

Appendix 2: Seed Procurement

1. Seed Collection

Seed availability is a serious impediment to reforestation. To produce seeds from the local flora, mother trees (local seed sources) should be identified and located in the area and a seed calendar should be prepared for each mother tree. To ensure that genetic diversity is enriched or maintained in rehabilitation, forest seed collection should follow the following guideline:

- Collect or buy seeds from established seed sources in the same planting zone if possible. In seed sources in natural forests, mother trees are selected based on the criteria below. At present, there are more than 20 seed sources in natural forests established in different ecological zones with more than 20 potential planting species and seeds of many species are available every year. In addition, seed production areas of Acacia and Eucalyptus have been established in Meanork plantation and the seeds from these sources will be available from 2007. However, when seed is transferred from one ecological zone to another, it should follow the guideline of seed movement in the "Gene Ecological Zonation Map" developed by the Forestry Administration/Cambodia Tree Seed Project (2003).

In the absence of good seed sources, the following steps can guide seed collection:

- Collect seeds or wildings from a large number of trees (preferably more than 50) with a minimum distance of 100 meters between seed trees. However, when rehabilitation efforts aim at establishing forest for production rather than conservation purposes, seed can be collected from only 25 trees. The purpose is to avoid collecting seed from related mother trees. In fragmented degraded forests the number of seed trees and the minimum distance between seed trees are difficult to follow. Therefore, these requirements need to be adjusted and applied according to species and local conditions.
- Collect an equal amount of seed from each tree and keep the seed separate by tree until sowing or propagate separately and mix prior to planting.
- Collect seed during good seed years (years of flowering and fruiting) to enhance the likelihood of high levels of outcrossing.
- Collect seed several times a year for species that flower and fruit sporadically throughout the year.

Seed collection techniques vary from species to species:

- For some species, for example, *Dipterocarp spp.*, *Heritiera javanica*, *Sindora cochinchinensis*, and *Azalia xylocarpa*, seed is collected from the forest floor. In some cases the trees may be shaken to release the seeds, for example *Pterocarpus macrocarpus* and *Albizia lebbek*. The seed collected should be carefully checked and cleaned, as it may be infected by fungus. If possible the seed should be collected frequently to ensure that only fresh seed with good germination capacity is collected.
- For other species, for example *Dalbergia spp.*, the seed is collected directly from the trees, if necessary by climbing. In many cases simple techniques using ladders can be used. Seed collection directly from the trees will normally be of good quality.

2. Seed Handling

2.1 Maintaining Identity

Once collected seed must be stored in a ventilated container and kept in a shaded area. Seed batches must always be properly labelled both during transportation and subsequent storage. Always use two labels, one fixed to the outside of the container or bag, and one inside together with the seed. The labels and ink should be waterproof. Seed must be transported to the seed processing depot as quickly as possible.

2.2 Drying of Fruits and Seeds

Seeds with high moisture content are more prone to heat damage, so that direct sunlight should be avoided until the moisture content has reduced. Initial drying under shade is recommended; once the moisture content has lowered, the seed may be exposed to direct sun drying. Fruits of species with recalcitrant seeds (example *Dipterocarp spp.*) should never be sun-dried.

2.3 Seed Extraction

Fleshy fruits need to be de-pulped through a combination of soaking in water followed by gentle abrasion. Once clean, the seeds can be pre-dried on mats or layers of old newspaper that absorb excess water. Frequent turning is important in this drying process so that the batches are dried evenly.

Pods and cones can be left dried under the sun until they crack open. When a pod is hard to crack open, a knife may be used and individual seeds extracted.

Dipterocarp seed need to be de-winged. This may be done manually for small quantities, but for larger quantities, mechanical de-winging is needed.

2.4 Seed Cleaning

Some simple methods for seed cleaning are available which include screening and sieving, water floatation and blowing, and fanning and winnowing.

2.5 Seed Storage

Recalcitrant seeds should be sown immediately after collection without storage because they cannot survive more than two weeks in an uncontrolled environment. Orthodox seed can be stored. Seeds of leguminous species can generally be stored for many years in normal room conditions.

If seed cannot be taken directly to the nursery it should be stored in a cool, dry, and dark place with good air circulation. Use cotton bags; not plastic, as they lack air circulation. The bags should be protected from rain and they should not be placed directly on the forest floor as the seed may absorb moisture, and seed quality may deteriorate. Remember that each seedlot must have labels (normally two: inside and outside) showing a date of collection or procurement.