a) Extracting rooted branch seedlings; b) Collecting rooted branch seedlings; c) Rooted branch seedlings ready to sow; d) Seedling beds 15 x 15 cm; e) Preparing cocoon nursery beds; f) Cocoon nursery with 50 x 50 cm spacing

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Factsheet

Kanoppi Phase 2

Bamboo cocoon nursery system: new approach to planting and restoring degraded land

1. Background

Indonesia needs an integrated strategy to solve the problems of degraded land and weak landscape management while at the same time improving community livelihoods, alleviating poverty, creating employment and rural development, which are the main priorities of government programs. Bamboo, an excellent pioneer plant, is one of the solutions for rehabilitating and restoring ecological functions in degraded landscapes, with accompanying economic benefits.

However, bamboo has a mortality rate of up to 90% in extreme environments on degraded land. To counter this, we have developed a simple nursery process that extends the seedling incubation stage, called 'cocoon breeding system' or 'cocoon nursery'. Cocoon nurseries are priorities for catalyzing the Thousand Bamboo Villages program in Indonesia. A nursery is bamboo resource capital that can be used by a community to create a 'bamboo village' with community-based industries. To support this, collaboration is needed with government, non-governmental organizations, and the larger-scale private sector.

2. What is a cocoon nursery?

A cocoon nursery develops bamboo seedlings by growing a strong root-rhizome system on the main stem of bamboo, which encourages the bamboo to clump, ready for planting. These seedlings have a high survival rate and the approach speeds the entire process because when the seeds are planted they grow more quickly into larger clumps.

3. Why do we need a cocoon nursery?

This new nursery system is based on experience — including failure — in attempting to grow bamboo, especially on marginal and degraded land with extreme conditions. The condition of the land is actually not the main cause of failure. The biggest mistake is incorrectly preparing the bamboo seedlings.

Like other types of plants, bamboo seedlings also need adequate water and maintenance to guarantee their growth in the first and second years. In the cocoon nursery system, we produce stronger bamboo seedlings with root rhizomes that have been formed and are ready to be planted. There are several advantages of cocoon nurseries.

1. Bamboo rhizome seedlings that are ready to grow in the field
2. Guaranteed success
3. Seedlings at a competitive price if produced at sufficient scale
4. Cooperation developed in communities
5. Bamboo seedlings as resource capital owned by a community partnering with industry
6. Speed harvest time to 5–6 years

4. Community participation

The key to success of a cocoon nursery is community participation. This needs to be supported by increasing a community's capacity in bamboo management, which is the basic capital for developing bamboo as an industrial raw material.

Through a bamboo farmers' field school, the capacity of farmers can be built to maintain bamboo quantity and quality. Sustainable cooperation can be built to strengthen interaction with larger-scale bamboo industries.

The formation of bamboo farmers' groups is an important stage in the development of a bamboo village, starting with the participatory cocoon nurseries. In parallel, capacity can be built in the management of bamboo under the Sustainable Bamboo Forest system, if such is already present in the community.

5. How to establish a cocoon nursery?

3.1 Choose the site

A cocoon nursery can be established on community-owned land or in a forest area (after reference to permissions and regulations). There are several factors in choice of a site.

1. The site should be flat, close to a water source and the planting location.
2. Access to the site should be easy, to encourage maintenance over 2–3 years.
3. An area of 0.5–1 hectares should be allocated for seedling beds, which can hold 5000–70,000 seedlings. The beds will be used in the initial stage for up to six months.
4. An area of 1–10 hectares should be allocated for the beds of the cocoon nursery, which can accommodate the 5000–70,000 seedlings transplanted from the seedling beds.

3.2 Prepare the site

Infrastructure will affect the success or otherwise of seedlings in the nursery. Important factors to address are 1) irrigation; 2) shade; 3) mulch; and 4) spacing of seedlings.

1. **Irrigation**

   An irrigation, or watering, system is an important factor in success. The irrigation system must be intensive to maintain moisture in the soil and the microclimate in the nursery, especially during the dry season.

2. **Shade**

   A shade system protects the nursery from direct sunlight, especially during the dry season, and heavy rain in the wet season. A shade system also helps maintain micro-humidity in the nursery.

3. **Mulch**

   A mulch system also helps maintain soil moisture and reduces evaporation after watering. A mulch system can be 1) artificial (plastic); or 2) natural (grass and dry leaves).

4. **Seedling spacing**

   Spacing between seedlings is important for ensuring good growth. For the early stage of germination of rooted branches in the seedling beds, use spacing of 10–15 cm for 6–8 months. After the leaf shoots appear on the rooted branches, the seedlings can be transplanted in the cocoon nursery beds with spacing of 50–60 cm and covered by mulch.

5. **Infrastructure**

   During the 2–3 years of the cocoon nursery, supporting facilities are needed.

   - Work lodge
   - Information board
   - Nursery condition information board

6. Maintenance

   Maintenance involves watering, checking seedlings, replacing dead seedlings and recording the number of growing seedlings.

3.4 Prepare the seedlings

Rooted branch seedlings should be selected from a local species growing in the area. Collection can be done collaboratively by the community or with people who often harvest bamboo. There are several points that must be considered when collecting rooted branches as seedling sources.

1. Take a strong rooted branch, with healthy buds. Be careful to not damage the buds.
2. Peel off the skin of the buds and then immerse the branch in root-stimulating hormone.
3. Keep the rooted branch with good buds and peeled skin in humid conditions.
4. Rooted branches should immediately be planted in seedling beds. If it is not possible to plant directly to the beds because of transportation difficulties, the rooted branches must remain in humid conditions, up to a maximum of 48 hours. Otherwise the rate of germination will decrease.

3.5 Transplant

After 2–3 years in the cocoon nursery, the seedlings will be ready to be transplanted in the targeted planting site. Preparing the seedlings for transplanting is an important factor in success.

1. Top parts of the seedlings should be cut back to a height of 100–150 cm.
2. The rhizome root should be transported with its soil to ensure that the rhizome remains moist.
3. Each rhizome seedling will weigh 10–20 kg.
4. Preparation of rhizome seedlings should be done before the wet season. The seedlings should be planted at the start of the wet season.

3.6 Preparation of location and planting

Several factors need to be considered in preparing the planting location.

1. Size of planting hole
2. Plant spacing
3. Planting system