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Applications

INFO-SHEET

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# Thorny Perimeter Fencing

In many situations, strong and impenetrable fencing is required. The conventional approach is to lay out barbed wire fencing with concrete grouted iron posts at regular intervals. Barbed wire fencing is expensive to install, especially where the requirement may be for many kilometres of protection. It is not necessarily impenetrable, and can be cut or damaged with relative ease.

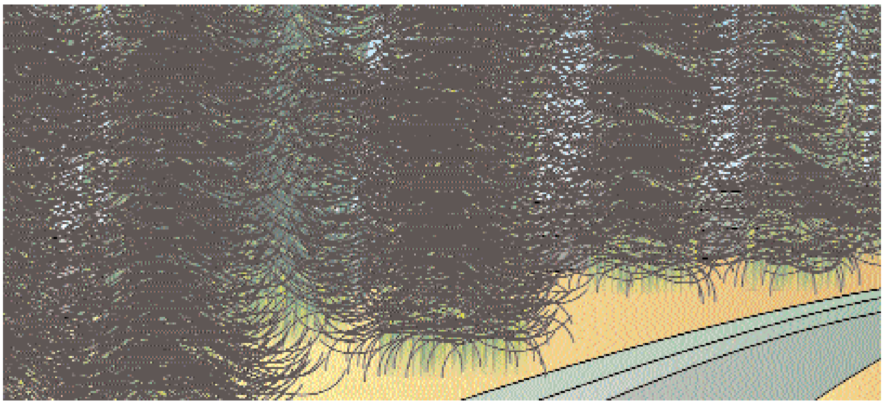
Biotic fencing, in the form of strips of thorny bamboo clumps, linearly placed along the perimeter in one or more rows, provides a low-cost, low-maintenance and environment-friendly solution. Thorny bamboo fencing can be used (a) in conjunction with conventional fencing such as barbed wire fencing or cement/stone walls, (b) as stand-alone.

## Why Bamboo?

Bamboo grows easily in a wide range of habitats. It is extremely fast-growing. Its unique root and rhizome structure forms an interlocking underground matrix that provides stability and soil-binding capability. Bamboo is hardy and adaptable, and requires little maintenance after establishment.

## Which Bamboo?

For perimeter fencing, where the dominant objective is protection, and culm production or quality is a secondary function, thorny bamboo is



recommended. Thorns are actually sharp, pointed, woody branchlets that arise from the nodes of bamboo plants of some species and from primary braches. Most bamboos are not thorny.

The recommended species for thorny perimeter fencing is *Bambusa bambos*, a hardy species. Although it thrives in conditions of good moisture, it can also be planted and established in less favourable conditions. Commonly known as '*kanta bans*' in many states, it is found almost through-out the country, and is common in central and south India. There are local names too – *Bongu veduru* (Andhra Pradesh), *Kotoha* (Assam), *Bidduru* (Karnataka), *Illi, Mula* (Kerala), *Toncur* (Gujarat), *Saneibo* (Manipur), *Nal bans* (Punjab, Haryana), *Mungil* (Tamil Nadu) and *Nehor bans* (West Bengal).

## ESTABLISHING A THORNY PERIMETER FENCE (TPF)

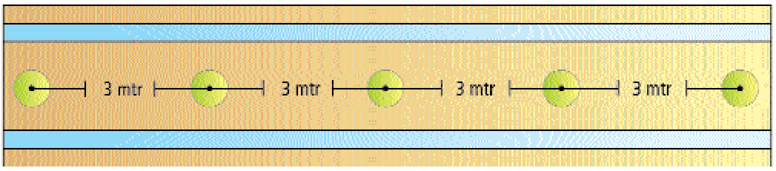
### Assessment of Plant Material

Form an estimate of the number of plants that will be required. This will depend on the length of the plantation strip, the local rainfall, soil and environmental conditions, and the degree of protection required.

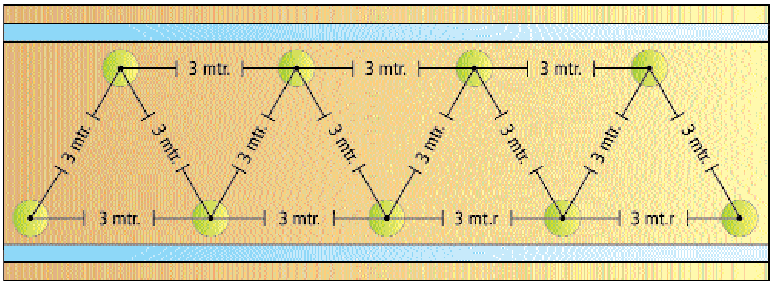
- TPFs can be established in linear arrangements of 1, 2 or 3 rows. The maximum protection is afforded by 3 rows, and the least protection by single-row fencing. In good growth conditions, for example in the North East, the spacing between plants (along the row) can even be 4 x 4 metres. In less favourable, drier conditions, a spacing of 3 x 3 metres is recommended.

- 250 plants per kilometre will be required for each row if the spacing is at 4 x 4 metres, and 334 plants per kilometre if the spacing is at 3 x 3 metres. Multi-row planting should be done in a triangulated manner, to increase the protection.

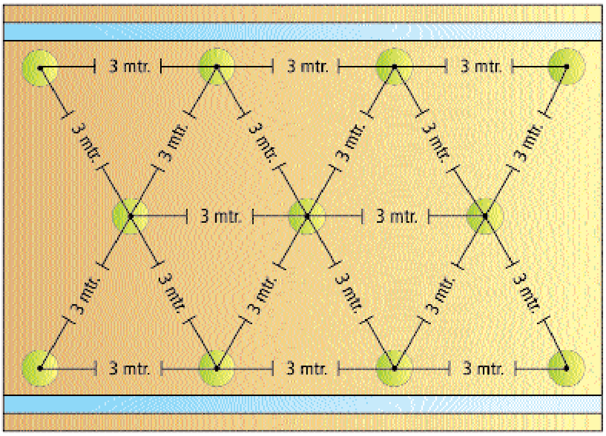
- For a single row scheme, the plants should be arranged like this:



- For a 2-row scheme, the plants should be arranged like this:



- For a 3-row scheme, the plants should be arranged like this:



The number of plants required per kilometre is as follows:

| | *1-row scheme* | *2-row scheme* | *3-row scheme* |
|---|---|---|---|
| 3 m x 3 m spacing | 334 | 668 | 1002 |
| 4 m x 4 m spacing | 250 | 500 | 750 |

Distances between the rows will be 3 metres for 3 m x 3 m spacing, and 4 metres for 4 m x 4 m spacing.

## Site Planning and Design

- Determine the spacing and the number of rows, depending on local conditions and the degree of protection required. If used in conjunction with other fencing (barbed wire, stone/brick walls), leave a gap of at least 5 metres between the fencing and the first row of plants.

- In some cases, it may be necessary to prevent the bamboo spreading beyond the intended area. In these situations, plan for shallow trenching 4 to 5 metres away on either side of the fence. Trench depth of 70–90 centimetres is adequate to prevent the bamboo from spreading. The trench can also provide additional protection and drainage, and serve as a channel for irrigation.

- Bamboo does not tolerate extended periods of waterlogging, and cannot be grown in depressions, ponds and similar water features. Shallow depressions in which water can accumulate should be filled up.

## Plant Material (Types and Sources)

The area of land required will vary with the number of rows, and local conditions. With a 1 metre trench and 4 metres gap between the first row and the trench, the minimum required depth of the strip of land will be:

| | *1 row scheme* | *2 row scheme* | *3 row scheme* |
|---|---|---|---|
| 3 m x 3 m spacing | 10 m | 13 m | 16 m |
| 4 m x 4 m spacing | 10 m | 14 m | 18 m |

In case a shallow trench is not required and the gap is 3 metres, then the depth of the strip of land needed will be reduced as follows:

| | *1 row scheme* | *2 row scheme* | *3 row scheme* |
|---|---|---|---|
| 3 m x 3 m spacing | 6 m | 9 m | 12 m |
| 4 m x 4 m spacing | 6 m | 10 m | 14 m |

The plant material may be:

| | | |
|---|---|---|
| Seedlings from seeds, if available | At least 1 year old and well established | |
| Vegetatively propagated | From branch or culm cuttings<br>Rhizome offsets | Well rooted and healthy, of a minimum height of 24”, and kept in a nursery for at least 2 months.<br>The culm should be 1–2 years old, from a healthy, mature clump. The rhizome should not be in a dry or desiccated condition. The rhizome buds should not be damaged. |
| Tissue culture plants | | Should be hardened for at least three months, healthy with well-developed roots and a minimum height of 18". |

## Plantation Time

As a thumb rule, plantations should be established 1–2 months before the anticipated date of the monsoon. Plantation can continue through the monsoon period till a month before winter sets in. In the post-monsoon months and before winter, the plantation may need to be nurtured with water and nutrients. Plantation in wintry conditions should be avoided

## Site and Soil Preparation

Clear the strip of land of weeds and other herbaceous growth. Shrubs and sparsely distributed trees can be retained – they will provide shade in the formative years of the plantation. If possible, plough the land. This activity is best carried out 15–20 days prior to actual plantation. This allows stones to be removed and the soil to be loosened before planting commences.

## Pitting and Trenching

- Mark out the pit configuration in the formations decided.

- It is not necessary to dig the shallow trench on either face of the plantation in the first or second years – this can be delayed, unless required for drainage purposes, till the third year.

- Dig pits of 45 cm x 45 cm x 45 cm for vegetatively propagated plants, and 60 cm x 60 cm x 60 cm for rhizome offsets.

- If available, place organic manure/compost (3 kg for each plant) at the base of the pits. Alternatively, provide chemical fertliser; a general norm is 150 gm N + 150 gm P + 150 gm K.

## Planting

Place the plants in the pit and cover with soil. Provide 15–20 litres of water to each plant.

## Irrigation and Fertiliser

Water may not be needed after initial planting in high rainfall areas during the monsoon period. Dry season watering is however required, especially during prolonged drought periods, when the plant will come under stress.

Watering can be done through field channels (the shallow trenching on either face of the TPF can be utilized), through can or bucket watering, or with a hosepipe. It is useful to have a reliable source of water – a tube well or dug well, or a distributary of an irrigation system. Since it is a narrow strip plantation, tankers can also be used, especially in dry areas.

Once mature, with its root, rhizome and clump systems fully established (typically in the third or fourth year), the TPF's need for water will be considerably less. The canopy will have formed, conserving moisture within the strip, and the leaf litter will provide nutrients and mulch.

The bamboo strip plantation will benefit from fertiliser, especially organic manure, in the year of establishment, and a moderate application regime subsequently. With each passing year, the requirements of irrigation and fertliser can be reduced and tapered off.

## First Year

*Irrigation*
In high rainfall and good growth conditions, provide water (10–12 litres to each plant) every third day in the dry season, and every alternate day in moderate rainfall conditions. If it rains, watering is not necessary.
In dry conditions, provide water every day (10–12 litres) for the first two months, and every alternate day for two months thereafter. In the dry season, continue with this regime. During rainy days, watering is not necessary.

*Fertiliser*
Bamboo plants respond well to fertilisers. Apply organic manure, if available, by mixing with the soil immediately before planting (3 kg per plant) and, subsequently, two more times in the first year, at three-monthly intervals. If chemical fertiliser is used, apply it three times after planting in the first year (150 gm N + 150 gm P + 150 gm K). Chemical fertiliser should not be allowed to directly touch the rhizome, or newly emerging shoots.

It is a good idea to get soil testing done, to determine the fertiliser, nutrient and water regime to be followed. The norms given above should be modified, taking into account the soil analysis.

*Soil working*
Soil loosening and mounding will not be required in the first year. In high-growth areas, weeding may need to be done, depending on the intensity of weed growth, either twice or thrice in the year.

## Second Year

A number of shoots can be expected in the growth season (normally coinciding with the monsoon): 4–5 shoots can be expected in good growth areas, growing to 8–14 feet; 2–3 shoots will emerge in less favourable conditions, growing to 4–6 feet. Thorns will be noticeable, but not prolific.

In the second year, irrigation and fertiliser intensities can be reduced. However, continued irrigation, if available, will provide better and more rapid development of the clumps. The fertiliser dosage can be reduced, to two applications.

Weeding should be done only 1–2 metres away from each clump, the rest of the area should be left undisturbed. Mounding should be done by heaping the soil around the base of the clump, two months prior to the onset of the monsoon.

Clump vacancies due to mortality should be filled up with fresh planting material.

## Third Year

A larger number of shoots can be expected in the growth season (normally coinciding with the monsoon): 10-12 shoots can be expected in good growth areas, growing to 24–30 feet; 6–8 shoots will emerge in less favourable conditions, growing to 8–12 feet. Thorns will be visible, and begin to be a hindrance to movement through the strip.

Weeding should be discontinued, or limited to one weeding after the monsoon. Mounding activities should be carried out. Irrigation should be continued, while fertiliser application can be reduced to once during the year.

## Fourth Year

From the fourth year, the TPF will have been established as a thorny barrier. Management activities can be limited to keeping access paths clear and continuing irrigation. Mounding will be difficult because of the dense and thorny nature of the barrier, and difficulty of access. 12–15 shoots can be expected in good growth areas, growing to 40–45 feet; 9–12 shoots will emerge in less favourable conditions, growing to 15–20 feet.

## Estimating Costs of TPFs

Several elements of the cost structure of the TPF are site-specific.

- Some costs depend on the objective of the plantation, and the degree of protection to be provided. The decision on how many rows will be established will depend on: (a) the degree of protection needed, (b) availability of land, (c) whether the TPF is to be established as stand-alone, or in conjunction with other protection.

- A 3-row configuration will require more plant material, more pits, greater land, and increased fertilization and irrigation. A 1-row configuration will require less of each of these. On the other hand, it will also give less protection, and formation of the barrier will be slower.

- Local wage rates are another important variable.

- The requirement of irrigation, fertiliser and clump management will vary with the local climatic and growth conditions.

The core cost elements for establishing and maintaining a TPF are as follows:

- *Land preparation*
  This includes site clearance, tilling and removal of debris. An average norm employed for costing purposes, for land preparation of a 1-kilometre stretch of land is 70–80 work days. For most protected installations, the requirement will be less.

- *Ranging and pit preparation*
  Ranging begins with a survey of the strip, and then marking out pit locations in accordance with the row scheme to be adopted. A norm for such work will be around Rs 5 per pit, inclusive of ranging.

- *Plant material*
  The costs of plant material vary with the propagation method used, and the source of supply. Tissue-cultured plant material is available at Rs 15 per hardened plant. Vegetatively propagated plants range from Rs 10 to 12 per plant. Seed-based plant material is available from Rs 5 to 10 per plant. Rhizome offsets vary from Rs 25 to 35 per plant.

- *Planting*
  Planting costs (i.e. placement in pit, soil heaping, providing water) range from Rs. 4/- Rs. 5/- per plant.

- *Irrigation*
  Irrigation is site-specific. If watering is done through field channels/trenches, the cost will be around Rs 2 to 3, and if it is done through can, bucket or hosepipe, the cost will be around Rs 4 to 5. Of course, the cost of watering will depend on the distance and type of source of water.

- *Fertiliser*
  The cost of fertiliser per plant will be Rs 10 to Rs 30, depending on the source. The cost of organic manure varies in different places, ranging from Rs 3 to Rs 10, and the cost of chemical fertiliser is similar.

- *Weeding*
  Weeding is required only till the second year. During the second year, 2 to 3 weedings will be required. In the third year, 1 or 2 weedings will be required, which can be managed by 30–40 work days.

- *Mounding*
  Mounding should be done before the monsoon during the second and third years, that is, once a year. The cost will be Rs 14 to Rs 18 per plant for two years.

- *Clump management*
  The cost of clump management will be very little if the objective of the plantation is only protective fencing. Only watering and weeding is required, and there is no need for pruning or removal of branches.

- *Vacancy filling*
  The cost of vacancy filling is normally taken as 15 per cent of the plantation cost. The total cost will be around Rs 500 to Rs 700 for planting, heaping and watering, apart from the cost of plant material.

- *Trenching*
  The cost of trenching will be around Rs 10,000 to 12,000 (at Rs 5 per sq. m x 2200 sq. m) .

The indicative costs per kilometre of establishing single-row thorny perimeter fencing will range, depending on local conditions and the management regime needed, from Rs 33,000 to Rs 42,000. 2-row and 3-row fencing will add 35–40 per cent more to the costs, for each row added.

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