Bamboo
Value chain
Management
A solution for
India

WORLD BAMOO WORKSHOP 2019, Imphal, Manipur

Mr. Kamesh Salam
Managing Director,
Cane & Bamboo Value Chain Management Pvt. Ltd,
Founder ; South Asia Bamboo Foundation
Founder : World Bamboo Day
My tribute to Gandhiji on his 150 Birth Centenary Celebration
98 likes

indianpac #NAFDialogues - “Gandhi once said that if village industries are revived, millions of villagers will be employed and will get full wages. This is in sync with the Sustainable Development Goal #1. Poverty Elimination. What he said then, is relevant even today.” - Kamesh Salam
My inspiration (late) “K. Tombi Singh” my grand father.

At Raj Bhawan, Imphal 1952
Outstanding Green Activists in 2018 from IFGE
“Without bamboo the Indian would be poor, very poor, very poor indeed!”
1st MIZORAM BAMBOO DAY 3rd March 2012
Bamboo Cultural Implication

Bamboo

ไม้ไผ่

Bambú

竹

대나무

Bambus

Indian

Wood of the poor

Chinese

Friends of the people

Vietnamese

Friends

Thais

Flexibility but strong
Bamboo as Plant

Applications

Biodiversity

Distribution Map

1500 Species

Fast Growing Grass

- Rhizomes
- Shoots
- Sheaths
- Culm
- Branches
- Leaves
- Buds . . .

- Structure - Housing
- Tools - Agriculture
- Food - Shoots / Beer
- Fibre - Paper / Rayon
- Energy - Biomass / Charcoal
- Music - Entertainment
- Rhizomes
- Shoots
- Sheaths
- Culm
- Branches
- Leaves
- Buds...
• Variety
• Biodiversity
• Mono - culture
• Ecology

• Forests
• Managed Ecology

Bamboo as Plant

Environment

Forests vs Plantations

Peoples Participation

Plantations

Gopal Deb Roy - Tripura

• China
• India
• Asia
• Africa
• Latin America
Bamboo Culture

Traditions

Local Knowledge
Global Knowledge

- People
- Traditional Wisdom
- Entertainment
- Religion
- Human Ecology
Bamboo Commerce

- Agriculture
- Fishing
- Housing
- Mats
- Furniture
- Baskets
- Tools
- Poles
Bamboo in Agriculture

- Agriculture
- Fishing
- Structures
- Wind Breaks
- Soil Errosion

Accessories

- Green Houses
- Tools
- Grain Bins
- Traps
- Fences

Traditional

Modern
Bamboo Architecture

Bridges

Engineering

Co-operation

• Tensile Strength
• Rope making
• Peoples Participation

Monpa Tribe - Arunachal
Apa Tani Houses - Arunachal

- Roofs
- Walls
- Doors
- Windows
- Posts
- Beams
- Flooring
- Furniture

Bamboo Architecture

Housing

Engineering

Co-operation

Riang House - Tripura

Mizo Window
Bamboo Furniture

Systems

Domestic
Office
Institutional

- Systems
- Jigs and Fixtures
- Tools and Machines
- Adhesives

- Tables
- Chairs
- Stools
- Beds
- Cabinets
- Kiosks
- Containers

Office Partitions
Janak Mistry - NID
Bamboo Fences

- Walls
- Trellis
- Mats
- Doors
- Fences
- Gates
- Kiosks

Agartala

- Streets
- Fields
- Houses

- Local Economy
- Employment Generation
- Aesthetic Sensibility
Bamboo Mat Boards
Angamali
Local Economy
100,000 Weavers
Craft as Industry

- Mat Weaving
- Employment
- Co-operative
- Development
Bamboo Baskets

Angami

Cultural Value
Local Respect
Refinement

• Dowry Basket - Ahiru Angami
• Master Craftsman
• Traditional Wisdom

• Branch as Joint
• Jigs / Fixtures / Moulds
• Mass Customization
Bamboo Baskets

Mizo

Cultural Value
Local Respect
Refinement

- People
- Users
- Craftsmen
- Traditions
- Functions
Bamboo Baskets

- Multi Purpose
- Fishing
- Carrying
- Storing
- Sorting
- Cleaning
- Processing

Dimasa

Cultural Value
Local Respect
Refinement

- People
- Users
- Craftsmen
- Traditions
- Functions
Bamboo and Women

Empowerment

- Multi Purpose
- Fishing
- Carrying
- Storing
- Sorting
- Cleaning
- Processing

Fire
Wood
Water
Grains
Bamboo for Paper

India

Paper Mills

Local Economy

Ecology

• Conflict
• Politics
• Pressure Groups

• Fibre
• Rayon
• Paper
• Newsprint
• Packaging
• Boards

Bamboo used in Paper Production in India

<table>
<thead>
<tr>
<th>Year</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1936</td>
<td>50%</td>
</tr>
<tr>
<td>1950</td>
<td>74%</td>
</tr>
<tr>
<td>1970</td>
<td>95%</td>
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<td>1980</td>
<td>29%</td>
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<tr>
<td>1990</td>
<td>27%</td>
</tr>
<tr>
<td>1995</td>
<td>22%</td>
</tr>
</tbody>
</table>

*source: UNDP report for NEDFI, Assam*
Bamboo – Manipur’s life and culture
Characteristics of Bamboo

• Bamboo is the fastest growing plant on this planet.
• A critical element in the balance of oxygen and carbon dioxide in the atmosphere.
• A viable replacement for wood.
• An enduring natural resource.
• Versatile plant with a short growth cycle.
• Could be a critical element of the Indian economy.
• Essential structural material in earthquake architecture.
• A renewable resource for agro-forestry production.
• An ancient medicine.
• An integral part of the arts.
• Tool for erosion control.
Bamboo Business Development

Money & Finance

Land, labour & other inputs

Industry & market
BAMBOO

Traditional

- Sliver
  - Articles Of Daily Use
    - Handicrafts
  - For Furniture, etc.
  - Furniture
  - Engraved Arts

- Strip

- Culms

Industrial

- Sliver Based Products
- Strip Based Products
- Fibre & Particle Board
- Bamboo & Wood Composite
- Chemical Processing

Construction

- Housing
- Scaffolding
- Road Building, etc.

Food & Medicine

- Shoot
- Beer
- Cough Syrup, etc.
Industrial Utilisation Of Bamboo (Panels)

- From Slivers
  - Bamboo Mat Board
  - Curtain Board
  - Sliver Board
  - Mat & Curtain Board
  - Concrete Board
- From Strips
  - Bamboo Flooring
  - Ply board
  - Lumber for Furniture, etc.
- From Particles
  - Particle Board
  - Strengthened Particle Board
- Composites
  - Bamboo & Wood Floor
  - Hollow Bamboo & Wood Lumber
  - Bamboo & Wood Container Floor
  - Overlaid Bamboo & Wood Concrete Forming

Bamboo Flooring
Ply board
Lumber for Furniture, etc.
Particle Board
Strengthened Particle Board
Bamboo & Wood Floor
Hollow Bamboo & Wood Lumber
Bamboo & Wood Container Floor
Overlaid Bamboo & Wood Concrete Forming
What is Bamboo?

- Bamboo belongs to family Gramineae (Grass)

Its basic characteristics are:
- Woody culm above the ground
- Rhizome under the ground
- Culm and rhizome form a framework
- The leaf has a short stalk
- Perennial
- Grows mainly through vegetative multiplication
- Sporadic/ Gregarious flowering habit
Types of Bamboo
(Mainly of two types)

**Sympodial**
(Grows in clumps)

**Monopodial**
(Grows singly)
Bamboo Industrialization in NER

- HPC Paper Mills at Jagir Road, Cachar (Assam), Tuli, (Nagaland) in 1980
- Bamboo Chipping units at Manipur and Meghalaya.
- Visit of Bamboo Entrepreneurs to Taiwan organized by NSIC in Mid 1990 with a buy back model for Chop Sticks??
- Bamboo Flooring Board unit Shifting to Sairang, Mizoram from Falta EPZ, West Bengal in early 1990.
- Bamboo units /CFCs by DC Handicrafts/UNDP/ KVIC in NE
- Bamboo Units of NMBA/DST/ TIFAC
- Bamboo Mat board units at Burnihat, Meghalaya & Lengpui, Mizoram
- Bamboo Boards and Beyond project by UNDP and NID.
- CBTC/UNIDO Project in Assam.
- Bamboo Units at Tripura, BTP, Assam and Mizoram
- National Bamboo Missions Part 1 and Part 2
Milestones

- Supreme court ban on felling of Timber 1996
- The bamboo flowering in early 2000
- NMBA/ NBM/TIFAC
- Bamboo Sticks imports
- IKEA
- Policy Supports (Board/commodity)
- Apex Body for Bamboo !!!!
Is Bamboo a history in NE India?

Hindustan Paper Mills (Assam/ Nagaland) 3 paper Mills closed

ANNUAL REQUIREMENT BY EACH PLANT OF BAMBOO: 500000 TO 550000 LAKHS MTG
Commercial Recommended Bamboo species by NBM

- *Bambusa tulda* (Jati)
- *Bambusa balcooa* (Bhaluka)
- *Bambusa nutans* (Mokal)
- *Bambusa bambos* (Kota Bah)
- *Dendrocalamus hamiltoni* (kako)
- *Dendrocalamus giganteus* (Munro)
- *Dendrocalamus asper* (Malasia bamboo)
- *Dendrocalamus strictus* (Lati Bah)
- *Melocanna baccifera* (Muli)
- *Ochlandra travancoria* (Oda/Odai)
Bamboo Forest:
Unmanaged Clumps
Selective Harvesting
BAMBOO LOADING FOR TRANSPORTATION BY ROAD
Mode of Transport in villages
TRANSPORTATION OF BAMBOO BY ROAD
Tea vs Bamboo (case study)
Bamboo contains rich starch, sugar, etc which are nutrients for fungus, termites etc and are therefore prone to attack.
Treatment and grading
Challenges with Bamboo
Traditional Knowledge
Management of existing Stock
Bamboo Industrialization in NER

LACK OF ADEQUATE SHED AREA
Lack of Professionalism

IMPROPER POWER CONNECTION
Status of Bamboo Industrialization in NER

Machinery Condition at CFCs:

- Most of the machines are non functional from the date of installation
- Machines are not suitable to the product line.
- Proper backup from machinery suppliers is not received
- Lack of spares parts and operating manuals.
- Most of the CFCs put up their machines in inadequate space
- Working condition not as per specified norms
- Output yield lower than specified norms
MACHINERY

CONDITION
Stick units in Assam with imported machines from China
Investment and outputs in Mizoram ??
Monumental Pieces !!!!
Bamboo sectoral approach

- Innovative approach
- Market driven approach
- Material (species) approach
- Sector specific
- Technique based approach
Technical inputs for bamboo/cane
Project:

Explore various applications of bamboo
Explore new joints, combinations
New Product /Woven / Furniture Development/Housing and constructions
Conduct Training workshops
Understanding the sector/cluster/region

Each cluster/region have something unique
Need to ensure good quality raw material

So farming of selected species
Suitable to the region
What to make is very important

So design new products
Create quality production through regular training and technical inputs (Design and Technology) market oriented.
Design for bamboo sector

Innovative approach

Market driven approach

Material (species) approach

Sector specific

Technique based approach
Innovative approach
Market approach
Material (species) based approach
Sector Specific
Technique Specific approach
Maximum (appropriate) utilization
Case study – Kerala - Angamali
Case study – Kerala - Trivandrum
Case study – Tripura - Katlamara
Case Study Barpeta Road, Assam
BRANDING

[Image of the Atra Bamboo logo and product images]
PACKAGING
MRP Rs.??
Production system (batch production)
Appropriate technology (based on product range)
Treatment/finish/protection
Transportation (Bulky/knockdown/cost)
Awareness
Encourage Cluster members & entrepreneurs
Create human resource
Skill and capacity building
New technology and designs
Create opportunities
Training Module
Self learning
**Woven products-hand tools**

Tools to cut and split the bamboo into thin slivers
To help in weaving, drilling stitching etc.

Hack saw, knifes, hand drill, drill bit, sand paper, file, scissors
Chisel, Hammer, Measure tape, steel scale etc.

- A tool kit bag to arrange and carry the tools
Accessory products - hand tools + power tools
Tools to cut and split the bamboo into various required sizes
To help in forming, shaping, joining and drilling

Hack saw, various knives, hand drill (power drill), drill bit, sand paper, file, scissors, chisel, hammer, hot air gun (blow lamp)
Measure tape, steel scale etc.

- A tool kit bag to arrange and carry the tools
Furniture products - hand tools + power tools

Tools to cut and split the bamboo into various required sizes
To help in forming, shaping, joining and drilling

Hack saw, various knives, hand drill (power drill), drill bit, fastener bit, sand paper, file, scissors, chisel, hammer, hot air gun (blow lamp), Sander, c-clamp, hand planner, Measure tape, steel scale, right angle etc.

❖ A tool kit bag to arrange and carry the tools
Bamboo Shoot Value Chain
Bamboo Shoot & Pickle Development
Bamboo mat clusters - Kerala and Nagaland
Bamboo Mat Production Cluster Development

TULI & TIZIT CLUSTER

- Rs.120 per mat (8 x 4 ft)
- Production cap per month 3000 nos. approx.
- Major buyers: Timpact, Nano steel and NBDA
Bamboo Mat

Bamboo Mat Board

Bamboo Corrugated Roofing Sheet
Aggarbatti –cluster (Mizoram and Assam)
Import of Bamboo Sticks from SE Countries
ITC’s “Mangaldeep” in Assam
Bamboo Value Chain in Northern India
Punjab- Banjer Bhag, Bhaarwain road, Hoshiarpur

Bamboo Species:- Dendrocalamus strictus

Step 1: Selection of good bamboo

Good quality bamboo which are around 30 ft long with no defects are selected for cutting.
Step 2: Cutting of Bamboo

Selected bamboo are then cut into three parts (top, middle and base) Almost 7ft each.

Top part of the bamboo which are thin and flimsy are made into bundles for sale.
Step 4: Pattern/ design

Patterns are made by rolling the bamboo in between two hot iron rods. It is just for the look.
Step 5: Straightening

Final step where bamboo is straighten and made into bundles of 10-15 bamboo.

Other products for lite constructions are also made from it.
Bamboo Species: - Dendrocalamus Hamiltonii

The base culm which has higher wall thickness is sent to the paper mills.

The remaining culms are used for making ladder for construction purposes.
Bamboo Furniture training centre at Talwara with Panjab Forest Department
Existing Bamboo Value Chain
Raw Bamboo Value Chain...
Bamboo furniture value chain
Value Addition and Profit margin by value chain actors

Value Addition and Profit Margin

- Cultivator
- Collector
- Local Trader
- Big Trader
- Wholesaler
- Retailer

Legend:
- Green: Net profit
- Red: Cost
- Blue: Value addition
Proposed Bamboo Value Chain for Bio Refinery /CNG

### Bamboo Production
- Farmers/Cultivators in non-forest areas
- Beneficiaries of the Dept of forest including Bamboo Mission
- This sector is dominated by tribals who practice Jhum cultivation or either cut Bamboo grown in forests in contravention of existing legislation, or by small farmers who grow bamboo plants alongside their regular crops

### Bamboo Procurement
- Bamboo Collection Centres (BCC)
- Micro and Mini Processing Centres
- Collection Agents
- Brokers/Aggregators
- Functionaries of the Bamboo Development Agencies, Dept of Forest including Bamboo Mission

### Bamboo Processing
- Flattening
- Chipping
- Drying
- Segregation
- Shredding
- Pelletization

### Transportation
- Railways
- Waterways
- Mini Trucks
- Trailers
- Large Trucks
- Lorries

### Ethanol /CNG Production
- Fermentation
Bamboo Harvesting-Manual

Manual Cutting using machete (Includes cutting, forwarding, delimbing and stacking)

Skidding includes carrying bamboo from harvested site to road heads or siding to the road side.

Manual loading in carrier in order to transport it to the point of sale or consumption

Transport from harvesting/storage site to point of sale/consumption through road, rail or water.
Primary Processing
Bamboo processing
Flatten Bamboo: Traditional practice

Easy transportation
Thanh Hoa (Vietnam)
Supply Chain
Farming Systems
Thanh Hoa Supply Chain Transportation- Model
Thanh Hoa Supply Chain - Primary processing
Primary processing
Waste to wealth
Bamboo Charcoal
Chaing Mai- Thailand- OTOP
(one village one product)
Anji- China (machanized handicraft)
Main actors of value Chain (1) Thah Hoa Province, Vietnam

- Farmers
- Collectors
- Traders
- Pre-processing workshops
- Processing workshops
- Finishing factories
- Exporters
- Final buyers
Main actors of value chain (2)

Growing
- Farmers
- Collectors

Processing
- Traders
- Pre-processing workshops
- Processing workshops

Finishing – Marketing
- Small & Micro
- Finishing factories
- Exporters
- Final buyers

Growing → Processing → Finishing – Marketing
Current Vs Benchmarking Practice

Direct Supply Model
Current practice in India countries
Waste rates 50 to 70%

Pre-Processing Model
Current model in China
Waste Rates 5 to 10% (Moso)

Farmers & traders
Processing businesses

Blinds
Flooring
Panels
Chopsticks
Charcoal

Farmers & traders
Primary Processing Workshops (Local Value Adding)
Processing businesses
Competitiveness: Resource Utilization Across Sub-sectors

Bamboo Utilization 100%

3 Main Sub-Sectors

- **Handicrafts**
- **Bamboo Shoots**
- **Industrial Processing**
  - 4 types

**3 Main Sub-Sectors**

- **Raw Culms**
- **Bulk Products**
- **Medium Value**
- **Premium Value**

**Other Developing Products** (inc textiles)

4 Types of Industrial Processing:

1. **Sheath & Rhizome**
   - 5-10%
2. **Shoots**
   - 30-40%
3. **Base**
   - 5-10%
4. **Middle lower**
   - 40-50%
5. **Middle upper**
   - 5-10%
6. **Top**
7. **Twigs**
8. **Bamboo poles**
9. **Leaves**

**Premium Value**

- **Fiber boards**
- **Charcoal, Pulp**
- **Charcoal, Pulp**
- **Leftovers & processing waste**

**Medium Value**

- **Handicrafts**
- **Blinds, Mats, Carpet**
- **Brooms**
- **Charcoal, Pulp**

**Bulk Products**

- **Bamboo poles**
- **Scaffoldings/furniture**
- **Chopsticks, Toothpicks**
- **Chopsticks, Toothpicks**

**Raw Culms**

- **Sheath & Rhizome**
- **Charcoal, Pulp**
- **Fuels**
- **Bamboo Shoots**

Source: Zhu 2005
Indian Specifications for Bamboo & Bamboo Products

IS 14588 : 1999  Specification for Bamboo Mat Veneer Composite for General Purposes
IS 13958 : 1994  Specification for Bamboo Mat Board for General Purposes
IS  1902 : 1993  Code of Practice for Preservation of Bamboo and Cane for non-structural purposes
IS  10145 : 1982  Specification for Bamboo Supports for Camouflaging Equipment
IS  9096 : 1979  Code of Practice for Preservation of Bamboo and Cane for Structural purposes
IS  8242 :1976  Method of Tests for Split Bamboo
IS  8295 :1976  Specification for Bamboo Chicks ; Part 1 Fine, Part 2 Coarse
IS  7344 : 1974  Specification for Bamboo Tent Pole
IS  6874 : 1973  Method of Tests for Round Bamboo
IS  15476 : 2004  Specification for Bamboo Mat Corrugated Sheets
Public Toilet at Kaziranga NP.

Open to public       Pay & use
Public Toilet at Kaziranga NP.
ADB sponsored Tarayana Foundation cluster based training at Bhutan
With ADB Team
BUILDING WITH BAMBOO
BAMBOO CONSTRUCTION WORKSHOP
WITH JORG STAMM

AT GOLDEN PAGODA ECO RESORT
TENGAPANI, NAMSAI, ARUNACHAL PRADESH

24 OCTOBER – 2 NOVEMBER 2018

DAY-WISE LEARNINGS
FROM THE WORKSHOP
Day 1: 24 October
Day 1: 24 October

Dr. Taj demonstrating the various species of bamboo

Various species of bamboo

Grading of bamboo

Grading of bamboo
Day 2: 25 October
Day 2: 25 October
Day 3: 26 October

Learning joineries
Setting up the workbench
Cleaning the bamboo
Making of nails
Day 3: 26 October

Sharpening the nails

Making the first beam

Making the first column

Presentation on ‘Bamboo Value Chain Management’
Day 4: 27 October
Day 5: 28 October

Trip to Parsuram Kund
Day 6: 29 October

Design Workshop: Modern Bamboo Structures
Day 7: 30 October

Planning the site layout

Laying out the site

Transporting the columns to site

Digging the holes for the footings
Day 8: 31 October

Emptying the borax solution

Preparing the frames

Preparing the frames

Preparation of frames
Day 9: 1 November

Carrying the frames

Lifting

Erecting

Checking the levels
Day 9: 1 November

Pouring the concrete

Fixing the tripod

Setting up the structure

Tying the ropes
The Bamboo Pagoda at Namsai
Android Mobile Application

“BAMTECH”

Launched by

Shri Hardeep Singh Puri
Hon’ble Minister of State (I/C) for Housing & Urban Affairs, GOI
On 22nd February 2018
at New Delhi
BAMTECH APP

Bamboo housing and construction on digital platform available at Google play store an initiative of BMTPC and SABF

NOW AVAILABLE IN:

GET IT ON
Google Play
BAMBOO CONSTRUCTION & HOUSING

BAMTECH APP

Now available in App Store

Available on the Apple App Store
Launched by Shri Hardeep Singh Puri Hon’ble Minister of State (I/C) for Housing & Urban Affairs, GOI On 22nd February 2018 at New Delhi On Android Platform
Promotion of BAMTECH app in Manipur
Thimphu, Bhutan
Now Available on Google Play Store
Inside every menu the app branches out to different subjects as shown in these screens which shows more in detail on click.
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Once on click all screen contains different information supported by illustration and images. Some screens dedicate to a full gallery as well.
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Some screens dedicate to a full gallery as well.
CNG from Bamboo

AgroGas

INDIA’S FIRST BIO-CNG FOR VEHICLES
Bamboo based Bio CNG in Manipur
Introducing Bamboo Straws And Bamboo Toothbrush
BAMBOO-THE GREEN GOLD
Value Chain Management and Sustainable Development in INDIA

Releasing in May 2019
Govt of Thailand, WBO members, 
WBO President, Kamesh Salam:
Declaration of
World Bamboo Day
18 Sept 2009
World Bamboo Day 2019 at Thimphu, Bhutan
Thank You