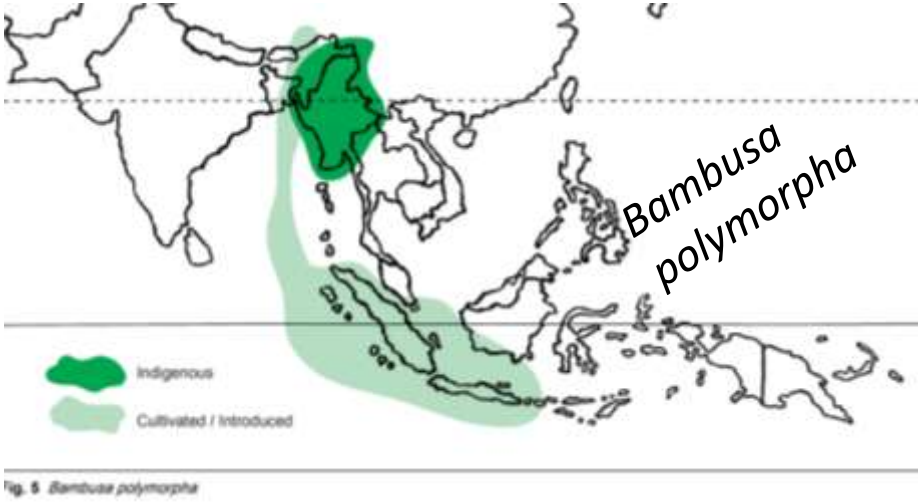
Trend of Bamboo Equivalent Green weight ('000 tonnes)

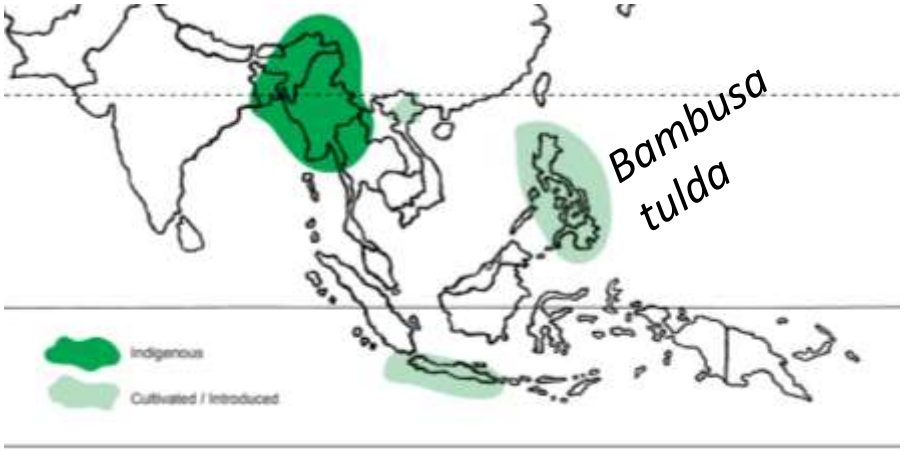


Natural distribution range of woody bamboos and areas of cultivation









Priority species

- 38 species prioritized by INBAR and IPGRI
- 10 species prioritized for India by NBM and 19 species by NMBA
  - *Bambusa balcooa, B. bambos, B. nutans, B. pallida, B. polymorpha, B. tulda, B. vulgaris, Dendrocalamus asper, D. brandisii, D. giganteus, D. hamiltonii, D. strictus, D. stocksii, Melocanna baccifera, Ochlandra travancorica, Oxytenanthera parvifolia, Schizostachyum dullooa,* and *Thyrsostachys oliveri*
- Restructured NBM (2018) has shortlisted 10 species
  - *B. tulda, B. bambos, B. balcooa, B. cacharensis, B. polymorpha, B. nutans, Dendrocalamus asper, D. hamiltonii, Thyrsostachys oliveri, Melocanna baccifera*

Priority bamboos of Restructured National Bamboo Mission and their distribution

Species	Assam	Arunachal Pradesh	Meghalaya	Manipur	Mizoram	Nagaland	Tripura	Sikkim
*Bambusa balcooa**	+	+	+	-	-	+	+	+
*Bambusa bambos **	+	+	+	+	+	+	+	
Bambusa nutans	+	+	+	+	+	+	+	+
B. cacharensis	+						+	
Bambusa polymorpha		+	+				+	
Bambusa tulda	+	+	+	+	+	+	+	+
*Dendrocalamus asper***	+							+
D. hamiltonii	+	+	+	+	+	+	+	+
Melocanna baccifera	+	+	+	+	+	+	+	+
Thyrsostachys oliveri	-	-	-	-	-	-	+	

* Found outside NE region also; ** exotic species

Constraints in resource use

- Estimated growing stock is of all the bamboos- species-wise estimates available only for a few States
- Most of the stock is in remote, inaccessible areas and catchments or Protected Areas
- Depletion of resources- due to change in land use, encroachments, gregarious flowering followed by poor regeneration (mainly due to biotic interference)

Resource enhancement- steps required

- Bamboo resource mapping- “What cannot be measured, cannot be managed”
- Improving regeneration within forests- in selected areas
- Intensive cultivation of selected fast growing bamboos and high-yielding genotypes, in non-forest areas

Productivity enhancement

- Present yield: 2-3 MT/ha (forests); 10-15 MT/ha (plantations)

- **Bamboo in forests-**
  - need appropriate silviculture treatment (mainly soil management, decongestion, fire protection, scientific extraction)
- **Bamboo outside forests-**
  - need introduction of high yielding genotypes of selected species and intensive cultivation (can increase yield to 50-100 MT/ha)
  - Integration of bamboo in agro-forestry systems

Planting prospects of species

(Haridasan and Tewari, 2008)

- **Country-wide:** *Bambusa balcooa, B. bambos, B. nutans, B. tulda, B. vulgaris, Dendrocalamus hamiltonii, D. giganteus (*7 species*)*
- **Regional:**
  - *Dendrocalamus asper- Kerala, NE and Uttarakhand*
  - *Dendrocalamus strictus- All over India in dry areas*
  - *Phyllostachys pubescens- Arunachal Pradesh, Himachal Pradesh*
  - *Guadua angustifolia- Kerala*
  - *Dendrocalamus stocksii- Karnataka, Maharashtra*
  - *Melocanna baccifera- NE*
  - *Thyrsostachys oliveri- Tripura, Bengal,*
  - *Ochlandra travancorica- Kerala*

List of Selected High-yielding Genotypes available in NE India (with RFRI)

B. tulda	*B. balcooa*	*B. nutans*	*D. hamiltonii*
RFRI/Bt-01	RFRI/BBA-03	RFRI/BN-05	RFRI/Dh- 24
RFRI/Bt-07	RFRI/BBA-04	RFRI/BN-16	RFRI/Dh-50
RFRI/Bt-18	RFRI/BBA-14	RFRI/BN-02(G)	
RFRI/Bt-34	RFRI/BBA-21		
RFRI/Bt-98			
RFRI/G/Bt-01			
RFRI/Bt-A20			
7	4	3	2

License agreement for commercial production:

- Devleela Biotech, Chhattisgarh
- Chroma Biotech, Dibrugarh
- MP State Bamboo Mission
- State Bamboo Development Agency, Assam
- Bihar Forest department
- IFGTB-Coimbatore
- Indira Gandhi Krishi Vishwavidyalaya, Raipur

RFRI's high yielding germplasm supplied to farmers through KVKs of Assam Agricultural University, based on Agreement with State Bamboo Development Agency

Ongoing Programme (2017-27)

Conservation and Evaluation of Genetic Resources

Bambusa balcooa	*Thyrostachys oliveri*
Bambusa nutans	*Schizostachyum dullooa*
Bambusa pallida	*Schizostachyum pergacile*
Bambusa polymorpha	*Dendrocalamus hamiltonii*
Bambusa tulda	*Dendrocalamus longispathus*
Bambusa cacharensis	*Dendrocalamus giganteus*
B. bambos	*Melocanna baccifera*
B. vulgaris	

Total 493 accessions of 13 species have been collected from different regions of NE India


BAMBOO UTILIZATION

Mode of utilization

- Traditional utilization- handicrafts, bamboo shoots, etc.
- Industrial utilization- high value timber replacement products, bamboo flooring, pre-fab structures
- Value added utilization- charcoal, cosmetics, wine, vinegar, etc.

Product diversity

- **Handicrafts-** manual processing, high value addition- e.g., incense stick, sericulture, domestic appliances
- **Bamboo shoot**
- **Bamboo in construction**: scaffolding and traditional constructions
- **Industrial use-** mechanized and semi-mechanized processing
  - Premium processing for high value products- bamboo wood, bamboo flooring, laminated furniture
  - Medium value processing- chop sticks, mat boards
  - Low value processing- limited value addition- pulp and paper, charcoal
- **High value addition drives innovation and private investment**
- **Low value addition activities generate direct income and contribute to growth in rural areas, sustaining families and villages.**
- **Business development strategy should be combination of both**

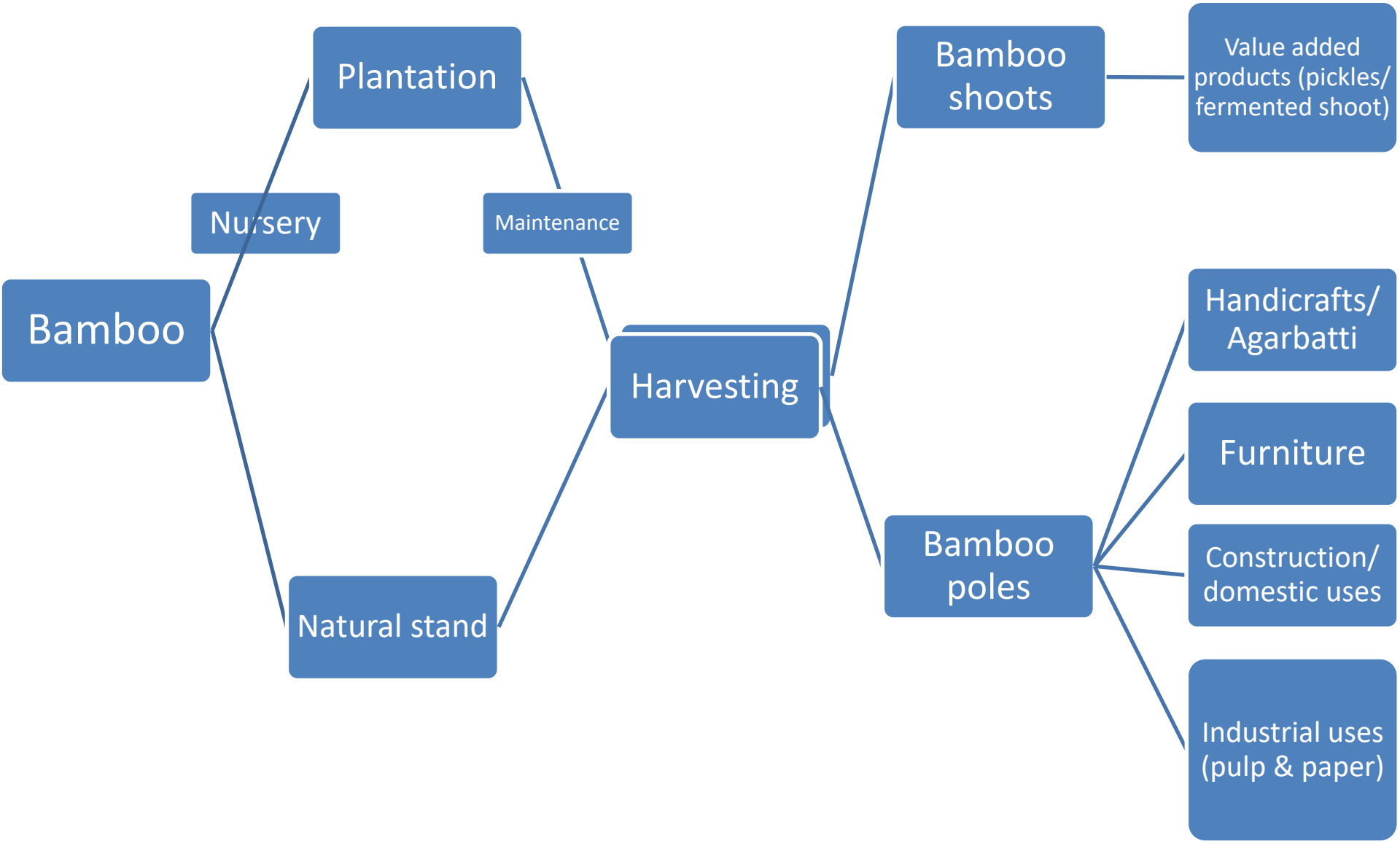
Demand and supply

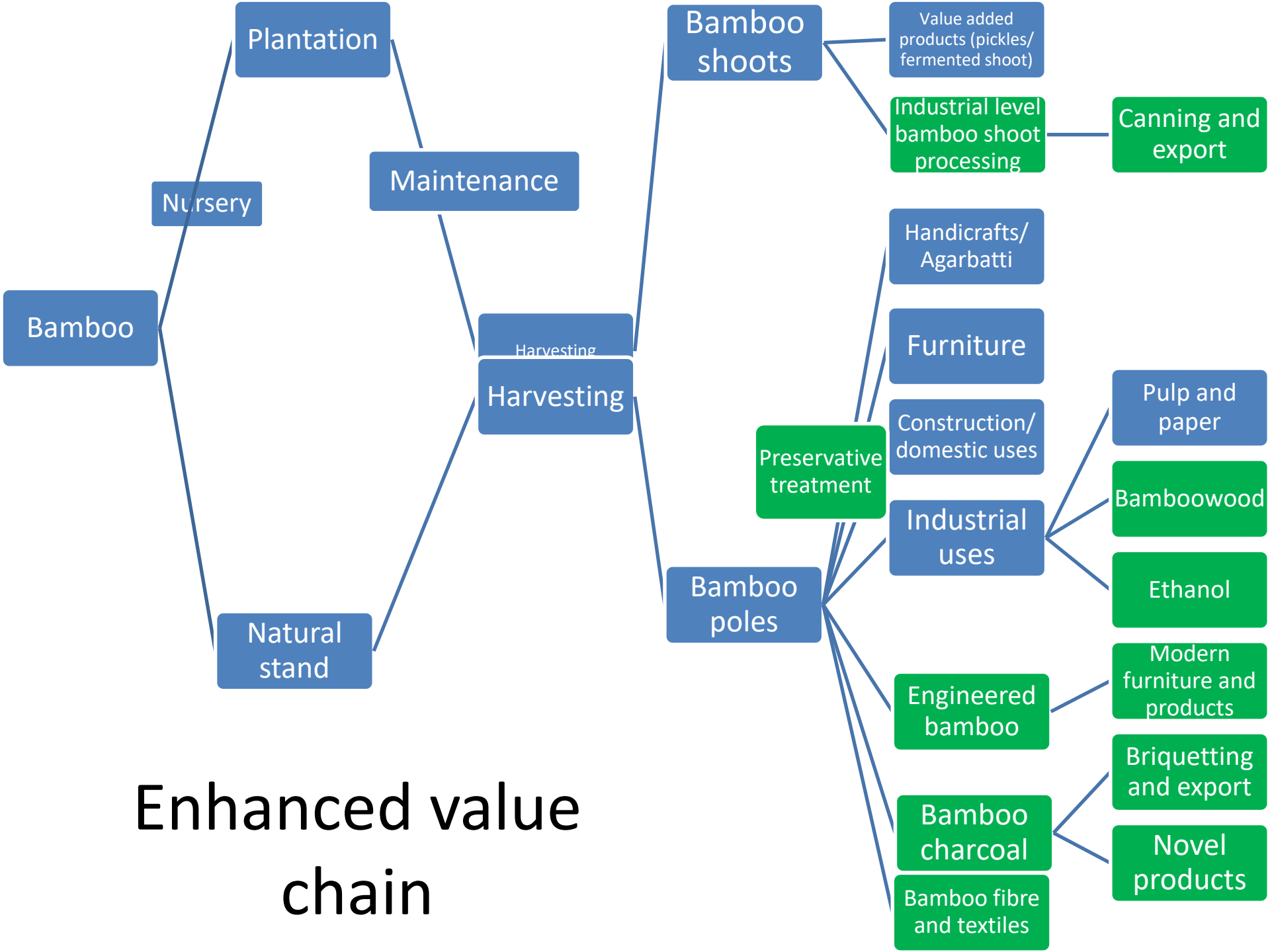
- Demand – about 30 million tonnes (old estimate, needs revision)
- Supply- about 15 million tonnes
- Reasons for shortfall
  - 85% of growing stock is in forest areas- less accessible, steep terrain with lack of road communication
  - Bamboos are intermixed with other vegetation- extraction and transport are difficult
  - Low productivity of forests due to biotic pressure and deficiencies in management
- **Solution:**
  - **domestic cultivation of commercially important bamboos in non-forest areas- in an intensive manner**

New demands in NE India

- Increase in demand is expected
  - Rise in urbanization and increase in living standards- demand for bamboo furniture
  - Demand for construction material in rural housing schemes/ tourism projects
  - Novel uses viz., bamboo composite as reinforcement
  - Bamboo for bio-ethanol -Assam Biorefinery Pvt. Ltd- needs 5 lakh MT/year-(to be commissioned in 2023- will produce 49,000 tonnes of ethanol, 19,000 tonnes of Furfural, 11,000 tonnes of acetic acid and generate 20MW of power)- Joint venture of Numaligarh Refinery Ltd., Fortum and Chempolis
  - Demand for bamboo flooring in Europe and USA- Three factories are in the NE India (Mizoram, Tripura and Assam)- Mutha Industries in Agartala the largest

Traditional value chain

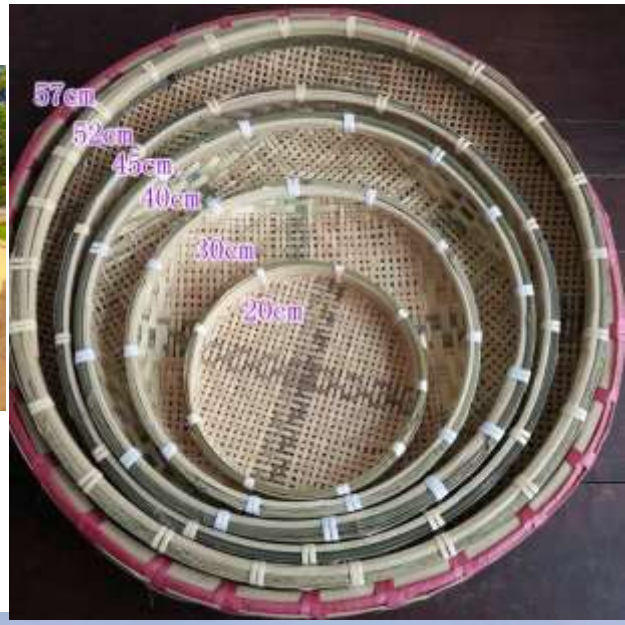




Enhanced value chain

Bamboo treatment

Traditional uses



New uses





















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Charcoal products

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Bamboo yogurt

Bamboo beer

Bamboo leaf tea

Bamboo in cosmetics

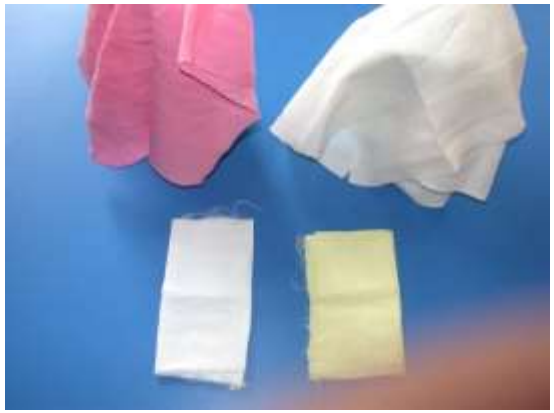
Bamboo- lemongrass hairwash

Eye gel

Bamboo and Silk shampoo

Bamboo skin cream

Bamboo fibre for clothes



Bamboo flavone

Medicine

Beer

Beverage

Bamboo plastic composites

Bamboo fibre + silk

Bamboo fibre + wool

Bamboo Scrimber Flooring

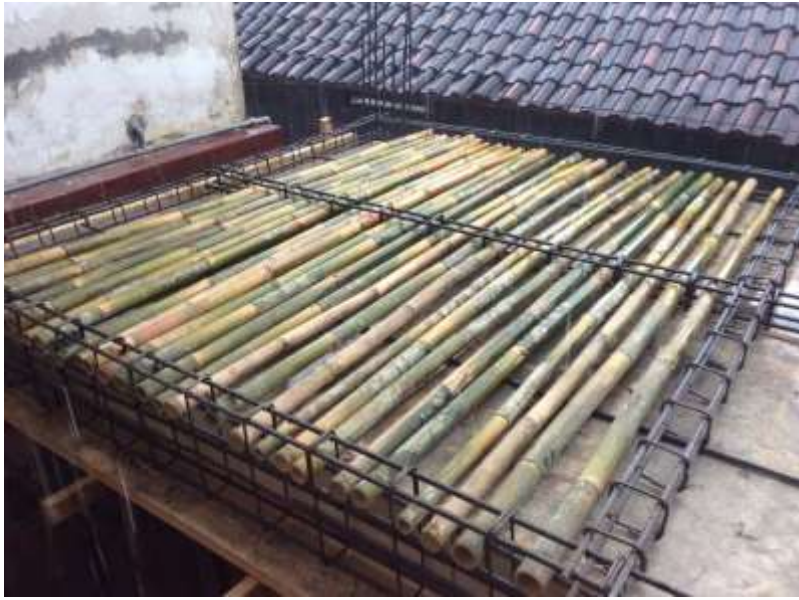
Bamboo veneer

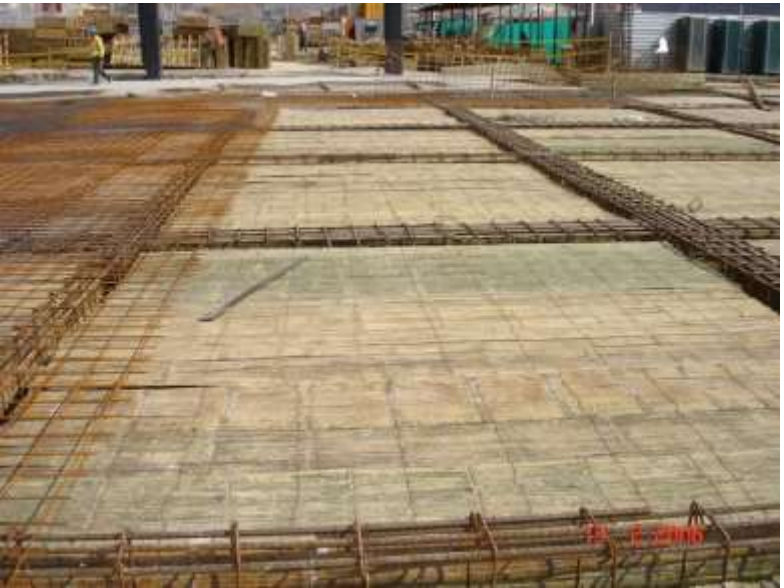
Treated bamboo products in sericulture

Muga Moth Cage

Furniture traditional and modern

Bamboo reinforced concrete





Bamboo Ecological Tourism

Bamboo in constructions

Flyover made of bamboo at Guwahati

THE ROAD AHEAD

Improvement on supply side

- Increase the area under plantations
- Promote private plantations
- Improve silviculture- in forests and plantations
- Use of high yielding quality planting stock
- High quality bamboo nurseries
- Intensive management of plantations

Improvement in utilization

- Enhance the value chain- by addition of processes that add value and employment
  - bamboo preservative treatment
  - industrial level primary processing
  - better finishing of products
  - better packaging
  - use of e-marketing channels
  - novel products for export market

Investment in R&D

- Mapping of resources
- Conservation of genetic resources
- Selection of plus clumps
- Quality planting stock production
- Intensive management of plantations
- Value addition to products
- Generation of novel high value products

Policy and legal issues

- Farmer friendly rules of harvest and transport to promote private plantations
- Minimum support price/ crop insurance for bamboos
- Financial support mechanisms
- Market information
- Skill development on design and product diversification
- Institutional support for local consumption and export
- Quality standards and certification schemes

PROSPECTS AND CHALLENGES

Prospects

- 9 out of 10 priority bamboos have natural distribution only in NE India. High variability provides scope for selection of high yielding, fast growing genotypes and their cloning for use all over the country. (Using a limited number of clones is fraught with risk of failure due to any disease or pest pandemic)
- The growing conditions are ideal for bamboo- rich soil, high humidity, moderate temperature, high rainfall
- Bamboo nurseries- can be a profitable venture due to low maintenance cost, in rural areas
- Bamboo plantations and primary processing- possible
- Industrial use- less at present; new industries are coming up- can boost up the demand
- Domestic use is also quite high- providing scope for employment and rural development

Challenges

- No information available on specieswise growing stock- to aid in planning for any major industrial use
- Very high diversity- specieswise mapping is required to plan extraction and transport
- Landuse changes- especially cash crop cultivation and shifting cultivation
- Very less area under plantations- mostly found in homesteads- collection and aggregation becomes necessary


THANK YOU