MAINTENANCE OF BAMBOO PLANTATION

INTRODUCTION

Maintaining bamboo plantation (year 1-5) is important to increase the survival rate and early maturation of plantation. After the establishment of plantation (and survival of plants) and before maturation (clump reaching its maturity: bamboo culm / poles reaching its maximum height and diameter: ready for harvesting); maintenance is crucial.

Once the bamboo plantation reaches maturity and culms are ready to harvest (Year 5/6 onwards), sustainable management and harvesting is crucial (refer to technical bulletin: Sustainable harvesting and management).

There are two stages in maintaining bamboo plantation:

(a) Seedling stage (year 1-3): This is the phase between planting and canopy closure, which usually lasts for about 1-3 years depending on the planting material, site condition, species, density of planting and growth. In some sites, this phase could be between Year 1-2. During this phases, maintenance practices focusses on protecting the young clumps from competing vegetation and provide them enabling environment for rapid growth.

(b) Early maturation stage (year 3-5): During this phases, maintenance activities are focussed on clump management (cleaning, pruning, thinning to reduce clump congestion).
MAINTENANCE DURING SEEDLING STAGE (YEAR 1-3)

During this phase, maintenance practices focused on ensuring survival of plants and to enable faster regeneration or increase in number of culms / poles.

Key maintenance practices include:
1) Vacancy filling or beating up
2) Weed control
3) Soil loosening
4) Soil amendments including fertilization
5) Soil mounding and trenching
6) Mulching
7) Additional maintenance aspects (irrigation, trench, etc)
8) Inter-cropping

Timing to undertake maintenance (at least twice during year 1 and 2 each)

a) Just before end of rainy season: During the end of active rain period (to accumulate and increase soil moisture; and when seeds of weeds are not completely mature enough to produce more weeds).

b) Beginning of rainy season: Eliminate weeds and shrubs in initial period of growth and enable bamboo plants to grow vigorously during active rainy season.

VACANCY FILLING OR BEATING UP

Even with best planting and maintenance, 100 per cent survival will not be possible. For commercial bamboo cultivation: to maximize yield, replacement is necessary. During the first year, 10-15 per cent and during the second year 5 per cent vacancy filling may be necessary.
WEEDING AND SOIL LOOSENING

Growth of a young bamboo plants in early stage can be hampered by weeds and any other competing vegetation. Weeds weaken the root and stem development, and also contribute to occurrence of insect, pest and disease. Weed clearance should be done at least two times each, during the first two years. The weed eliminate climbing vines as well.

Weeding and soil loosening improves the sanitary environment (turning soil reduces pests and insect attack); enables free expansion of root, rhizomes and increases moisture retention capacity of soil.

There are two options for weed clearing and soil loosening namely (1) ploughing and (2) spot weeding.

**Ploughing and soil loosening:** If ploughing is possible, undertake ploughing in the bamboo plantation area or site. Along with ploughing, clear all the weed and loosen the soil around bamboo clumps.

![Ploughing the entire plantation](image1.jpg)

![Weed clearance and soil loosening close to bamboo plants where ploughing may not be possible](image2.jpg)

**Spot weeding and soil loosening:**

If ploughing is not possible, undertake spot weeding in a radius of 1 to 1.5 meters around the bamboo clumps.

![Soil loosening must be done starting from plant till a distance of at least 50 cm radius; up to a depth of 15 cm.](image3.jpg)
SOIL AMENDMENT INCLUDING MANURE AND FERTILISER APPLICATION

Manure and fertiliser application stimulates rapid growth of plants. All sorts of soil amendments including organic (cow dung, compost, farm yard manure, ash) and inorganic fertiliser (NPK) can be applied. Thoroughly mix the applied manure/compost with loosened soil. Alternatively, fertilizer can also be applied by creating trenches or holes around the bamboo clump. After application of manure / fertilizer cover the trenches / holes with soil.

TRENCHING

Heap / mound the soil mixture around and over the base of the plant; and prepare a trench (at least 50 cm radius) around bamboo plant to retain water.

MULCHING

Spreading a thick layer (~ 5 to 10 cm) of organic matter (green and/or dry matter: straw, trees leaves and twigs) on surface of soil. Helps in conserving soil moisture (reduce evapo-transpiration), controls weed growth and improves soil fertility and organic carbon.
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**Amount and timing of manure / fertilizer**

**First application:** One month after planting (when plant resume regrowth after planting), apply one basket (5 kg) of well rotten manure or compost. In addition to this, 50 gm of NPK can also be applied.

**Second application:** At the beginning of next rainy season (year 2), apply two baskets (10 Kgs) of manure or compost. In addition, 100 – 150 gm of NPK may also be applied.

**Third application:** In the beginning of next rainy season (year 3), apply 5 baskets (30 Kgs of manure or compost). In addition, about 500 gm of NPK can also be applied.

Repeat the process in following years.

**Please note:** Bamboo has high demand for silica. Bamboo leaves, rice husk, etc. are rich in silica. Compost prepared using bamboo leaves, rice husks are good.

**Caution:**

- Make sure sufficient soil moisture is available: Apply inorganic fertilizer (NPK) only when there is sufficient soil moisture and/or rain. In case of dry conditions, application of NPK will result in fertilizer poisoning mortality of plants.
- Do not apply the inorganic fertilizer (NPK) directly to sensitive parts of the plant like rhizome.
- Always mix the fertilizer well with soil and manure and/or cover with soil.

**ADDITIONAL MAINTENANCE ASPECTS**

**Irrigation:** Irrigation helps in reducing mortality in young plants and facilitates growth. Especially during year 1 of plantation establishment irrigate bamboo plants during long dry spells in an interval of 10 – 15 days. Apply water (15 – 20 litres) in trenches created around bamboo plant by channel irrigation or spot irrigation.
ADDITIONAL MAINTENANCE ASPECTS

Trenching for increasing water retention and soil moisture: In drier location or semi-arid regions, rainfall is relatively scanty. Trenches can be created to collect and store more water to increase soil moisture by collecting the run-off generated.

“V” trench: In slopy land, create a trench above (30 cm above bamboo plant) following the slope. The size of trench will be approximately 1.5 meter in length X 30 cm width X 30 cm depth

“Half moon” trench: In slopy land, create a trench above (30 cm above bamboo plant), following the slope. The size of trench will be approx. 1.5 meter (radius) X 30 cm width X 30 cm depth

Flat Land: Create a rectangular trench (1.5 M length X 30 cm width X 20 cm depth) or create a circular trench around the bamboo clump (1 meter radius).

Flood Management: Prolonged flood conditions will cause rotting of rhizome and root system due to abnormal respiration metabolism caused by shortage of air flow. Firstly, donot plant bamboo in locations prone to floods. In case of accidental flood creating a drainage system is essential.
INTER-CROPPING WITH BAMBOO

Inter-cropping is highly encouraged as it is beneficial for farmers to generate income till bamboo plantation provide regular income. In addition, inter-cropping helps in weed control, reduces evapo-transpiration, and increases soil organic matter. With inter-cropping, there will be regular maintenance of plantation site (without additional work), which favours survival and growth of bamboo. Depending on the site condition, species, scientific management practices, harvesting of bamboo can start from four – six year. Until complete canopy closure inter-cropping can be practised.

During the initial two years, due to large spacing, any crops (including high light demanding crops) can be grown.

During year 3 and 4 with canopy closure, shade loving crops can be inter-cropped.

Commonly grown intercrops (first and second year): Soya bean, cassava, mustard, tobacco, chilies, water melon, vegetables, tuber crops, pine apple, banana, peas, green gram, lintels, pigeon pea, pea nuts / ground nut, moringa, papaya, etc. corn and wheat can also be grown (but they are intense consumer of nutrients and belong to same family of bamboo).

Commonly grown intercrops (year 3 and 4): Ginger, turmeric, shade loving sweet potato and yam, medicinal plants, and other shade loving crops.
Other control measures during year 1 – 2 or 3 (depending on growth of plantation)

- Don't do trimming of foliage and branches and shoot collection to allow the bamboo stands to build sufficient energy / food reserves for optimal growth.
- Maintain fencing and fire break, and prohibit cattle or animals from intruding as bamboo is an excellent fodder for cattle/animals.

THUMB RULE:

- Do not plant intercrops within a radius of 1 to 1.5 meters around the bamboo clump to avoid competition.
- Avoid intercrops belonging to grass family (maize / corn, wheat). Both bamboo and inter-crops compete for nutrients and are attacked by mostly same insects and pests.
EARLY MATURATION PHASE (YEAR 3-5)

The focus of maintenance during early maturation phase (~ year 3-5) is to reduce clump congestion and coppicing and train the clump to make it easier for harvesting the matured bamboo poles which are commonly found in the centre of the clump. Clump congestion is not a serious problem in *Yushania alpina* (high land bamboo), but a serious problem in low land bamboo (*Oxytenanthera abyssinica*), and bamboo belonging to genus *Bambusa*, *Cephalostachyum*, and *Dendrocalamus* species.

If the clumps are not managed from the beginning (first three to five years), clump congestion is likely to happen.

Congestion of bamboo culms / poles in a clump is one of the most serious problems in sympodial bamboos which makes it difficult for harvesting the mature poles (placed inside the clump, close to the centre).

When young culms are injured or felled (which are usually found in the periphery of clump), many coppice shoots develop creating clump congestion.

The maintenance techniques to be adopted are as follows:
1) Cleaning and thinning
2) De-budding and Pruning
3) Shoot thinning
4) Fire control
5) Soil loosening and mounding
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CLEANING AND THINNING
Start thinning from the year 3 or 4 year of plantation. Remove / cut dead, old or damaged culm/pole (found in the middle of the clump), and malformed culms. Usually new shoots, are produced towards the outer side and those located in the inner portion are the older ones.

Cleared clump with easy access to center of clump for easy harvesting. Maintain it year after year.

PRUNNING AND DE-BUDDING
Pruning branches and de-budding in bottom one-third of height of bamboo culm reduces clump congestion and helps in providing a healthy and airy environment within the clump. It also reduces pests and diseases. Pruning and de-budding should be introduced from year 3 of the plantation. Best time for pruning and de-budding is end of monsoon (once the new shoots develops into a well grown culm).

Prune/ debud the branches/ buds very close to node to avoid regrowing of sprouts for left over branch buds. Use sharp tools (hack saw to avoid damage to outerskin).
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PRUNING AND DE-BUDDING

De-budding

SHOOT THINNING

During shooting, there can be numerous shoot emerging from the same mother culm or pole. They usually develop into weak culms due to insufficient water and nutrient supply from mother culm / pole. Keep one or two shoots to grow from a single mother, and dug out other shoots. Shoot thinning improves the quality of emerging bamboo poles.

One bamboo rhizome has about 6-12 buds which has potential to produce 6-12 bamboo poles depending on species.

Four bamboo shoots/ poles emerging from a single mother, results in poor quality (lesser diameter & of height bamboo poles)

Only one shoot emerging from a mother culm, leave it to grow into a culm

Three bamboo shoots emerging from one mother culm (left) and two bamboo shoots emerging from one mother culm (right). Leave one strong bamboo shoots to grow into a culm (each mother) and dug out weakest ones.
FIRE CONTROL
After cleaning, pruning and thinning of clumps, remove the cut culms, branches and twigs from bamboo plantation to avoid fire outbreak and incidence of pest, insect and diseases.

Maintain fire break at least 5 meter surrounding the bamboo plantation.

SOIL LOOSENING AND SOIL MOUNDING
Loosen the soil surrounding the bamboo culm, apply 5 baskets (~ 30 Kg of manure / compost / ash) and if available additional 500 gm of NPK, mix it with loosened soil and prepare undertake soil mounding on base of clump and trench around the clump.