TREE NURSERY

A short manual on tree planting and tree nurseries

SUMMARY

This manual belongs to:

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INTRODUCTION

In the Kilombero valley most people still rely on firewood for cooking. Since access to the Udzungwa Mountains National Park is forbidden, the community is forced to cut down trees in villages and nearby forests such as Magombera Forest. This contributes to environmental degradation and deforestation.

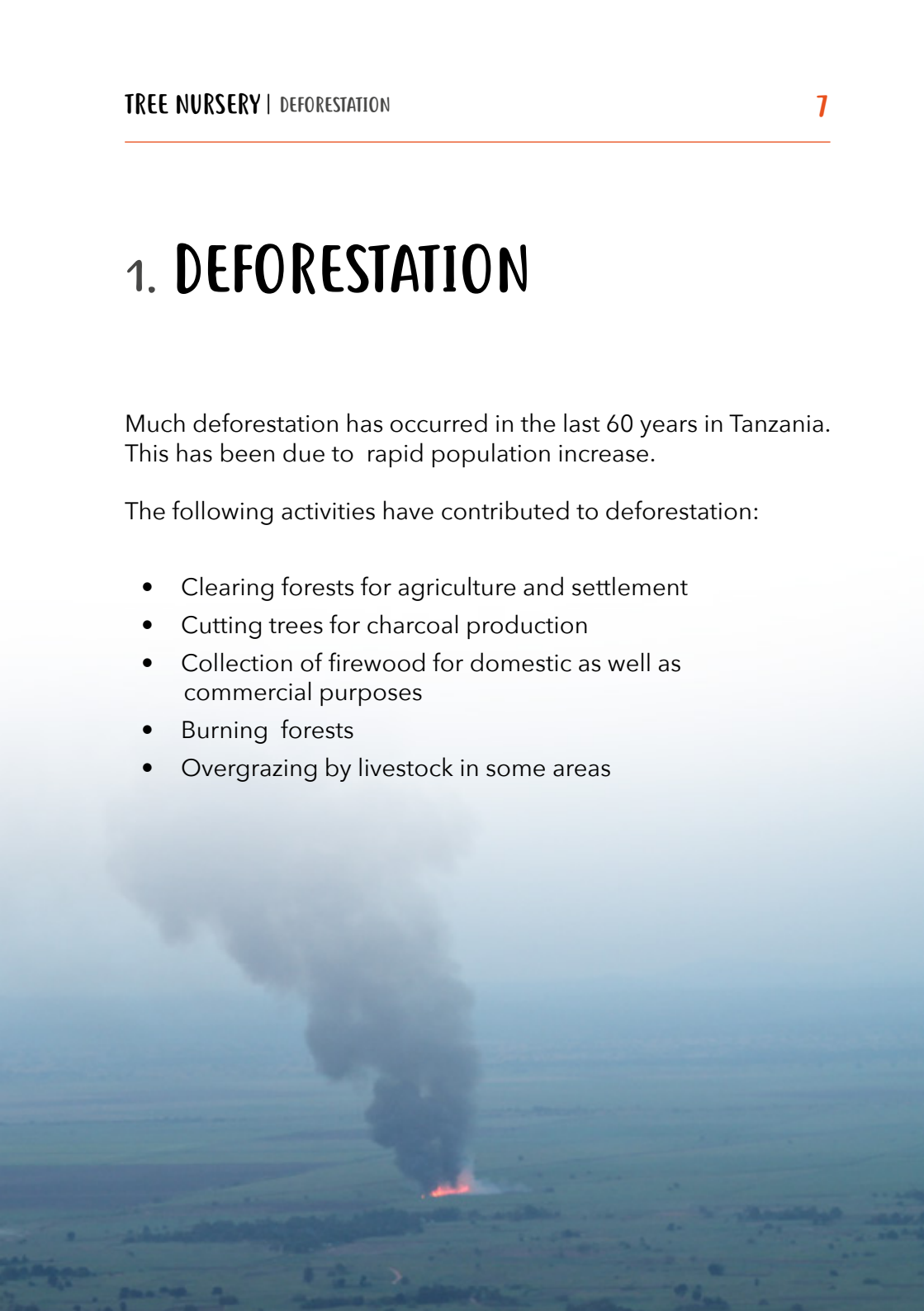
For this reason, Mazingira is promoting tree planting in farms (agroforestry), villages, schools, local institutions and along roads.

1. DEFORESTATION

Much deforestation has occurred in the last 60 years in Tanzania. This has been due to rapid population increase.

The following activities have contributed to deforestation:

- Clearing forests for agriculture and settlement
- Cutting trees for charcoal production
- Collection of firewood for domestic as well as commercial purposes
- Burning forests
- Overgrazing by livestock in some areas



Deforestation is a danger and a plague!

It should stop!

Some of the consequences of these activities are:

- Shortage of water
- Shortage of construction poles and timber
- Fuel wood scarcity in some areas
- Shortage of fodder during the dry season
- Silting and flooding of rivers and streams
- Declining soil fertility leading to low crop yields
- Increased soil erosion

2. TREE IMPORTANCE

Trees are important and necessary for many reasons

Tree planting is essential to the Kilombero valley, for a sustainable future.

FIREWOOD

TIMBER, POLES, POSTS

FODDER

FRUITS

PRODUCTS

HONEY, GUMS, TANNINGS, OIL, DYE

MEDICINES

CHARCOAL

GAME

UTENSILS AND HANDCRAFT

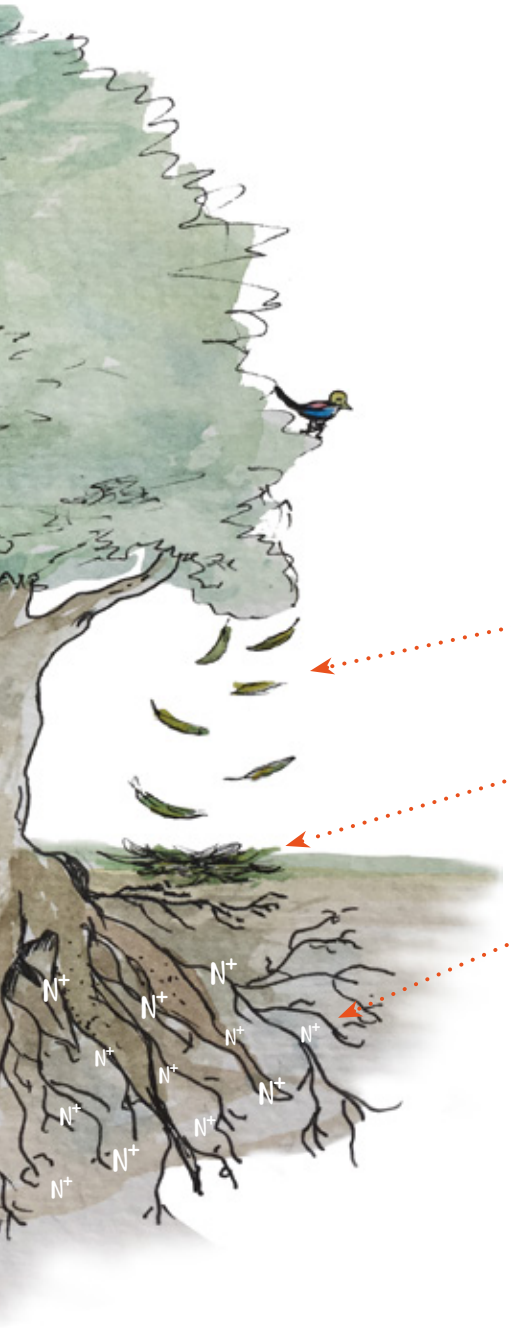
BIODIVERSITY

CULTURAL, RITUAL,
SOCIAL FUNCTIONS

SOIL PROTECTION,
SOIL EROSION CONTROL

TOURISM

RAIN, WATER,
STREAMS, RIVERS



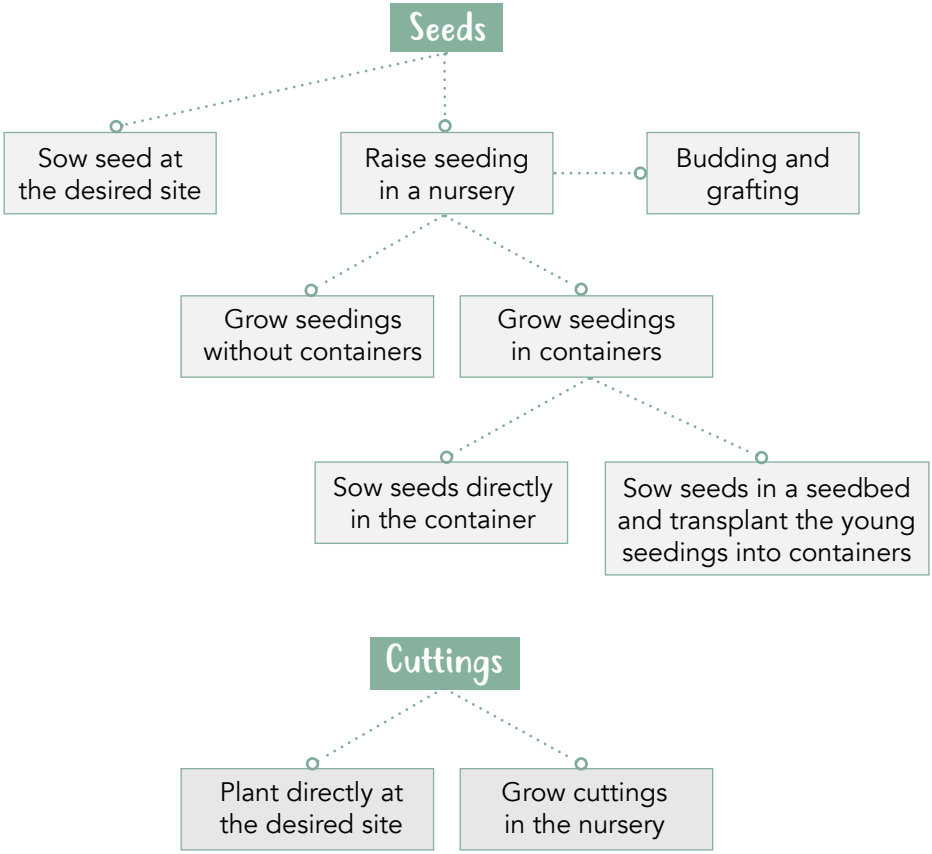
SERVICES

Fertilization

Mulch

Nitrogen Fixation

3. METHODS OF TREE PROPAGATION



Seedlings can be produced from seeds or cuttings. Examples of seedlings grown from seed are *Khaya anthotheca, Milicia excelsa* and *Cedrela odorata*. Seedlings grown from cuttings are, for example, *Milicia excelsa.*

4. SEED COLLECTION AND EXTRACTION

4.1 SEED COLLECTION

Seeds can be purchased or collected from the wild. The best option is to collect seed in the place where the seedlings are to be planted. Seeds should be collected from ripe or mature fruits, cones or pods from the best individual trees which are of good quality and disease-free.

Selection of mother trees (seed source) will depend on the end use:

- For live fencing: shrubs or trees with dense or thorny branches
- For timber: very straight trees with few branches
- For fodder: trees with palatable, dense foliage and/or pods
- For fruit: trees producing good quantities of sweet, healthy fruit of marketable size

In order to provide genetic variation, seeds should be collected from as many trees as possible. Different tree species require different seed-collection techniques.

The best way of collecting most seeds is to harvest ripe pods or fruits before they open and fall to the ground.

Some large or hardcoated seeds and fruits can, however, be collected after they have fallen to the ground

Seeds and fruits should be collected immediately after they have fallen to reduce insect or animal damage

In some cases, pods, fruit or seeds may be dislodged by shaking or beating the branches

4.2 SEED EXTRACTION

Once pods, cones or fruits have been collected, seeds should be extracted. Extraction methods can be:

- Threshing

- Depulping by soaking in water and drying seeds in the sun

- Hand extraction

If you don't use the seeds immediately, store them in rodent-proof containers and storehouses.

Stored seeds should be thoroughly dry. The lower the temperature at which the seed is stored the better. Label the container with the species name, date and site of collection.

5. TREE NURSERY

One way to propagate trees is to grow them in a tree nursery. Mazingira set up tree nurseries to support agroforestry and tree planting. This manual explains the importance, establishment and maintenance of a tree nursery.

5.1 TREE NURSERY DEFINITION

A tree nursery is the area set aside purposely for preparation of seedlings before being planted on farms.

5.2 OBJECTIVES OF A TREE NURSERY

- To grow young trees with suitable root systems
- To produce enough good planting stock at the right time for planting
- To cover unexpected eventualities and minimise losses during propagation

5.3 ADVANTAGES OF A TREE NURSERY

- It gives you control over the number and species of trees you want to plant
- It provides quality and better trees
- It provides many different varieties of seedlings
- It eases the care of seedlings located in the same area
- It eases the identification and treatment of tree diseases
- It provides employment (seedlings sale)
- It can teach people the importance of trees and the best way to tend them

5.4 TYPES OF TREE NURSERIES

Tree nurseries may be described according to a variety of elements: period of activity of the nursery, type of species planted, etc. With regard to the type of species to be planted we may have a pad nursery, vegetable nursery, tree nursery etc. With regard to the time plants are kept in the nursery, there are 3 types of nurseries.

1. PERMANENT NURSERY

This is where plants are available all the time. This type of nursery is used to produce and distribute seedlings on a large scale, such as tree farms like SAO HILL-Mufindi –Iringa (Tanzania).

2. MEDIUM NURSERY

This is the type of nursery where seedlings stay in the nursery for a specific time, in general not more than five years.

3. TEMPORARY NURSERY

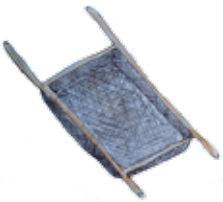
Here seedlings are produced then remain in the nursery for a short time for just a single season. At the same time this nursery may be used for shifting seedlings from permanent or medium nurseries to the farms.

5.5 CHARACTERISTICS OF A TREE NURSERY

Select a suitable site to start a nursery. A suitable area should be:

- **flat** but not subjected to flooding. In this case the ground should be levelled and water should be drained to avoid stagnant water
- **close to a water source** (water easily and constantly available even during dry seasons)
- **shady** in at least half of the chosen site
- **cleared** of pebbles, grasses and any hard materials
- **fenced** to prevent animals from destroying the plants (seedlings)
- **easily accessible**, if possible near a road
- **free from weeds** which disrupt the growth of seedlings
- **located on suitable soil** and near a supply of good topsoil
- **accessible** for supplies and to the expected planting site
- **protected** from climatic extremes

5.6 TREE NURSERY TOOLS



Wire mesh

Hoe

Wheel barrow

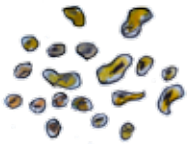
Knife

Spade

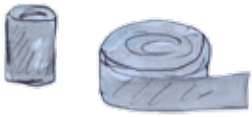
Rake

Watering can

Hose pipe



Seeds



Polythene tubes

Composted soil
(rich in nutrients - dark brown)
from biomass decomposition

Animal manure

Rice husks

Sand

Local and biological herbicides/ pesticides (i.e. ashes for controlling termites and leaf infusion of *Azadirachta indica* to water the seedlings for reducing weeds)

5.7 PREPARING A TREE NURSERY

- Clean your area of pebbles, grasses and any hard materials.

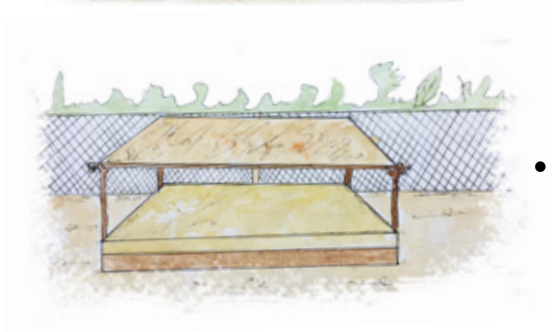
- Fence your area to protect against invading animals that could destroy plants (seedlings).

SEEDBEDS

After preparing the area, make a seedbed to sow seeds. There are 3 ways to prepare a seedbed:

- Dig an area under a tree

- Build a movable table and put under a tree



- If there are no trees, construct a sheltered seedbed

The size of the seedbed depends on the number of trees you intend to have. Normally for 20,000-30,000 trees, a seedbed of about 2 meters long and 1 meter wide should suffice.

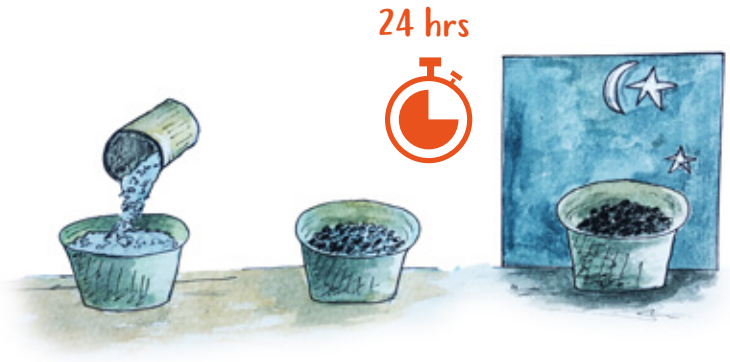
- Place 3 inches of rotten soil or composted soil on the ground
- Put 2 inches of sand on top, level it or mix the soil and sand keeping the same ratio; example 1 bucket of sand with 1 and half buckets of soil.

5.8 SEED PREPARATION

After preparing the seedbed, treat seeds for sowing. Different seeds need different treatments before sowing in order to germinate properly. Seeds with hard seed coats, i.e. many leguminous as well as other kinds of trees, require treatment to break the resting stage (seed dormancy) and to speed up germination. Some seeds need to be boiled or put in hot water for a while before being sown, such as *Albizia sepium*.

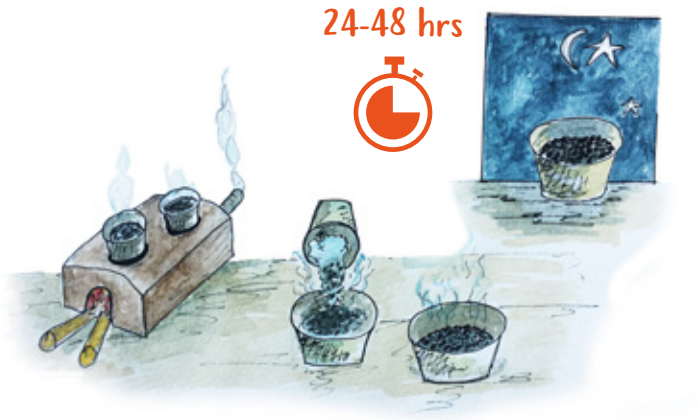
COLD-WATER TREATMENT

- Pour cold water into the container with seed and leave to soak for a day
- Remove the swollen seed from the container and sow immediately
- Leave unswollen seed in the container for one more day and then sow



HOT-WATER TREATMENT

- Boil some water in a pot. Use 3 parts of water and 1 part seed
- Remove the pot from the fire and pour the hot water into the container with the seed
- Leave the seed to soak for a day or two
- Remove the swollen seed from the container and sow immediately
- Leave unswollen seed in the container for one more day and then sow.



MECHANICAL TREATMENT

- Place the seed on a hard surface
- Use a hammer or stone to carefully break the seed coat and remove the seed
- Sow the seed immediately.

Read the table below for more specific information.

Species name	Seed treatment to help germination	Time from sowing to germination	Number of days till transplanting	Number of months till planting in the field
Cedrela odorata	NO TREATMENT	10 Days	3	4 - 6
Gliricidia sepium	Soak in cold water for 3 days	7 - 8 Days	3	3
Leucaena leucocephala	Boil and leave in hot water for 2 days	5 Days	3	4 - 5
Senna siamea	Soak in cold water for 3 days	10 - 15 Days	4	5
Mangifera indica	Soak in cold water for 5 days, hammer and then plant	20 - 30 Days	10	4 - 8
Milicia excelsa	NO TREATMENT	18 Days	5	4
Khaya anthotheca	NO TREATMENT	14 - 20 Days	6 - 10	6 - 9
Albizia lebbeck	Soak in cold water for 4-6 days	8 Days	3	3 - 6
Grevillea robusta	NO TREATMENT	14 - 21 Days	5	6 - 9
Acacia mangium	Boil in water at 100°C	8 Days	3	4 - 6

5.9 SEED SOWING

After treating the seeds, spread them on the seedbed and then spray sand on top until completely covered

You can alternatively sow seeds directly into lines in the seedbed

Some seeds can be directly planted into polythene tubes (see section "Preparation of soil and polythene tubes"). An example is *Khaya anthotheca*.

5.9.1 SHADOWING THE SEEDBED

After sowing, if the seedbed is not shaded, build a roof of grasses to protect it from the sun. The shelter may be 1 meter high.

5.9.2 WATERING

After sowing the seeds, continue watering twice a day, morning and evening during dry periods until the seeds germinate

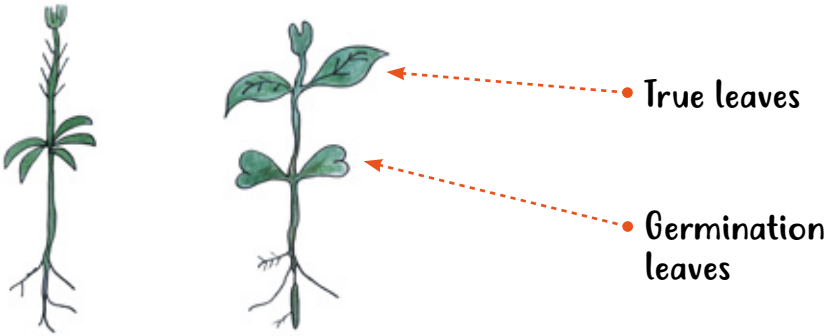
After germination keep watering twice a day till you transplant

If very hot, water in the evening

If it rains heavily, there is no need to water because too much water kills the seeds.

5.9.3 SEED GERMINATION

Once seeds have developed germination leaves they can be transplanted into polythene tubes.




AMOUR FOR

6. SEED TRANSPLANTING

6.1 PREPARATION OF SOIL AND POLYTHENE TUBES

After germination, prepare polythene tubes for seedling transplanting. The containers to use, may be industrial manufactured polythene tubes or recycled boxes, papers, plastic bottles cut in half.

This is the procedure to prepare the soil where seeds are to be planted

Sieve soil, sand and manure separately

Mix soil, sand, manure and rice husk in the ratio of 3:1:1:1

Mix the mixture with water

Cut polythene tubes to 8-10 cm high

Fill the polythene tubes with the mixture

Arrange them in rows ready for seedling transplanting

Keep watering them to compact the soil and allow weeds to grow in order to eradicate them from the tubes before transplanting

Before transplanting, remove the weeds from the polythene tubes

6.2 TRANSPLANTING

This should be done in the morning or late in the evening to avoid direct sun light which may damage the plants. Before starting the procedure, it is advisable to wash hands properly to avoid contact with some chemicals on the skin that could kill or damage the young sprouts.

6.3 THINGS TO CONSIDER WHILE TRANSPLANTING SEEDLING

Transplant seedling once it has 2-3 leaves. Pour water on the seedbed before transplanting to ease uprooting and avoid breaking off roots. Use a sharpened stick while uprooting.

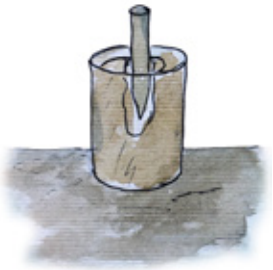
If roots have gone deep into the soil cut them off by using a sharp tool like a knife or a laze blade.

If the seedbed is wet enough you can also use a hand to uproot without disturbing other plants. Hold leaves and not the shoots to avoid killing the seedling.

After uprooting pour water on the seedbed to avoid damaging and killing remaining plants.

Also it is good to cut secondary roots, if any, by using sharp instruments as directed.

In the polythene tube make a small hole with a finger or a small stick then slowly put the seedling into the hole.



Make sure roots are not entangled then add more soil to cover the roots.

Keep your seedlings in the shade to avoid direct sun which may kill plants. Remove from the shade after 14-21 days. Some seedlings may take longer depending on type (see the information table).

6.3 ROOT PRUNING

Root pruning is the cutting off of roots which grow too long and move out of the polythene tubes.

Cut them several times to avoid roots anchoring onto the ground, making transplanting difficult.

7. DAILY CARE OF A TREE NURSERY

Make sure you water twice a day, morning and evening

Correct early weeding Late weeding

Keep your nursery neat and clean by weeding when necessary

Watch out for dangerous diseases which may attack your seedlings and, if you notice any, take action and report to the Mazingira technician.

Protect your seedlings from animals and thieves who may steal and destroy your plants. You can use fences or even watchmen.

Record keeping is really essential once you have a nursery

In order to be successful you need to monitor and keep track of your nursery. To do this you need to have the following records:

- Sources of seeds
- Date of sowing
- Date of germination
- Date of transplanting
- Number of seedlings available in the nursery
- Disease attack (if any) and steps taken to combat the problems
- Visitors to the nursery and their advice (if any)
- List of people who took the trees

SPECIES PRODUCED IN MAZINGIRA TREE NURSERIES

Scientific name	Common name	Use
Cedrela odorata	Mwelezi / Mnukanuka	Timber, plywood, veneer
Gliricidia sepium	Mgliricidia	Firewood, green manure, live fencing
Leucaena leucocephala	Mlusina	Firewood, animal feed, charcoal
Senna siamea	Mjooro	Animal fodder, intercropping plant, windbreak, shelter plant, medicine
Mangifera indica	Muembe	Food, medicine
Milicia excelsa	Mvule	Timber, medicine
Khaya anthotheca	Mkangazi	Timber, medicine
Albizia lebbeck	Mkenge	Animal fodder, medicine, timber
Grevillea robusta	Mgrevilea	Timber, firewood, soil fertilizer
Acacia mangium	Mzanzibari	Timber, firewood, soil fertilizer

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a forest for all