



## Establishing a tree nursery in Kenya

<b>Source</b>	World Agroforestry Centre (ICRAF)
<b>Keywords</b>	Plant nurseries, seedlings, plant propagation, trees
<b>Country of first practice</b>	Kenya
<b>ID and publishing year</b>	7808 and 2013
<b>Sustainable Development Goals</b>	No poverty, decent work and economic growth, industry, innovation and infrastructure and sustainable cities and communities

### Summary

This practice provides an in-depth explanation of the establishment of a tree nursery. Based upon a success story in Kenya, important factors as location, size, preparations and operations aspects are explained and elaborated accordingly.

This document also touches upon aspects as the seed bed preparation, the potting, the pricking out and, eventually, the handling of seedlings, providing an adequate overview for smallholder farmers willing to learn more about establishing and running tree nurseries.

### Description

#### 1. Factors that influence location

Where to site a nursery is an important issue to consider before starting, because it influences the effort that will be required to maintain it, the way in which it will be managed, and the ease of access to users. Some of the factors to be considered in selecting the site for a nursery include the following:

1. There should be a reliable supply of water, ideally being near a river or ponds, or where a water tank or a drum to store water is available.
2. The site should be accessible all year round, so that customers are able to get seedlings easily, and so that nursery

staff can manage plants and transport mature seedlings to planting sites and / or markets.

3. Good soils and other planting materials such as sand should be available easily.
4. The site should be protected from strong winds and from livestock, should receive sun, and should be on a gentle slope to allow drainage.

#### 2. Factors that influence size

How big a nursery should be depends on many different factors, of which the following are most important:

1. The space available for establishing the nursery. The land available on farms may only be small in area, but more space may be available in public land like school yards or church grounds.
2. Whether you will grow the seedlings in pots or in beds, and whether they will be raised from seed or from grafts, or from bare rooted cuttings, etc. This will influence the amount of space each plant needs. Remember that in a nursery additional space is required for keeping collected soil, sand and manure, and for mixing these materials.
3. The numbers of seedlings to be raised for personal use and for sale. When considering the size of the



market for seedlings, it is better to start by being conservative in estimating what your market will be.

4. The amount of water that is available to maintain seedlings.

### 3. Facilities and resources

When establishing a nursery, it is important to have somewhere to keep nursery tools safely and in good conditions. This does not have to be at the nursery itself, but could be in the house, school, church or other location.

The basic tools needed for a nursery include jembes, pangas, shovels, empty tins with small holes in the bottom (to substitute for a watering can), and kitchen knives for root pruning. If resources allow, then proper watering cans, wheelbarrows, pruning knives, knife sharpeners, soil sieves and shovels are also all useful.

### 4. Nursery site preparation

#### 4.1 When to start raising seedlings

The time to start work in the nursery depends on when field planting is planned. It is important to allow sufficient time for seedlings to grow to a size where they will survive well in the field (normally 30 to 45 cm, though this depends on the species, where seedlings will be planted in farms, and how they will be managed).

The initial labour needed to establish a nursery – in bed construction, soil collection, fencing, the procurement of tools, etc. – can take considerable effort but can be done some time in advance of raising seedlings.

The sourcing of seeds or rootstocks that will be used to establish nursery plants (see below) will also often need to be done in advance.

### 4.2 Soil collection

The soil used to raise seedlings should be fertile and should drain well. Once a suitable collection site has been identified, clear the surface of weeds, leaves and other litter, then dig out the topsoil to a depth of about 10 cm deep.

Remove any stones and roots, ideally by sieving. Then mix 2 parts of soil with 1 part of manure or compost and 1 part of sand (if available).

### 5. Nursery operations

Tree nursery operations involves various activities such as: seed sourcing, seed bed preparation, sowing seeds, potting, pricking out, shading, watering, weeding, root pruning, application of additional fertilizers or manure.

#### 5.1 Sourcing seed and pre-treatments

##### 5.1.1 Sourcing tree seed

It is important to try and use good quality seed in planting. Seed can be collected from trees locally – from farms, forest or public land as long as one collects from at least more the 30 trees – or can be bought from suppliers. It is a good idea to collect seed with neighbours; then bulk this seed together and share it out.

In this way, diversity is maintained in planted material, which is important in promoting good performance. When getting seed from a supplier, it is important to look at the seed and check that it appears to be of good quality, and hasn't been collected too early (is immature) or contains many empty seed.

Before planting a lot of seed, it is a good idea to first check it's viability by seeing if it germinates well. Once you have an idea about viability, then it will be possible



to estimate how many seed need to be planted to get a certain number of trees (for example, how many seed to plant in an individual pot).

Seeds can be bought from local seed dealers, from NGOs, and from institutions such as KEFRI and the Forest Department. More information on how to source seed can be obtained by getting in contact with your local seed centre, or by reading resources like ICRAF's Tree Seeds for Farmers Toolkit (referenced at the end of this guide).

### 5.1.2 Pre-treating seed

Sometimes it is important to treat seed before it is planted, in order to improve on the level, speed and uniformity of germination. These treatment methods can be used when seed does not otherwise germinate well.

The most common methods for pre-treatment are:

- Soaking seed in hot water until the seeds look swollen. This is used for seeds of trees such as calliandra, most acacias, tamarind, leucaena and albizia. Procedure: boil water and pour it over seeds in a container.
- Allow to cool and leave the seed in the water until the seeds look swollen.
- Soaking seed in cold / cool water. This method is recommended for seeds that have soft seed coats such as sesbania, tephrosia, dalbergia species, gmelina, gliricidia and acacia augustissima, etc.

The time for soaking varies between 12 to 48 hours, depending on the tree species.

### 5.1.3 Procedure

- Soak the seeds in cold water which is 2 times its volume.

- Remove all floating seeds.
- Sow the remaining seeds at the bottom in containers in the nursery or sow directly in the field after cracking the seed shell method.

This method is used for tree species with a hard coat like melia (mukau), podo species, croton megalocarpus, etc.

The cracking is done to allow water penetration for easy germination. Cracking is done using a sharp knife, a stone or a cracking machine.

Nicking-cut slightly the seed at one tip to allow water penetrate (Ref to the tree seed toolkit for farmers) Seeds such as Croton megalocarpus, Neem, Cassia spp. and Kei apple can be sown directly into the container. Fine and light seeds such as Eucalyptus, Casuarina are sown in transplant beds and later pricked out into containers.

It is important that fine seed is mixed with sand and uniformly broadcast on the seedbed to avoid overcrowding that can lead to damping off.

- Do not sow the seed too deep in the soil; the depth of holes should depend on the size of the seeds (usually 5 mm to 1 cm). Sowing too deep is likely to prolong seed germination period or seeds may rot. Put a seed in each hole; gently cover with soil equal to the size of the seed itself. Water the pots.
- Make a light shade with grass (netting material) to cover the pots or the seed bed after sowing.
- Water the sown seeds twice a day, early in the morning before 9.00 a.m. and in the evening after 4.00 p.m. If this is not possible then water in the evening only since most of the water at this time is taken-up by the plant since there is very little evaporation.



### 5.2 Seed bed preparation

Nursery beds can be arranged in different ways. Potted seedlings can be raised on a flat bed, or can be set into a sunken bed, which is a basin like excavation of about 1 m by 1 m and about 10 cm deep.

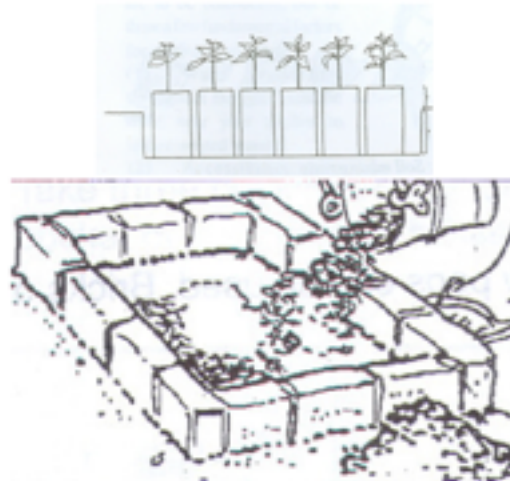
Such a structure holds seedlings together, and helps to conserve water in dry areas. Raised beds are used for establishing bare-rooted seedlings; as the sides of the bed can be broken down to reveal the roots of plants, ready for transplanting.

Staking slats of wood into the ground in a square or rectangle with sides of about 1 m and then filling this structure with soil (mixed with sand if possible) makes a raised bed. Alternatively, the sides can be made from bricks or the like.

It is normal to germinate small seeds such as e.g. blue gum (eucalyptus), sesbania or cypress in such seedbeds, to allow them

to germinate before transferring small seedlings to pots or planting them directly.

Figure 2. An example of a sunken bed, filling a raised bed made from bricks with a mix of soil and manure



© FAO/TECA

### 5.3 Potting

Potting mixture (soil, sand and compost / manure) should be moistened and then pressed into containers to a depth of about three-quarters of the height of

Table 1. Fertilizer application



© FAO/TECA



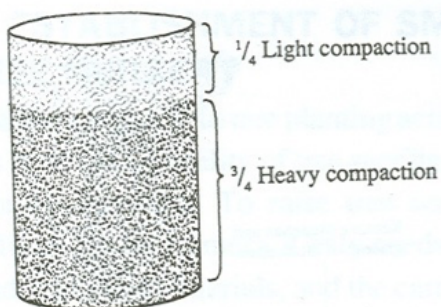
pots. Pots should then be topped up more loosely with mixture and pressed down lightly to about 2 cm below the top. Heavy compaction should be avoided at the top of pots because it will inhibit root penetration.

Before planting seed, containers should be watered lightly. Sometimes, more than one seed can be planted in a pot and then, if more than one germinate, seedlings can be removed to leave a single individual. This approach might be used if germination rate is expected to be quite low (see more below).

Figure 3. Levelling the soil of a raised bed, to a depth of about 2 cm from the top



Figure 4. Soil compaction



#### 5.4 Sowing seed

When raising seedlings in pots it is normal to use polythene tubes that are around 10 cm in diameter and 20 cm deep, though the size of pots will depend on the species in question and the time that seedlings will be in the nursery. Instead of using plastic tubes, other locally available materials that

can be used include small tins, milk packets, cardboard boxes, banana fibre containers, calabashes and clay pots.

It is better to use open-bottomed than closed containers, since this allows healthier root development and possible root pruning. If tins or other containers are being used, it is important that holes are made in the bottom to allow the movement of water.

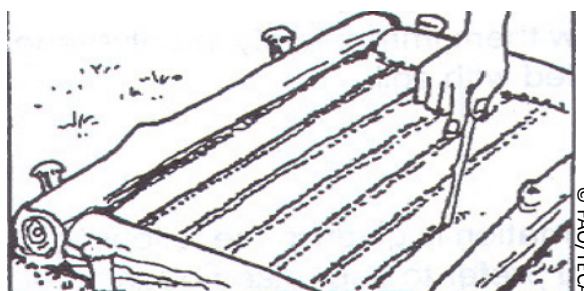
Seed sowing time depends on the species and the time it takes to attain size for planting out (30 to 45 cm). It is important the seeds are sown in time to enable the seedlings attain the recommended size (at least 30 to 45 cm in height). This should be attained before the onset of rains (April or November for Kenya).

##### 5.4.1 Sowing seeds in a seedbed

When planting seed in nursery beds, use the procedure outlined hereafter.

1. Draw lines 10 cm. apart or the width of your palm (Figure 5).
2. Sow at the spacing of 10 cm. between seeds (Figure 6).
3. Cover the nursery with dry grass or maize stalk then water (Figure 7).

Figure 5. Draw lines 10 cm. apart or the width of your palm



##### 5.5 Pricking out

This is the process of transferring young and tender seedlings from seedbeds into containers (pots). Pricking out should be carried out when the seedlings reach a



height of 2 cm. This is usually about two weeks after sowing but depends on the species.

Figure 6. Sowing seeds in a seedbed

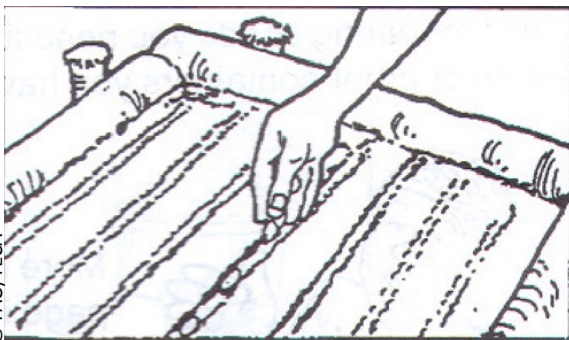


Figure 7. Cover the nursery with dry grass or maize stalk then water

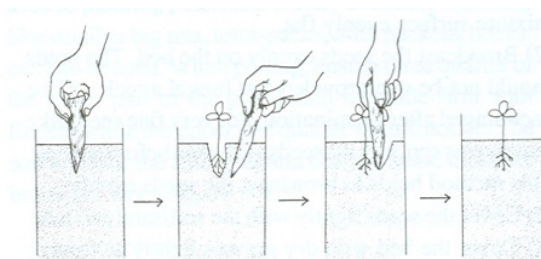


### 5.5.1 The pricking process

- Water the seedbed and containers properly before commencing the operation.
- Ensure adequate shade is available.
- Take an empty container and fill with water to  $\frac{3}{4}$  levels.
- Hold the leaves of the seedlings and insert a pencil thick stick (dibble) underneath the root system to loosen the soil.
- Pull out the seedlings gently and immediately put them in the container with water. Note that if the roots of the seedlings are kept under sunshine they lose water and may die.

- Make a hole at the centre of the pot using a stick.
- If the roots are too long clip off the tip.
- Do not hold the stem of the seedling because they are tender and feeble –this may injure the seedlings.
- Hold the stick in the tilting position and insert it in the soil about one cm away from the seedling to the same depth as the hole.
- Push the soil towards the seedling to hold it tightly. This ensures that all the air pockets around the roots are closed.
- Using your fingers cover the hole you made.
- Water the containers properly once more after planting. Seedlings pricked out from same batch of the seed bed should be arranged in the same place.

Figure 8. Pricking process



### 5.6 Shading

Construct a shade to protect the seedlings from direct sunlight for two to three weeks after pricking out. Use locally available materials such as grass, mats, or banana fibers for shade construction.

### 5.7 Watering

The regular supply of clean water is essential to plant growth. Plants are made out of more than 90 percent water. When grown in containers, nursery plants have only a limited volume of substrate and do not have the ability of mature trees to search for water from below the soil



surface. The amount of water seedlings require depends on various factors.

### 5.7.1 Seedling age

More water is required after germination when the seedling is young and at pricking out but this requirement reduces as the seedling grows in age.

The amount of water should be reduced four weeks before the seedlings are planted out. At that stage, the soil can be left to dry out completely and the plants to wilt for a day. The process should be repeated several times.

### 5.7.2 Amount of sunlight

If the area is sunny, more water is needed and vice versa. However, do not keep the area shady for too long to reduce water use.

### 5.7.3 Soil type

A sandy soil loses water faster than a soil with high clay content hence need more frequent watering. However a clayish soil becomes hard and cracks if it dries out. The substrate should be watered thoroughly so the water should be directed to the soil and not the leaves except to dust the soil lightly.

A watering can or a hosepipe with a nozzle should be used to ensure uniform distribution water and one should water the whole bed and not just the plants in the centre of the bed. Low water pressure is good but one should ensure that water gets to the bottom of the container to avoid a dry and hard bottom, which will affect the growth of the roots as they get to the bottom of the container.

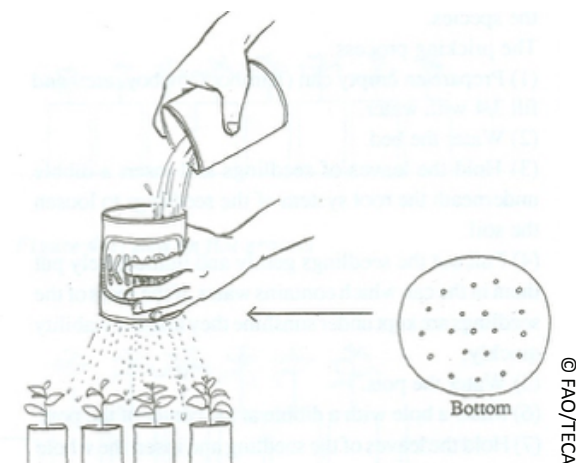
Water should be clean to ensure seedling health so water from such sources as kitchen waste should not be used. Too

much water can damage the plants just as much as not enough water because of water logging which makes the roots not breathe. Avoid direct use of hosepipes while watering the seedlings as this may wash away the soil. Use a watering can or an empty tin with holes at the bottom.

Figure 9 shows how watering is done using a simple tin with holes at the bottom. This is used to reduce the power of water drops which cause soil erosion. It helps distribute water evenly. As already mentioned, watering in principle should be done twice a day early in the morning and late in the afternoon after 4.00 p.m. when the sun is not strong. If this is not possible, then water once a day in the evening. During rainy seasons, watering may be done once or not at all.

Avoid under watering and over watering. Use adequate amount of water, e.g. 20 litres for 1 000 seedlings.

Figure 9. Watering using a tin with holes at the bottom



### 5.8 Weeding

Weeds are a threat to healthy seedlings development. They compete with seedlings for nutrients, water and light hence they must be controlled. With your hands or a dibble gently pullout unwanted growth (rugging) this should be done whenever



weeds are observed. Remove all the weeds around the beds with a jembe and don't leave any rubbish around unless you are sure that this can be converted to compost.

### 5.9 Application of additional fertilizers (nutrition)

Fertilizers or manure is applied when the seedlings show sign of weakness. The most common fertilizers are NPK and DAP. It's important to note that manure from livestock can also be used. However weakness of the seedlings can be caused not only by insufficiency of the nutrient but also by pests and disease.

### 5.10 Root pruning

Root pruning is the cutting of roots to control root system development beyond the container. Why root prune? When seedlings have reached to a certain size and their roots become longer than the depth of the pots.

If the roots are left without pruning, they penetrate into the ground and develop the root systems there. Once the root system develops under the ground, it is hard to move the pots, and if the roots are cut when the seedling is old, the seedlings will be weakened; hence periodical root pruning is required before the root system reaches into the ground.

The period and interval of pruning depends on different species and other conditions. Root pruning should be done regularly preferably every 2 to 3 weeks. Prune when seedlings are the height of the span of your palm and when their roots have started to penetrate into the under surface.

#### 5.10.1 Procedure

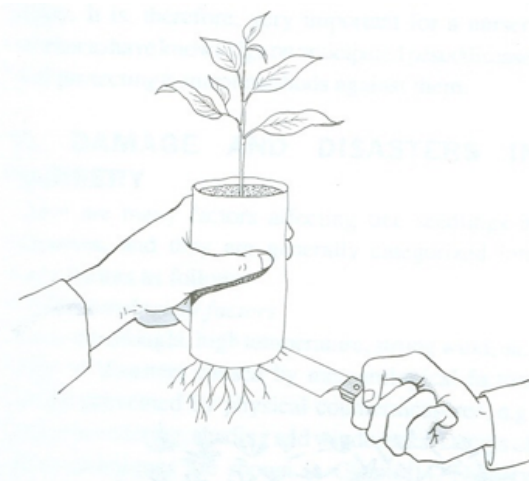
1. Water the seedlings properly before root pruning.

2. Using a sharp knife or wire or scissors to cut the long roots underneath the container. You can also uplift the containers (wrenching) to cut overgrown roots.

Figure 10 illustrates root pruning using a knife: when root pruning, the knife should face downwards while the plant being root pruned is place horizontally.

3. Water the seedlings well after root pruning. This helps the plant withstand moisture stress.
4. Note that to reduce root pruning, you can place the seedlings on a bed of stones or on polythene sheet and this reduces root development.
5. If the seedlings are in a raised bed, prune the roots by using a panga, knife or wire underneath the bed, soon after watering.

Figure 10. Root pruning using a knife



© FAO/TECA

### 5.11 Hardening off

Hardening up is to expose the seedlings to harsh conditions to make them strong so that they will be able to survive under harsh climate in the field after planting out.

It is also a gradual preparation of seedlings for field conditions.

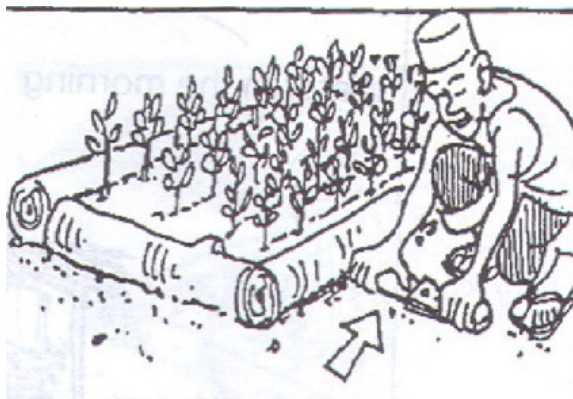




### 5.11.1 The hardening up process

1. When the seedlings grow and reach the planting size, the shade should be removed to exposure to more sunshine.
2. Reduction in watering intensity (quantity) and frequency-water twice a week and later once a week.
3. Before planting out, root pruning should be carried out frequently or re-arrangement of pots to allow more adoption to stress.
4. Good preparation for out planting results in good field survival, therefore hardening off should be done 2 to 3 weeks before out planting time.

Figure 11. Root pruning before planting out



### 5.12 Postponing planting

If it's not possible to plant when the seedlings are ready for planting out (reached right size for planting is 1.5 ft) or the seedling are not bought, cut the tips of the plant to suppress further growth so that they will not be overgrown during next season planting.

## 6. Seedling protection

Seedlings are delicate and susceptible to attack by various pests and diseases as well as weather conditions. Such damages can seriously weaken or kill the seedlings. It is important that the damages be dealt with immediately.

Damage and disasters in the nursery may be categorized as below.

### 6.1 Weather conditions

This is damage caused by the adverse weather conditions. We can either regulate watering or shading to comply with prevailing weather conditions.

### 6.2 Human

This is the stealing and / or intentional damaging of seedlings by human beings. Fencing and security are such options to overcome this.

### 6.3 Livestock and wild animals

Livestock and wild animals browse or graze on seedlings. Fencing can offset this.

### 6.4 Rodents

Field mice / rates frequently cause serious damage to seedlings in the nursery as well as in the field by eating them. To control these, cleaning the nursery helps to reduce their population.

### 6.5 Insects

Termites are the most common recorded insects in the nursery. They eat the roots and stems of many tree species. Eucalyptus is particularly susceptible to termite attack. Termite may be controlled by several methods:

- putting a thin layer of ash (2 to 3 cm thickness) on the bed, where the pots or tubes of seedlings will be placed. However periodic application is required since ash cannot be effective for long;
- digging out the queen from nearby colonies (termite hills), use of plant extracts and chemicals in severe cases;
- using chemicals such as dieldrin and aldrin;
- if milk packs are used as pots wash the packs with soap water or solution of



insecticide before use, otherwise termites may be attracted.

### **6.6 Fungal disease**

Although there are various diseases, which attack seedlings in the nursery, dumping off and wilt are described here since they are the most common fungal diseases in the country.

### **6.7 Damping off**

This is a fungal disease caused by pythium spp., Rhizoctonia salani and other various fungus. The severity of the attack usually increases with increase in soil moisture.

Dumping off can occur before germination, after germination and at pricking out.

The fungi attacks the seedlings at soil level and causes rotting of the part attacked consequently killing the seedling. Susceptible species include Eucalyptus, Casuarina, Kei apples etc. Conditions favourable to spreading of the disease are:

- high sowing intensity;
- over watering;
- using soil with under-composed material; and
- damaging the bark of tender seedlings.

### **6.8 Control measures**

Use of optimum sowing density. Use of appropriate quantity of water or not damaging the bark of seedlings.

## **7. Types of seedling diseases**

### **7.1 Wilting**

This is a dying bark of the main shoot of a seedling. It is mainly caused by overcrowding. Separating the seedlings or immediate planting out can help control it.

### **7.2 Powdery mildew**

First small white powdery patches are formed on the leaf surface and later the whole surface of the leaf is covered with

white powdery mycelial colonies. Damaged leaves gradually defoliate.

This affects the growth of young seedlings. Control-fallen diseases leaves should be buried in soil or burned and the young seedlings sprayed with benlate.

## **8. Field planting - planting out**

A lot of trees have been planted all over the years e.g. in farms or public areas however, only a few survive. This is due to poor knowledge on proper timing, technical aspects on proper tree planting, and tending techniques. It's important to note that healthy seedlings cannot grow well or survive if not planted properly.

Natural regeneration of trees grows without any care, but their survival rate is generally very low and unstable. This section is developed to enable farmers, extension agents and tree nursery operators get guidance in proper tree planting and tending techniques for high survival rate. It's important to ensure that seedlings to be planted are big enough (at least 1.5 ft high).

Always remember to plant as soon as possible after you get the seedling from the nursery. Do not plant trees too close to buildings and installations such as power (electricity) lines, water pipes or telephone posts.

Water the seedlings just before transporting from the nursery to the planting site; this water is to protect seedlings from drying up during the transportation.

Note: It is better to plant your seedling when it has rained for at least two weeks or when the soil is really soaked with water (if water penetration has reached a certain depth-30 cm from the surface), so that even if no more rain is available the plant can take off. Plants grow well if the soil is soaked



before planting or if the rain continues after planting for two weeks.

### 8.1 Spacing

Plants may be spaced at 3m by 3m, or 5m by 5m, or 6m by 6m, or 8m by 8m, or 10m by 10m (larger spacing is used for indigenous species or fruit tree species like mangoes since these trees requires large spacing). For hedges, the spacing can be 15 cm between the plants or 30 cm between plants in a line to allow the fence grow faster.

### 8.2 Digging holes

Planting holes should be dug before rainy season commences if possible since water collects in it and makes the survival easy even when rain is not much. Dig a hole 30 cm x 30 cm (the distance from your wrist to your elbow) or 45 cm x 45 cm or 60 cm x 60 cm (especially in dry areas). However the size of the hole will also depend on the size of the seedling.

The purpose of planting hole is to soften the soil so that the roots of the tree can easily penetrate and the loose soil can catch and contain more moisture.

### 8.3 Planting process

- Water the seedling before transporting them from the nursery to the planting site. This water is to protect the seedlings from drying up during the transportation.
- Transportation of seedlings: don't pile them up each other when transporting. Using boxes or bags are recommended if the planting site is far but always carry the seedlings upright. Transferring seedlings from the nursery to the field needs great care to avoid damaging them. If the seedlings were raised in polythene tubes or tins:
  - prepare a box or sack;

- chose strong seedlings;
- pack the seedlings by arranging them neatly, ready to transfer them to the field.
- If ready to plant, re-fill quarter of the holes with wet top soil around the holes or with the soil removed when preparing the holes.
- Fill quarter of hole with soil.
- Remove the polythene bag or tube by tearing it while holding the seedling upright.
- If the seedling was raised in a tin or any other container, bang it from the top slightly.
- Remove the seedling from the tube with its soil by holding it under the stem.
- Put the seedling in the hole and cover it with the top soil and then the sub soil.
- Place the seedlings in the hole without removing the pot soil or bending roots.
- Press down the soil nicely.
- Fill the hole with top soil from the forest or the best soil you have nearby (from trees in the farm or collected around the banana base). This soil can be mixed with manure if possible to provide the plant with more nutrition.
- Use your hands to firm the soil carefully around the roots.
- Make sure the seedlings sits in the ground at the same level it sat in the container or nursery.
- When the hole is filled, tread gently with your feet to firm the soil. Firm it into the shape of a well or basin so that it catches rain water and holds water you put on it. Water the seedlings immediately after planting (Figure 12). Water the seedling if the rain is not enough. If you plant in dry season, water two times a week-early morning and later in the evenings or at least once but in the evenings (Figure 13).



- If the plant is not safe, build a fence of sticks or thorns around the seedling to protect the plant from goats and children.

Note: some tree species will need support. If a tree seems too weak or not very straight, place a strong stick in the ground close to the seedling and tie a piece of old plastic wrapper (sisal string can damage the seedling) between the stick and the seedling.

Figure 12. Tread gently with your feet to firm the soil after the hole is filled

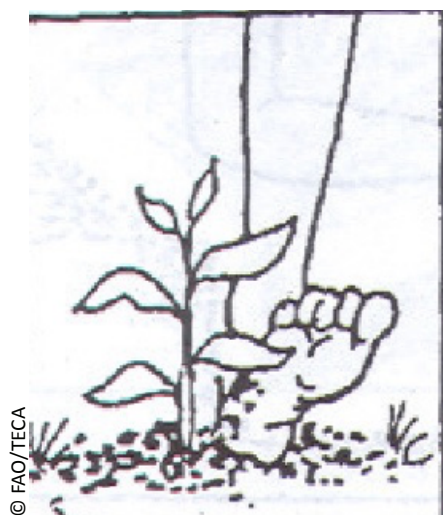


Figure 13. Water the seedling if the rain is not enough



## 8.4 Mulching

After planting, the soil surface of the planting holes is covered with some materials (dry grass / leaves / twigs) to avoid evaporation or to help the plant retain water. This technique is called mulching. Note that small stones can also be used as covering materials.

## 8.5 Water harvesting

To utilize rain water effectively, several types of micro-catchment are used to harvest the water effectively and conduct it to the seedlings.

- Shallow trenches: V shaped trenches are dug to conduct the rain water to the planting holes.
- Divisions of the ground: this method is used where the rainfall is very scarce. Ground is divided by ridges and all the rain water is conducted to the plants.

## 9. Direct sowing and planting cuttings in the field

Direct sowing or planting can be done for tree species like Sesbania, Albizia, Gliricidia and others used for live fencing, fodder and improving soil fertility.

### 9.1 Direct sowing procedure

- Prepare the field by tilling the land and make lines.
- Treat seeds as recommended (see page 9). Plant the seeds in lines and at recommended spacing (see page 25).

### 9.2 Planting stem / cuttings procedure

- Cut a stem from the mature branches of a tree like Gliricidia, Mulberry, Cassava, etc.
- Put a mark to show the upper side.
- Store the cuttings in the shade and water a little to quicken sprouting.
- Plant the cuttings with the upper mark showing without delay. Cuttings can also



be temporarily planted in polythene tubes for them to sprout before actual planting in the field.

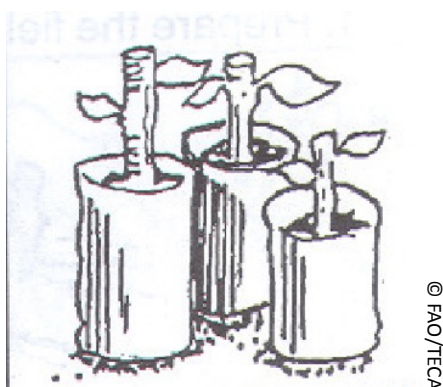
- Direct sowing of seeds or cutting planting should be done only when the rainy season has fully set in.
- Cuttings are well-suited when making a dense living hedge around the homestead, fodder bank or vegetable garden.

Figure 14. Cutting placed in the soil



© FAO/TECA

Figure 15. Cuttings temporarily planted in polythene tubes before actual planting in the field



© FAO/TECA

## 10. Further reading

- Moir K., Vandenbosch T., & Scull-Carvalho S. 2008. Growing Trees and Gardens for Life. Practical Tips for Healthy Tree Nurseries and Home gardens. Nairobi. World Agroforestry Centre.
- Kevyn E. Wightman. 1999. Good Tree Nursery Practices: Practical Guidelines for Community Nurseries. Nairobi, Kenya. The World Agroforestry Centre

- Ruvuga S., Otsyina R, Bohringer A., Phalen A., (2002). Establishing and Managing your Own Tree Nursery, Makoka, Malawi: P.O. Box 134 Zomba. The World Agroforestry Centre (26 pages).

Figure 16. Kisiwa primary school tree nursery and the students who take care of the nursery in Kenya



© FAO/TECA

Figure 17. Participants at an ICRAF workshop visiting a Kenya Agriculture Research Institute tree nursery



© FAO/TECA

## 11. Agro-ecological zones

- Tropics, warm

## 12. Objectives fulfilled by the project

- Women-friendly;
- resource use efficiency; and
- pro-poor technology.