

Module 2: Growing Agroforestry Seedlings

Goal

Farmers will use appropriate nursery techniques to propagate seedlings for planting in their Forest Gardens.

Learning Objectives

- 1. Understand benefits of tree nurseries.
- 2. Learn best practices for preparing a tree nursery site and constructing nursery beds.
- 3. Learn how to pretreat commonly used tree seeds.
- 4. Learn sowing methods for seed species supplied.
- 5. Learn tree nursery management best practices.

Venue and Timing

This module should be facilitated three to four months before the start of the main rainy season. It should take place on the lead farmer's Forest Garden site or a participant farmer's site. The Forest Garden should have a nursery site identified prior to the workshop. Though individuals' nurseries rarely need to take up more than about 50 square meters of space, the site for this training event should be spacious enough for all trainees to safely work around each other during module activities.

Relevant Technical Manual Chapters

Before this training event, the facilitator should read, review, and thoroughly understand the following chapters and sections in the Technical Manual:

- Chapter 4: Seeds
- Chapter 5: Seedling Propagation
- Chapter 13: Permagardening (Convenient Spacing Tools section)

Preparation

- Identify a nursery site (on the lead farmer's or a participant farmer's land) where the training will take place and inspect the site to make sure it meets the general nursery site requirements.
- Decide which agroforestry tree seeds to provide, based on Forest Garden designs and applicability for the project area.

- Depending on the tree species that participants will grow, and resources available (e.g. will they have tree sacks?), determine which tree nursery techniques (bareroot bedding, tree sacks, and/or vegetative propagation) and seed pretreatment techniques (e.g. soak, scarify and soak, boil and soak, etc.) need to be covered with the group.
- Prepare 100-150 seeds for planting, based on the selected species' pretreatment requirement.
- Prepare cuttings, if necessary.
- 3-4 weeks before the workshop, ask the lead farmer to sow several seeds in 5 tree sacks and care for them.

Supplies

- $\frac{1}{2}$ wheelbarrow of wood ash
- ¹/₂ wheelbarrow of charcoal ash
- 4 x 1.5 meter wire mesh for sifting soil
- 3 wheelbarrows of sand
- 1 wheelbarrow of topsoil
- 1 wheelbarrow of manure (If topsoil is sandy, bring two wheelbarrows of manure)
- 15 tree sacks per participant (5 for the activity, 10 for the assignment)
- 5 spade shovels
- 3 watering cans
- 1 wheelbarrow of *Azadiractha indica* (neem) or *Eucalyptus sp.* leaves, where available
- 100-150 hard-shelled tree seeds (e.g. Leucaena leucocephala, Acacia nilotica)
- nail clippers (1 set for each participant and 1 set for each facilitator)
- 100-150 Pretreated seeds
- 5 tree sacks with several germinated trees (~10-15 cm tall and 8cm in diameter)
- 50 liters of water
- 1 cup
- String
- 3 containers of soil for opener activity: one sand, one clay and one loam. Add water to the soil so it is moist for the demonstration.
- Materials for building shading structures for nursery beds: corner poles, cross-poles, and shading material (palm fronds or grasses) (see Activity 1)

Total Time

Approximately 4 hours

Handouts in Farmer's Workbook

- Types of Soils
- Nursery Construction
- Nursery Species Chart

Module 2: Growing Agroforestry Seedlings

Summary of Activities

Opener: Name That Soil (30 mins)

- Do a simple soil test
- Improving soils through mixing types and amending

Activity 1: Build a Tree Nursery (2 hours)

- Form small groups
- Determine where to establish the nursery
- Establish nursery beds appropriate to the seeds selected

Activity 2: Seed Pretreatment (30 mins)

- Why pretreat seeds
- Compare treated and non-treated seeds
- Demonstrate scarify and soak method
- Practice scarify and soak

Activity 3: Sowing Seeds (30 mins)

- Farmer demonstrates how to sow
- Farmers practice sowing

Activity 4: Nursery Care (30 mins)

- Discuss the importance of raising healthy seedlings
- Demonstrate proper watering techniques
- Demonstrate proper weeding techniques
- Demonstrate proper thinning techniques
- Pruning green wall seedlings
- Hardening off

Debrief and Take Home Activity 5: Establish Your Tree Nursery (30 mins)

- Debrief workshop activities
- Identify your nursery site
- Prepare beds (bare root and sacks) and build your shade structures over them
- Sack and seed distribution
- Follow-up

Opener: Name That Soil

Description

Good soil is important for raising healthy tree seedlings. This activity teaches farmers how to identify different types of soils, how to select the best type of soil to use for the nursery, and how to add amendments to improve soil that has too much sand or clay.

Instructions for Farmers

Today you will learn how to prepare a tree nursery. First I want to talk about one of the most important components in your nursery: the soil.

1. Do a simple soil test

Soils are composed of three types of materials: silt, sand, and clay. The best soil for growing seedlings is a mix of all three, called loamy soil. These three containers have soils from three different locations, containing sandy, clayey, and loamy soils. Everyone come and look and touch the soils.

- Which is best for raising seedlings, and why?
- What are the types?
- What are the drawbacks of sand for nursing trees?
- What are the drawbacks of clay for nursing trees?
- Why is loamy soil best for nursing trees?
- How can you tell the type of soil (sand, loam, clay) by holding it in your hand?
- Where can you collect good soil?

2. Improving soil through mixing types and amending

For the two soil samples you decided not to use in the nursery, how can you improve those soils?

- How do you turn sandy soil into good soil for raising seedlings?
- How do you turn clayey soil into good soil for raising seedlings?
- What is the fourth important medium for healthy soils? (humus)
- What is humus and where does it come from?
- Where can you get manure/compost?
- Where can you get sandy soil? Loamy soil?

Activity 1: Build a Tree Nursery

Description

Farmers form small groups and each group prepares a 1 meter x 1 meter nursery bed to practice building nurseries and sowing the seeds provided, using bare-root and sack seedling growing methods.

Instructions for Farmers

1. Form small groups

Split into groups of 4 to 5 farmers each.

2. Where to establish the nursery

The first thing you want to do is identify the best place for establishing your nursery. What are some important considerations you need to think about?

Nursery siting

- What do you look for when deciding where to site your tree nursery?
- Why would you put the tree nursery near your home? Why not in your field?
- How big will the beds need to be to raise the seedlings you want?
- How much space do you need for your nursery sites, including the beds and work space?
- Why is it so important to have easy access to water from a year-round reliable water source?
- What can damage your tree nursery?
- How do you prepare the nursery site?

3. Establish nursery beds appropriate for the seeds selected

For each growing method, each group will build a 1 meter square tree nursery with the materials I brought today (tree sacks, soil, compost/dried manure, neem/eucalyptus leaves, palm/banana leaves or grasses for shade, poles, shovels, sifting material, screens). I will walk around and answer questions while you are building your nursery.

Tree Sack nursery

- Which trees are best to grow in sacks?
- How do you prepare the soil mixture/potting medium?
- How do you fill the sacks? (how tightly to pack the soil)
- How do you prepare the land for the sacks? How do you arrange the sacks?
- What are the pros and cons of tree sacks?

Bareroot

- Which trees can be grown in bareroot beds?
- How do you prepare the beds?
- What is double digging?

- How do you mix or amend the soil to obtain the best growing substrate?
- What are the pros and cons of bareroot seedlings?

Direct seeding and cuttings

- Which species are good for direct seeding? How is it done (2-3 per hole)? What are the challenges with direct seeding?
- Which can be grown by planting cuttings? How?

Protecting the nursery

- What can attack the nursery (livestock, pests, disease)? What should you do to protect the nursery?
- Why is it important to protect seedlings from direct sun?
- What locally-available items can you use to protect your nursery?
- How do you build a shade structure?
- How can you remove most weeds before planting your nursery?

Activity 2: Seed Pretreatment

Description

After small groups prepare tree nursery beds and shade structures, the facilitator instructs farmers how to treat the selected agroforestry seeds before planting using the scarify-and-soak technique. After instruction, farmers practice pretreating seeds themselves with monitoring and feedback from the facilitator.

Instructions for Farmers

1. Why pretreat seeds

We have prepared our nursery site. Now we will pretreat the tree seeds for planting.

- Who has experience with pretreating seeds before sowing?
- Why would you want to pretreat seeds versus just sowing them without pretreating them?
- What are some common seed pretreatment methods?

2. Compare treated and non-treated seeds

We will look at seeds that have been pretreated and compare them to seeds that have not been pretreated.

- Do you notice any difference between pretreated and untreated seeds?
- Do you notice anything else about these treated seeds?

3. Demonstrate scarify and soak method

I will now demonstrate **the scarify and soak** method used for most hard-coated agroforestry tree seeds (e.g. *Leucaena leucocephala, Acacia nilotica*). The easiest tool for this is a nail clipper.

- Why do you use a nail clipper?
- Where do you cut and how deep?
- How long do you soak them in water?
- Where do you want to avoid cutting?
- What does pretreating the seed actually do to the seed?

4. Practice scarify and soak

Now you all will practice using nail clippers to scarify some hard-coated seeds. I will walk around to make sure you are scarifying in the correct place and the correct depth. When you are finished scarifying the seeds, place them in a cup of water to soak overnight.

- How long do scarified seeds need to soak in water?
- Do all seeds need to be scarified before soaking?
- When would a seed not need to be scarified before soaking? Examples?
- Do all seeds need to be pretreated before sowing? Examples of some that do not?
- What are some other seed pretreatment methods? When do you pretreat seeds?

Activity 3: Sowing Seeds

Description

Now that the nursery beds, sacks, and seeds are prepared, a volunteer from the group demonstrates how to sow seeds, then farmers practice sowing.

Instructions for Farmers

1. Farmer demonstrates how to sow

For each seedling growing method, I would like a volunteer to demonstrate the sowing technique.

- What time of day is it best to sow seeds? Why?
- What time of day should you pretreat your seeds, so they will be ready to sow at the right time?
- How deep should you plant the seeds?
- **Sacks**: How many seeds should be sown per sack?
- Bareroot: How should seeds be spaced in a nursery bed?

2. Farmers practice sowing

Everyone will now practice sowing seeds in sacks and beds.

Activity 4: Nursery Care

Description

Farmers discuss how to care for seedlings in their nursery and demonstrate proper watering, weeding and thinning techniques.

Instructions for Farmers

1. Discuss the importance of raising healthy seedlings

To raise healthy seedlings, you need to take proper care of your seedlings by watering, weeding and thinning. Seedlings are living things, and like any living thing, they grow and produce best when they are given the proper nutrients and care

- What resources do seedlings need to be healthy, and where do they come from? (nutrients, sunlight, air, water)
- What happens if you give them too much of anything, i.e. water, sunlight, or nutrients?
- What happens if you plant stunted or unhealthy seedlings in your field?

2. Demonstrate proper watering techniques

Who wants to demonstrate how to water seedlings? [with the watering can head attached and not attached]

- What times of day should you water your nursery?
- If it rains and the soil is still very wet at watering time, should you still water your nursery?
- How much water should you use to water your seedlings?
- If a watering can is available, what is proper watering technique?
- If a watering can is not available, what is proper watering technique? What other materials can you use instead of a watering can?
- How do you know if you're not watering enough? What should you do?
- How do you know if you're watering too much? What should you do?

3. Demonstrate proper weeding techniques

Timely weeding is very important for a healthy and productive tree nursery

- Why is it important to weed your nursery?
- How often should you weed your tree nursery?
- When should you start weeding in your nursery?
- Why should I keep grasses and weeds cleared around the beds?

4. Demonstrate proper thinning techniques

Who can demonstrate how to thin seedlings on the tree sacks I brought today?

- Why should you thin your germinated seedlings?
- How many seedlings should remain in tree sacks after thinning?
- At what spacing should bareroot seedlings be thinned?
- Should you thin in the sun or in the shade?
- How tall should seedlings be when thinned?
- What should you do if you have some sacks where no seeds germinated?

- How do you decide which seedlings to thin out, and which to replant?
- After transplanting, why should disturbed soil be repacked?
- Should replanted seedlings be watered? When?

5. Pruning green wall seedlings

- What's the purpose of pruning green wall seedlings?
- Why is it important to prune the terminal buds for the first time while they are in the nursery?
- How do you prune them?
- Is this the only time they should be pruned? When else?

6. Hardening off

- What is hardening off?
- Why is it important?
- When does it start? How long should it last?
- What happens if you do not do it?

Debrief and Take Home Activity 5: Establish your Tree Nursery

Description

Following the training, farmers will each be given 10 small tree sacks and 20-30 seeds and instructed to establish their nursery beds, shading, and practice sowing seeds in beds and sacks.

Instructions for Farmers

You will practice what you learned today and build a tree nursery on your own farm within one week.

1. Debrief workshop activities

- Do you have any questions about what we practiced and learned today?
- Will you be able to use what you learned today to build your own tree nursery?

2. Identify your nursery site

Determine where you will place your nursery. Be sure you find a place that meets the following criteria:

- sufficient area
- suitable climate and soils
- water of adequate quantity and quality
- security from theft, vandalism, animals
- appropriate drainage—slight slope if needed
- wind protection
- **3.** Prepare beds (bare root and sacks) and build your shade structures over them Double dig and amend soils for bare root beds, mix soils and fill sacks, build shade structures, and sow the seeds you were given. The beds should be large enough to hold all the seedlings you would like to grow.

4. Sack and seed distribution

If your nursery looks good when the lead farmers comes to inspect it, the lead farmer will give you more tree sacks and seeds for your nursery.

Follow-up

When lead farmer visits participant farmers, he/she will observe and mentor farmers to pretreat and sow several seeds, ensuring proper technique. Upon visit completion the lead farmer will distribute 3,000 more tree sacks (where applicable) and agroforestry seeds.

Evaluation Checklist for Skills Learned in Year One

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At the end of the year you will be evaluated on the following practices that you learned and discussed during training events. After demonstrating that you have completed the year one evaluation criteria, you will be invited to continue in the second year of the project.

Year 1 Evaluation Criteria

- Green Wall
 - At least one row planted, surrounding the entire site
 - At least part of the second row is planted
 - Proper spacing between rows
 - Proper spacing across lines
 - Terminal buds pruned
 - Brush and weeds cleared
 - Dead fence surrounding green wall (for all projects where this is determined to be a requirement)
- Alley Cropping and/or Contour Planting
 - Minimum of 1 row planted across cropping area
 - Agroforestry trees interspersed throughout site
 - Proper spacing between rows
 - Proper spacing between trees within rows
 - Contour lines followed (on sloped sites)

• Compost

- Appropriate placement
- At least two active piles
- Good mix of materials (N, C, water, air)
- Passes stick test when the pile's stick is pulled out; if the stick is warm it passes the test)
- Demonstrated product and application
- Permagarden
 - Double-dug beds
 - Raised or sunken beds
 - Amended soils
 - Mulching
 - Triangular spacing
 - Adequate spacing between plants
 - At least four species/plant types
 - At least two species/types that were not planted previously by the family
 - Companion planting

Module 2: Facilitator's Notes



The facilitator should use the following pages to note down any questions or findings from the group that should be kept for or addressed at a later time. Depending on the module this may include species selection by group, crops identified in seasonal calendars, or anything else that should be noted.