CHAPTER 3

TREE PLANTING TECHNIQUES
SEED COLLECTION

1. SELECTING TREES FOR SEED PRODUCTION
The appropriate selection of seed producing trees results in a high quality of seed for healthy trees. Thus, seeds shall be appropriately selected based on the following conditions:

1.1. Appropriate selection of mother tree
- Mother trees shall be selected in the natural forest or forest plantation, because the seeds from trees that grow alone mostly have disease, slow development and bad shape.

![Diagram showing natural or plantation forest versus single mother tree]
- We shall select mother trees with a smooth, straight shape, few branches, without any holes, and free from disease.

- We shall not select trees that are too old or too young.
1.2. Selection of tree by purpose

We shall select mother trees according to their desired purpose:

- For construction, the mother tree will have a straight and smooth stem, with few branches.

- For firewood, we shall select trees that are fast growing with bushy branches, the best types will have a high coppice potential.
For animal fodder, we shall select trees that:
- have leaves and fruit that can be eaten by animals
- are fast growing
- have many branches and leaves
- have high coppice potential

**Note:** Evergreen species provide more fodder than coniferous species

### 1.3. Location of source for appropriate seeds

Seed should be collected in any area with a similar climate to the planting area, with consideration of latitude, temperature, rain ratio and type of soil.

Seeds collected from upland areas (mountainous or highland area) shall not be planted in lowland areas and vice versa. The best way is to collect seeds from the area to be replanted because they are already adapted to the climate in the area.
2. SEED HARVESTING METHODS

2.1. Time limits for seed collection

A good time for collecting seeds is when the fruits of the trees are all fully ripe. Make sure that the fruits to be harvested are mature, we should not harvest too early or keep them too ripe. In general, we can identify ripe fruit through the following characteristics:

- Colour of the fruit: the skin changes from blue/green to dark brown/yellow, or the skin becomes dry.
- Colour of the wing: for any fruit with wings, fibers appear slightly on the wings, become hard and dry and turn from pink to purple red, and sometimes turn from light green to dark green with light red.
- Smell: the fragrance of some fruit is noticeable when they are ripe.
- Being eaten by animals: animals frequently eat ripe fruit, providing a good indicator for collection.
- Splitting fallen fruit: fruit of some trees are ripe and loose in their pod. If we split the pod, we will see its internal part is white and hard, such as *Afzelia xylocarpa*, *Sindora siamensis*, *Delonix regia*, but for some species we can see the sprouts clearly that are white or green, such as *Dipterocarpus alatus*, *Hopea odorata*, *Dipterocarpus tuberculatus*, and *Dipterocarpus obtusifolius*.

2.2. Seed Collection Methods

2.2.1. Collecting fruits from branches

Seeds on lower branches are easy to harvest but they are not good quality. Seeds from the upper branches are good but they are difficult to harvest. Therefore, we should collect seeds from both the lower, middle or upper branches.

2.2.2. Other means of seed collection

2.2.2.1 Collection of naturally fallen fruits

The collection of fallen fruits is the easiest method, especially for tree species with fruit or a large seed such as *Tectona grandis* and some other species, which have fruit with wings.
- Collection tools: rakes, knives, and baskets, palm-leaved mats or plastic sheets
- Steps:
  - Clear the ground beneath the seed tree (remove fallen leaves, grass and weeds) before the ripe fruits fall, to ease collection;
  - Lay a plastic sheet under the tree to collect the falling fruits; and
  - Collect the fruits daily and clean them by sorting out the rubbish.
2.2.2.2 Shaking the tree or its branches
Fruits or seeds of some trees do not naturally fall simultaneously, so we should shake the trunk or branches so that the ripe fruits or seeds fall together. It is an easy collection method.

- Steps:
  - Clear the ground under the tree, then lay down the mat or plastic sheet;
  - Shake the trunk or branches by using a long picking stick; and
  - Collect by sorting out fresh from dried fruits.
2.2.2.3 Cutting fruit-bearing branches
When fruits or seeds are high on the tree, beyond your reach, and its stem is tough on the branch, and will not fall when shaken, then you have to cut the fruit-bearing branches to collect the fruits on the ground.

- Steps:
  - Select branches with good fruits;
  - Use a stick attached to a sickle or adze to cut the selected branches; and
  - Collect the fruits or seeds from the cut branches.
2.2.2.4 Tree climbing to collect the fruits or seeds
This is a method to collect fruits or seeds with tough stems that are hard to make fall, or for seeds that stick to their open pod. This method requires skills in tree climbing.

The fastest and safest way is to use steps. Aluminum steps, which are portable, and easy to use, are recommended. However, farmers could also use a self-made bamboo ladder (7-9 m).

Alternatively, farmers can climb the tree and use a saw, adze, machete, or other similar means to cut down small branches, which bear fruit, for collection on the ground.
3- SEED TREATMENT

3.1 Seed picking

The fruit or seed of trees (the differences between fruit and seed are indicated in Annex 2) harvested as ripe fruit, a pod, fruit with a dried ripe pod, or a single seed, shall be picked carefully in order to avoid decay due to fungus or rot. Once the seeds are picked, they are easy to store. The most appropriate picking and caring methods are required.

Most seed picking requires the prior drying of pods, but some species need to be soaked in water to ease picking. Below are easy methods for seed picking and caring:

3.1.1 Pod Drying

- Dry the pod under the sun on a cement floor, plastic sheet or cloth until the pods crack. This method is used for *Acacia*, *Casuarina equisetifolia*, *Pinus merkusii* and *Cassia siamea*. The pods can be dried in a large basket or colander with a mat underneath. When they crack and open, the seeds drop onto the mat.

- Some pods do not crack even if we dry them in the sun. In this case, we should crush them by stepping on them with our feet, or by putting them into a sack and beating them a pestle. These species include *Peltophorum dasyrrhachis*, *Albizia lebbeck*, and *Dalbergia bariensis*.
Others do not crack and cannot be beaten because by doing so the seeds inside the pods will be damaged. In this case, we should pick them manually, such as *Moringa oleifera*.

- Clean the seeds by winnowing or sprinkling to remove the pollen

- Wash the seeds in a water basket, select the floating seeds, then immediately throw away the water.
Dry the seeds again. If we want to plant the seeds quickly, we do not have to dry them.

3.1.2 Pod with flesh inside

It would be more comfortable if we could pick the seed from its pod at home. However, we should not spend more time than necessary for seed picking, and we should not store or pile seeds as this interrupt their development. Heating or sour smelling while seed are piled on each other could decay or reduce the germination quality of seeds.

Below is the method to pick and clean seed:

- Soak the pod in water (1-2 days) until the flesh becomes soft enough for cleaning;
- Clean the pod by hand thoroughly and carefully, separate the seed from the flesh;
- Sort out the floating pods and flesh then drain the water from the bucket;
- Dry the seed in the wind; and
- Winnow the seed to sort out the waste.
3.2. Seed drying for long storage

Seeds shall be dried under the heat of the sun so that they can be stored for a long time. Below are appropriate seed drying methods:

- Spread and level the seeds on a palm mat, plastic sheet, bright-colored plastic sheet (a dark-colored plastic sheet will accumulate too much heat for the seed), or winnowing basket, then choose a location where there is sun for the whole day.
- Stir the drying seed 4 to 5 times per day to ensure that the seed is thoroughly dry. If possible, we should keep the seed in the shade when the weather is too hot (from noon till afternoon).
- Before rain or dawn the seed should be kept in the house.
- Dry the seed for 1-3 days depending on the moisture level of the seed.
- When drying, you should prevent damage by rodents or birds.

**Note:** Seeds that easily rot, such as the winged-species (Recalcitrant) should be sown or germinated soon after harvest because these species cannot be dried.

4. SEED STORAGE AND MAINTENANCE

If the seed needs to be germinated 2 or 3 days after harvest it can be kept in a cloth sack in the house without the use of any special moisture controllers. If the seed is to be kept for a long duration, then you have to be aware of some appropriate storage methods.
4.1. Seed that can be stored for long or short term

Initially, you should understand the types of seed that have natural characteristics to enable long-term storage. Seeds that rot quickly (Recalcitrant) cannot be kept for long and you have to grow them immediately after harvest.

![Quickly decaying species (Recalcitrant)](image)

The species with seed that can be dried (Orthodox), as shown in the picture, can be kept for longer.

![Dry seed species (Orthodox)](image)
4.2. Storage (for seeds that can be stored - Orthodox)

It is important that we maintain the moisture and temperature of the seed at a low level, and that we regularly check both.

Below is important guidance for storing seed:
- Store only new, ripe and well dried seed;
- Store the seeds in a dry, cold location that is waterproof and shaded, but accessible by air, in order to keep them alive for a long time.
- Seed affected by moisture shall be stored in containers not accessible by air, such as a barrel, tin or glass bottle with a tight cap. Otherwise, you can add a moisture-absorbing element such as kitchen ash, dried coal, dried cooked rice, or small pieces of paper. The moisture-absorbing elements shall form one fourth of the content of the container.
• You should label the containers in which you store seed with the name and type of seed, location and date of harvest.

![Seed label diagram]

• If it is possible, you should also record the germination rate of the seed on the label. To be able to calculate the germination rate of a particular seed, you should germinate some seeds and see how many grow. If you see that 8 among 10 seeds grow, then the germination rate is 80 percent. With this information, you will be able to determine how many seeds are able to grow when you store them in between the harvest and planting period.
To prevent the stored seed from being damaged by termites, ants or fungi, you should mix the seeds with neem leaves before loading them into the storage container, or you can mix a spoonful of neem oil, bean oil, or kapok oil into a kilogram of seeds, or use one or two cockroach repellants mixed with ten kilograms of seeds.

Prevent the stored seed from being destroyed by rodents or birds.

Storing seed in firmly closed containers:

- Do not keep damp seeds in closed containers;
- Use airtight containers such as a plastic barrel, a bottle/jar or a bucket with a firm cover; and
- Open the seed storage containers when necessary.
Some seeds are not accustomed to drying or cold temperatures, such as *Durio zibethinus*, *Mangifera indica*, *Artocarpus heterophyllus*, *Garcinia mangostana*, *Nephelium lappaceum* and kinin. These seeds can only be kept for up to one to two days in a simple room. It is better if we can plant these seeds quickly after the harvest.

To store these seeds:
- We must not dry them excessively. We should only dry the outside husk and keep the inside moist;
- Plastic bags should be half filled with seeds and half filled with slightly damp coal, saw dust or sand.
- Keep the bagged seeds in a cold place.
- Open plastic bags for one hour and a half per day to allow the circulation of air.

5. TRANSPORT OF SEED
5.1. Transportation of quickly rotting seeds -
After harvest, we should quickly transport the seeds as follows:

5.1.1 Pack in a bag
- Store 3-5 kilograms of seeds in a plastic or cloth bag, close the bag but make sure that air has access;
- Place the bags in a vertical position in the store room;
- Cover with a plastic sheet when transporting.
5.1.2 Burying in sand
- Place sand at the location where you want to store the seeds;
- Lay the seeds on the sand (2-3 seed height);
- Continue layering for 2-3 layers finishing with a sand layer.

5.2. Transport of Long Lasting Seeds
This kind of transport shall consider the following points:
- Take good care of the seeds during transport to the nursery bed, and during storage before sowing;
- When transporting, we shall double pack; the first layer should be plastic to keep out rain and the outer layer should be board or cloth sacking to avoid damage from hard objects and as protection from sun light.
Some advice for people responsible for transporting seeds:
- Keep the seed bag away from water and do not expose to the sunlight. When transporting, we shall use a thermometer to check the temperature and moisture in the storeroom. We shall not allow the temperature of the seed bag to exceed the setting, otherwise, the seeds will be ineffective or dead; and
- Take care with sticking the label onto the seed bag;

Advice for people responsible for the nursery bed:
- Store the seeds properly upon delivery;
- Take care with the remaining seeds, do not leave seeds on the nursery bed or in the sun, as this can reduce the quality of the seeds or spoil them; and
- Use small bags to separate the seeds in the larger bag to avoid opening the bag many times, which can increase the seed moisture.