Let's Make the Nursery for Better Life

Improve your standard of living and environment by planting trees.

KENYA FORESTRY RESEARCH INSTITUTE KEFRI

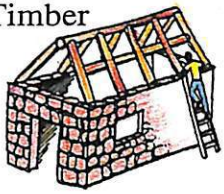
Social Forestry Handbook Series 1 (S F T P)

JICA

More trees provide better life for you

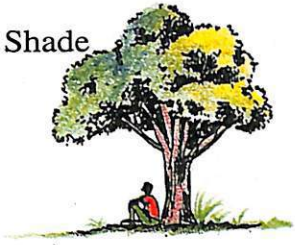
People are living with various benefits from trees. Some of them are tangible such as timber, fuelwood, fruits and others are intangible like shade, soil conservaion, etc.

Timber



Fuelwood

Furniture



Carving

However, it will become more and more difficult to get trees, because Kenya has rapidly increasing population. Therefore we need to plant more trees to make our life more pleasant and improve our living standard.

And this work has to start now.

CONTENTS

§ 1. Small Scale Nursery Establishment

1. You can be flexible when to plant trees.
2. You can raise seedlings of suitable number and species according to your demand.
3. You can get income by selling seedlings.

STEP1 Location

a) Constant supply of water, if possible near a river bank or near your house.

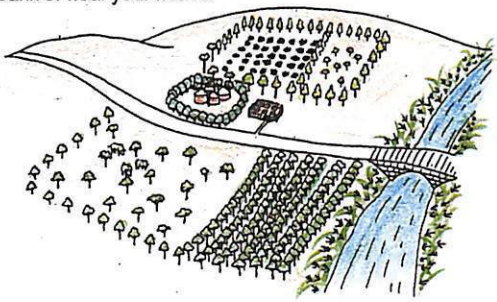
b) Good sunny condition.

c) Availability of good soil, preferably forest soil.

d) Gently slope for water drainage.

e) Protection from strong wind and animals.

f) Accessibility by road or path.



STEP2 Size

The size of nursery depends on the number of seedlings you want to raise. The size may be influenced by available space, labour, water, tools, materials and market. Normally a group intending to raise 1,000 seedlings a year will need a space of 5m by 4m. If you are intending to raise 2,000 seedlings a year you will need a space of 7m by 7m.

STEP3 Facilities

a) Sunken bed----The size of sunken beds should be 70 cm by 70 cm and depth of 10 cm. They are able to hold the pots in position and also conserve moisture. And then, you do not forget to put a layer of ash to control termites.

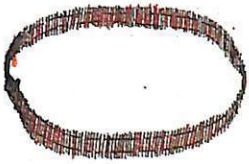
b) Seed bed ----They are located in one of corners of nursery, and they have no specific size. To make seed beds, you need to prepare big stones, small stones, sieved sand and sieved sand mixed with sieved soil.

c) Fencing ----Fencing around the nursery is important to keep livestock off. A fence by poles is enough for starting a new nursery. For permanent usa, a live fence using species like *Euphorbia tirucalli* is recommended.

d)Water drum ----Water drum is necessary if the source of water is not near.

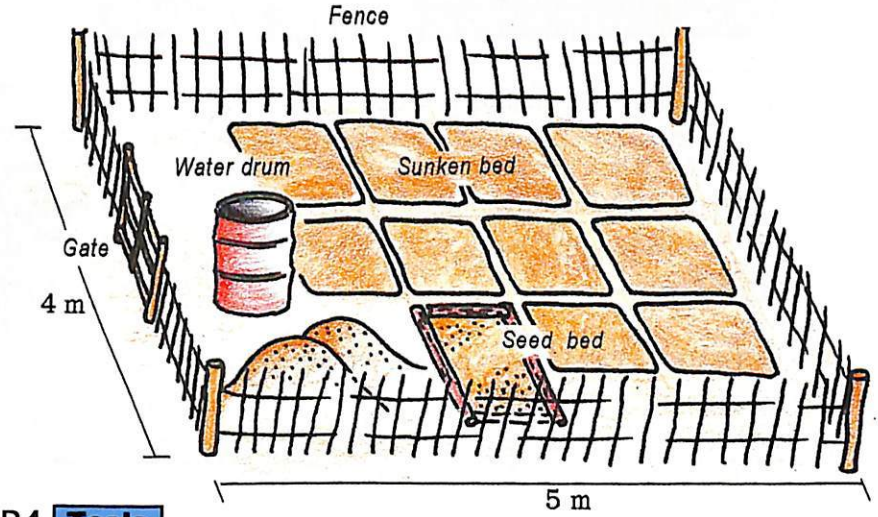
Sunken bed

Seed bed



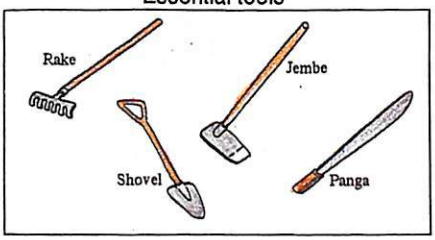
Fencing

Water drum

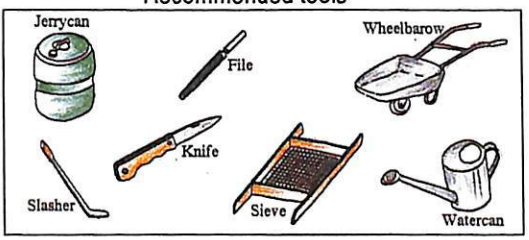


STEP4 Tools

Essential tools

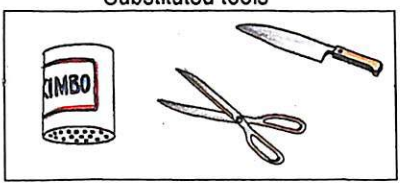


Recommended tools



You can start your nursery only with farming tools which you are using every day. Watering cans can be substituted with other locally available materials like empty tins with small holes at the bottom. Also kitchen knives can be used as pruning knives.

Substituted tools



STEP5 Time of activities

The time to start nursery work depends on the time of planting out of the seedlings.There must be enough time for seedlings to grow to plantable size, 30 cm to 50 cm, before the begining of rainy season.
Suitable times of nursery activities are as follows :

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Activities	Nursery Establishment Soil mixing Sowing preperation	Sowing	Pricking out			Watering , Weeding , Root pruning				Hardening up	Planting	

※ The slow growing species like *Tamarindus indica*, *Dalbergia melanoxylon* and *Terminalia blowrii*, should be sown very eary, preferably in early January. Eucalyptus species and Luecaena luecocephala may be sown later, preferably in June or July.

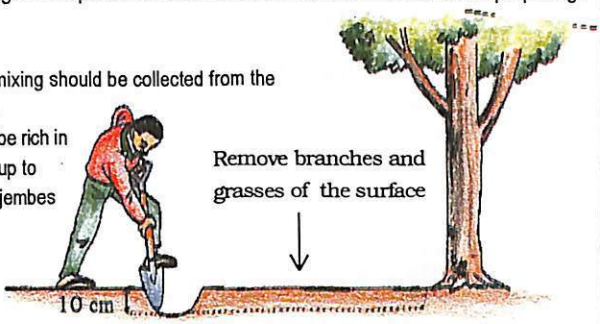
§ 2. Soil Mixing & Preparation of Sowing

STEP6 Soil mixing

The soil should be sieved to remove stones, branches, roots and other unnecessary matters. The soil is mixed with fermented cow manure in the ratio of 4 : 1 .
If the soil is clay, sand should be added to allow air and water to infiltrate. To make a good media, a little water is applied to the mix to improve the potting. It is important that soil media is moist but not wet when preparing.

Point 1

The soil used for Soil mixing should be collected from the forest (under the trees).
Because, the soil must be rich in nutrient.The soil is dug up to about 10㎝ deep using jembes after scraping off the plants and litters.



Point 2

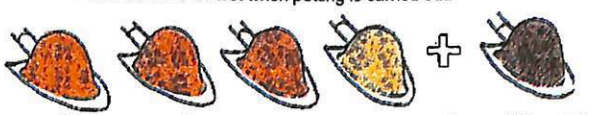
For Soil mixing, it is recommended to collect the soil three months prior to the nursery establishment so that the organic matter can mature, and the seeds of weeds germinate and can be removed easily.

Point 3

Soil must be sieved to remove stones, branches, roots and unnecessary matters before mixing.

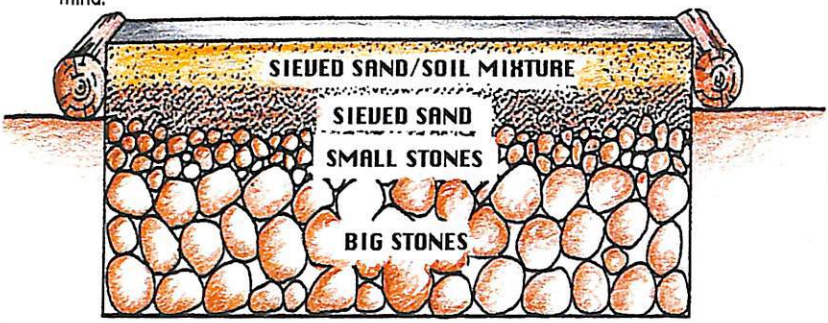
Point 4

The soil is mixed with fermented cow manure in the ratio of 4 : 1. (Don't use chicken manure because it is too strong.) If the soil is clay, sand should be added to mix in potting. It is important that soil media is moist but not so wet when potting is carried out.



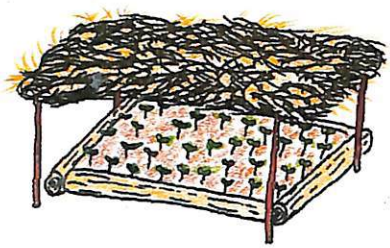
STEP10 Seed bed

The fine seeds and also the large seeds with low germination rates are germinated at the seed beds. When sowing in the seed beds, keep the following instructions in mind.



① Use the timber to make the soil/sand mixture surface evenly flat.
② Sow the seeds evenly and broadcast on the bed. The seeds should not be overcrowded lest fungi attack is encouraged after germination.
③ For very fine seeds like *Eucalyptus* species, mix the seeds with sand before sowing.
④ Cover the seeds lightly with soil to keep the moisture.
⑤ Water the bed gently. Use of the watering can with fine holes or the empty can with fine holes at the bottom is recommended.

Point 4



Make light shade using small poles and dry grasses to protect from direct sunshine.

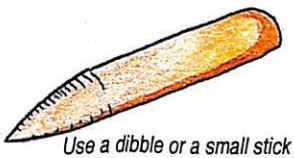
Point 5

Water twice a day, early in the morning before 9:00 a.m and evening after 4:00 p.m. Watering in hot daytime must be avoided. For the gently watering, use the watering can with fine holes or otherways.

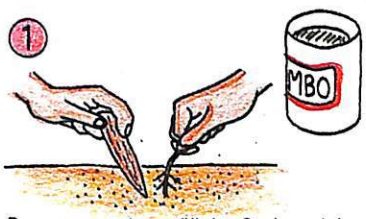
§ 4. Pricking out

STEP11 **Pricking out**

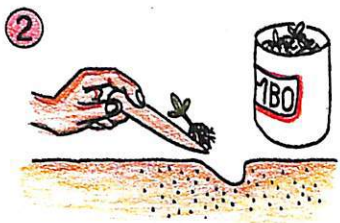
Next process after sowing on seed bed is Pricking out. Pricking out is done when seedlings have grown to 2cm to 4cm in height. This process is usually done about two weeks after sowing, but may depend on the species. Pricking out is a delicate process and should be done carefully.
The method is as the following figures ;



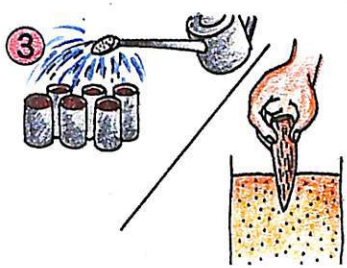
Use a dibble or a small stick when Pricking out



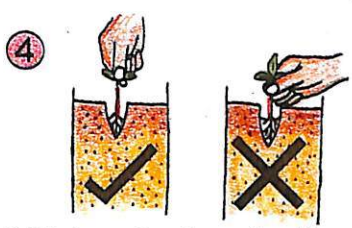
Prepare an empty can (Kimbo, Cowboy, etc.) and fill 3/4 with water. Water seed bed properly. Then, hold the leaves of seedlings and insert a dibble (or a small stick) underneath the root system of seedlings to loosen the soil.



Pull out the seedlings gently and immediately put them in the can which contains water. If the roots are not protected from sunshine they may dry out easily.



The pots should be watered before the seedlings are transferred. A hole is made with the dibble at the centre of pot.



Hold the leaves of seedlings and insert the roots system gently in the holes. Do not hold the stems of seedlings because they are tender and feeble. If you do not treat so, seedlings are injured and they will be blighted.

5

If the root is too long it may be ripped off.

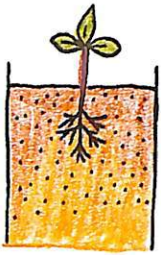
6

Hold the dibble in a tilting position and insert it in the soil about 1cm away from seedlings to the same depth as the hole.

7

Push the soil towards the seedlings to hold it tightly. This ensures that all the air pockets around the roots are closed.

8

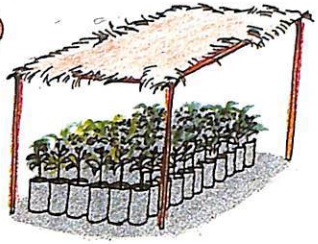


Cover the hole you made.

9

Water the pots properly.

10



Make the shade. The seedlings pricked out from the same batch of the seed bed should be arranged in the same place.

§ 5. Nursing

STEP12 Shading

Shading is necessary to control or minimize evaporation by protecting the nursery bed from direct sunshine. Particularly after pricking out, the seedlings should be kept in full shade for 2-3 weeks. The shade materials are dry grasses and small poles like straight branches. Some of the species that require shade are Cassia siamea and Casuarina equisetifolia. The species like Croton megalocarpus and Acacia polyacanta may not require shade.

STEP13 Weeding

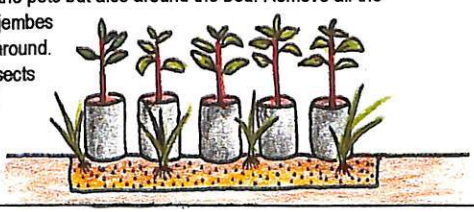
Weeds are threat to healthy growth of the seedlings and must therefore be controlled. This is because the weeds compete with seedlings for water, nutrients and sunlight. Weeds may sometimes harbour pests which may damage your seedlings.

Point 1

Don't wait until the weeds become too big with deep roots. In case the weeds over-grow, use a dibble or a small stick to root them out.

Point 2

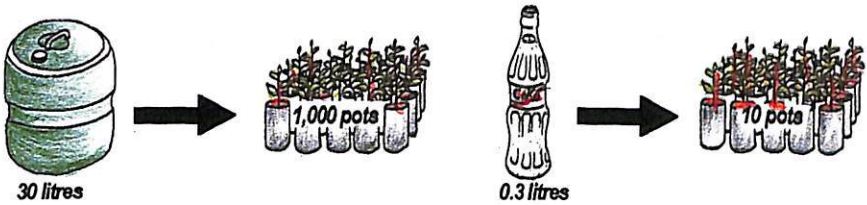
Weeds come up not only in the pots but also around the bed. Remove all the weeds around the beds with jembes and don't leave any rubbish around. Becase the weeds attract insects which feed on seedlings,and also give them a place to hide.



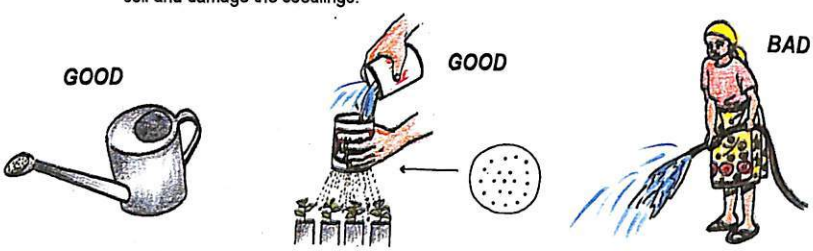
STEP14 Watering

This is one of important activities in the nursery activities. Proper watering raises the good seedlings.

Point 1 The seedlings should be watered twice a day early in the morning (before 9:00 a.m.) and late in the evening (after 4:00 p.m.). Watering of 30 litres per 1,000 seedlings is recommended. (The quantity of one soda bottle is for 10 seedlings)



Point 2 A watering can or a empty can with small holes should be used for watering. An hosepipe should not be used because strong jets of water are likely to wash away the soil and damage the seedlings.



Point 3 The intension of watering is to keep the soil highly moist but never sodden or dry. Over-watering and under-watering are bad for seedlings growth.

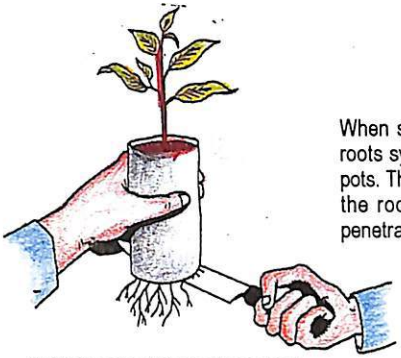
Over-watering may lead to root rot and may also encourage prolification of fungi.

Under-watering results in poor root development.

Proper watering brings up healthy seedlings.

§ 6. Root pruning

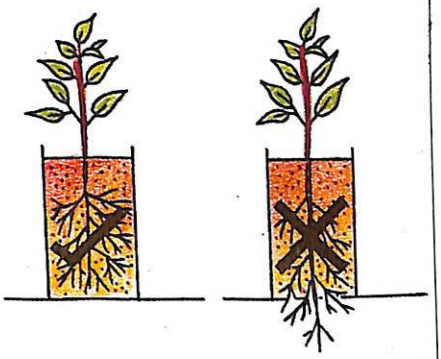
STEP15 **Root pruning**



Cut the roots at the bottom of pot.

When seedlings have reached a certain size, their roots system becomes longer than the depth of the pots. The part of overgrowth should be cut by knife. If the roots are left without the root pruning, they penetrate into the ground and develop root system.

Once the root system develops under the ground, it is hard to move the pots, and if the root is cut when seedlings are transplanted, the seedlings will be weakened.

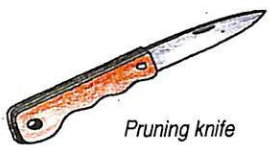


Point 1

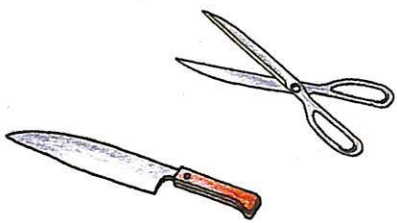
Periodical root pruning is required before root system develops in the ground. The interval of root pruning is usually every 2-3 weeks, but it depends on different species and other conditions.

Point 2

When the root pruning is carried out, it is advisable that the nursery stock is watered before and after the root pruning. Especially the water after root pruning helps the seedlings to withstand moisture stress.



Pruning knife

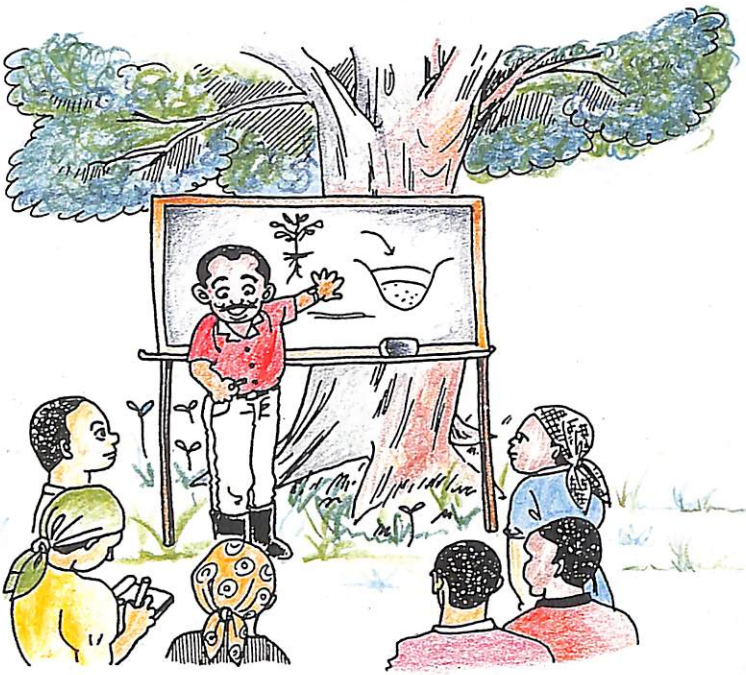


A Kitchen knife, scissors can be used as pruning knives.

MEMO

Your name

Your address



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