Bamboos of Meghalaya- Commercial Utility

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Introduction

- Bamboos include 1670 species in 125 genera belonging to three tribes: Arundinarieae (temperate woody bamboos), Bambuseae (tropical woody bamboos), and Olyreae (herbaceous bamboos) (Soreng et al., 2015, 2017), while the FAO report includes 1642 species, including 1521 woody bamboos (INBAR, 2016).

Bamboo Bearing Areas in Meghalaya

- The extent of bamboo bearing area in the forests of the state is 5943 km2 (ISFR (2017). \
- However, in ISFR (2011), it was shown 4793 km2.
- Thus change in the area with respect to ISFR (2011) is 1150 km2.

Some Unique Properties of Bamboo

- Bamboo, displays higher **tensile strength** than many alloys of steel.
- It has capabilities for higher **compressive strength** than many mixtures of concrete.
- It displays a **higher strength-to-weight ratio** than graphite—one of the strongest natural materials. The high silica in bamboo makes it indigestible to termites.
- High Moisture resistant
- During regeneration, the bamboo plant's root system stays completely intact, so **soil erosion** is prevented.
- Bamboo is by far the **fastest growing natural resource** in the world. It grows to maturity in just 4-5 years- in contrast to a tree which take decades to mature.
- One-hectare of broad leave forest produces 750 Kg of oxygen compared to 1350 kg of oxygen by one hectare of bamboo forest.
- India boasts of a rich 11 million hectare bounty of bamboo plantations

Bamboo bearing areas in Meghalaya by density in recorded forest area (Area in Sq. km)

Recorded Forest Area	Pure bamboo	Dense bamboo	Scattered bamboo	Clumps hacked	Bamboo regeneration	No bamboo
9,496	63	2,815	1,830	68	17	4,703

Uses of Bamboos

- The tender shoots, used for pickles and curries. Fermented shoots are also consumed.
- The slivers, used for tooth picks and meat barbecues, ribs for fans or slats for sun screens, or the dried culm as the sturdy lathi and for construction of the so called bamboo houses.
- Agricultural implements, anchors, arrows, back scratchers, baskets, beds, blinds, boats, bottles, bows, bridges, brooms, brushes, buildings, caps, cart-yokes, caulking material, chairs, chicks, chopsticks, coffins, combs, containers, cooking utensils, cordages, dust-pans, fans, fences, fish-traps, fishing-nets, fishing rods, flag-poles, floats for timber, flutes, flower-pots, food, food-baskets, fuel, furniture, hats, handicrafts, haystack stabilizers, hedges, hookah-pipes, joss-sticks, kites, ladders, lamps, lance staves, lanterns, lining of hats and sandals, masts, match-sticks, mats, musical instruments, nails, net floats, ornaments etc

Uses of Bamboos

Fermented Shoots

Pickles

Bamboo Venegar

Uses of Bamboos

Bamboo mats: It is important to note that mats are often purchased by the outside traders from Garo cane and bamboo workers. *Bambusa jaintiana* is mainly used for weaving mats.

Bamboo Baskets: The Khasis make different types of bamboo baskets (Khoh) which are used either as ‘carrier’ or as ‘container’. A special kind of basket Khop trop woven out of bamboo has a cover to protect the contents from rain. This has a special utility in the long journies. Oranges are also carried in these baskets. Khoh-kwai, the large cylindrical bamboo baskets are used.

Hunting and fishing: Villagers make use of bamboo for making various traps in the agricultural fields. Also uses for keeping areca nuts in the curing ponds

Fishing Trap

Bamboo as Firewood

Bamboo-Uses

- ***Phyllostachys mannii,*** is commonly planted as **hedge** in Shillong (Meghalaya), Mizoram and in Nagaland for beautification/ landscape.
- The leaves of *Bambusa vulgaris* are considered to be of high nutritive value; they are also fed **to chicken as a deficiency diet** to supplement vitamins.
- **Wildlife:** Himalayan black bears and musk deer, feed on several species of genus *Arundinaria, Drepanostachyum* and *Thamnocalamus* in high altitude close to the tree line. In India, endangered red panda *(Ailurus fulgens)* is dependent on Himalayan bamboos.
- **Bamboo charcoal** is generally used by goldsmiths. In Japan, bamboo charcoal is used in gardening as it is believed to preserve to soil.
- **Activated Carbon:** The demand of **activated carbon** in India is increasing day by day. Activated carbon is also used for purification water and air. Removing hydrogen sulfide from natural gas and filtering breathing air in air-conditioning units. In this second application, activated carbon helps remove radon and odors from the recirculated air.

Bamboo-Uses

- Bamboo is considered generally a **safe building material**. Its capacity to survive an earthquake or a hurricane is well known.
- **House Construction:** Bamboo is employed in different ways as a building material for roof structure in form of purlins, rafters, reapers as reinforcement in foundations, flooring, doors/windows, walling, ceiling, water storage tanks, manhole covers and even for roads in slushy areas.
- Although urban Khasis of Meghalaya give more emphasis on the modern technologies and synthetic building material, yet bamboo houses are still common sight in rural Khasi and Jaintia Hills.
- **Roofing:** Bamboo trusses form a good substitute for supporting roof loads and transmitting them to the foundations through columns. Bamboo trusses are fabricated using culms having an outer diameter of 50-80 mm.
- **Bamboo reinforced mud wall:** Mud wall gives protection against heat and cold.

Bamboo-Uses

- **Flooring**: Rural houses on raised platforms use bamboo for flooring while bamboo culms used as floor joints and beams act as framework. Over this framework, covering sheathings of split bamboo, bamboo boards/mats, small/full culms or flattened bamboo strips are suitably fastened.
- **Doors and windows:** Shutters made of bamboo mats, fixed on wooden frame is common in rural housing.
- **Scaffolding**: The platforms made of timber planks can be replaced with bamboo culms Bamboo poles lashed together have also been successfully used as scaffolding in high rise buildings.
- **Wildlife:** bamboo provides support to many species of wildlife. Some of these, such as elephants (*Elephas maximus)*, the wild cattle *(Bosgaurus and B. javanicus)* and various species of deer (Cervidae) and primates (including macaques *Macaca* and leaf monkeys *Presbytis)*, pigs (Suidae), rats and mice (Muridae), porcupines (Hystricidae), and squirrels (Sciuridae) are incidental feeders on Southeast Asian bamboos
- **Supports Birds: B**amboo also supports many species of birds. In addition to the hundreds of species that may feed incidentally in bamboo forests, numerous species favour bamboo or are confined to this habitat MC Neely (1996)

Biofuels

- **Bamboo for Bio-fuels:** The Assam biorefinery - which cost NRL and its Finnish partners Chempolis and Fortum 40 billion rupees - is India's first to use bamboo as feedstock and is expected to annually produce 50,000 tonnes of **ethanol,** 16,000 tonnes of **furfural** and 11000 tonnes **acetic acid**.
- The process has the potential to generate 143 L of ethanol per dry ton of bamboo process waste

Bamboo-Uses

- Bamboos fast growth, ability to grow on varied soils and climate, renewability and positive socio-economic impacts make them an excellent species **for combating climate change.**
- **Carbon Sequestration:** On one hand, high growth potential and ability to store large amounts of carbon make them a very good species for mitigation of climate change by way of carbon sequestration and on the other hand their environmental and socio-economic services can help communities in developing countries to adapt to the changing climate . One hectare of bamboo can sequester upto 62 t of CO2 yr-1, whereas equivalent of young forest sequesters 15 t of CO2 yr-1.
- **Bamboo Wine and Beer**: In Tanzania, a kind of wine is collected from the chopped off tips of *Oxytenanthera braunii* (Mgeni, 1983). Therefore, bamboo beer is a kind of high healthy beer, which can help lower blood-lipid when consumed frequently

Bamboo-Uses

- **Bamboo Vinegar**: The vapour that comes off the heated bamboo can be condensed to produce a liquid known as bamboo vinegar. It gets this name from the high content of **acetic acid**, though this ingredient is accompanied by many other compounds, especially phenols, such as **guaiacol and cresol**. This liquid can be applied in many purposes. Bamboo vinegar has been produced in Japan for many years and is used medicinally to **treat eczema, atopic dermatitis, and other skin diseases,** used in cosmetics, insecticide, deodorants, food processing, and agriculture
- **Bamboo Shoots:** A bamboo shoot is young culm of certain bamboo species that are harvested at the time it appears above the soil surface or shortly after, for consumption. *Bambusa polymorpha* is considered as one of the best in the world producing quality edible shoots, which have a distinct sweet taste in the raw state (Awasti and Tewari, 2008).

Bamboo-Uses

- Bamboo Toilet Paper.
- Bamboo Coffee Filters.
- Disposable Bamboo Paper Cups.
- Reusable Bamboo Paper Towels.
- Bamboo Baby Diapers.
- View fullsize. Bamboo Copy Paper.

Bamboo Shoots in Meghalaya

Chimonobambusa

D. hamiltoni

D. hamiltonii

Melocanna

Phyllostachys manii

Khasi ladies selling on GS Road

Tura Market

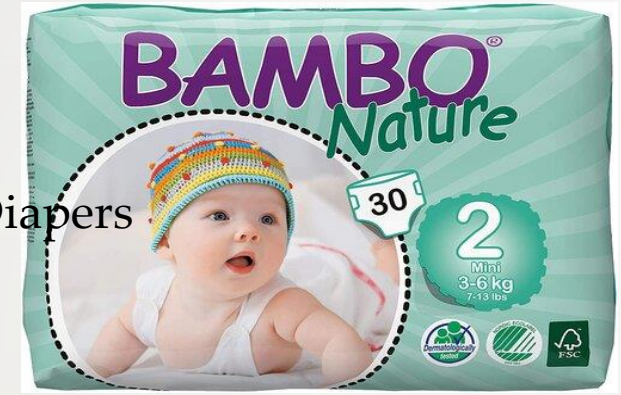
Lamp Shades

Bamboo Textile Products

Paper and Pulp Products

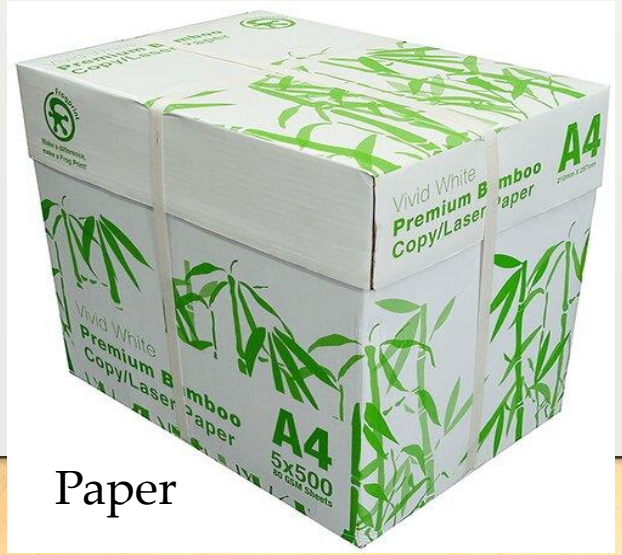
Bath Tissue

Diapers



Coffee Filters

Paper Towels



Paper

Paper Cups

Bio-Energy Products

Bamboo Chips

Charcoal

Briquettes

Pellets

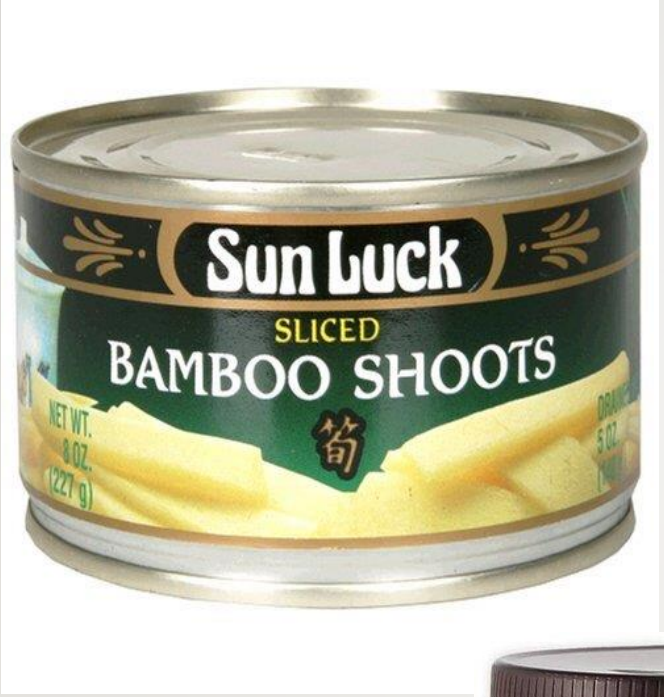
Bamboo Bio-energy Products

- **Bamboo Chips:** are a form of biomass fuel created by processing bamboo stalks into small pieces, which can be used **as a renewable energy source for generating heat or electricity through various bioenergy conversion methods,** making it a sustainable alternative to fossil fuels; essentially, bamboo chips are a readily usable form of bamboo biomass for **bioenergy production**.
- **Briquettes**: Bamboo briquettes are a sustainable alternative to traditional charcoal and firewood that can be used for cooking, heating, or power generation:
- Bamboo briquettes are made by crushing bamboo into a powder, mixing it with a binding agent, and then forming the mixture into briquettes. The briquettes are then dried to improve their combustion properties.

Bamboo Bio-energy Products

- **Bamboo pellets:** are a renewable energy source made from bamboo that can be used for cooking, heating, and industrial steam furnaces:
- Bamboo pellets are made by grinding bamboo into a powder, then pressing it into small, shiny pellets that are typically 6–12 mm in diameter. The process is similar to making pellets from sawdust, wood, or rice husk.

Food Items



Tea

Salt

Beer

Food Items- Bamboo Salt

- Bamboo Salt: Also known as “jukyeom,” Bamboo Salt crafted in Korea for decades. To create it, hollow stalks of bamboo are packed with sea salt, sealed with mineral-rich clay, and baked at high temperatures up to nine times to impart a unique, complex flavor and aroma to the salt.

Bamboo Beer

- Bamboo beer can be made by fermenting grains with bamboo dust or leachate, or by soaking bamboo in grains' spirit:

- Anti-Fatigue, Anti-Aging, Antibacterial, Antiviral, Enhance Immunity, Anti-Cancer and Biological Effects.

Bamboo Tea

- Bamboo tea is an herbal infusion that originates from the leaves of the bamboo plant. Bamboo Tea is a herbal drink made from dried bamboo leaves and has been used as a medicine since ancient times, as well as a refreshing and soothing beverage taste. The process for making bamboo tea is the same as for other teas. **Bamboo Tea is rich in silica and other antioxidants, with one leaf containing around 70 per cent organic silica. Strengthens Bones. Rejuvenates joints. Good for hair, nails and teeth.**

Sports Goods

Scating Board

Paddle board Paddle

Ski Poles

Bottle

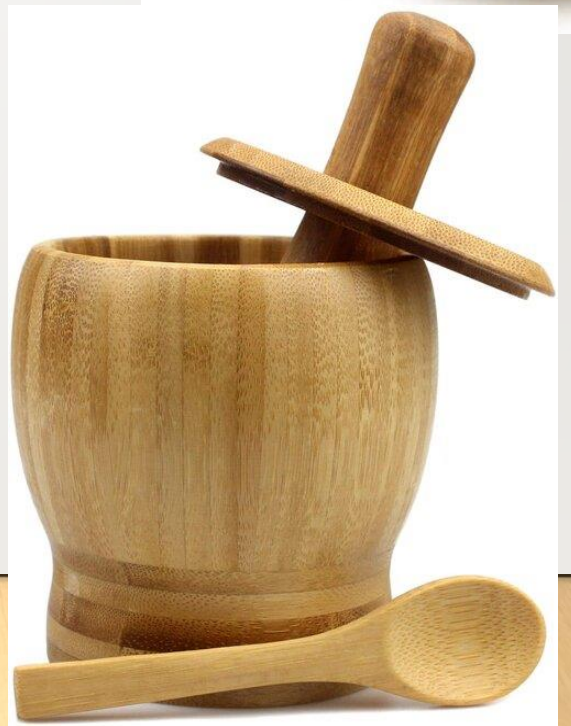
Base Ball Bat

Kitchen Items

Salt & Pepper Grinder

Chopping Board

Steamer



Mortar & Pestle

Bamboo Uses

- **Biodiesel:** Bamboo can be converted into biofuels like ethanol.
- **Bamboo Wood:** **Bamboo wood** offers you flooring for the insides of your house, decking for your outdoors and cladding for that rich feel on walls- along with doors. Eg: Epitome brand of Tripurs
- **Agarbatti:** Round Agarbatti Sticks
- **Bamboo Boards**: As Basic material for Ikea and other industries
- **Paper and Pulp Industry:** Bamboo can be pulped to produce paper
- **Bamboo Ply:**

Bamboo Uses

- **Bamboo Textiles:** In recent years different technologies have been developed that allow bamboo fiber to be used for a wide range of textile, fabrics, yarn, cloth, clothing and fashion applications such as T-shirts, pants, underwear, socks, towels, bedsheets, pillow covers, blankets, mattresses, and even bulletproof vests.
- **Replaces Plastics:** Bamboo fiber is a kind of natural fiber, and bamboo is rich in resources, with green, low-carbon, recyclable characteristics, thus using bamboo fiber to manufacture bamboo fiber-based composite materials to replace plastic is conducive to the promotion of a green economy and ecological civilization

Bamboo for Medicine

- Bamboo for Medicine Bamboo has been used for its medicinal properties for centuries, particularly in traditional **Chinese medicine**. It is believed to have a wide range of therapeutic properties, including **anti-inflammatory, anti-microbial, anti-cancer, and anti-oxidant effects.** However, despite its potential, there are several challenges and limitations associated with the use of bamboo as a medicinal plant. One of the biggest challenges is the **lack of scientific research and clinical trials** to support its efficacy .
- Pharma application of *Pleioblastus amarus* (Keng) Keng f. leaves will be considered **to treat inflammatory lungs, fever, and other relevant ailments in South China** (Kiruba et al., 2007). Leaf extract of bamboo is being used to treat several respiratory disorders such as colds and phlegm. Bamboo leaves are being used to treat neuronal disorders like epilepsy in children (Gupta and Ranjan, 2016; Panee, 2015).

Bamboo Baskets

Blinder Square

Species-wise Utility of Important Species of Bamboo

Species name	Habita	Parts Used	Uses
Bambusa balcooa	Cultivated and wild	Branch, culm, leaf, young shoot	Agricultural implements, construction applications, house roofing, thatching, partition wall, scaffolding, firewood, brooms, winnowing tray, baskets, musical instruments, raw materials for paper and pulp industry; leaves are used as fodder for cattle and goat; young shoots are edible; also grown as hedges.
B. bambos	-do-	Culm	Walling, flooring, partition walls, baskets.
B. cacharensis	-do-	Branch, culm, leaf, young shoot	Construction applications, house roofing, thatching, partition wall, scaffolding, firewood, baskets; leaves are used as fodder for cattle and goat; young shoots are edible.
B. jaintiana	-do-	-do-	-do-
B. multiplex	Planted	Culm, Leaf	Fencing, grown as hedges.

Species-wise Utility of Important Species of Bamboo

Species name	Habita	Parts Used	Uses
B. multiplex var. rivieroerum	Planted	Whole Plant	Grown as an ornamental plant.
B. nutans	Wild	Culm, leaf, young shoot	Construction applications, making ropes, poles, water pipes, spindle and other local purpose, raw material for paper industry; grown as ornamental species, also used for religious purposes; young shoots edible.
Bambusa pallida	Cultivated and Wild	Culm	Supporting material for construction purposes, raw materials for paper and pulp industry, baskets, mats, vessels to store water
B. polymorpha	Cultivated	Culm	Supporting material for construction purposes, making baskets, mats, grown as an ornamental plant.
B. tulda	Cultivated and Wild	Culm, young shoot	Supporting material for construction purposes, thatching, walling, roofing, scaffolding, mats, raw materials for paper, pulp and rayon industry, musical instrument, toys, baskets, food-grain containers, fishing rods, handicrafts, firewood, winnowing fan for rice and

Species-wise Utility of Important Species of Bamboo

Species name	Habita	Parts Used	Uses
B. vulgaris	Cultivated and wild	Culm, young shoot	Raw material for pulp, paper industry, thatching, walling, roofing, fencing, scaffolding, furniture, animal cages, poles, handicrafts; young shoots edible
B. vulgaris var. vittata	Planted	Culm	Grown as an ornamental plant.
B. vulgaris formawaminii	Cultivated	-do-	-do-
Chimonobambusa callosa	Cultivated and wild	Culm, leaf	Fencing, thatching of native houses, musical instruments, smoking pipes, arrows
Dendrocalamus hamiltonii	Wild	Branch, culm, Leaf, young shoot	Raw material for pulp, paper and rayon industry, supporting materials for concrete buildings and bridge construction; roofing, walling, scaffolding, fencing, matting, firewood, agricultural implements, kitchen and cookware components, fishing rods, animal cages and baskets, handloom and handicrafts, poles, water and milk vessels, binding and caning of chairs, branchlets used as tooth brush, bows; young bamboo shoots edible; leaves used as fodder

Species-wise Utility of Important Species of Bamboo

Species name	Habita	Parts Used	Uses
D. hookeri	Cultivated and Wild	Culm, young shoot	Walling, flooring, partition walls, baskets, water storing vessel; young shoots edible.
D. longispathus	wild	-do-	Raw material for pulp, paper industry, thatching, walling, roofing, handicrafts, baskets, tooth picks, food-grain containers; grown as an ornamental plant; young shoots edible
D. sahnii	Planted	Culm	Walling, fencing.
D. sikkimensis	Cultivated and wild	Culm, young shoot	Raw material for paper and pulp industry, fencing, poles, huts, ropes, boxes, water pipes; young shoots edible
D. strictus	-do-	Branch, culm, leaf, roots	Supporting material for construction purposes, raw material for paper, pulp and rayon industry, furniture, agricultural implements, vessels for holding water, bows and arrows, flooring, roofing, rafters, battens, baskets, walking sticks, branches used as tooth brush; leaves used as fodder for cattle; roots used as brooms and tooth brush; seeds used as food grains

Species-wise Utility of Important Species of Bamboo

Species name	Habita	Parts Used	Uses
Gigantochloa albociliata	Cultivated and wild	Culm	Making baskets, fencing
G. andamanica	Wild	-do-	Building huts and basket work, raw material for paper mills.
G. macrostachya	Cultivated and wild	Culm, young shoot	Baskets, mats; young shoots edible.
Melocalamus maclellandii	Cultivated	Whole plant	Caning of baskets
Melocanna baccifera	Cultivated and wild	Branch, culm, leaf, rhizome, young	Raw material for paper, pulp and rayon industry, supporting material for concrete building and bridge construction, fencing, thatching, matting, walling, roofing, water pipes, food grain containers, animal cages and feeding baskets, cattle sheds, farm house, musical instruments, handloom and handicrafts, hockey sticks; branches are used as brooms; leaves used as

Species-wise Utility of Important Species of Bamboo

Species name	Habita	Parts Used	Uses
Neomicrocalamus mannii	Wild	Culm	Walling
N. prainii	-do-	-do-	Basket Making
Phyllostachys mannii	Cultivated	Branch, culm, leaf, young shoot	Fencing, poles, baskets, walking sticks, firewood; branches are used as broom sticks, supporting materials for tendril climber vegetables; leaves are used as fodder for cattle and goat; young shoots edible.
P. nigra	Planted	Whole plant	Grown as an ornamental plant
Pseudosasa japonica	Planted	Whole plant	Grown as an ornamental plant
Sinarundinaria hirsuta	Wild	Culm, leaf	Walling of huts to hold mud plaster, roofing material, temporary partition walls, doors, nursery sheds, fences; young leaves is used as fodder for cattle.

Species-wise Utility of Important Species of Bamboo

Species name	Habita	Parts Used	Uses
Schizostachyum dullooa	Cultivated and wild	Culm, young shoot	Supporting material for construction purposes, thatching, walling, roofing, handicrafts, water vessel, baskets, mats, boxes to carry pan; young shoots edible
S. helferi	Wild	Culm	Basket making
S. mannii	Wild	-do-	-do-
S. munro	Wild	-do-	Bows and arrows, baskets; leaves used as fodder.
S. polymorphum	-do-	Culm, young shoot	Basket work, tying ceilings, making mats; young shoots edible.
Sinarundinaria falcata	Cultivated and wild	Culm	Walling, flooring, partition walls, fishing rods
S. griffithiana	Wild	-do-	Tying thatch of native houses.