Santa Fe Tree Nursery

The Santa Fe Women's Group has learned to make reforestation profitable. After taking an INA course in tree nursery reforestation, the Group saw the potential in continuing its tree production as a vital part of reforestation efforts in Costa Rica. While the Women's Group has already planted over 1,000 trees to reforest public places around Santa Fe, including the Santa Fe Wetlands, it is expanding its tree production to keep up with demand for good tropical hardwoods like teak, as well as precious endangered tropical species.

See how the Santa Fe Women's Group achieved energy independence with its biogas project

Aside from managing their own reforestation project, the women are collaborating with the local Agriculture Ministry office in its efforts to reforest under-utilized farm space. For this project the Women's Group has over 5,000 seeds germinating, all of them already destined to be planted on local farms in this important reforestation effort.

Since the Group has experienced so much early success with its tree nursery, the women intend to expand production. Other important forestry authorities are taking notice of this efficient tree nursery, offering the women a great economic opportunity. Other clients have agreed to buy trees from the Santa Fe Women's Group, compelling the women to expand their annual production capacity twenty-five-fold to 100,000 trees come the 2007 wet season. Since reforestation is an important ongoing effort all over Costa Rica, the tree nursery will likely enjoy a healthy market for decades to come, offering employment to both men and women in the community of Santa Fe.

Tree Nursery Reforestation Course

Introduction

This is an overview of the Tree Nursery Reforestation course that the Santa Fe Women's Group took to help launch its tree nursery business. The course was offered to the community of Santa Fe by INA, the National Learning Institute in Costa Rica, and taught by forestry engineer, Eliécer Monastel Villalobos. The course covers all of the necessary information to start a reforestation project using a tree nursery. Keep in mind, however, that some of the information, such as expected growth rates and periods, is specific to Santa Fe, located in tropical Costa Rica. Nurseries in non-tropical locations will likely differ in many ways, but some of the conventional wisdom in selecting and preparing a proper site for a tree nursery holds true wherever you are. If you are interested in tropical reforestation and would like to get hands-on experience in tree nurseries in Costa Rica, visit our rural tourism page to see how you can take part in your own reforestation project in the Santa Fe Women's Group's tree nursery.

Tree Nursery Reforestation: Topics Covered
1. Why use a tree nursery?
   - A tree nursery is the site where trees are cared for in the first stages of life
   - A tree nursery is a place where conditions are ideal for the initial production and care of trees that will later be transplanted in the field

2. The time of year to work in a tree nursery
   - In Santa Fe, production generally starts 2-4 months before planting in the field (when trees are being cultivated in bags)
   - If trees are grown to be used as clones, you should start 6 months before planting in the field. This cloning technique consists of planting the seeds directly into the ground and waiting until the trunk of the plant has 1.5-3 centimeters in diameter. You then cut, in a diagonal motion, 10 centimeters off the top and 15 centimeters off the roots. The tree is then ready to be transported to where it will be planted. The tree then regenerates what was cut snipped off. (This only works with species like teak that can regenerate after getting chopped in such a manner)
   - In areas where there is a long, harsh dry season, you should time your tree nursery production to plant your trees in the field as soon as the rains commence. So, depending on the species, you will start tree production in bags 2-4 months in anticipation of the rains and you will start your clone production 6 months before. Keep in mind that you may need a reliable irrigation plan in order to sustain your young trees in the nursery during the dry season.

3. Site selection criteria for a tree nursery
   - Make sure the area is free of weeds and other competing plants
   - Ensure the area has good drainage
   - Check for soil type and quality
   - Consider the availability of water resources
   - Assess the area for potential pests and diseases
   - Make sure the area is accessible for easy transportation of trees

4. Types of tree nursery
   - Greenhouse nursery
   - Field nursery
   - Hydroponic nursery

5. Equipment, materials, and tools
   - Soil testing equipment
   - Fertilizers and pesticides
   - Irrigation systems
   - Mulching materials

6. Seeds
   - Collect seeds from mature, healthy plants
   - Store seeds in a cool, dry place
   - Check seed viability before use

7. Land preparation
   - Clear the area of all vegetation
   - Prepare the soil by plowing and incorporating organic matter
   - Add fertilizers as needed

8. Sections of a tree nursery
   - Germinating beds
   - Disinfecting the soil
   - Filling bags
   - Creating rows to place the bags
   - Creating rows for "false stakes"
   - Transplanting trees

9. Germinating beds
   - Create beds with a slope of 2-3 degrees
   - Fill the beds with a mixture of soil and organic matter
   - Water the beds thoroughly

10. Disinfecting the soil
    - Treat the soil with a disinfectant before planting

11. Filling bags
    - Carefully fill the bags with soil
    - Ensure the soil is well compacted

12. Creating rows to place the bags
    - Create rows using stakes or string

13. Creating rows for "false stakes"
    - Create rows with "false stakes" to support the trees

14. Transplanting trees
    - Choose the best trees from the nursery
    - Dig a hole twice the diameter of the root ball
    - Place the tree in the hole
    - Backfill the hole with soil

15. Production techniques
    - Monitor the trees for growth and adjust care as needed
    - Prune and train the trees as necessary
    - Keep the nursery area clean and tidy

What is a tree nursery?
- A tree nursery is the site where trees are cared for in the first stages of life
- A tree nursery is a place where conditions are ideal for the initial production and care of trees that will later be transplanted in the field
• **Topography:** In order to allow proper drainage, the nursery will ideally have a 2-3% inclination. For those of you who are used to dealing with degrees of incline, a 3% incline is roughly equal to a 1.7 degree incline. (Inverse tangent of 3/100—or 3%—is about 1.7) Any more incline than this and your work becomes difficult and you minimize the production capacity in your nursery's lot, as you will have to make flat steps in the terrain for the rows of bags. (The surface area of the flat rows will be less than the original surface of the inclined ground)

• **Fertility:** The nutrients need to be "complete." The major elements, Nitrogen, Phosphorus, and Potassium need to have a 10%, 30%, and 10% concentration respectively. You also need to have the following elements in small quantities:
  - Calcium
  - Copper
  - Zinc
  - Boron
  - Magnesium
  - Iron
  - Sulphur
  - Manganese
  - Aluminum

• **pH:** Acidity or Alkalinity can inhibit tree development. The ideal pH range is between 5.5 and a neutral 7. In Costa Rica, acidity most often the problem when there is an imbalance in pH. Acidity can prevent the absorption of certain elements present in the soil. It can also provoke the solubility of Iron, Aluminum, and Manganese in lethal amounts to the young trees. To solve the problem of acidity, lime is most often used to bring the pH closer to neutral.

• **Antecedents:** You should look into what your land was used for before becoming an aspiring tree nursery. You should do studies of the soil to check for possible agro-chemical contaminants (when applicable). Also, the nutrients may be depleted if a very demanding crop was cultivated in that spot. Also, the soil may be very compacted if cattle had previously grazed there. As the pressure from a cow, which has a lot of weight and relatively small hooves on which such weight is distributed, is quite immense, pastureland is often very compact. If this is the case, you may need to loosen up the soil.

• **Rockiness:** A lot of rocks can be detrimental to tree production.
  - Rocks can inhibit root growth and/or direct roots to grow with an odd trajectory
  - Rocks take up space and can limit the overall capacity of the lot
  - Rocks can make work harder
  - Rocks can deform your plants

• **Texture:** The soil in your lot shouldn't be too clay-like, nor should it be sand-like. If the soil is pure clay, root formation and water drainage become very difficult. If the soil is very sand-like, the plant cannot firmly establish a solid base in the ground.

• **Water:** The tree nursery needs to have a reliable water source. The water needs to be free of contaminants and problems of pH and salinity.

• **Area:** The size of your lot will determine your production capacity. If you are planting your seeds directly into the soil to create production of clones, you can plant your seeds in a concentration of 20-25 trees per square meter, with an average of 80,000 to 100,000 trees per hectare (10,000 square meters). If you are using your lot exclusively for tree production in bags, you can place your bags in a concentration of 100 per square meter, with an average of 200,000 to 300,000 bags per hectare.

• **Accessibility:** If you are starting your tree nursery for commercial purposes, you need to have it accessible and visible. In rural Costa Rica sometimes the wet season makes a normally accessible road very muddy and only accessible by 4X4 vehicles. Also, visibility is often
very muddy and only accessible by 4X4 vehicles. Also, visibility is often a problem, unless the tree nursery has sufficient signs leading customers to the locale.

Types of tree nursery

- Two types of tree nursery, temporary and permanent, are distinguished from one another by their duration of usage and the materials they use.
- A temporary tree nursery is used for a period of less than four years and uses cheap materials. These nurseries usually are for personal and/or local consumption.
- A permanent tree nursery is used for a period of four years or more and uses more expensive construction materials. These nurseries usually are used for commercial purposes, selling to customers both locally and from afar.

Equipment, materials, and tools

- Equipment
  - wheel barrow
  - sprinklers
  - hoses
  - chain saw
- Materials
  - sand
  - soil
  - agrochemicals
  - seeds
  - fertilizers
  - lumber
  - tree bags
  - nails
  - perforated sheet thingy
- Tools
  - shovels
  - hammers
  - machete
  - rake
  - saw

Seeds

- Selection of seed-bearing trees
  - The trunk should be tall, thick, and straight
  - The tree should have healthy foliage and void of diseases
  - The tree should be mature, but not too old
  - The tree should be located in an accessible spot

* Land Preparation

Sections of a tree nursery

Germinating Beds

- The germinating bed is where seeds are planted and protected in their initial stages of growth.
- The germinating bed should be a wooden box with a depth of 12-15 centimeters and a width between 80 and 100 centimeters. You can make the bed as long as you need it to be.
- The germinating bed should be propped up to a height of about 80 centimeters.
- The germinating bed should be filled with sand for the following reasons:
  - Sand facilitates draining of water
  - Sand facilitates the extraction of the young trees when
- Sand facilitates the extraction of the young trees when moving them to the bags
- Sand doesn't compact like certain soils can
- Sand is generally cleaner than soils
- Sand provides a higher temperature to facilitate germination
- Sand has a loose consistency, allowing more oxygen to reach the seeds
- Sand facilitates the initial root growth