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BAMBOO: THE POOR MAN'S TIMBER-AN OVERVIEW#

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Abstract

Bamboo is a versatile and renewable resource, described by high quality and low weight, and is effectively worked utilizing basic instruments. The almost 1,500 described species of bamboos are ordered into three tribes: Arundinarieae (temperate woody bamboos, 546 species), Bambuseae (tropical woody bamboos, 812 species), and Olyreae (herbaceous bamboos, 124 species). Bamboo is the world's fastest growing woody plant. It is broadly perceived as one of the most important non-timber forest products because of the high financial advantages of bamboo based items. Bamboo grows three times faster than most different species. Bamboo has many natural advantages which have made it a most loved green building material. The review considers not only the ecological aspects when bamboo is utilized as a structure material but also its social and financial perspectives, to understand its maintainability way. A look at the realities uncovers that reasonable and economical usage of bamboo will open up a plethora of chances particularly for the rural poor. Preceded with technological, headway and research have placed bamboo into an ever increasing number of employments and as a crude material for a few modern. A need requirement for tackling its economical aspects potential is draw up a very well planned multilateral methodology.

Keywords: Environmental aspects, nontimber forest, renewable, socioeconomic, sustaina bility.

#General Article

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Introduction

The "Green Gold" of the 21st Century and generally known as "Poor man's timber" bamboo assumed a significant role in human culture and society since days of yore and today it adds to the resource needs of over a billion people around the world. India is the second biggest producer of Bamboo in the world after China. The yearly bamboo production in the country is assessed at around 3.23 million tons. In Asia, bamboo is the most incorporated part of the culture of life and is utilized as a substitute for woods. It has been generally utilized as fuel, food, for rural housing and shelter, fencing, tools, and different purposes. In modern days, it is being utilized as industrial raw material for pulp and paper, development and designing materials, board items, etc. India is extremely lucky to be honored with acceptable bamboo resources. Also, the bamboo shoots are devoured as food and are viewed as an acceptable good source of nutrition.

The north eastern states are the most bamboo producing states in the country. The North Eastern locale, a landmass of eight states, spread over a zone of 262179 km^2 speaking to around 8% of the all out a geological region of the nation with a population of about 39'04 million is an area which is plentiful in bamboo resources. The locale houses about two thirds of the bamboo resources of the nation spreading over and territory of about 3.10 million hectares where 89 types of bamboos are accessible. The bamboo is usually joined by lashing with vines, split bamboo or rattan (Larasati *et al*. 2013), although there are around 136 species of bamboo that exist in the country, still only some of them are commercially feasible. To address agricultural necessities, it is more suitable to apply agroforestry methodologies that advance the intercropping of cash crops with existing bamboo stands. Such systems infer the protection, the executives, and supportability of the bamboo forest while making opportunities for income generation through agroforestry. Rather than clearing whole regions from bamboo woods, corridors inside the bamboo resource can be cleared for farming. Such corridors would likewise fill in as firebreaks and transport courses. Under such an administration plot, bamboo timberland spread can be held while supporting agroforestry exercises.

The Nutritive Value of Bamboo Shoots

S.No.	Nutrient	Value (%)
1.	Carbohydrate	4.5
2.	Protein	2.6
3.	Fat	0.3
4.	Ash	0.9

Propagation of Bamboo

Regularly, the bamboos are propagated through the culms cuttings or rhizomes. Be that as it may, they can likewise be spread through the infrequently accessible seeds. Bamboo seedlings are raised on nursery beds and for a year or so they are permitted to develop on poly pots. Later the seedling is moved into the primary field. In the rhizome planting strategy, a little consideration is required. Here, culms of 1 year alongside roots should be dug and cut into 1 meter estimate and be planted in the rainy season.

Bamboo Nursery

Setting up a bamboo nursery is a handy answer for keeping up a regular supply of planting material for plantation and forest service ventures. The nursery doesn't require high investments. An essential tool for manual activities can be utilized.

Site Selection for Bamboo Nursery

Many factors should be considered in selection of a site for a bamboo propagation nursery. Like communication and transport, land use, rainfall, marketing, etc.

Size and Layout

The size of the nursery relies upon its planned production limit and on the size and time of plants to be developed. A nursery committed to the production of young liners or seedlings which are to be conveyed to different nurseries will require less space than a nursery which develops and stocks more established and bigger plants. Overall, the measure of time bamboo seedlings needs to stay in the nursery ranges from 8 to 12 months. As a rule, at least 5000 m^2 should be allocated for every 10,000 seedlings or youthful plants that will be raised yearly. The shape or layout of the nursery should be approximately square to minimize the length of the perimeter. The area needed for paths, roads, irrigation, ditches, and buildings should also be taken into consideration and represents additional space requirements to the entire nursery unit. Having more land than initially required provides an allowance for future expansion of the nursery production area.

Location and Accessibility

If conceivable, the nursery ought to be situated close to a thruway or open street to encourage tasks, correspondence and transport. Preferably, the nursery site ought to be as close as conceivable to ranch zones. This will include less vehicle time and expenses in conveying plants to the field. Plants will experience less worry during transport the quicker they can be conveyed to the field.

Water Supply

This is a basic part of a bamboo propagation nursery. The nursery should be situated in a zone where there is a bountiful and all time supply of water. On the off chance that the supply of water during the dry seasons is insufficient, a capacity tank should be developed. The measure of water required relies on the nursery size, watering

recurrence, precipitation and climatic conditions, the species to be raised, the number of propagation materials, and the strategy for watering to be utilized.
Topography: Local topography is a vital factor and in a perfect world, the site should incline delicately to about 5° so water can run off without causing disintegration. By and large, peaks and valley bottoms are unacceptable; areas on center to bring down inclines are best.

Soil

Nursery production requires very much depleted and ripe soil with a medium to light texture.

Sun and Shade

Plants in a nursery need a decent parity of daylight and shade. Locales that are vigorously concealed for the day ought to be maintained a strategic distance from. Fractional concealing is attractive in the exceptionally dry zones to forestall unreasonable day temperature. Parched territories with drying up conditions are not appropriate for a bamboo nursery.

Potting

Potting of propagates should be done carefully to ensure a high survival rate at the nursery. Polythene tubes or polybags are commonly used in potting containers. Polybags with a size of 40 cm x 50 cm are suitable for small bamboo plants and generally provide sufficient space for the development of roots, rhizomes, and new shoots.

Hardening

After being transplanted or potted, the seedlings and cuttings are kept under 50% shades. But as soon as transplants have recovered and commenced growth, they should be exposed to lighter and gradually hardened. Hardening is achieved by progressively exposing the plants to more adverse weather conditions similar to those in the planting field. By the time seedlings and cuttings are ready to be planted out in the field, their roots should be well developed and have healthy green foliage, which are prerequisites for shoot development. At least, one month before planting out, they should be bared to full sunlight and moved to the open field nursery where they are maintained up to the time they are taken out of the nursery and transported to field planting sites. Fertilizer should not be applied during the hardening period, especially two months before field planting, to prevent the development of succulent tissues.

Transport of Planting Material

Plants that are used for planting in the field should be hardened at the nursery before transporting them to the planting site. Plants that are very young and delicate have a lower chance of survival in the field. It is important to select plants that have well developed roots and rhizomes. Such plants will be able to absorb nutrients from the soil and will be able to adapt to the harsher conditions of the field more easily than plants which are still developing roots.

Plants at the nursery which have very long stems may be trimmed down to a height of 50 cm. It is however essential to ensure that the plants have sufficient foliage. Smaller plants with vigorous roots will require less energy for surviving in the field than taller plants.

Planting Procedure for Nursery Plants

While choosing the plantation site, check the quality of the soil. Bamboo can develop well on most soil; however profound permeable rich soil with high dampness content and a pH of 5.5 is ideal. Most soil waste is significant. Check that the land isn't inclined to flooding. Bamboo doesn't perform well on waterlogged soils. It is in this manner best for the ranch to be arranged on moderate slants. Plan the exercises with the goal that the planting design is finished in any event fourteen days before planting. The planting gaps ought to be situated in a north-south direction. This will give an ideal circulation of daylight to all the plants. Planting openings with a measurement of 1m and a profundity of 60cm ought to be uncovered and equally divided by the plant separating of 7m x 7m. Planting ought to match with the beginning of the blustery season.

Replanting

Not all relocated seedlings and cuttings will endure the field condition. The site ought to along these lines be visited normally to keep an eye on the growth of plants. Dead seedlings and cuttings ought to be supplanted. Replanting ought to be done quickly toward the beginning of the blustery season.

Cultivation of Bamboo

Climate Requirement

The bamboo plantation grows well in hot to warm temperate climatic conditions. But it must be remembered that it doesn't require temperature below 15 ^{0}C in the summers. Since the bamboo has thin roots as well as ample growth, you must make provisions to protect it from strong winds. Also, areas that receive cold winds are just not apt for bamboo cultivation as the winds kill the tips of bamboo leaves.

Soil Requirement

Bamboos can be developed and developed on a wide assortment of soils aside from rock-tossed soils. The Bamboo ranch additionally requires all around depleted sandy soil to dirt soil that ought to have a pH scope of 4.5 to 6.0. On the off chance that we talk about India, at that point, the Barack Valley locale is most appropriate for bamboo development because of the best soil and immaculate atmosphere conditions.

Manuring and Fertilization

For high growth and best yield, composts are utilized. Compost and treatment are significant when the seedling is relocated in the principle field. As the bamboo plants are overwhelming feeders, even the most extravagant soil will get cleaned out following not many years, if manures are not applied to them. In any case, it is constantly recommended to apply compost in the wake of collecting and past to inundating the plants. Potassium and Nitrogen are indispensable segments of the compost because of

which the bamboo trees react and develop well. Likewise, you should apply green excrements, natural fertilizer, wood debris and synthetic fertigation.

Irrigation

Irrigation must be done consistently while the bamboos are grown on nursery beds. Prompt water should be given at the hour of relocating seedlings from nursery to primary field. It must be noticed that bamboo trees are touchy to water logging consequently you should deplete out the dirt particularly during overwhelming precipitation or flooding. You can likewise embrace the trickle irrigation system framework for better use of water.

Weeding

Weeds rival bamboo plants by retaining supplements, water, and sunlight. Weeds have rhizomes that sprout again if not expelled. Measures to control weeds incorporate an exhaustive arrangement of the dirt before planting and the utilization of planting media and fertilizer which are free from weed seeds. A territory inside a sweep of 60 cm around each plant ought to be freed from all weeds and vegetation. Weeding ought to be done completely, efficiently and consistently. When removing weeds from the soil, no bit of the root system should be deserted.

Bamboo Insect Pests

- Bamboo Shoot and Culm Borers
- Bamboo Shoot Wireworms
- Shoot-Boring Noctuids
- Bamboo Shoot Weevils
- Bamboo Leaf Defoliators

Bamboo Diseases

Potentially serious diseases of bamboos in Asia include culm blight caused by *Sarocladium oryzae* in the village groves in Bangladesh and in the coastal areas of Orissa state, India; rot of emerging and growing culms of industrially important bamboo species in India caused by Fusarium spp.; witches' broom incited by Balansia spp.

Control of Bamboo Pests and Diseases

Various control methods including cultural control, biological control, physical control, and chemical control against bamboo pests and diseases have been reported in the bamboo plantation area; however, the use of compound pesticides is the most dominating measure utilized regularly. Other than contaminating the earth, the extreme utilization of wide range bug spray likewise slaughtered the common foes which bring about obstruction and resurgence of pest. Therefore, IPM program for bamboo is required:

- Cultural control
- Biological control
- Physical control
- Chemical control

Clump Management

The best possible upkeep of the clump improves the efficiency as well as facilitates the activity of the plantation worker. Clump management is mostly an upkeep task and incompletely a consequence of harvesting. As an upkeep activity, it includes evacuating undesirable culms to prevent clump congestion. Expulsion of old and spoiling culms is additionally important to advance the sound development of shoots and new culms. Unique consideration should be put on rotting in the stubs of culms that have been harvest.

Controlling the Spread

One of the significant parts of growing bamboo is controlling the spread of the rhizomes. There are two fundamental kinds of bamboo called runners, and clumpers. Runners are species of bamboo which spread out rapidly with long rhizomes underground that sprout a few new culms (or stems) all at once. Clumpers are bamboo plants that spread gradually around where they are originally planted. When managing attempting to control the spread of plants, pruning is normally the main alternative. By cutting old branches just as some new ones, bamboo can be etched to develop in littler spaces, regardless of whether you're utilizing clumpers or sprinters. Doing this an excess of can murder the plant also, or influence the size of the bringing plants back.

Harvesting

The harvesting can be started from the fifth year onwards. Then again, if there should be an occurrence of commercial cultivating, harvesting must be done from the 6th year. In the first harvest the sixth year, 6 culms can be harvested followed by 7 culms in the seventh year and so on.

Drying and Seasoning

Drying culms is normal in the handling of bamboo culm for most uses. Culms are likewise exposed to seasoning before machining, handling, and finishing products that are durable, stable and of high quality.Bamboo culms can be air-dried with or without sunlight or they might be furnace dried. Air-drying is more normal than oven drying since it is more prudent. Bamboo culms might be part of equal parts to accelerate drying activities. Bamboo culms might be altogether air-dried in very much ventilated shade for half a month. Drying requires flat stacking of culms on racks. In drying enormous amounts, the

butts and highest points of the culms are put on the other hand then tied in groups to prevent bending. Fixing green culms without the utilization of warmth requires several weeks. This is done under the shade, either by suspending the newly cut bent culm by the tip and connecting a load at the opposite end, or by laying the green culm on a level surface and applying adequate weight over the culm during the time of drying and setting.

Uses of Bamboo

- Soil adjustment, wind break, urban waste water treatment and decrease of nitrates pollution.
- Creating a fire line in conventional backwoods because of the high substance of silica.
- Removing barometrical carbon-bamboo can catch 17 metric huge amounts of carbon per hectare every year, adequately than some other species.
- The shoots are palatable.
- Building and development.
- Small scale and house ventures, for painstaking work and different items.
- New age items as wood substitutes
- Industrial items
- Transportation industry-truck bodies, railroad carriages and so forth.
- Boards and furniture
- Medicine
- Paper and pulp industry
- Long time wellspring of biomass for industry
- Fuel source-fit for producing 1000-6000 cal/g-for family units and little ventures is a deep rooted, proceeding with training.

Advantages of Bamboo

- Light, versatile and strong
- Environment friendly
- Accessible to the poor
- Self renewing resource
- Fast growing
- Highly productive

Limitations of Bamboo

- Requires conservation
- Shaped by nature
- Durability–bamboo is exposed to assault by parasites, bugs; hence, untreated bamboo structures are seen as impermanent with a normal existence of not over 5 years.
- Jointing–albeit many jointing procedures exist, their basic effectiveness is low.
- Lack of plan direction and codes.
- Prone to burst into flames exceptionally quick by the grinding among the culms during wind, and causes fire.

Role of Bamboo

Bamboo-based Construction Aspect

Bamboo has been utilized as a development material because of its simple accessibility, simplicity of functionality and its quality. it relies upon the age, measurement, divider thickness, position of burden an outspread situation from outside to inside and levels of water (Mahdavi *et al*. 2011). Regularly the joints are worked, in vernacular settings, all through with tied ropes or by entry points of the bamboo, easy to acknowledge yet not appropriate to send the whole bearing limit of the bamboo components (Sassu *et al.* 2016).

Environmental Aspect

Life Cycle Analysis (LCA) is the main device for evaluation of the effect that items and administrations have on nature. Since there have been just eight LCA-based investigations for bamboo development materials (Escamilla and Habert, 2014), including the reference article, rather than the LCA impact categories, this review following at the accompanying natural parts of bamboo-based development material. Bamboo has an extremely quick development rate, so it has been viewed as reasonable for afforestation (Basumatary *et al.* 2015).

Economical Aspects

The practical part of bamboo-based materials studied so far comprise of the expense of the material and the salary openings it makes. These jobs remember customary agricultural employments basic for developing regions just as higher-talented occupations required to process the bamboo raw material into esteem included items, for example, furniture, housing, composites, and so on (Dagilis, 1999).

Conclusion

Bamboo is one of the commercially cultivated crops in India and it is additionally considered as 'a poor man's timber'. Since time immemorial, bamboo has assumed an important role in the improvement of mankind. It is utilized for a wide range of day to day purposes, both as a woody material and as food. It has been the foundation of a significant part of the world's rural life and will remain so as the population increments. The properties as top level structure material and expanded accessibility of bamboo in our nation make it conceivable to utilize, bamboo in the field of development widely. Its high esteemed use advances the economical development of events, yet additionally spares forest resources to secure our ecological condition as a wood substitute. By thinking about the recipients of each progression from planting and harvesting of bamboo, to its processing in industries and finally, in development, the income generation opportunities for each socio-economic strata of society can be remembered for any advancement undertaking of bamboo and a maintainable financial and social development, environmental maintainability is a fundamental requirement.

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