

Bamboo Plantation Establishment

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Bamboo Plantations- Models

Bamboo is a multiple-use species; it is climate resilient, adaptable and can grow on degraded lands marginal land, farm boundaries, slopes, riverbanks and so on.

Different bamboo species are suitable for different agro-climatic conditions, ranging from coastal regions (sea level) to high mountains (up to 4000 m above mean sea level [AMSL]).

Models: Large-scale plantations/wood lots: Bamboo plantations of any scale (from 1 ha to thousands of hectares) can be aimed at commercial production of bamboo poles for generation of timber, shoots, pulp, bio-energy and so on, as well as ecological restoration (degraded lands, mined sites, ravines, riverbanks, etc.).



Models

- **Smallholder Farm Block Plantation:** Smallholder farmers can establish bamboo as agro-forestry or block planting of different scales (a few bamboo clumps to any scale).
- **Farm Boundary and Shelter-belt Planting:** Smallholder farmers can plant bamboo in farm boundaries, contour lines and shelter belts in the case of streams, rivers and so on.
- **Household Planting:** A few bamboo clumps can be planted close to homesteads to meet daily fuel wood, fodder and other sustenance needs



Choices of species

- It is important to consider the ‘**end use and agro-climatic regime (geographical location [latitude and altitude], climate, rainfall, soil type and other variables)**’.
- Consult **local research agencies** to understand which bamboo species could grow well in the plantation site.

Site Selection Criteria for Bamboo Plantation

- When selecting a plantation site, the points outlined below must be considered.
 - i. **Soil:** The most suitable soil type for bamboo is **sandy loam to clay loam** due to its porosity (permeability), fertility (high organic content) and water/moisture-holding capacity. The depth of soil should be at least 30-45 cm. **Highly compact or sticky or clayey soil, rocky, and extremely sandy soils are not as suitable.**
 - ii. **Light requirements:** Bamboo does not grow well under deep shade. It needs direct sunlight for rapid growth. It is advised to plant bamboo in an open area (direct sunlight) or in locations with sparse canopy (<10%).
 - iii. **Drainage/ water inundation:** Bamboos can survive flash floods (days), but most cannot survive under water inundation for prolonged durations (weeks/months; however, some Guadua bamboo species can grow in water-inundated areas for some months). Therefore, select a site that is well drained.
 - iv. **Topography:** Flat land and gentle slopes are best suited.
 - v. **Groundwater level:** The groundwater table/level should be lower than 50 cm.

Vi Location and accessibility: Easy to access and approach by road.

Types of Soil Particles Based on Size

Soil type	Particle Size (mm)
Clay	<0.002
Silt	0.002-0.075
Sand	Fine
	Medium
	Coarse
Gravel	4.75-75

Soil Types

Soil is usually referred to as the naturally occurring organic material found on the earth's surface. It is mainly composed of minerals, nutrients, water, other inorganic particles and some residues of plants and animals

- **Sand or sandy soil** is formed by the smallest or fine particles of weathering rocks. This soil is known as the poorest type of soil for agriculture and growing plants as they have very low nutritional value and poor water holding capacity.
- **Clay or clay soil** is mainly composed of the smallest particles of soil, which are densely packed with very little or no airspace and they effectively retain water. This soil is not suitable for growing plants as it is harder for moisture and air to penetrate into the soil.
What is Loamy Soil?
- **Loamy Soil** is the mixture of clay, sand and silt soil which consists of additional organic matter and is very fertile compared to other types of soil. It is well suited for cultivation as the plant roots get a sufficient amount of water and nutrients for their growth and development.
- **Silt:** Fine sand, clay, or other material carried by running water and deposited as a sediment, especially in a channel or harbour

Plant material selection and preparation and Transportation

- Select healthy seedlings and/or rhizomes (bamboo seedlings: six to nine months old; 50-80 cm in height; multiple stems) with well-developed rhizome and root systems.
- Harden the selected plants in direct sunlight (similar to the plantation site) for about two to four weeks to acclimatize the plants to field conditions.
- Trim about 50% of the foliage to minimize water transpiration loss.
- Always carry the plants by holding the polybags/pots to minimise disturbance to the rhizome and roots and avoid breakage of stems

Site & Land Preparation

Site preparation: is necessary to ensure better survival and faster growth, as well as to provide optimal conditions for performance of plantation.

Site preparation includes (1) land preparation (bush clearing), (2) soil preparation (soil loosening and weed control), (3) fencing to control access for cattle and (4) fire prevention.



Land preparation: Clear shrubs, bushes, weeds and any unwanted vegetation to ensure space availability.

Soil Preparation:

i. **Ploughing/tillage:** Plough the plantation site thoroughly (30 cm deep), which helps in churning/ rearranging soil layers and soil loosening, as well as improving soil quality.



Land Preparation:

ii) Strip preparation: In this method, first mark the rows of planting. Clear out the weeds by ploughing or clearing vegetation in strips (at least 1.5-2 m wide).



iii) Spot preparation: This is usually applied in sites where it is impossible to plough. The spots should be large (1-1.5 m in radius) from the centre of the pit.



Fencing:

Bamboo is a good fodder & liked by many small and large ruminants; it is necessary to guard the site by fencing it to prevent any risk from damage by domestic and wild animals (especially when plants are young).

The following points must be kept in mind at the time of fencing:

- i. If barriers already exist, only fence the places where animals can enter; and
- ii. Fencing must be done before any pit digging and planting.

Fire prevention: Clear all kinds of woody shrubs, grass and other vegetative materials, which can catch fire in the 5-m range around the site



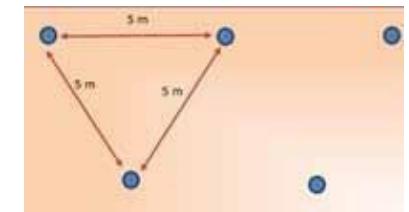
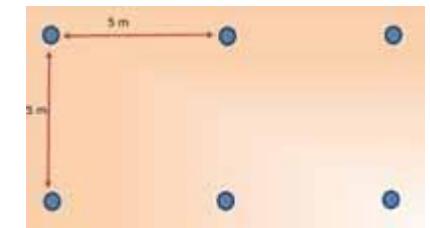
Spacing

Spacing is important to reduce above-ground competition for light and below-ground competition for water and nutrients.

- If spacing is too narrow, bamboo will mostly grow tall, but it will not produce large-diameter stems/culms. If the spacing is too large, sunlight will penetrate the canopy, allowing grass to colonize the site and increasing the risk of fire in the dry season. Spacing of plants depends on the species and purpose.
- 4 × 4 m: Small-diameter bamboo: 4-8 cm (e.g. *Oxytenanthera abyssinica*, *Dendrocalamus strictus*, *Bambusa multiplex*, *Thrysostachys oliveri*).
- ^{a)} 5 × 5 to 7 × 7 m: Medium-diameter bamboo: 8-15 cm (*Yushania alpina*, *Bambusa vulgaris*, *Dendrocalamus asper*, *Dendrocalamus hamiltonii*, *Dendrocalamus membranaceus*, *Bambusa tulda*, *Bambusa polymorpha*, *Cephalostachyum pergracile*, *Dendrocalamus brandisii*, *Bambusa balcooa*, *Bambusa bambos*, etc.).
- 7 × 7 to 10 × 10 m: Large-diameter bamboo 15 cm (*Dendrocalamus giganteus*)

Spacing

- Two patterns of spacing can be employed, which are as follows:
 - (a) rectangular spacing and
 - (b) triangular spacing.
- For large-scale commercial planting, it is recommended to adopt triangular spacing, which allows maximum utilisation of land area and spreading space between clumps



Planting

- **Staking Out:** According to Species
- **Pit Digging:** The size of the planting pits (length, width and depth) is crucial as it facilitates initial growth of the plant rhizomes and roots. Pits must be prepared at least 15 days before planting to facilitate weathering of soil
- **Planting:** Manure and fertiliser can be applied during planting. Apply one basket (5 kg of manure/compost) to the topsoil. Mix them thoroughly. Fill the topsoil mixture into the bottom portion of the prepared pit and compact it.



Planting

- Remove the polybags
- Place the bamboo plants on the pit. The neck of the polybag should be on the same level as the top of the pit.
- Fill the remaining topsoil mixture on the sides; then fill the bottom soil above it.
- Compact the soil in the pit.
- Prepare soil mounding around the plant; trench around the pit to enable water availability.
- **Note: Best time for planting:** Early rainy season is the right time for planting, as the plants will have sufficient moisture availability for a longer time to become established

