JAPAN INTERNATIONAL COOPERATION AGENCY

MINISTRY OF MINES, NATURAL RESOURCES
AND ENVIRONMENT, MALAWI

PILOT STUDY
ON
COMMUNITY VITALIZATION AND AFFORESTATION
IN MIDDLE SHIRE
IN
MALAWI

PRACTICAL MANUAL

MARCH 2005

SANYU CONSULTANTS INC.

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FOREWORD

This manual for Community Vitalization and Afforestation is Published for better enlightenment of villagers in Middle Shire concerning how to restore lost vegetation in and around villages, as well how to sustainably vitalize daily life and economy of local communities without aggravating or deteriorating its environment and ecosystem in their living sphere.

The project 'Pilot Study on Community Vitalization and Afforestation in Middle Shire in Malawi' has been started in 24 villages in TA Kuntaja and TA Kapeni during 2002-2004 for the purpose of verifying the proposed nature conservation techniques under the given conditions prevailing in this area. This manual contains very important but readily applicable practical skills to be tried in the area, and the editors are sincerely expecting that many villagers attempt to verify the viability of the skills depicted in this manual and assimilate their daily practices to radically revitalize their natural resources for better living environment and economic activities. The content ranges multidisciplinary fields of forestry, agro-forestry, agriculture, livestock husbandry and income generating activities. Chichewa language was employed for local leaders.

The editors express acknowledgement to those who have given special cooperation to publish this Manual, particularly NGOs including Wild Life and Environment Society of Malawi (WESM), Malawi Agroforestry Enterprise (MAFE) International Council for Research on Agroforestry(ICRAF), aid organizations like GTZ, USAID and NORAD and government agencies including MNREA, MOAI and MGYCS.

Part I MANUAL AT THE SITES

Part II MANUAL FOR TRAINING

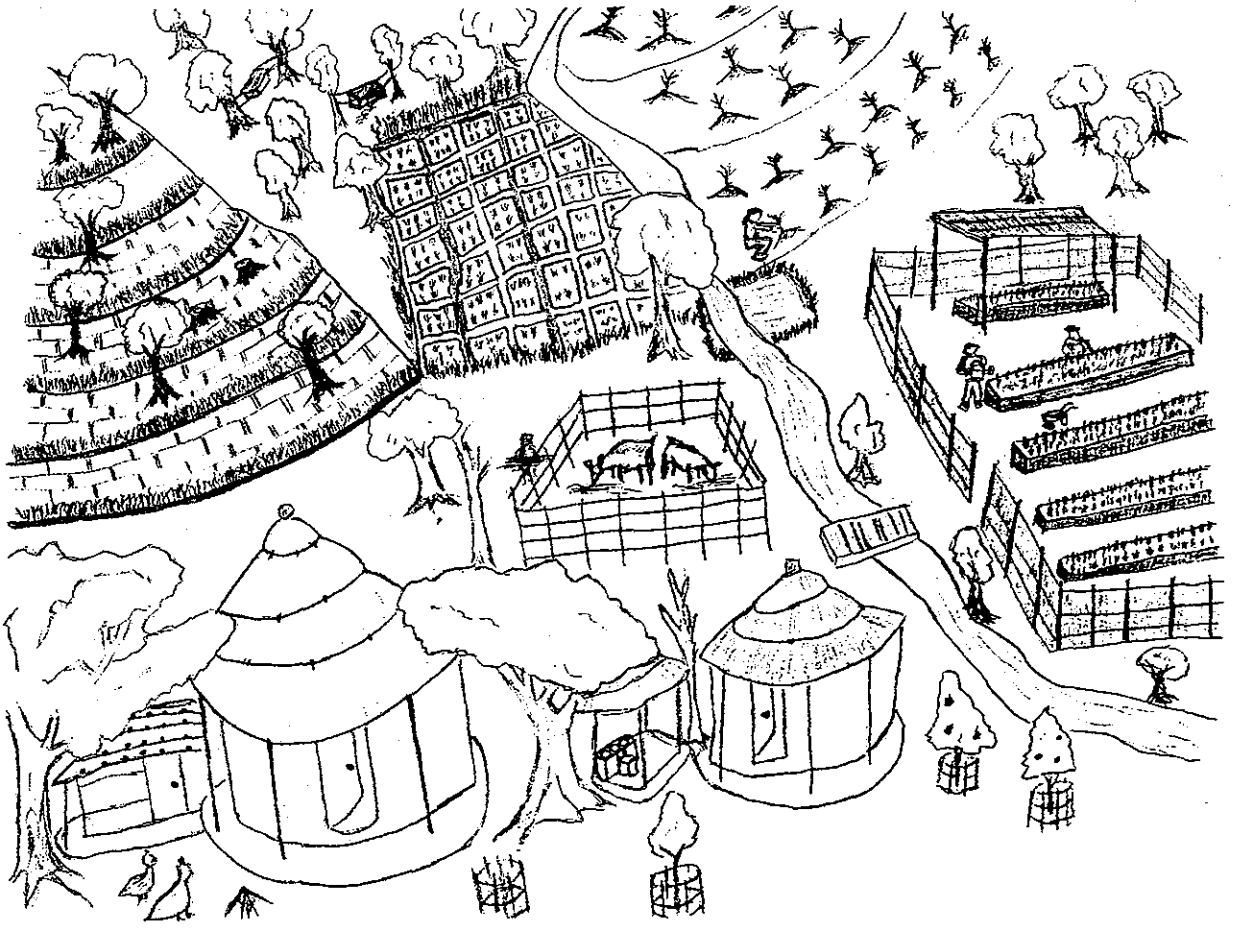
Part I MANUAL AT THE SITES

Part I

PRACTICAL MANUAL

FOR

COMMUNITY VITALIZATION & AFFORESTATION



SANYU CONSULTANTS INC.
PROJECT IMPLEMENTATION UNIT (PIU)
CHRISTIAN SERVICE
COMMITTEE OF THE CHURCHES IN MALAWI
(CSC)

CONTENTS

A. AFFORESTATION

B. IMPROVED COOKING STOVE (ENZARO JIKO)

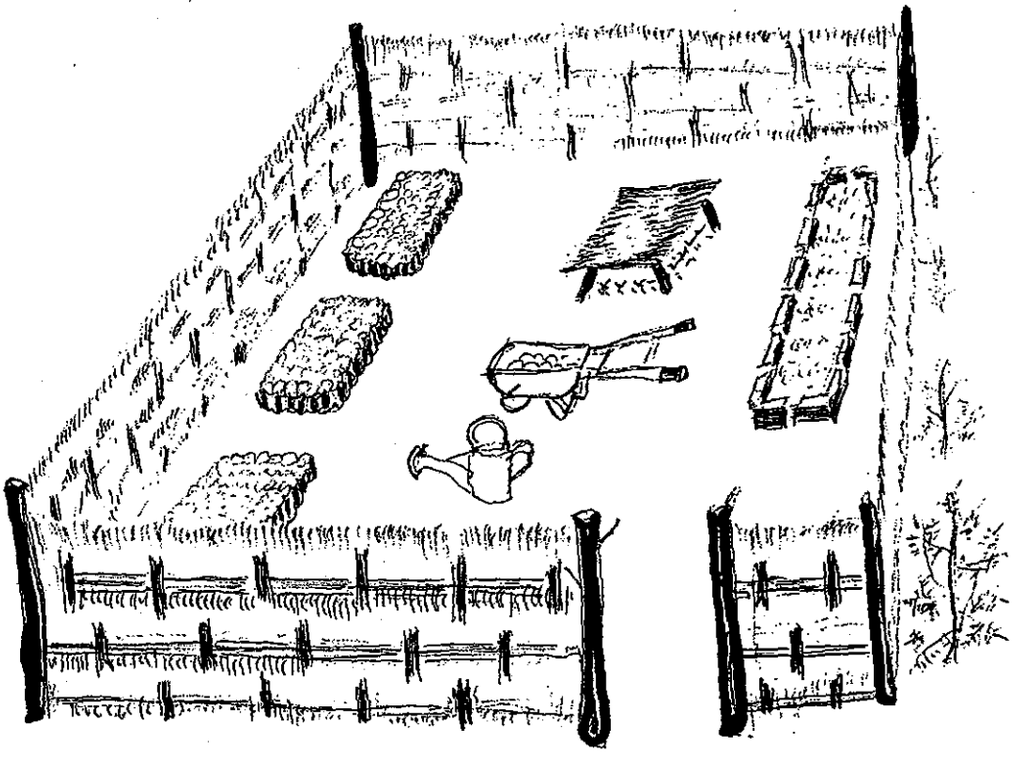
C. INCOME GENERATING ACTIVITIES

A. AFFORESTATION

1. NURSERY PREPARATION

AND

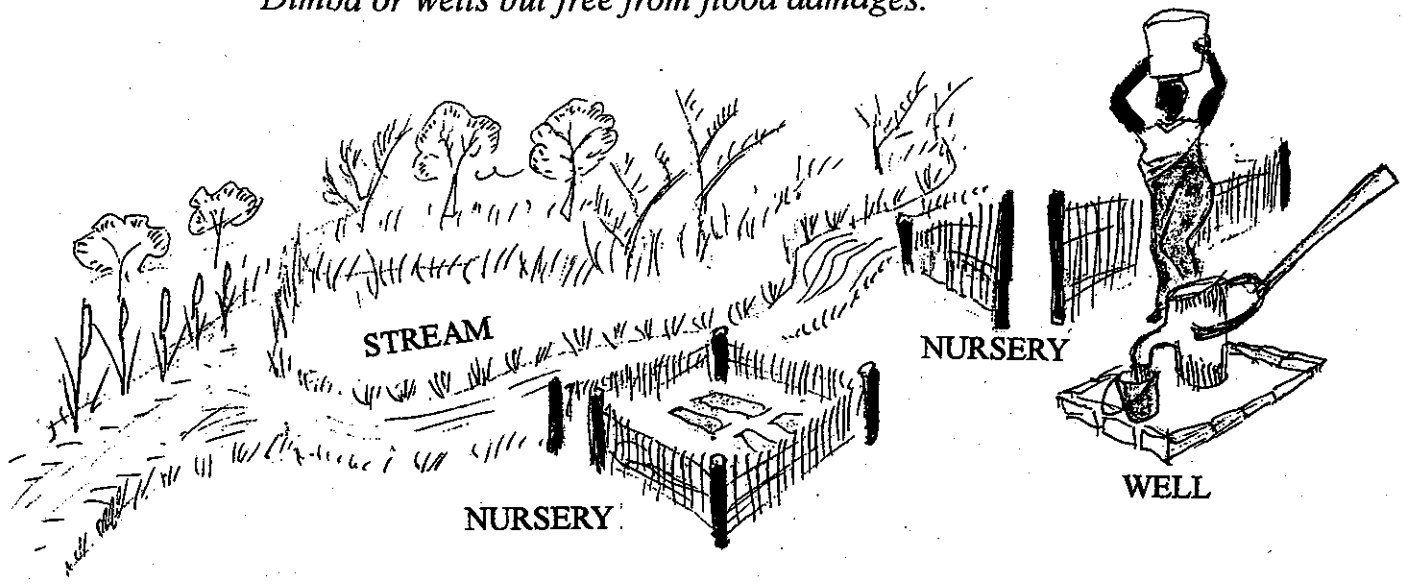
MANAGEMENT



1.1 Location of Nursery

How to Choose Right Location

(1) *Near water resources like perennial streams, fountains, Dimba or wells but free from flood damages.*

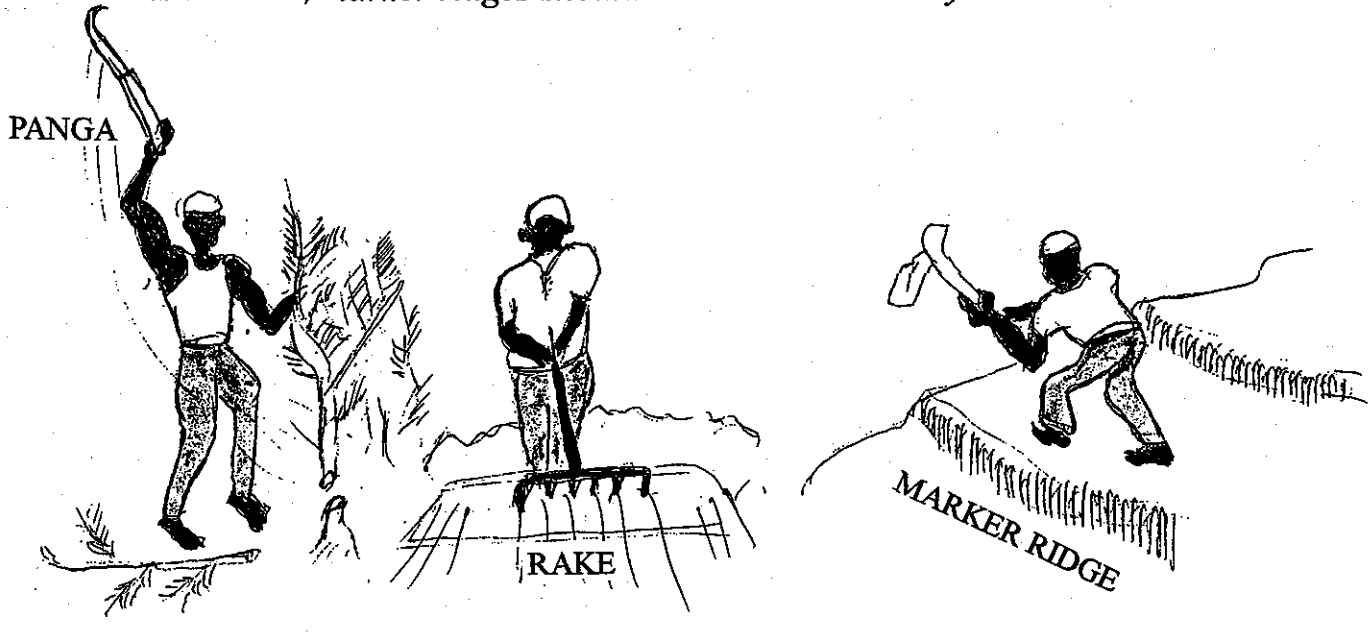


(2) *Sites where good loamy soils and manure are available.*

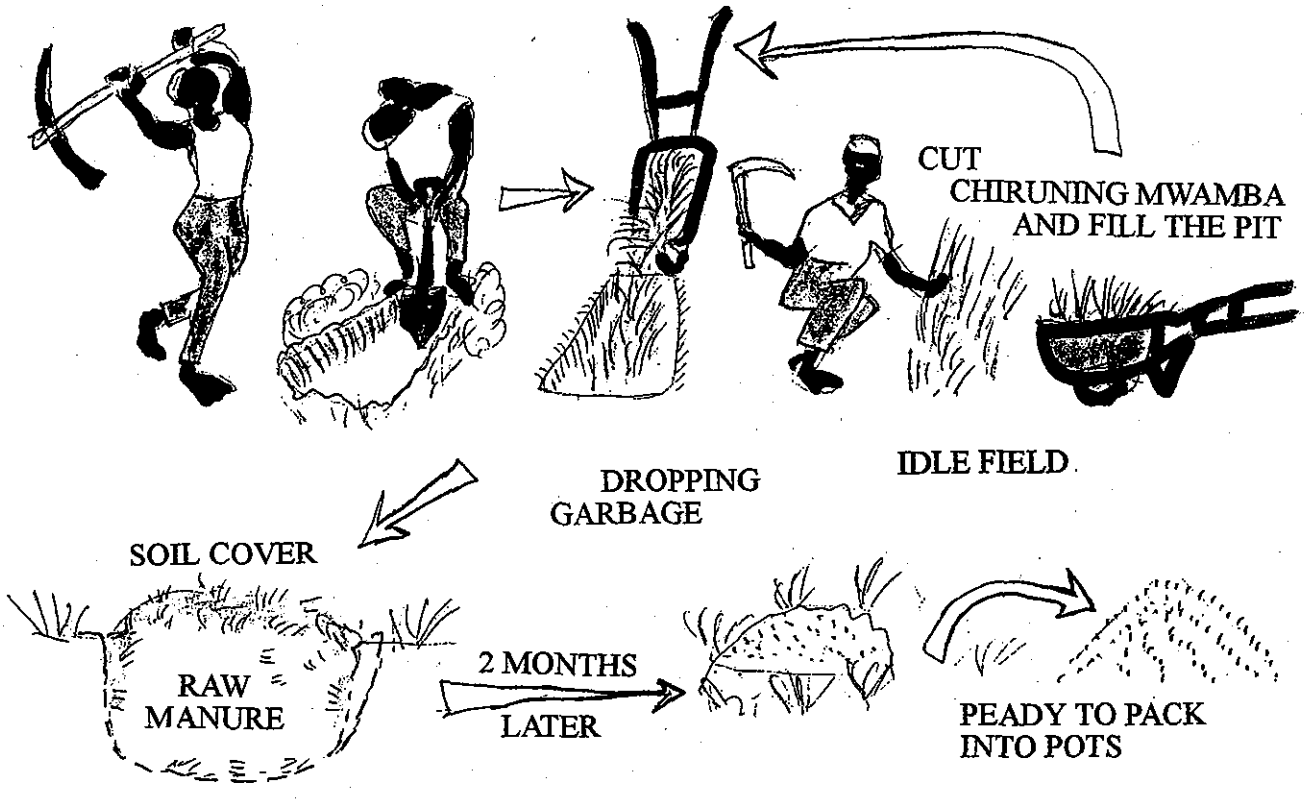
1.2 Land Preparation & Manure Making

How to Make Nursery Beds

A Slash shrubs, cut grass and level the surface. If the site is inclined, marker ridges should be made horizontally.



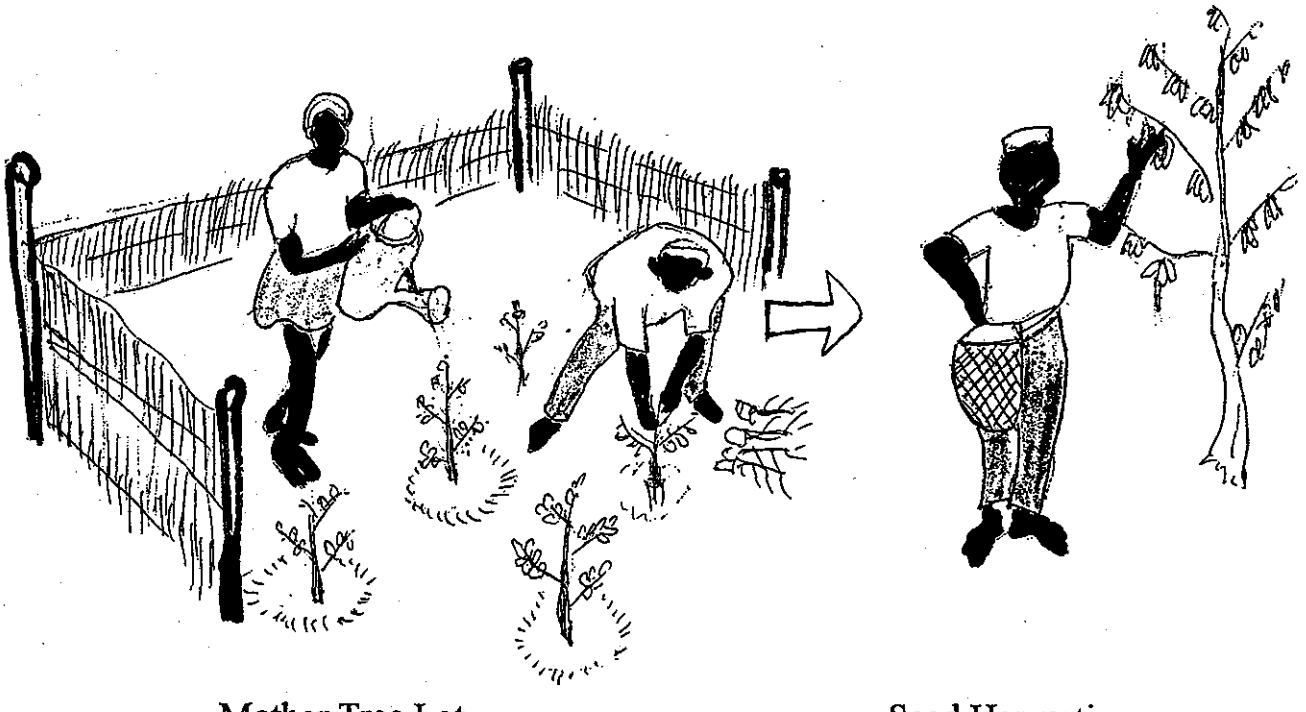
(1.2 Land Preparation & Manure Making-continued)



1.3 Procurement of Seeds

(1) *Create A Mother-Tree Lot In Your Villages*

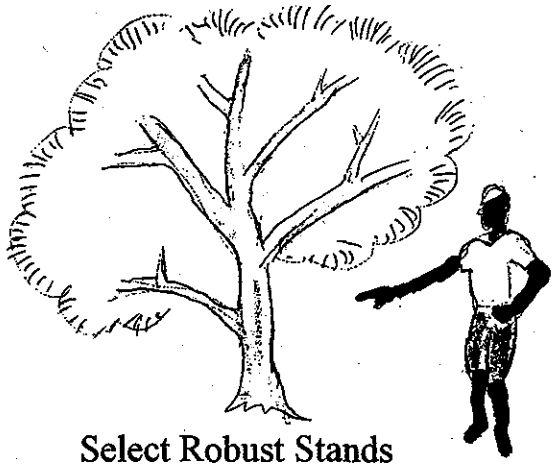
(2) *Find Robust Natural Stands In Any To Collect Seed*



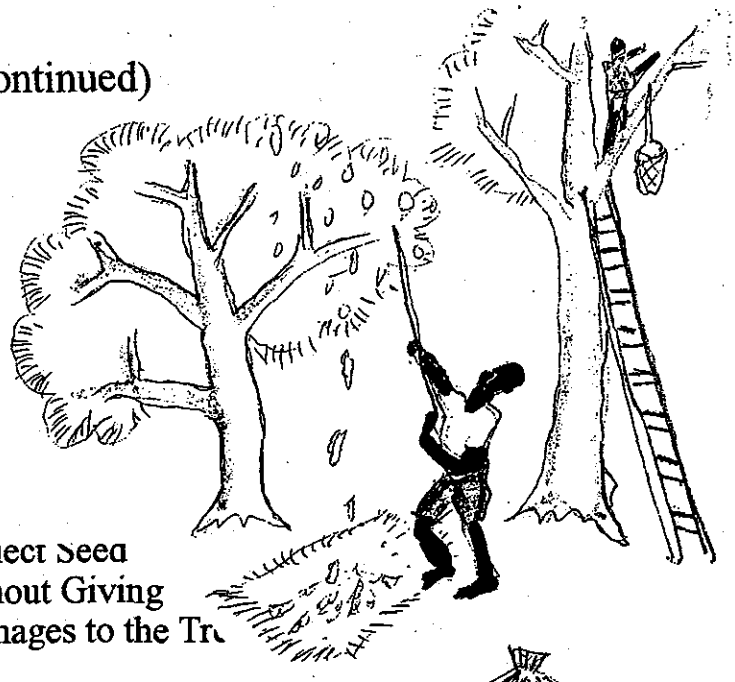
Mother Tree Lot

Seed Harvesting

(1.3 Procurement of Seeds –continued)

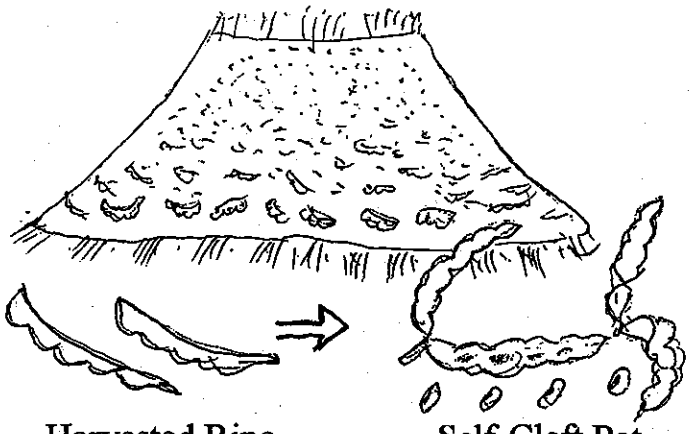


Select Robust Stands
with Abundant Seed



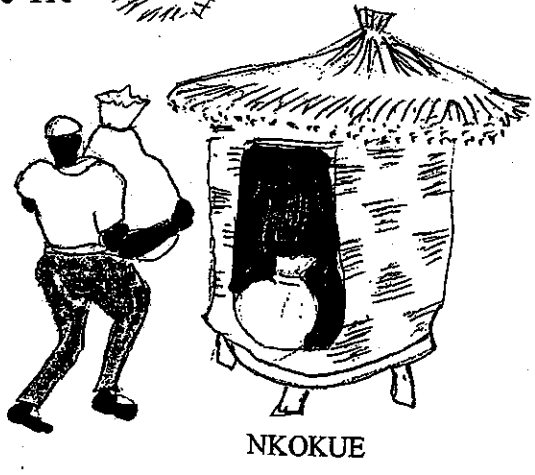
Collect Seed
without Giving
Damages to the Tr

Dry Seed Pads in the Sun



Harvested Ripe
But not Cleft Pots

Self-Cleft Pot
After Drying

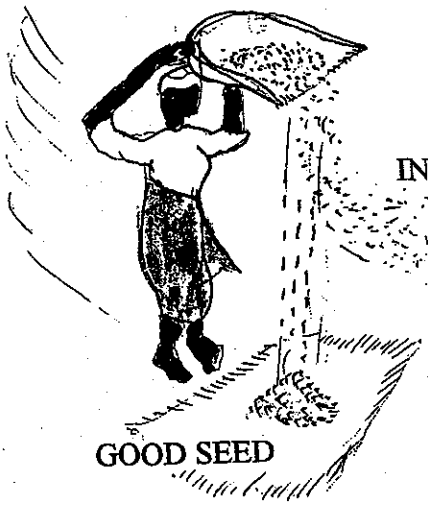


NKOKUE

Store Harvested
Seed in Nkokue

1.4 Seed Treatment & Sowing

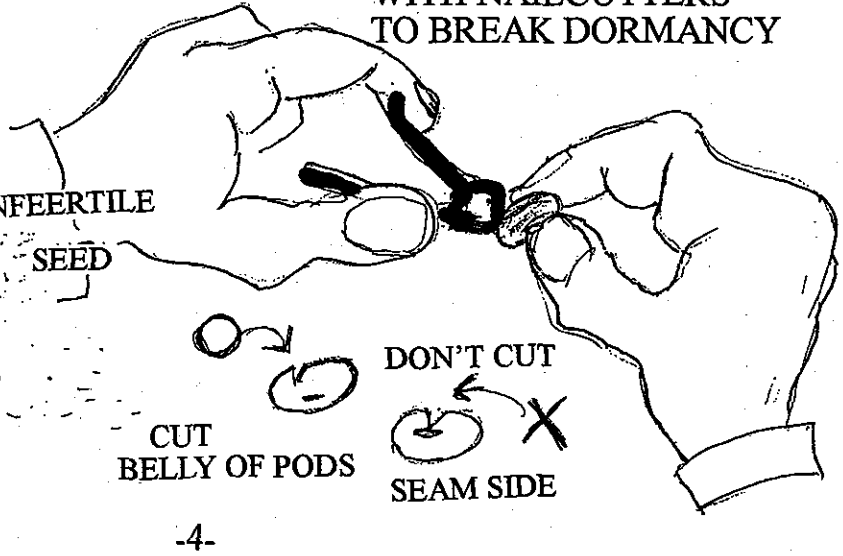
(1) WINNOWING
(SORTING)



INFEERTILE
SEED

GOOD SEED

(2) PINCHING, PODS
WITH NAILCUTTERS
TO BREAK DORMANCY



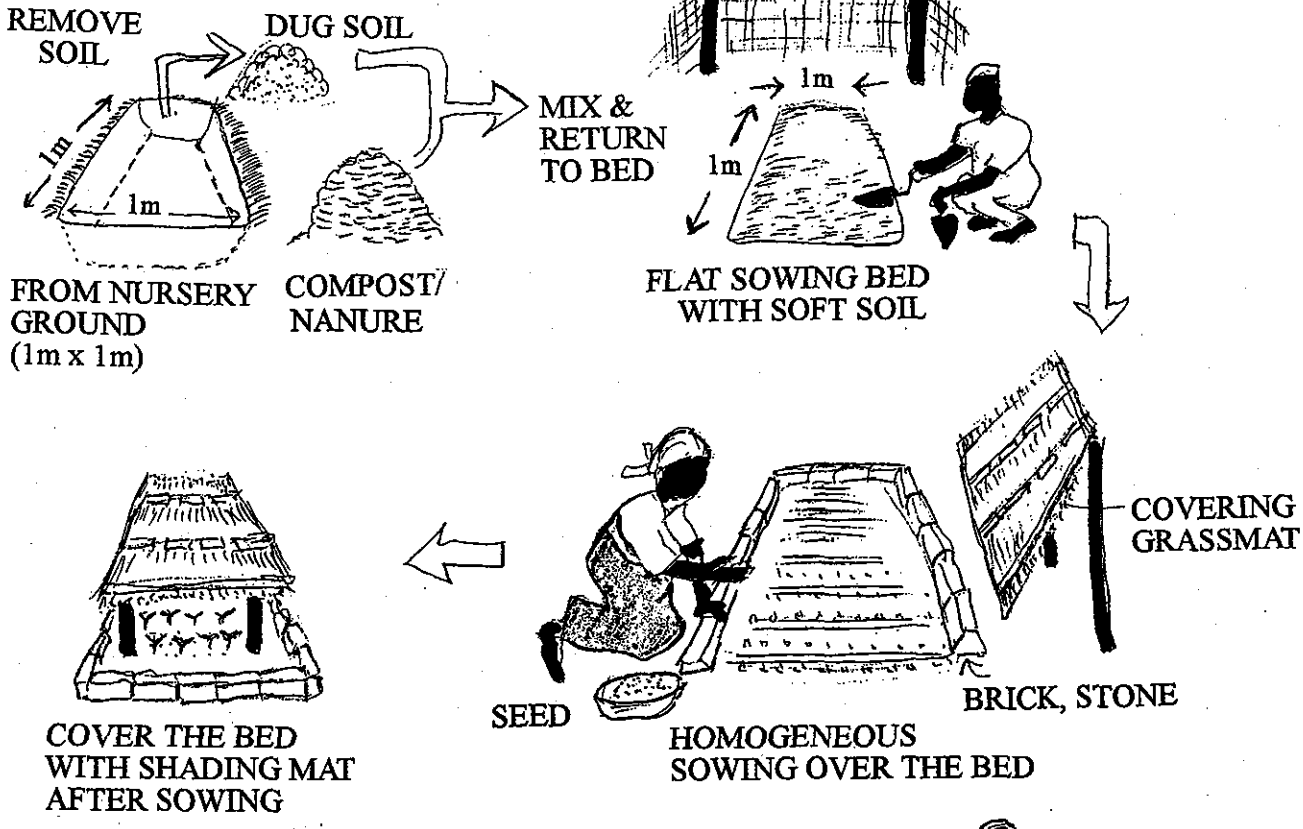
DON'T CUT

CUT
BELLY OF PODS

SEAM SIDE

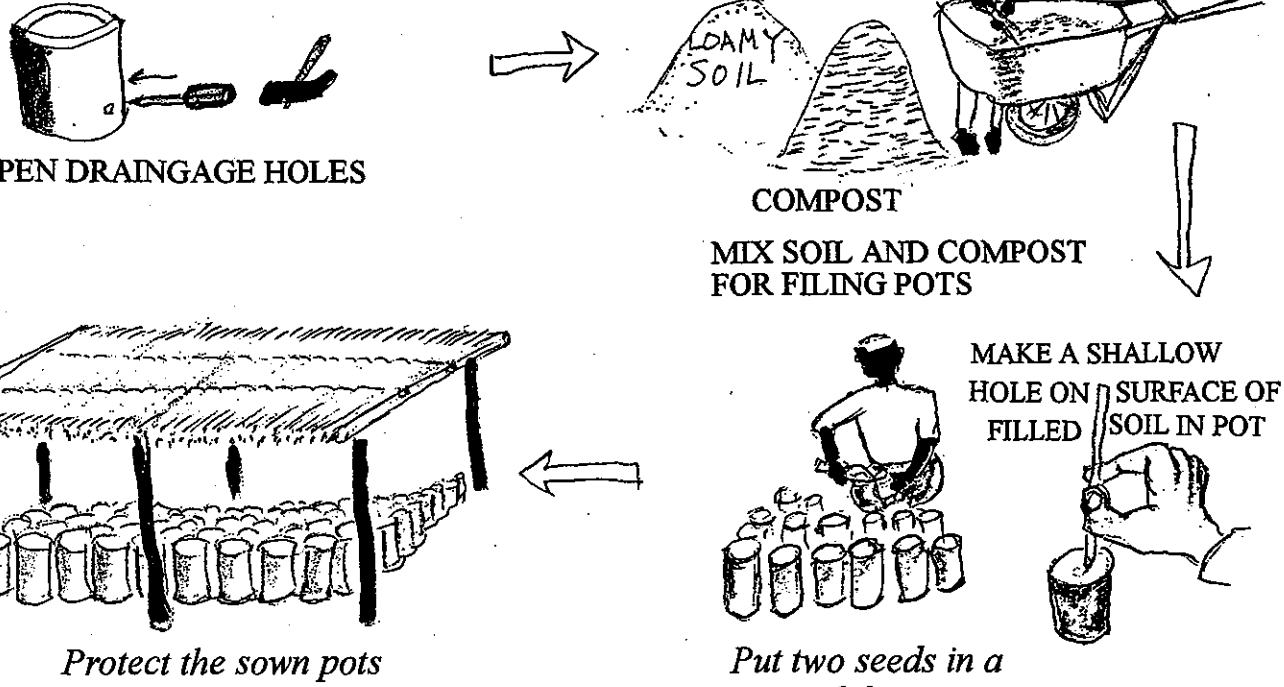
(1.4 Seed Treatment & Sowing–continued)

(3) Bed Preparation



(4) Direct Sowing to Pots

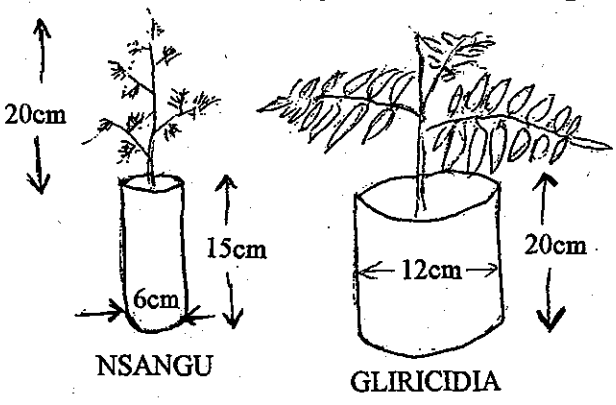
USE EMPTY CAN OR BOTTOMLESS POLY-POT

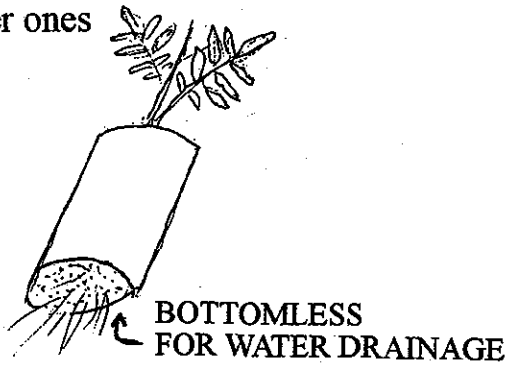


1.5 Transplanting to Pots or to Sapling-Beds

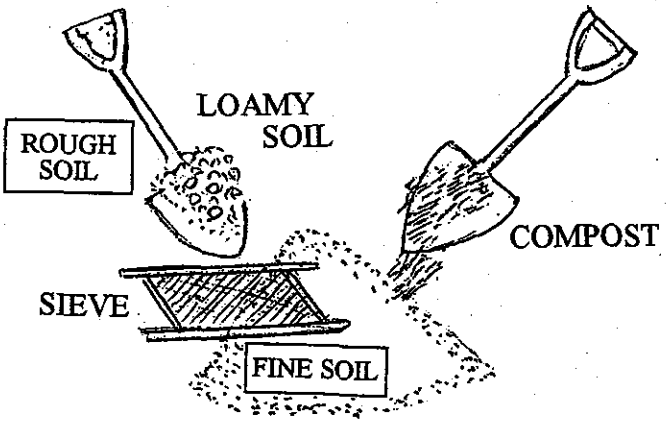
(1) Size of Pots

Smaller sized pots for early-planted seedlings
But larger ones for late-planted longer ones

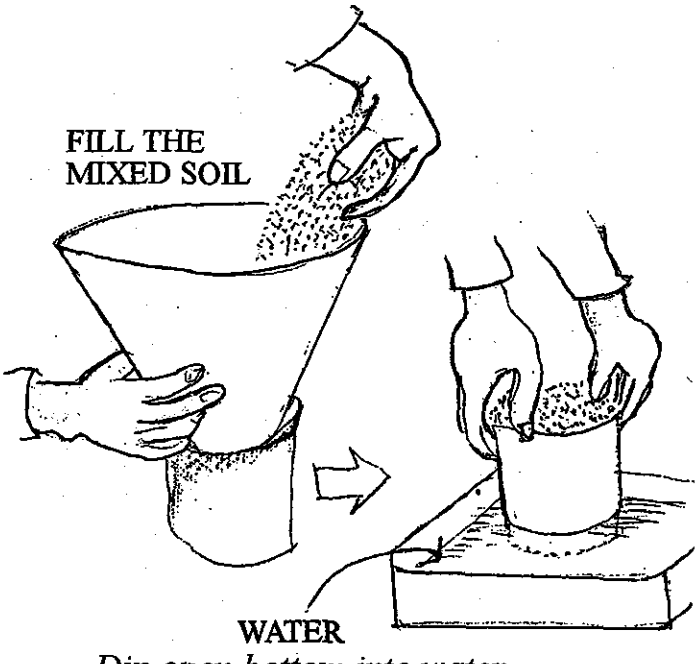




(2) Pot Filling

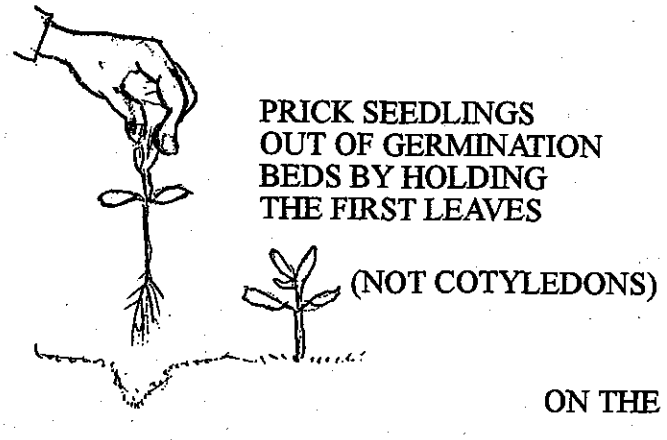


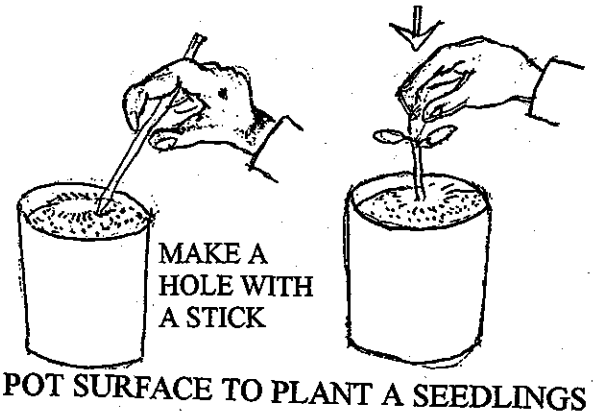
Prepare filling soil by mixing with compost should sieved before mixing



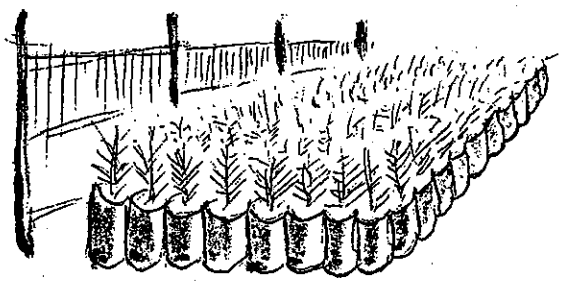
Dip open bottom into water to settle soil in packed pots

(3) Transplanting Seeds into Pots

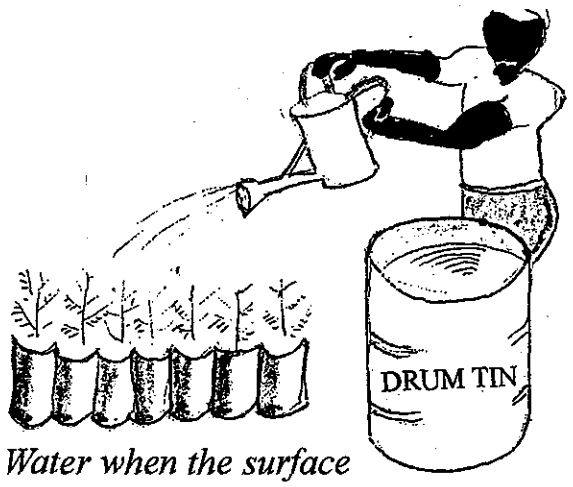




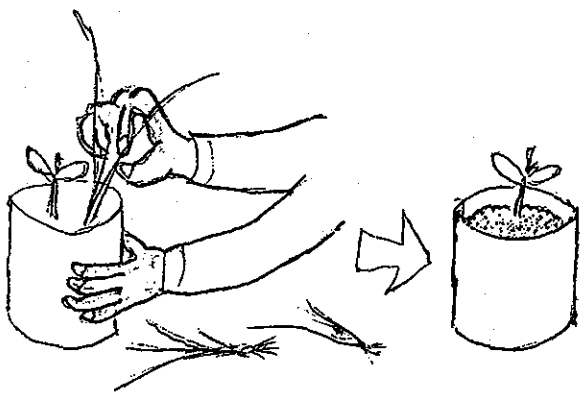
1.6 Care for Seedlings



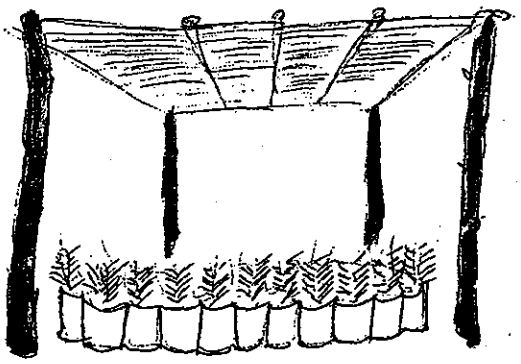
Align transplanted seedling pots in rows (the same spaces in batch)



Water when the surface of soil in pots dries



Pull out weeds from the sown/germinated pots



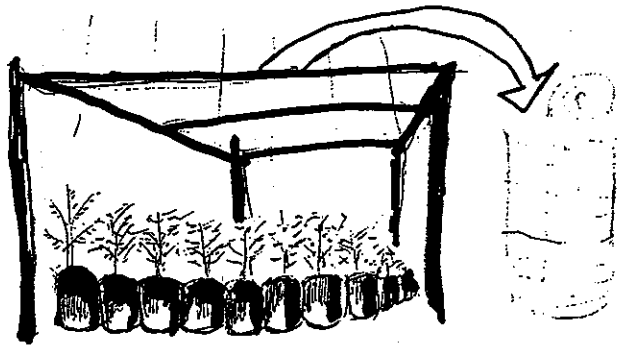
Cover with shading mats for weak seedlings

Cover pot soil

Cover pot soil with wood-ash to prevent ants

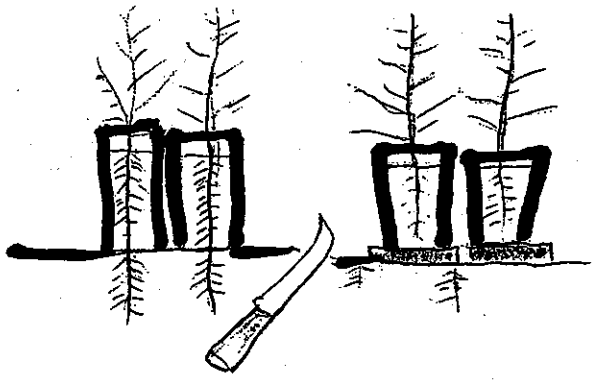
Garlic Juice

1.7 Preparations for Outplanting Seedlings to Woodlots/Cropfields/Homestead



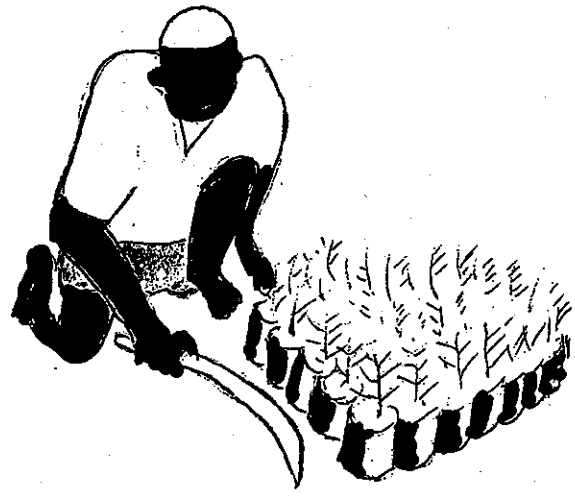
Take off shades and expose seedlings under the sun

Reduce watering so that the seedlings can withstand drought conditions (hardening)

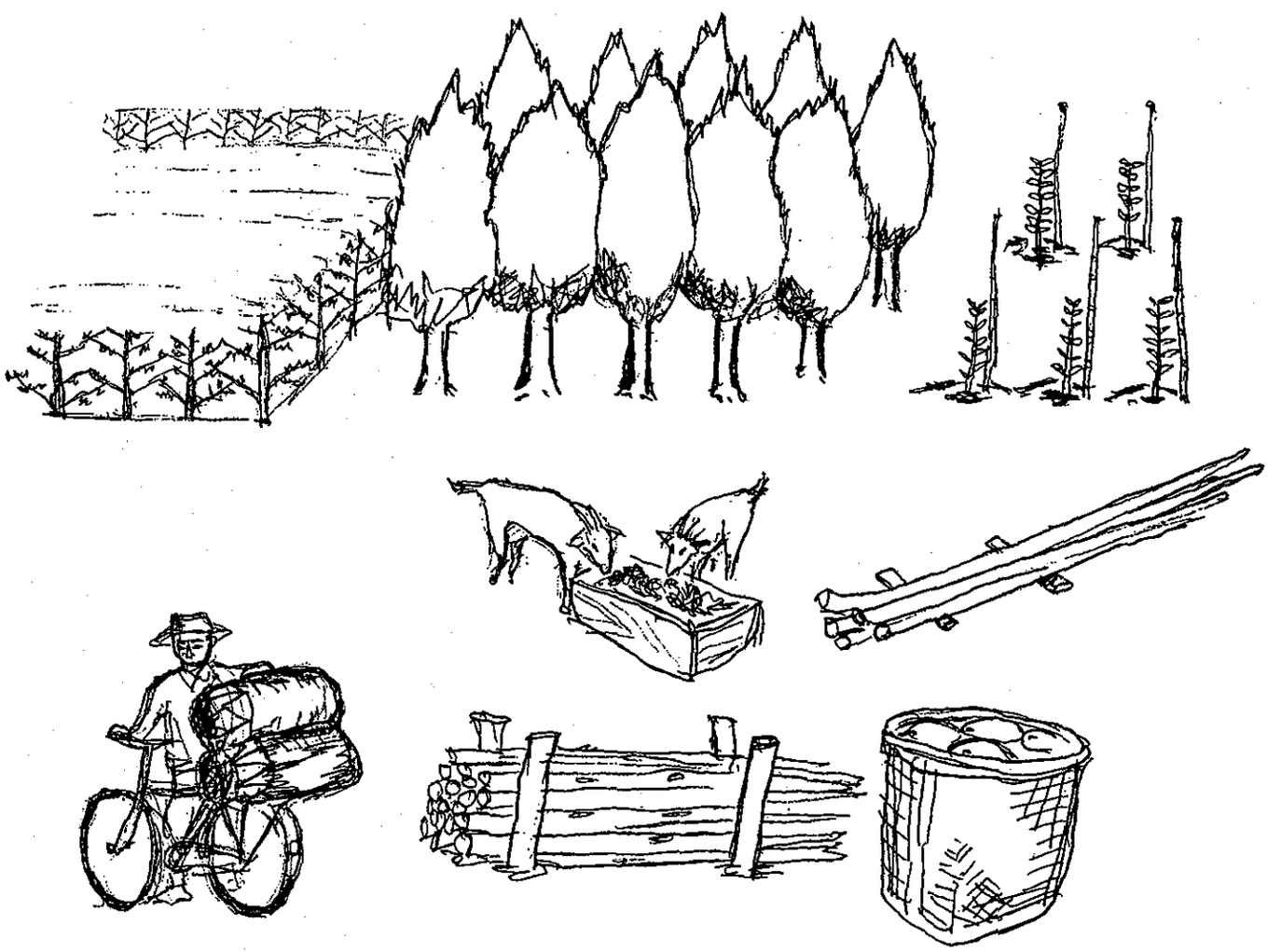


Root Pruning of stock in pots with a panga knife

Remove root pruned pots to dry ground



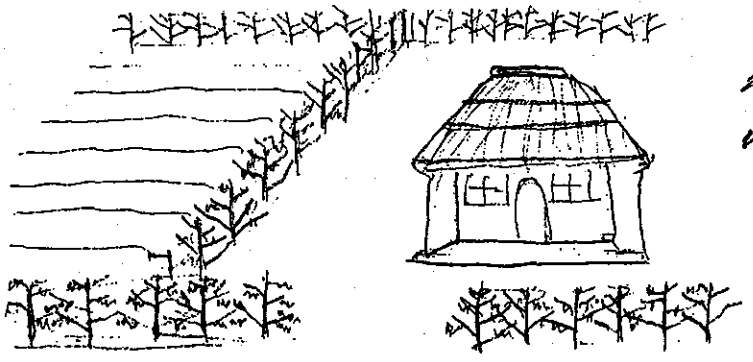
2. AFFORESTATION



2.1 Site Selection (A. Private, B. Community)

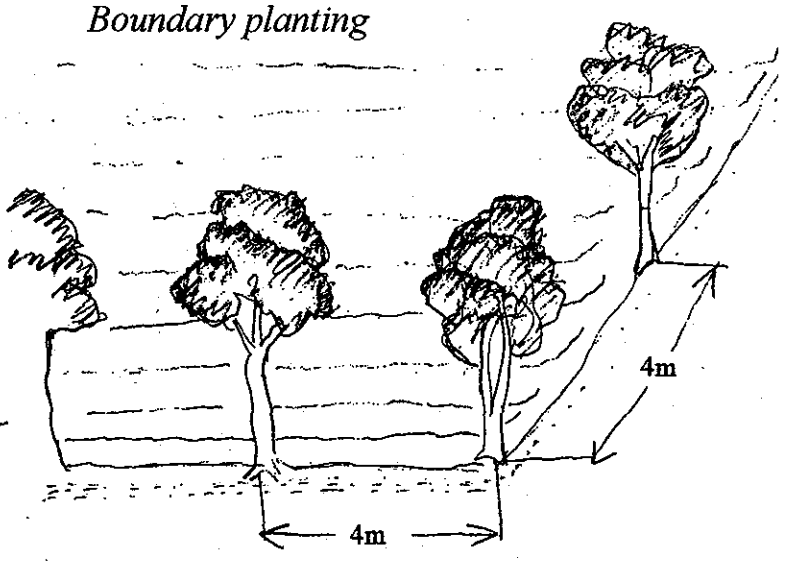
(1) Private Woodlots

Live Fences



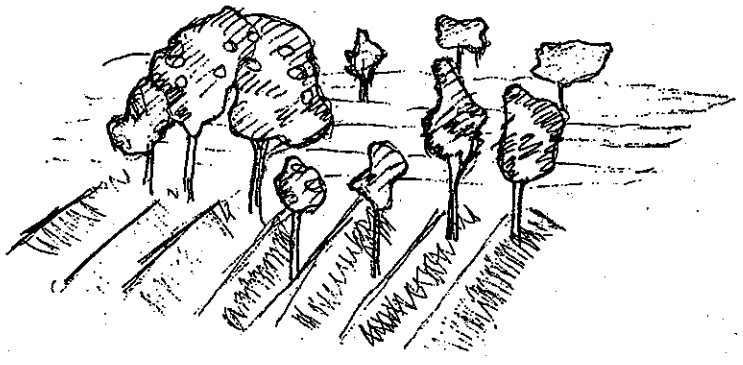
Live hedge is
- To make boundaries of farm plots, gardens/homestead
- To enclose animals

Boundary planting



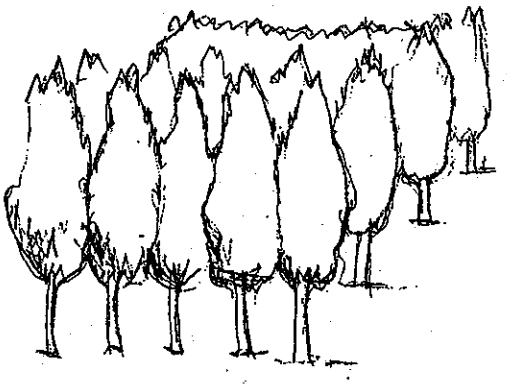
Boundary planting around farm with trees.
Tree products
- poles and fuel wood
-fruit, animal fodder, green manure

Trees protected in a farmer's field



To product natural regenerating trees in a farmer's field. As trees grow in size they also need attention to minimize shade effects on crops and to supply wood and other products

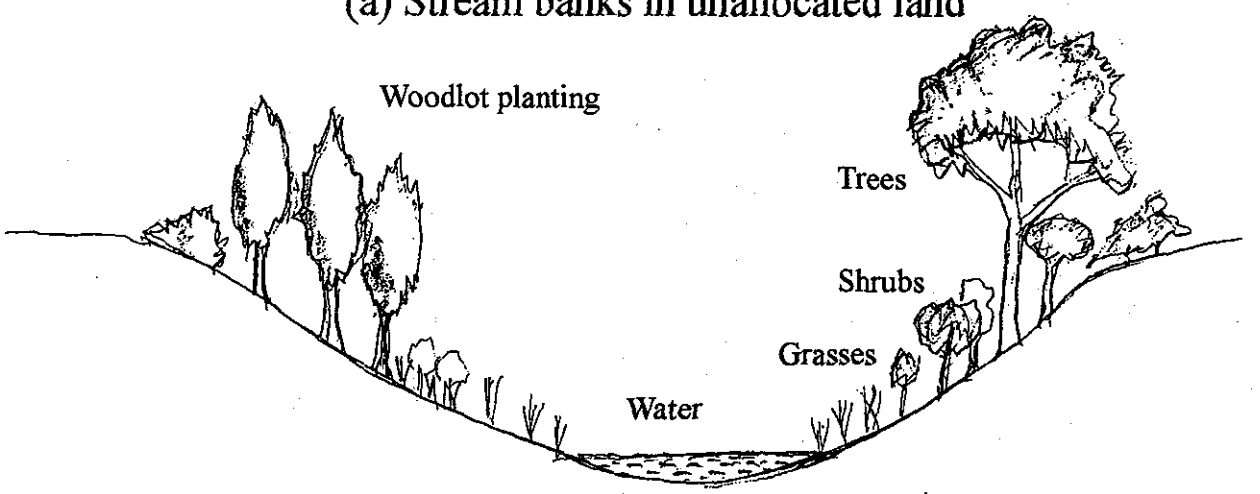
Woodlot planting



Woodlot planting
- for fuel wood 2x2m
- for poles 1x2m

(2) Community Woodlots

(a) Stream banks in unallocated land



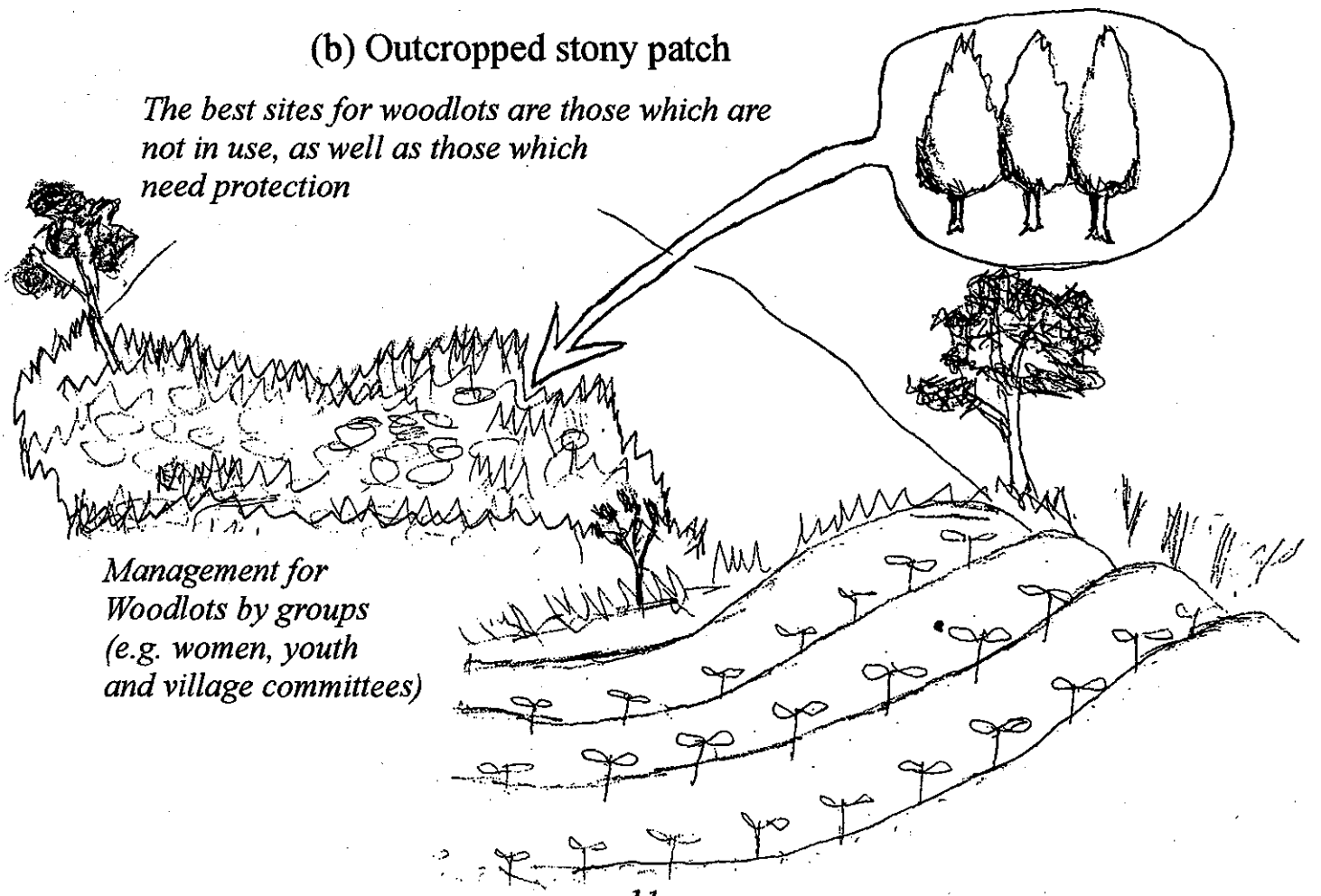
Stream banks are the most vulnerable land areas. Protection is vital to stabilize stream flow and reduce the risk of flooding and land slides.

- *Grasses: plant vetiver, napier or bamboo inside the strips*
- *Shrubs: sesbania sesban is ideal at a spacing of 1m x 1m*
- *Trees: plant in strips at 2m x 2m*

N.B. If you plant near streams remember that certain trees use more water and will reduce stream flow (particularly Eucalyptus species)

(b) Outcropped stony patch

The best sites for woodlots are those which are not in use, as well as those which need protection

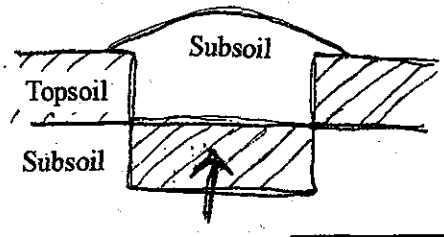


Management for Woodlots by groups (e.g. women, youth and village committees)

2.2 Manure/Trapping water

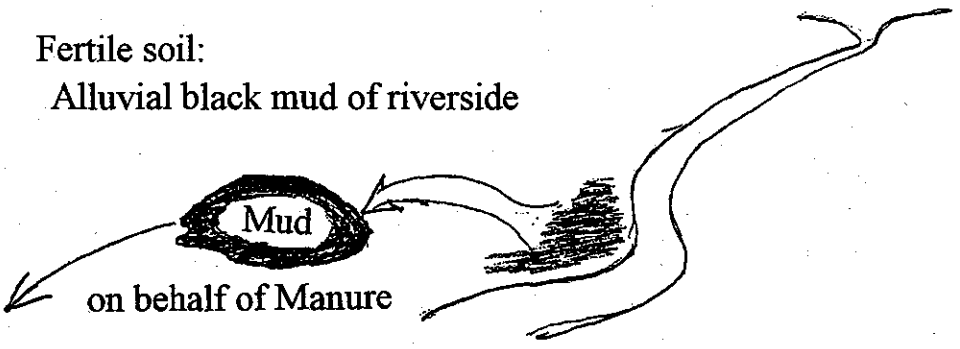
Good soils and water are basic elements for tree growing

Planting pit



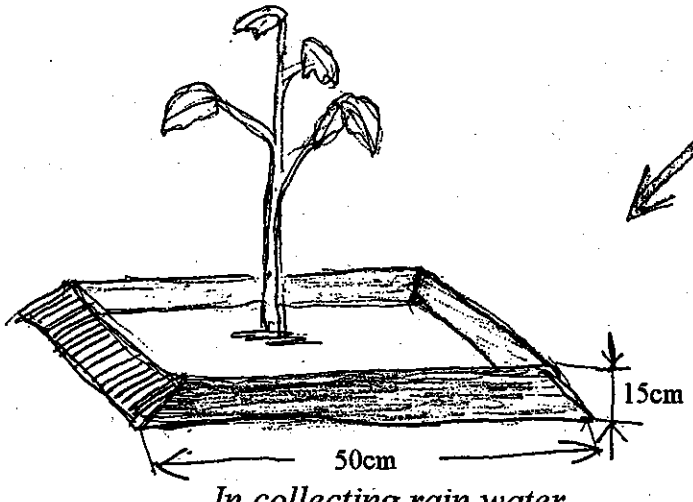
Topsoil + Manure

Fertile soil:
Alluvial black mud of riverside



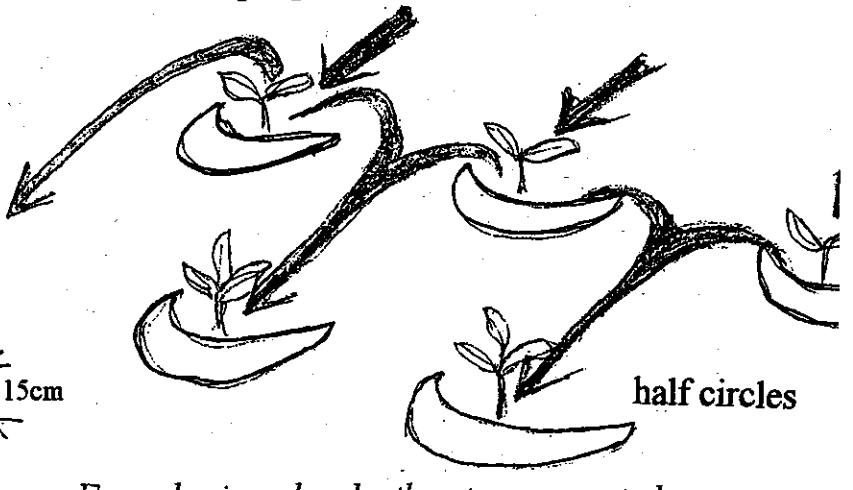
on behalf of Manure

Microcatchment/dam



In collecting rain water

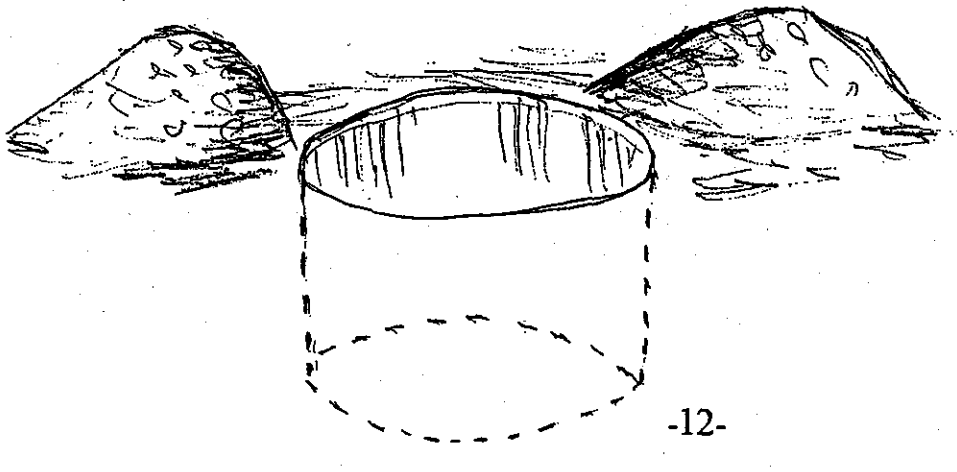
Alternate planting positions on sloping land



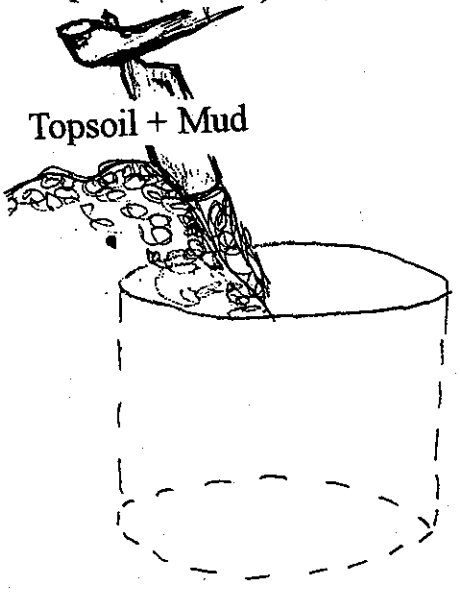
For sloping land, the trees must be planted in alternate positions so that most of rain water is used effective

2.3 Plant and pit digging

Dig pit 60cm x 60cm in diameter
Separating the topsoil form the subsoil

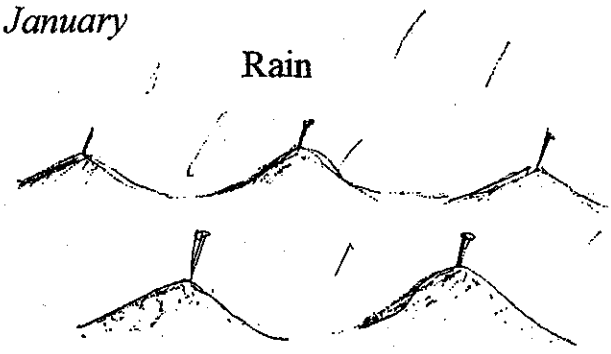


Fill in the hole starting with the topsoil (+ mud)

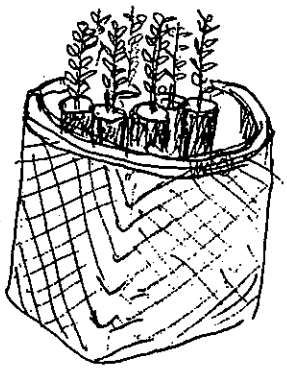


2.4 Out planting

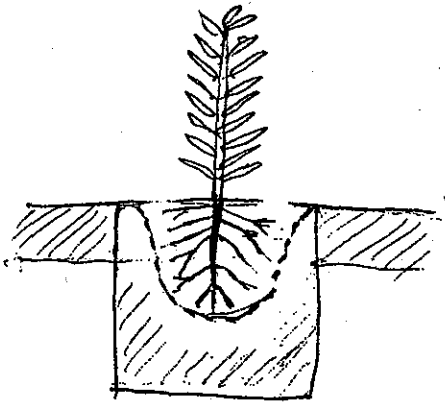
Time of planting: the start of the Rains by mid-December or early January



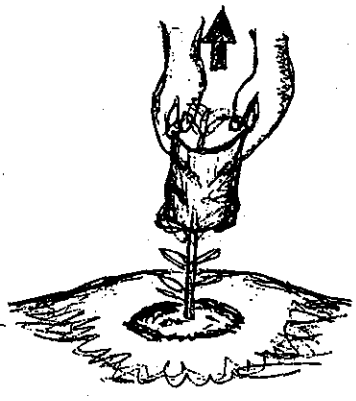
Transport seedlings to the planting site in a basket



Make hole in the center of a planting pit

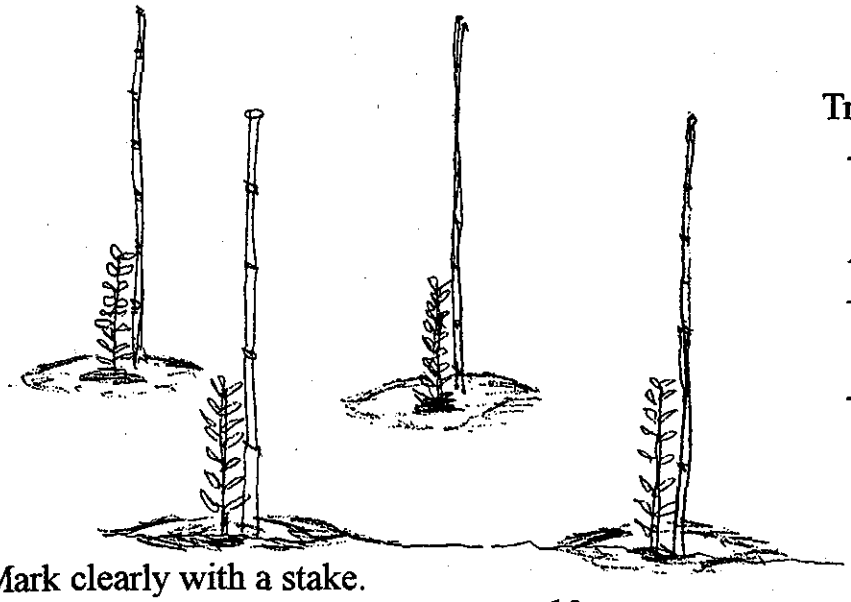


Dig a hole roughly 30cm In depth and 30cm in width



Remove the container lest the growth is retarded after transplanting

Firm the soil around the seedling



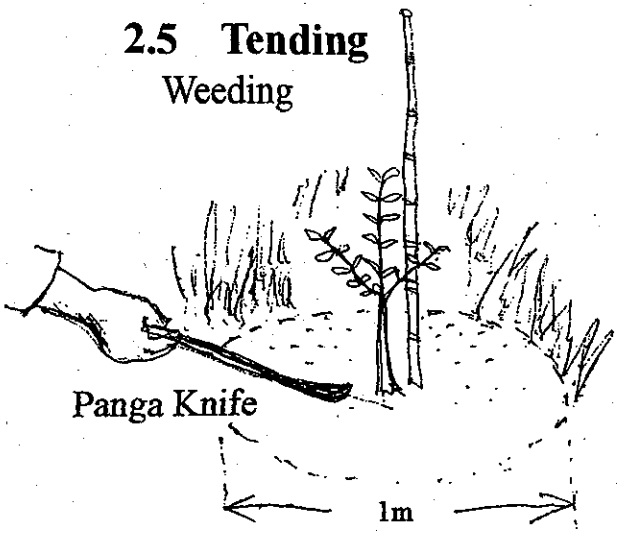
Mark clearly with a stake.

Tree spacing:

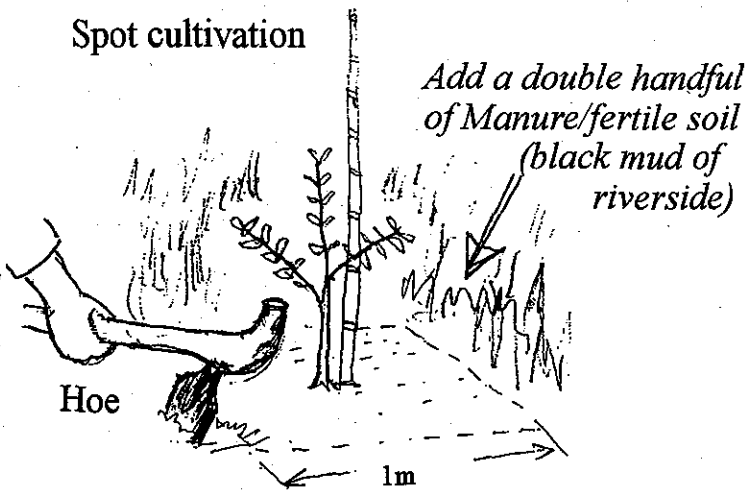
- *Wood lot: 2 x 2m for fuel wood, 1 x 2m for pole*
- *Around homesteads: 2 x 4m for apart*
- *Live fences: 0.4m apart for hedges; 1m for posts*

2.5 Tending

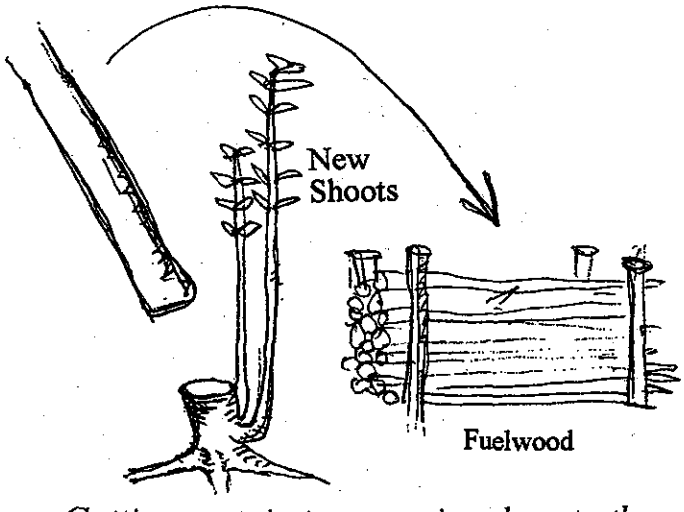
Weeding



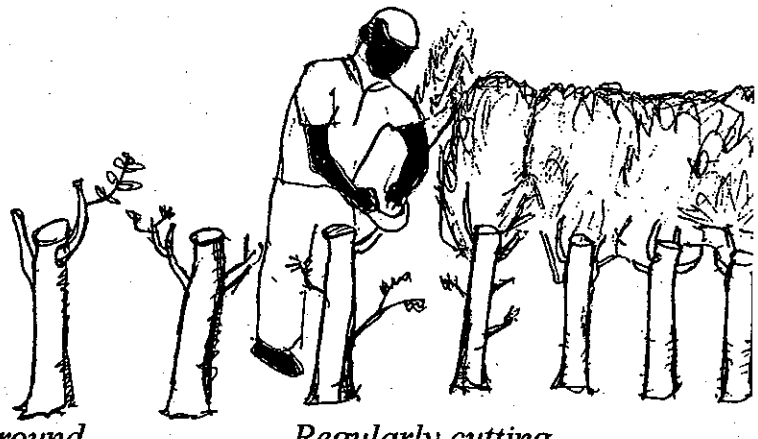
Spot cultivation



2.6 Coppicing/pollarding



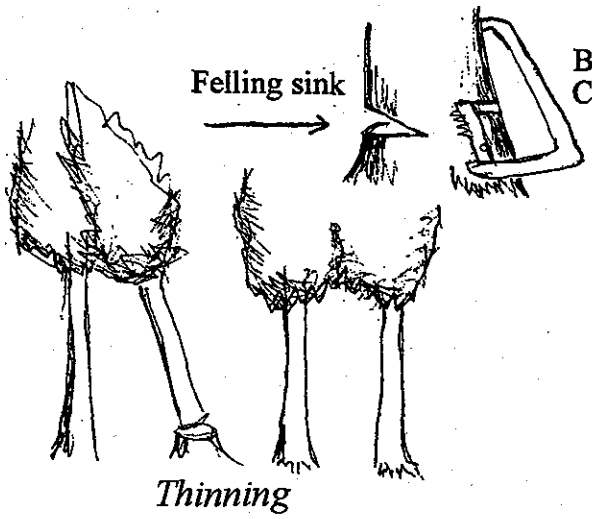
Cutting certain tree species close to the ground level to produce new shoots from the stump



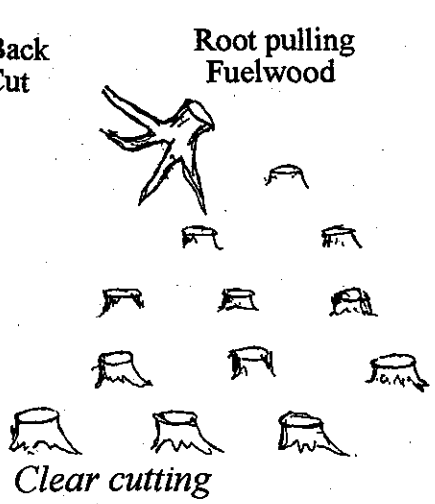
Regularly cutting back the shoots

2.7 Regeneration

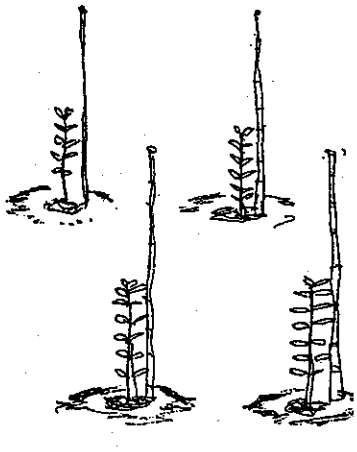
Thinning/Clear cutting/Replanting



Thinning



Clear cutting



Replanting

3. AGROFORESTRY PRACTICES

Table: Common fruit tree species for homestead planting and other use

Botanical name	Local name	Fuel wood	Timber/ furniture	Fodder	Medicine	Growth rate
Acacia galpini	Mkunkhu	x	x	x		Fast
Acacia polycantha	Mthethe	x	x	x	x	Fast
Acacia seiberiana	Minganzolo	x	x	x		Medium
Afzelia quanzensis	Msamba mfumu	x	x	x	x	Medium
Albizia lebbeck	Mtangatanga	x	x	x		Fast
Albizia zimmermanni	Mtangatanga	x	x	x		Fast
Bauhima thonningii	Chitimbe			x	x	Medium
Erythrina Abyssinica	Muwale			x	x	Medium
Ficus natalensis	Kachere		x	x	x	Fast
Khaya nyasica	Mbawa	x	x		x	Fast
Senna Siamea	Keshya wa milimo	x	x		x	Fast
Senna spectabilis	Keshya wa maluwa	x	x			Fast
Terminalia sericea	Naphini	x	x		x	Medium
Toona ciliata	Sendrella	x	x		x	Fast

Malawi Agroforestry Extension Project 'best-bet agroforestry and soil conservation practices

3.1 Selection of Species Seed Bank

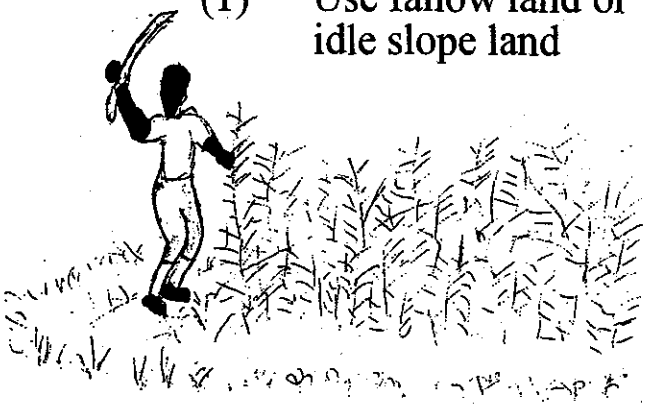
Crop-land type-agroforestry species

Recommended species	*Land type*	*Crop to be combined*
1. Gliricidia sepium	flat & moist/medium	Maize, Sorghum
2. Sesbania sesban (Jelejele)	flat/sloppy & dry	Maize, Cassava
3. Tephrosia vogelii	flat/sloppy & dry	Maize, sorghum
4. Leucaena leucocephala (lukia)	slop & moist	Maize, sorghum
5. Cajanus cajan (nandolo)	flat & dry	Maize, sweet potato, groundnut
6. Clotalaria juncea	sloppy & dry	Groundnut, millet, cassava

①Gliricidia ②Sesbania ③Tephrosia

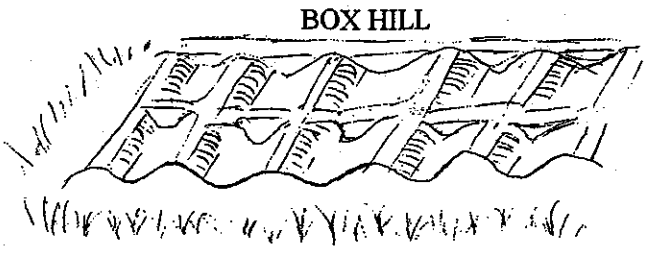
3.2 Land Selection & Preparation

(1) Use fallow land or idle slope land



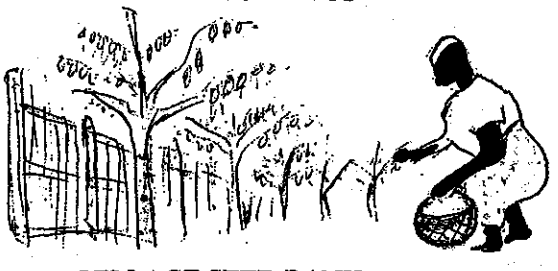
IDLE FIELD

Slash shrubs & plough into ridges

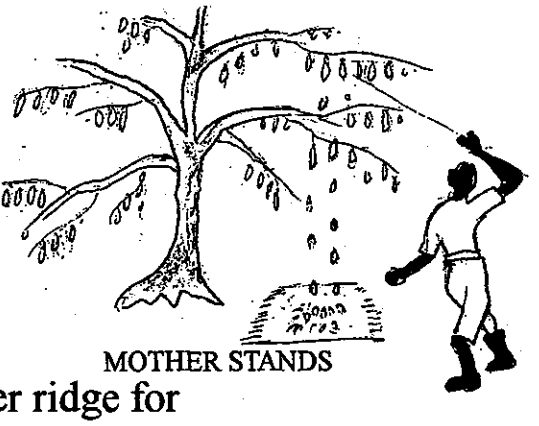


Tilling to ridged field

(2) Collect seeds from seed banks or mother trees



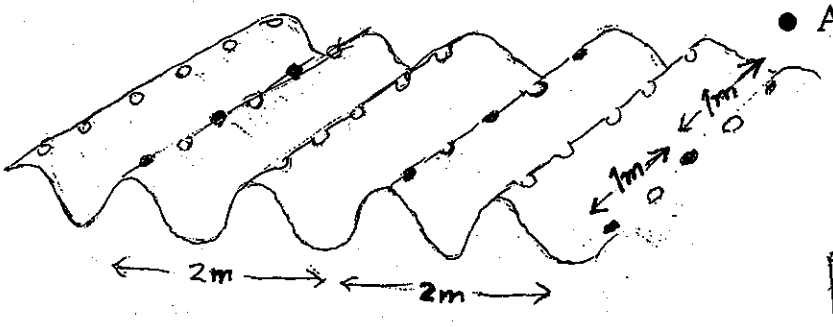
VILLAGE SEED BANK



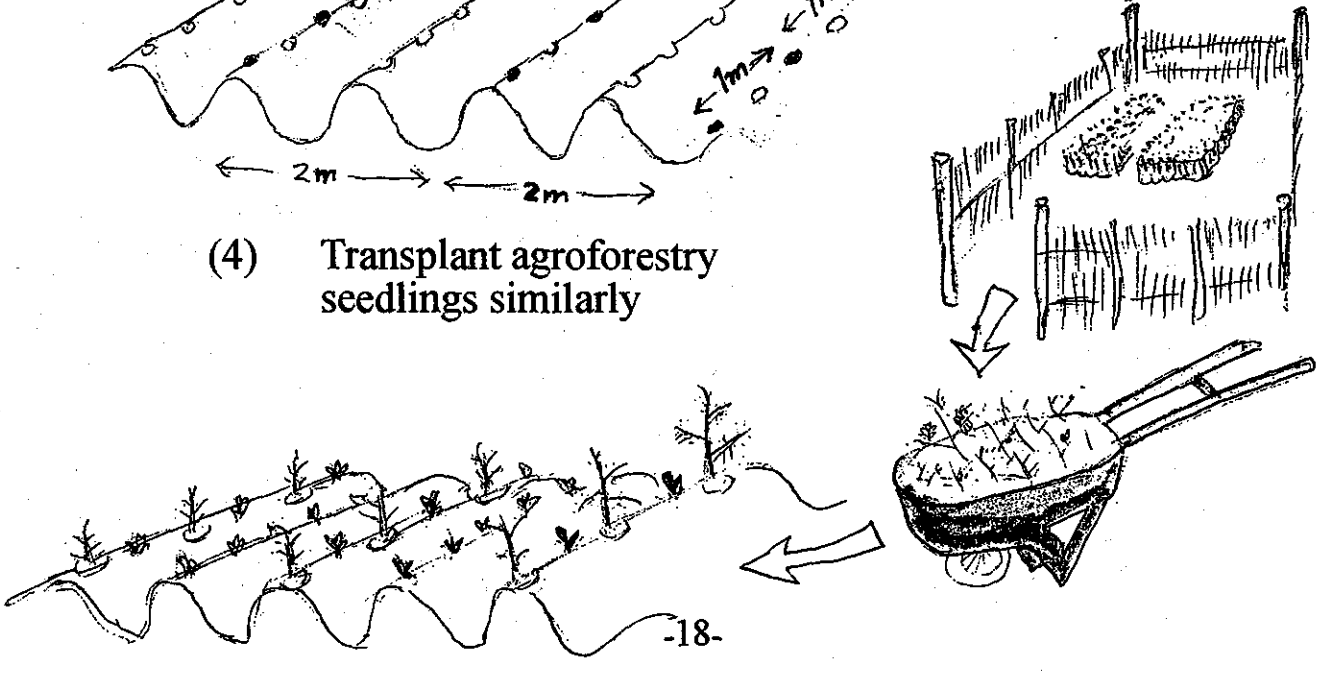
MOTHER STANDS

(3) Sow agroforestry seeds every other ridge for direct sowing

○ Chimang seed
● Agroforestry seed

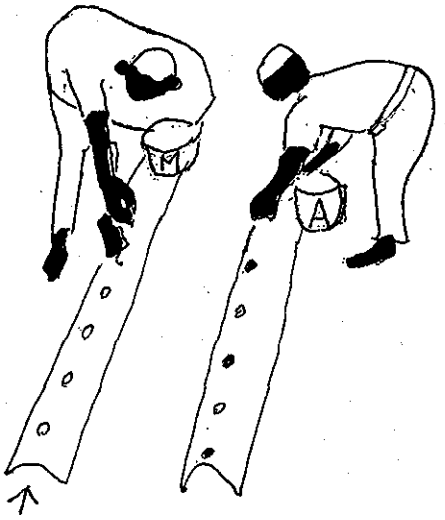


(4) Transplant agroforestry seedlings similarly

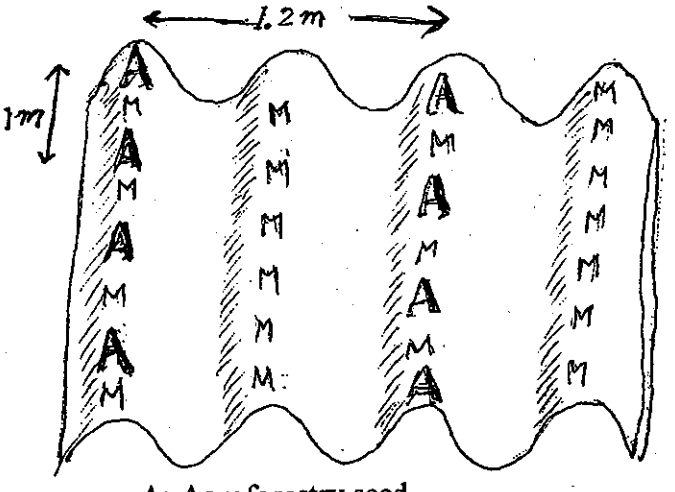


3.3 Sowing or Planting Cuttings

(1) Sow agroforestry seed every other row at constant interval

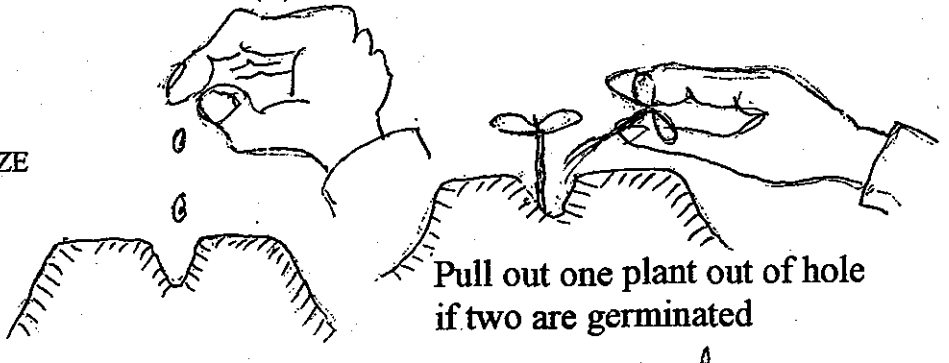


MAIZE ONLY AF + MAIZE



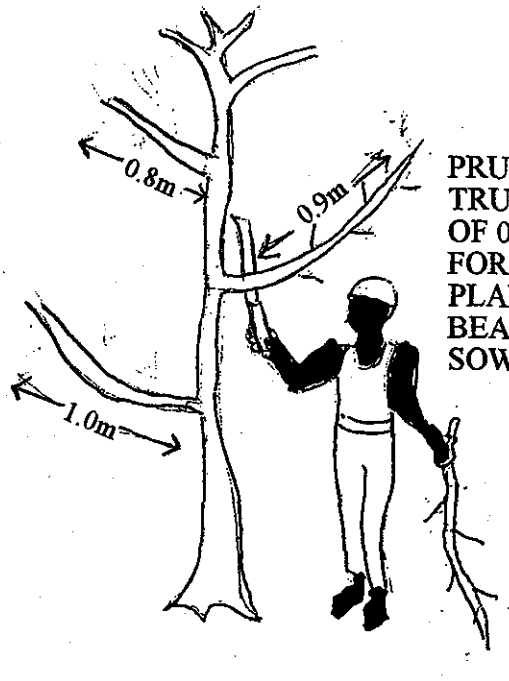
A: Agroforestry seed
M: Maize seed

(2) Sow two seeds in a sowing hole



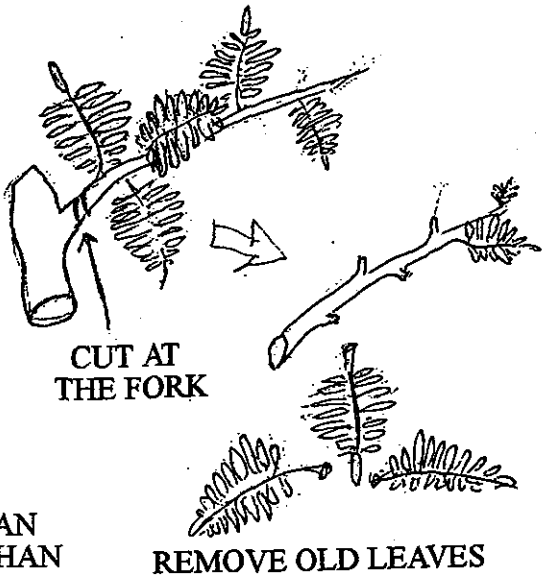
Pull out one plant out of hole if two are germinated

(3) Collect cuttings from adult trees but not from seed bank trees



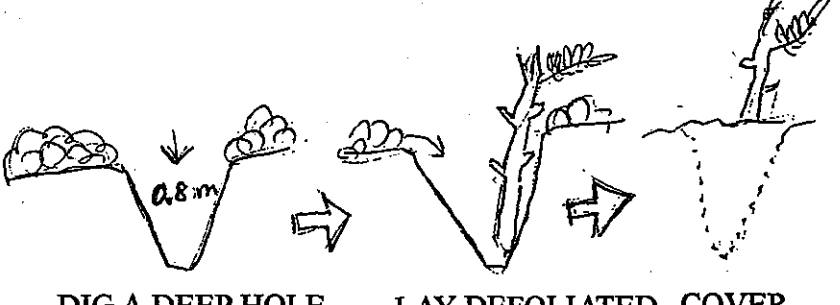
PRUNE TRUNCHEONS OF 0.8-1.0m LONG FOR CUTTINGS. PLANTED CUTTINGS CAN BEAR SEED EARLIER THAN SOWN STANDS.

(4)



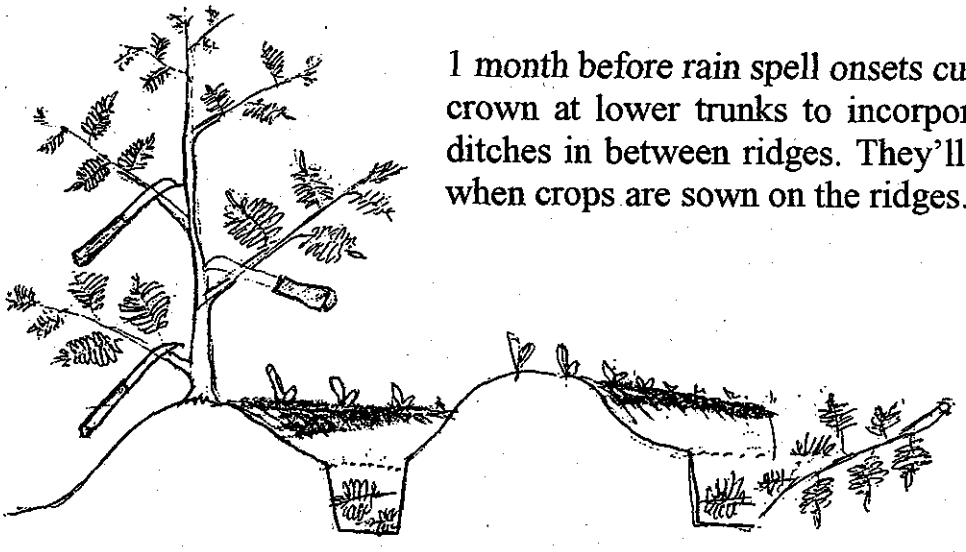
CUT AT THE FORK

REMOVE OLD LEAVES

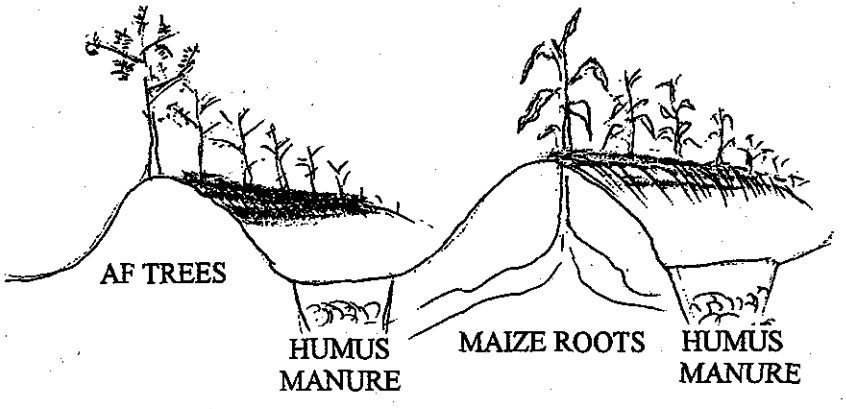


DIG A DEEP HOLE LAY DEFOLIATED CUTTING COVER SOIL

3.4 Biomass Harvesting & Incorporating



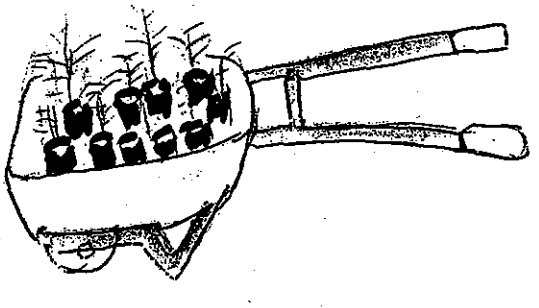
1 month before rain spell onsets cut branches crown at lower trunks to incorporate into nearby ditches in between ridges. They'll become humus when crops are sown on the ridges.



Green leaves and branches provide more nutrition to crops than dried up branches and withered away leaves. Larger branches can also as nkuni.

3.5 Regenerating Agroforestry Trees

After 4-5 years of using manure old agroforestry trees are uprooted to regenerate by planting young seedlings or direct sown.



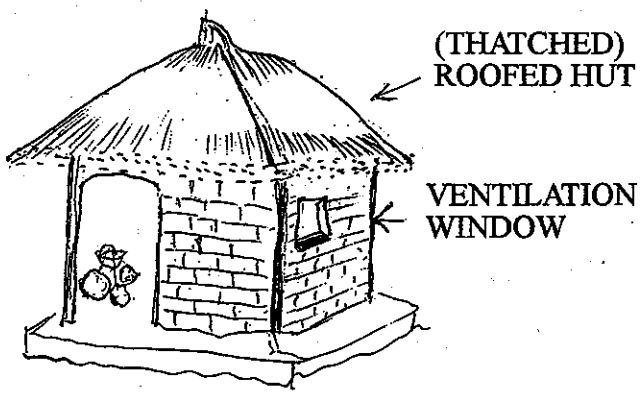
FORESTRY & AGROFORESTRY TECHNOLOGY

Tree Nursery Management & Planting Pattern

Tree Species	Month / Place	January	February	March	April	May	June	July	August	September	October	November	December
SF Acadia albida Eucalyptus camaldulensis	in Nursery bed						Prepare bed Collect soil Collect manure	Sow fast growing seeds Watering bed Weeding bed	Transplant seedlings				
	in Nursery tube	*Distribute* seedlings				Take care the nursery *Maintain* fence	Collect pots Collect soil *Collecti* manure	Filling pots with soil *Watering bed* Weeding bed	Transplant seedlings Watering pots Weeding pots *Shading* seedlings	Watering pots Weeding pots Shading *seedlings* Root pruning	Harden seedlings Start reducing watering *Weeding pots* Root pruning	Harden seedlings Select *seedlings* Root pruning	*Ditribute* seedlings
	in Field	*Out-plant* seedlings Fill them with pure soil	Make micro catchment Weeding	Make micro catchment Weeding	Weeding Watering	Weeding Watering	Weeding Watering					Select out-planting place Clear the places *Dig temporary* pits and fill them Mark the pits	Dig the former pits again *Out-plant* seedlings Fill them with pure soil
SF Afzelia quanzensis Bauhinia thonningii Khya anthotheca Melia azederach *Senna siamea* Senna spectabilis Terminaia sericea	in Nursery bed						Prepare bed Collect soil Collect manure	Sow fast growing seeds Watering bed Weeding bed	Transplant seedlings				
	in Nursery tube	Take care the nursery Maintain fence				Take care the nursery Maintain fence	Collect pots Collect soil Collecti *manure*	Filling pots with soil Watering bed Weeding bed	Transplant seedlings Watering pots Weeding pots Shading seedlings	Watering pots Weeding pots Shading seedlings Root pruning Start reducing watering	Harden seedlings Weeding pots Root pruning	Harden seedlings Select seedlings Root pruning	Ditribute seedlings
AF Gliricidia sepium Lanchocarpus capassa Moringa ofeifera Tamarindus indica	in Field	Out-plant seedlings Fill them with pure soil	Make micro catchment Weeding	Make micro catchment Weeding	Weeding Watering	Weeding Watering	Weeding Watering				Select out-planting place Clear the places Dig temporary pits and fill them Mark the pits	Dig the former pits again Start out-planting	Dig the former pits again Out-plant seedlings Fill them with pure soil
AF Tephrosia vogelii	Diresct sowing in Field	Cleanin field & Direct sowing		Weeding	Weeding Watering	Weeding Watering	Weeding Watering				Seed preparation	Select field Clean field	Clean field & Direct sowing

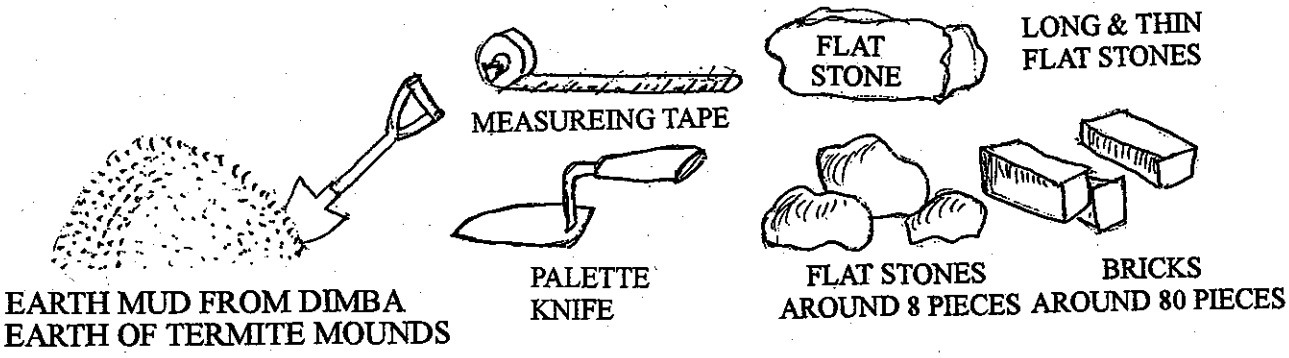
B. IMPROVED COOKING STOVE (ENZARO JIKO)

1. Selection of Place to Install Improved Stove

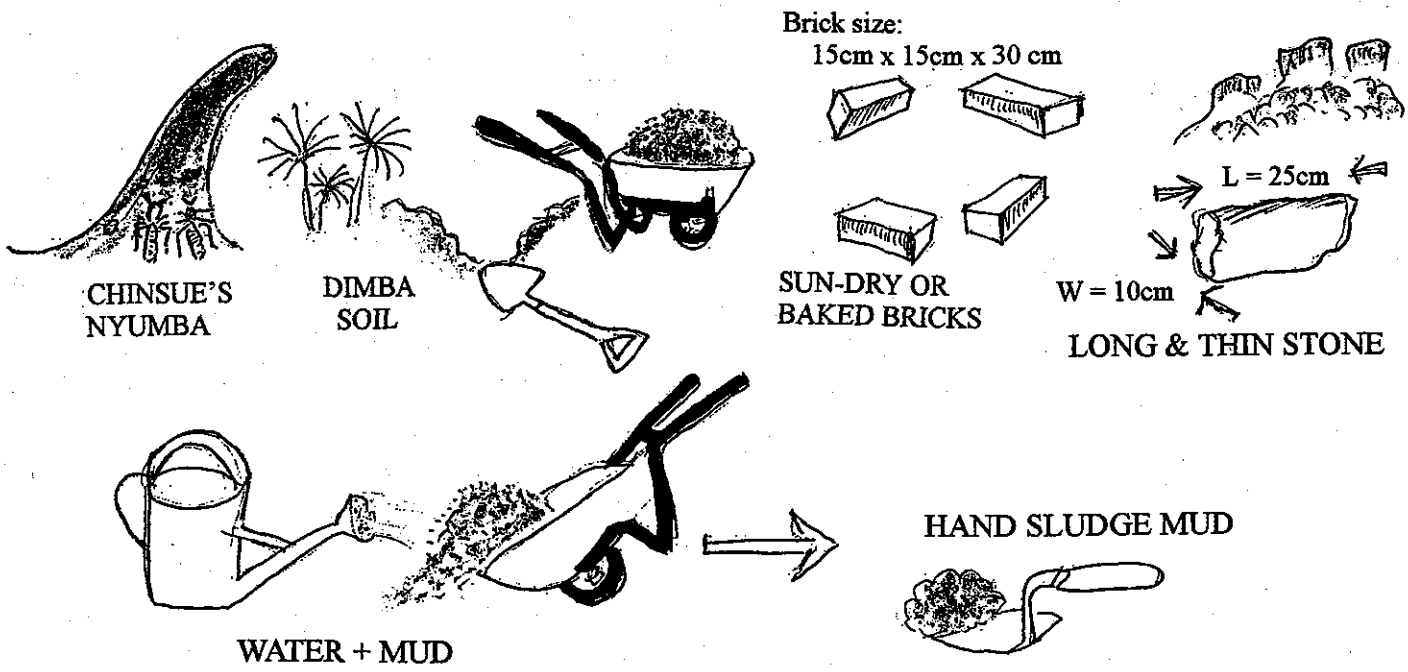


During rainy season it is better to cook in a kitchen hut rather than outdoor also it is desirable to have a ventilation window or some holes/chimney.

2. Material for Installing Improved Stove

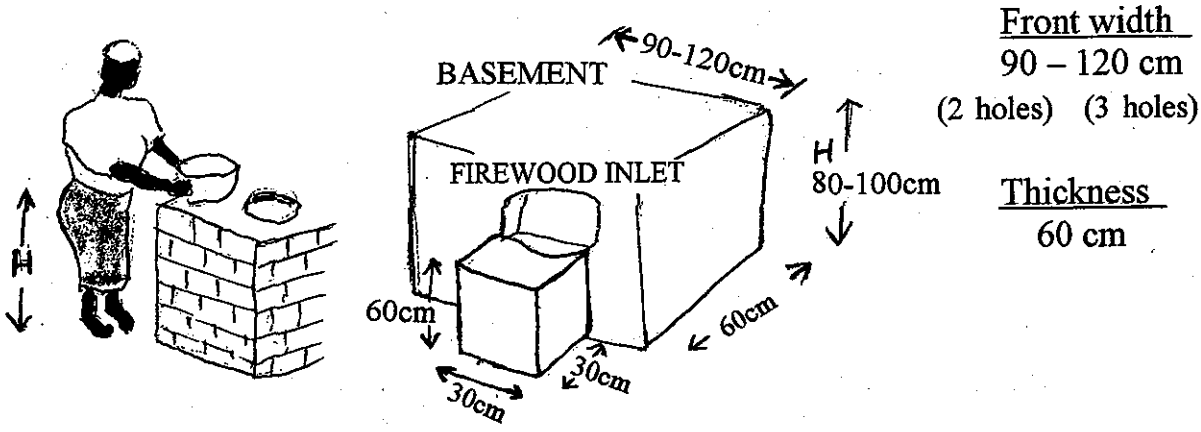


3. Provision of mud, bricks & stone pieces



4. Installation of New Improved Stone

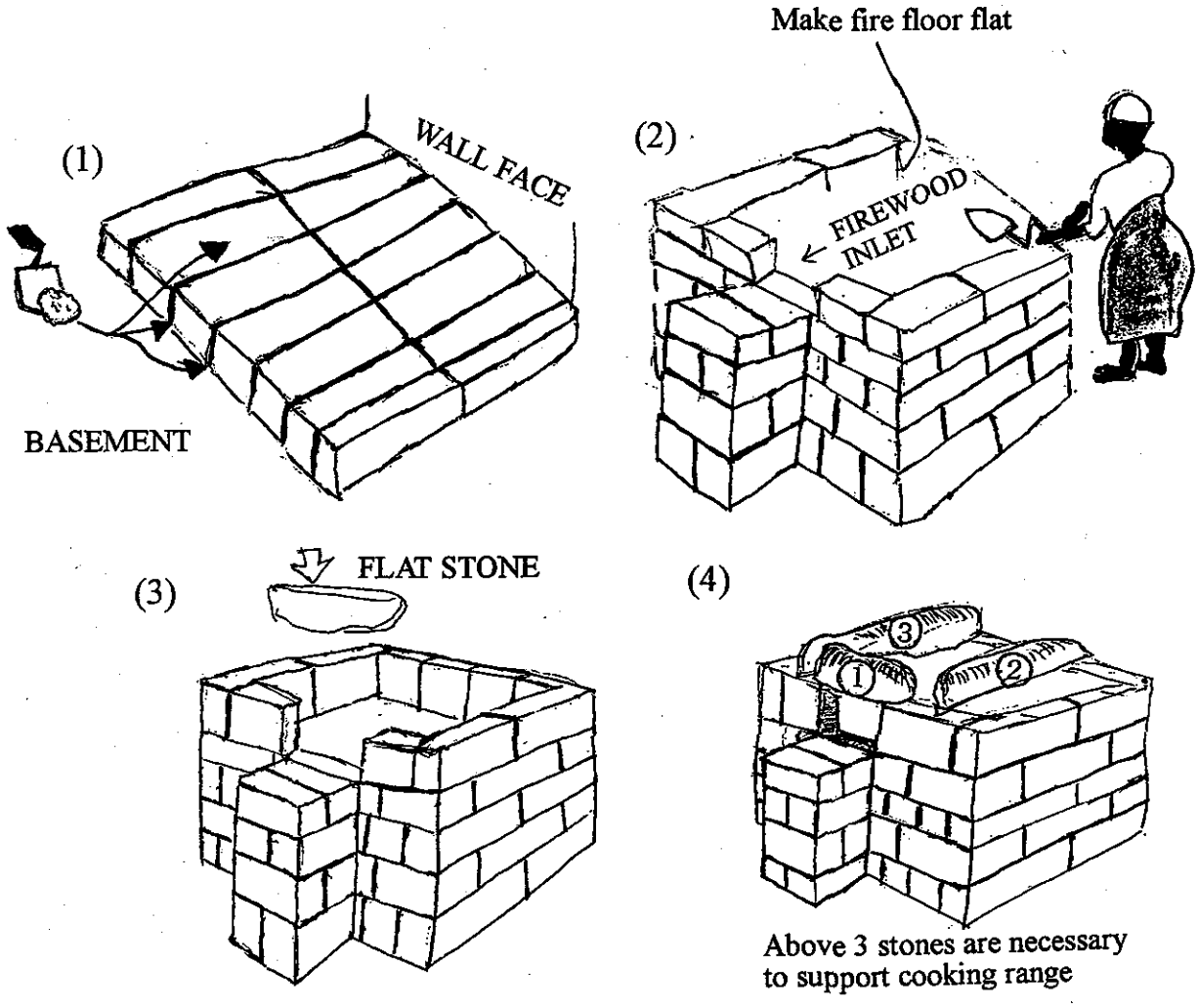
(1) The top height of the stove depends on the height of the user



Front width
90 – 120 cm
(2 holes) (3 holes)

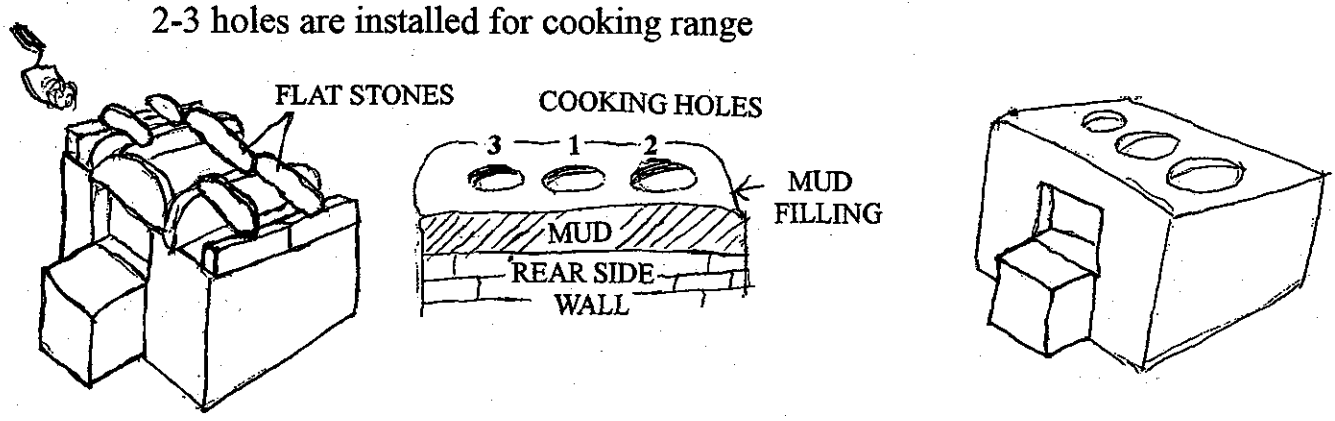
Thickness
60 cm

(2) Use of bricks

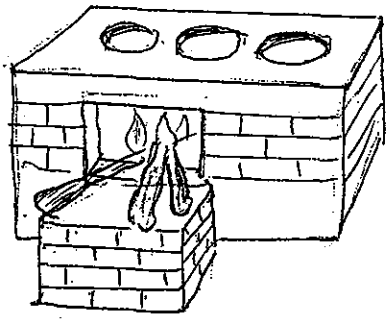


(3) Installing cooking range holes

2-3 holes are installed for cooking range



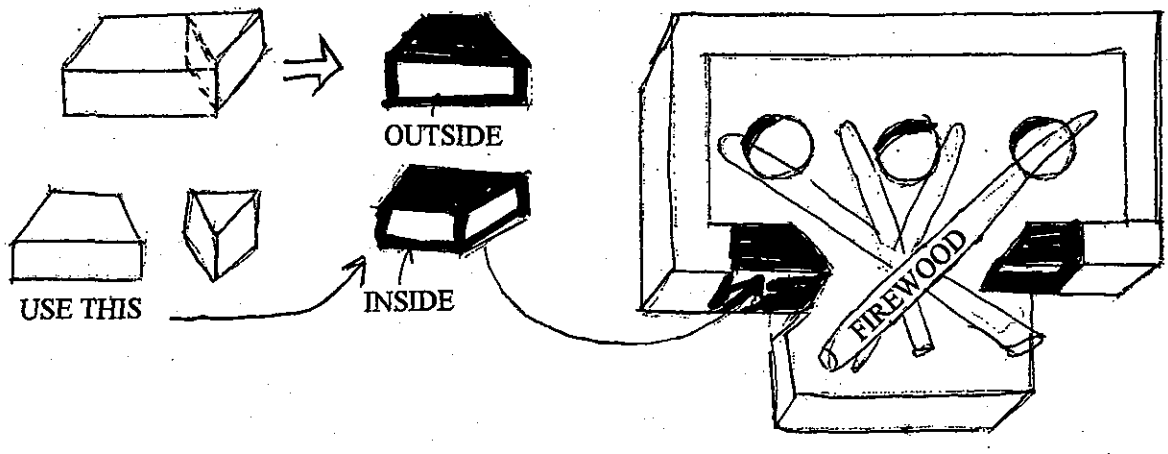
(4) Adding firewood supporting in front of firewood inlet



(5) Allow the installed stove to dry-up for 10 days before using

5. Rational Use and Maintenance

(1) Device: In order to allow uniform heat inside the furnace, deformed bricks can be placed in the firewood mouth.

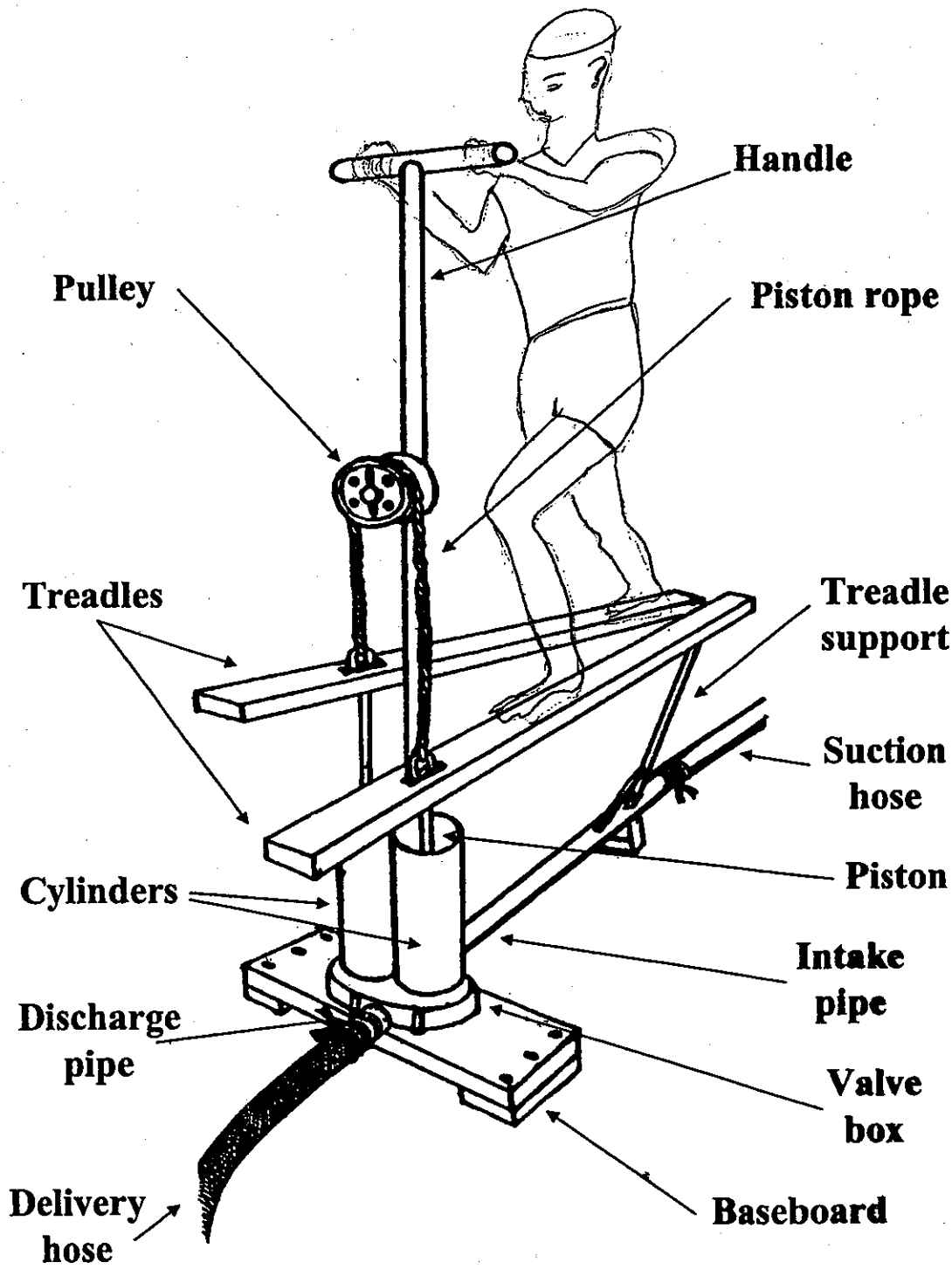


(2) Repair: The top part collapses down when stone pieces have crack by repeated heating, then it is necessary to collect again natural stone pieces to replace.

C. INCOME GENERATING ACTIVITIES

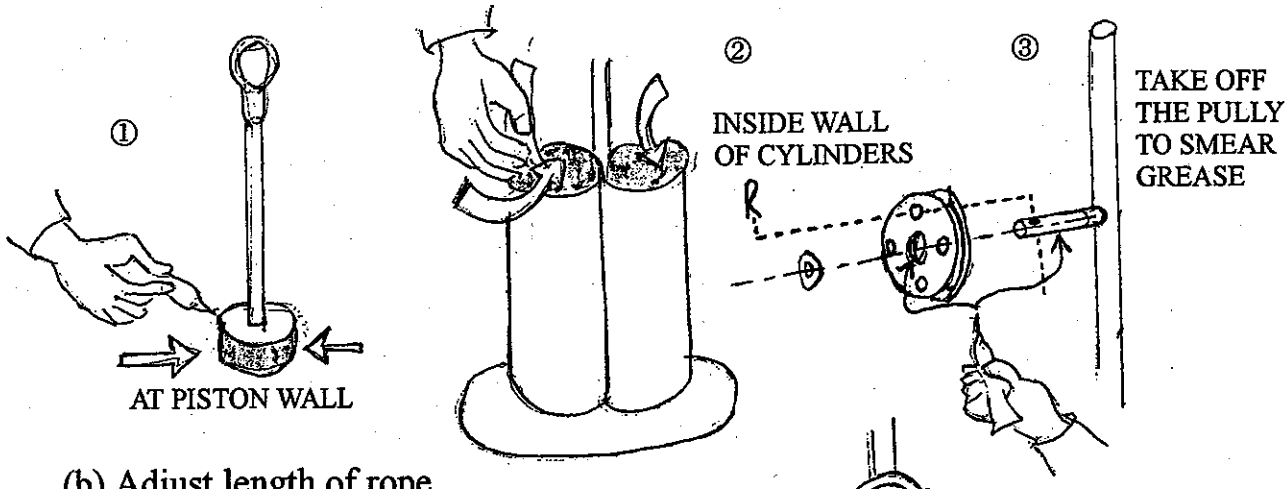
1. Small Scale Irrigation by Treadle Pump

(1) Structure of Treadle Pump



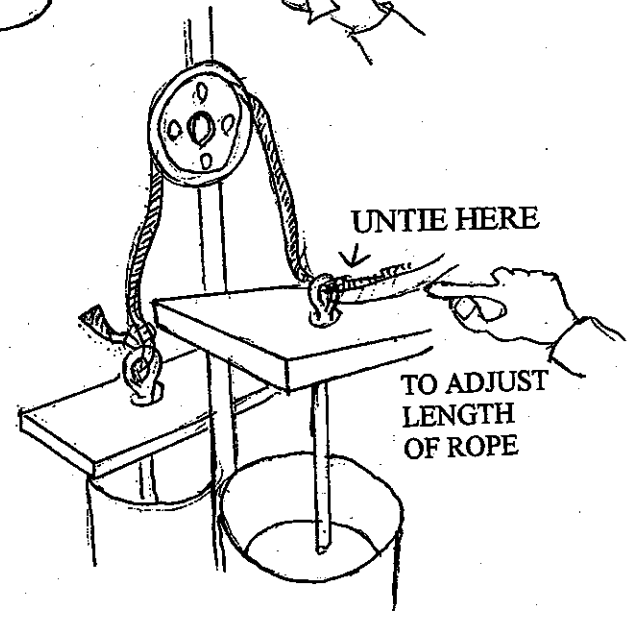
(2) Assembling and greasing

(a) The part of pistons is subject to friction heat.
Smear grease lubricate the part to make the pump last long.



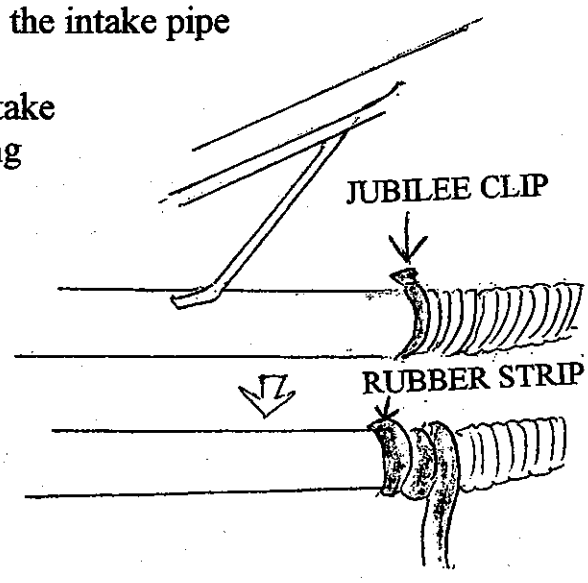
(b) Adjust length of rope around the pulley.

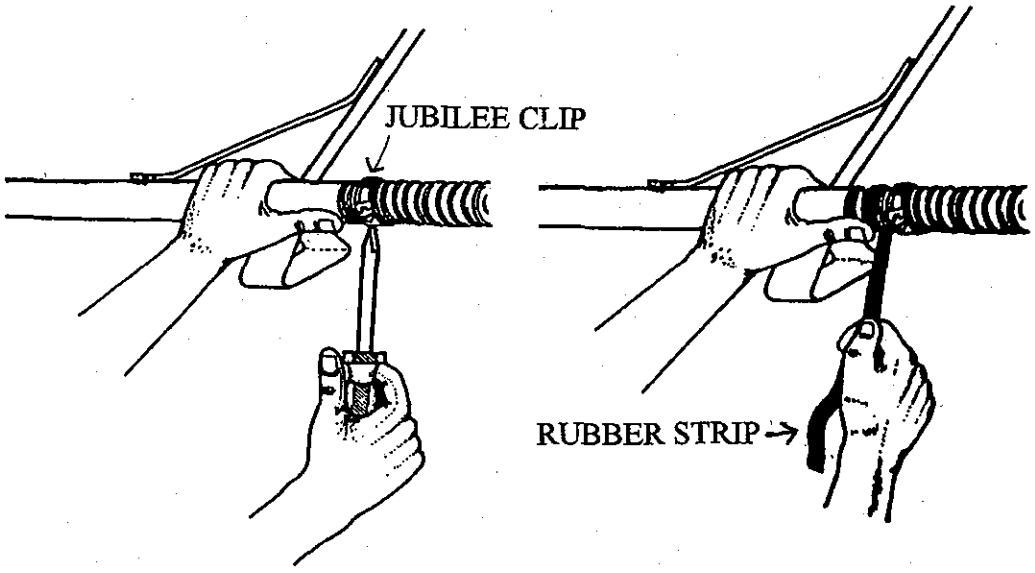
Unite either one tip of rope at the hole of cylinder rod. Then, fix the treadle board at the highest position and the other board at the lowest position. Tighten the rope and make a double knot to fasten rigidly to the cylinder rod.



(c) Connecting the suction hose to the intake pipe

Insert the suction hose to the intake pipe every time before use fixing on the pipe with a jubilee clip. Then make the connected joint air-tight with a rubber strip wound tightly on the joint.

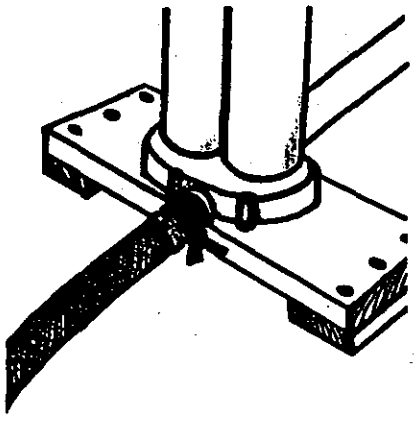




IF water fails to be lifted, please check the air-tightness of the part.

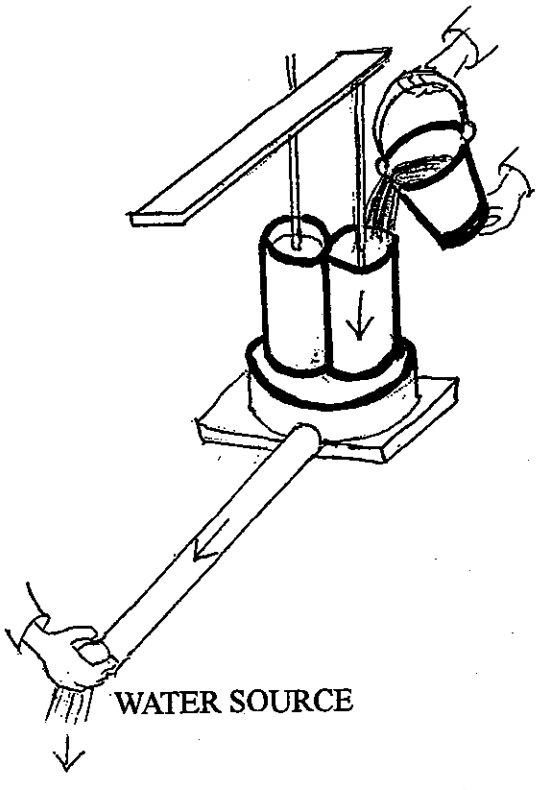
d) Connecting the delivery hose to tube

Connect the delivery hose to the discharge tube on the pump with a jubilee clip. Then make the connected part air-tight with a rubber strip wound tightly over the joint.



e) Trimming the pump

Two farmers are paired to start water lifting one pours water in two cylinders to fill water in the suction pipe-tube.
The other hold the end of suction at the water source.



When air inside the suction Hose completely evaluated. The farmer holding the tip can dip it into water source and water can be lifted using the treadle boards.

Storage

- Keep the cylinder upside down to dry
- Remove pistons from cylinder to maintain original shape

Water Channels

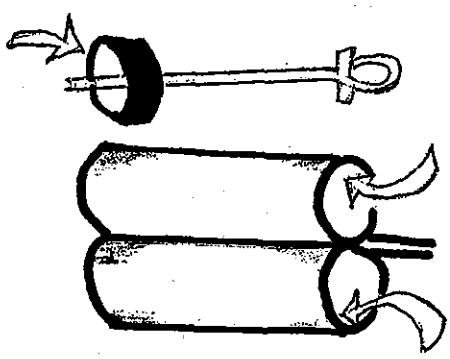
- Line them up with plastic sheet
- Reduces water loss through seepage
- Erosion of the channel

(3) Maintenance

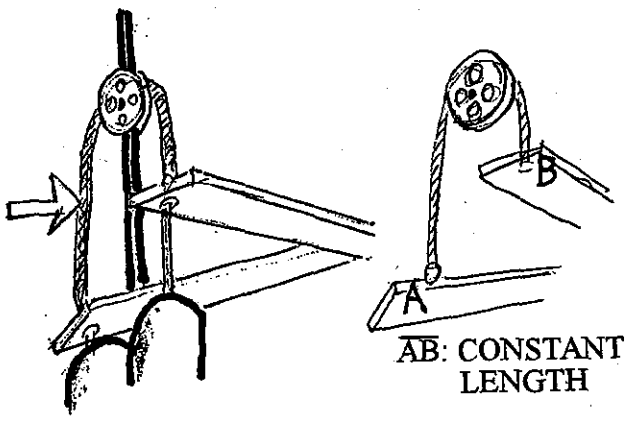
(a) Always smear grease

① Piston Seals

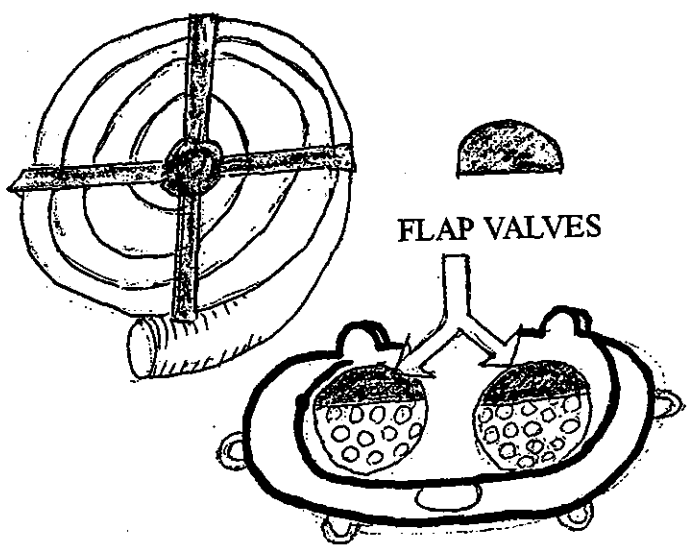
② Cylinder Wall



(b) Adjust Rope Length



(c) Rewind Delivery Hose in Roll after Use



(d) Check Flaps in the Valve for Robbish and Change Them When Worn Out.
Tighten the bolts holding the valve if loose

Apart from basin beds, other crops like maize can be planted in ridge fallow. The adjacent ridges hold the water.

MUST KNOWS

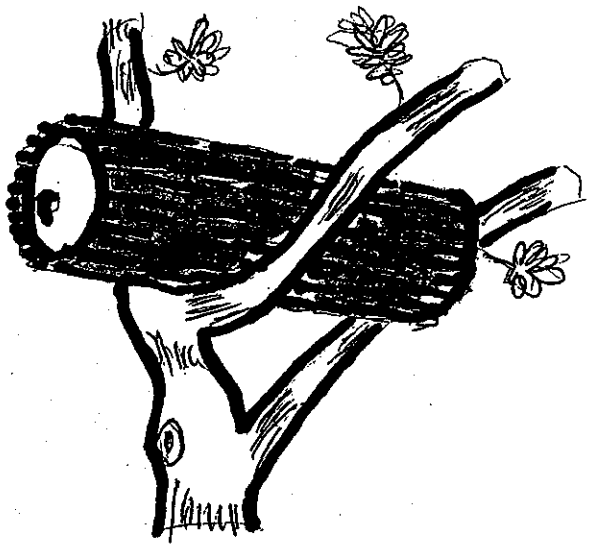
- The longer the delivery hose, the more force needed to pump water
- The higher the gradient for delivery, the more force needed to pump water

2. Bee-Keeping

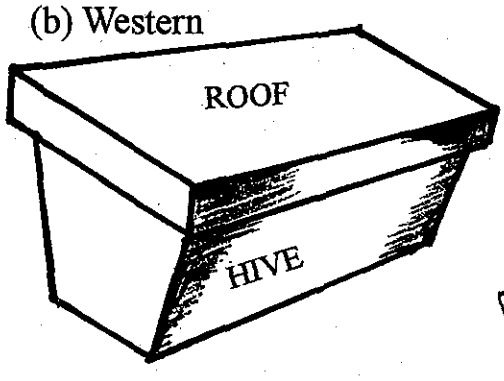
(1) Type of bee hives

(a) Traditional

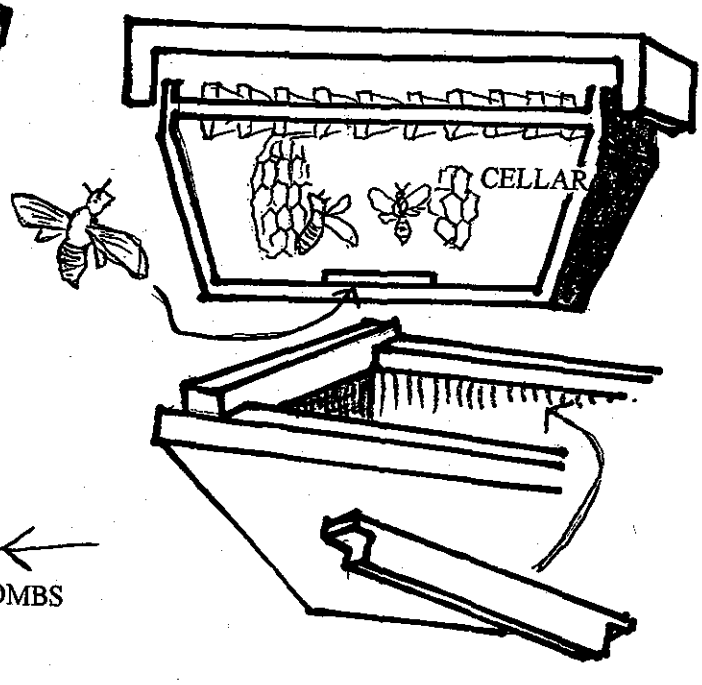
Made of carved log or tree bark, clay pot

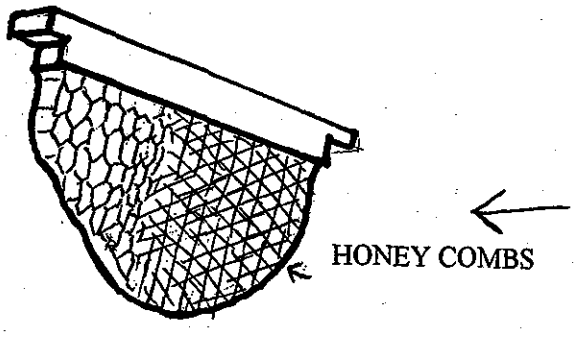


(b) Western



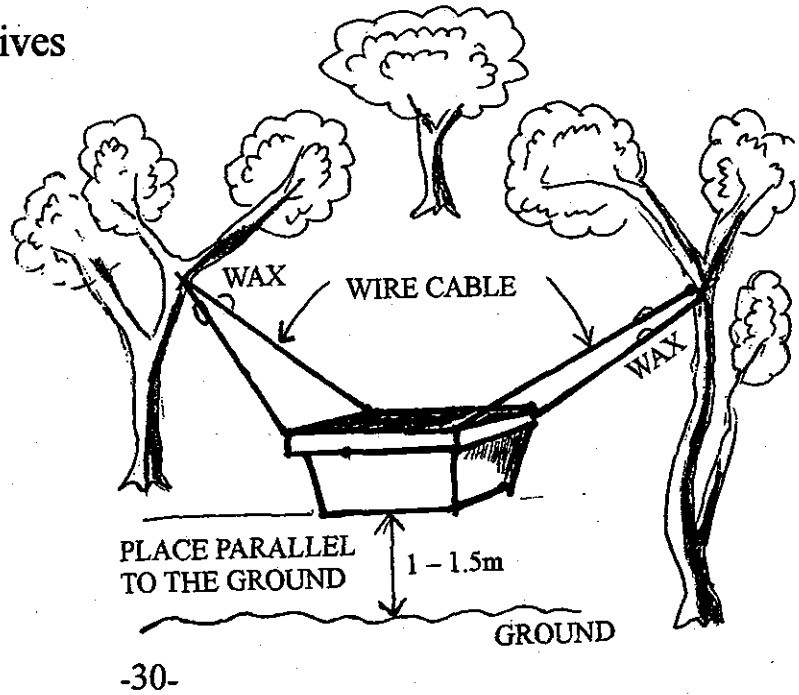
Made of wooden materials





(2) How to install bee hives

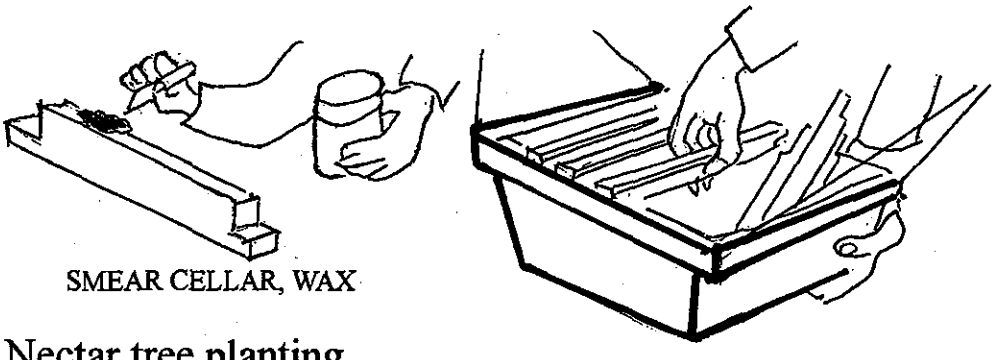
(a) Place bee hives in the shade.
(b) Better place it under tree canopy.
(c) Better place it in good ventilation, but wind-shelter.
(d) Place it near water source and trees with flowers as nectar sources.



(e) Protect bee hives
from ant invention,
for they steal honey.
(f) Hang hives away
from homesteads
as bees at times
can get wild

Why are beehives pended among trees?
Because rainwater and ants are difficult to invade them.

(3) How to attract bees to colonize

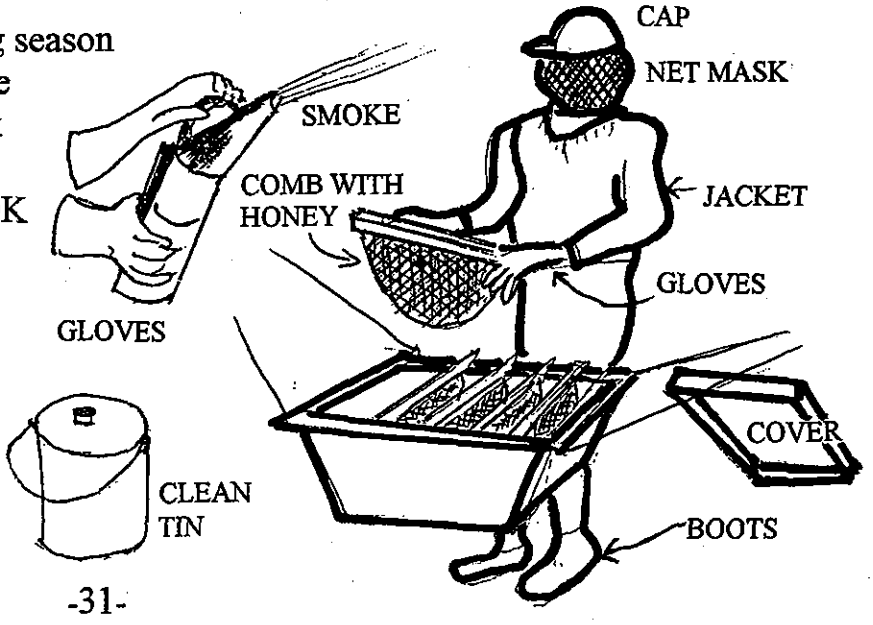


(4) Nectar tree planting

Around installed beehives lets plant useful trees that blossom nectar-rich flowers. Like Acacias, Mtowo, India, Mtangatanga, Mwanambewe, Mthethe, Mbale, Mlambe, Mtondo, Jelejele, Nadua, Masuku, Chitimbe, Nsangu etc.

(5) How to harvest honey

(a) Time: end of flowering season
(b) Appearance: combs are
covered with white wax
(c) Protect from sting of
bee, make sure suit is OK
(d) Smoke the entire
beehive with a smoker
(e) Then open the hive
removing hive cover
(f) Lift top bars to
collect honey
(g) Leave three comb bar
for feeding bees



MATURITY OF HONEY INSPECTION

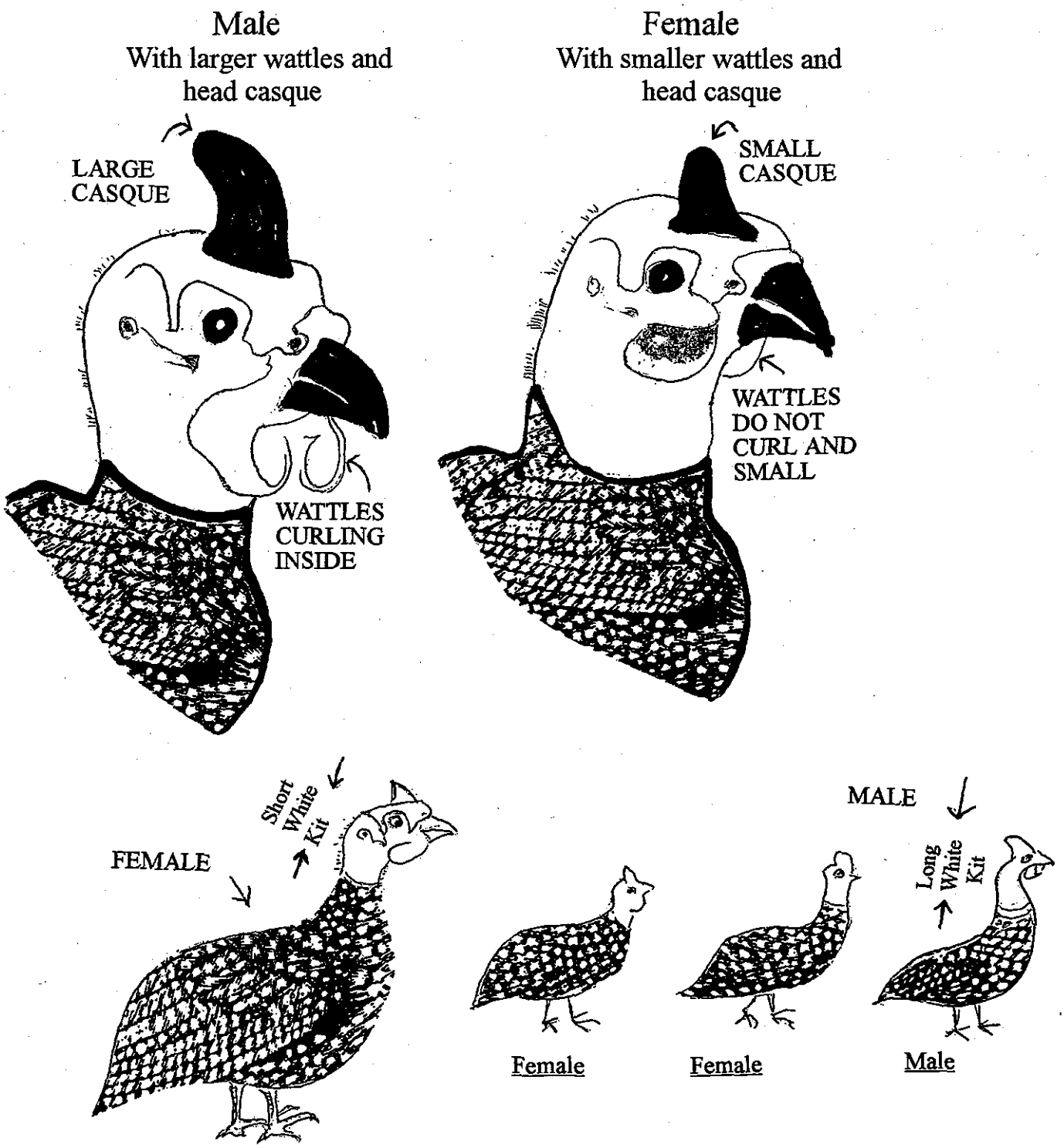
- Very dense
- Some is colour brown/light black
- Mature & immature honey be not mixed

HARVESTING TIME

- Any daytime if it is cold & cloudy
- In the evening/night any other day
- If hives are close to homesteads take care to harvesting and harvesting should be done at night

3. Guinea Fowl Rearing

(1) How to distinguish male from female



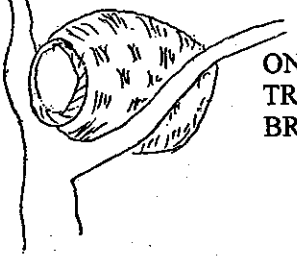
- A male usually guides/protests a flock.
  The ration of two female per male is ideal to avoid quarrel.
- A male usually pluffs/puffs itself.
- Close observation is always the best sex differentiation.

(2) Housing (Khola)

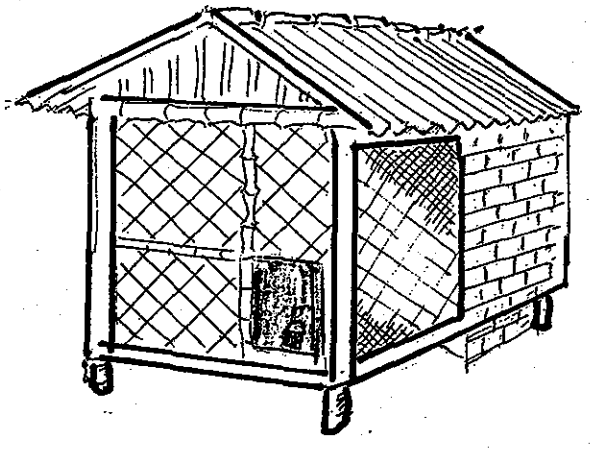
Objectives of providing khola are:

(a) To protect fowls from predator/thieves.
(b) To provide shelter during rainstorm.
(c) To feed keets up to 2 months old.

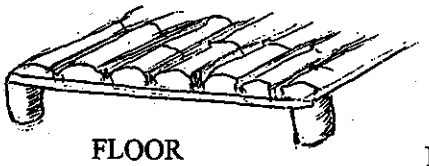
STROW WOVEN KHOLA FOR EACH FUEL



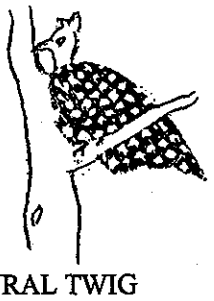
ON A TREE BRANCH



ROOFED KHOLA WITH VENTILATED FLOOR 3m x 3m, 3m x 6m



FLOOR



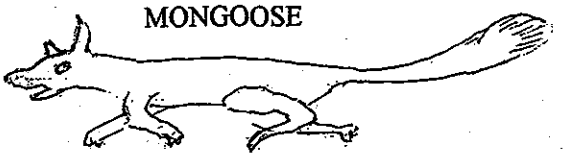
NATURAL TWIG SHELTER FOR WILD FOWLS (FOR FREE RANGE)

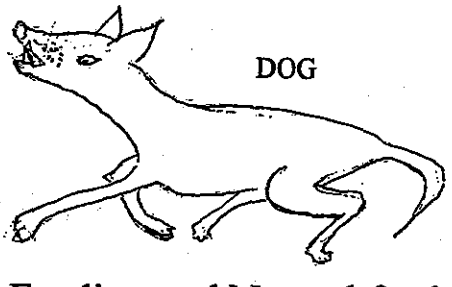
Use bamboo stick for floor, roof and supporting pillars as cheap material

(3) Predators

Trap and kill fowl's predators

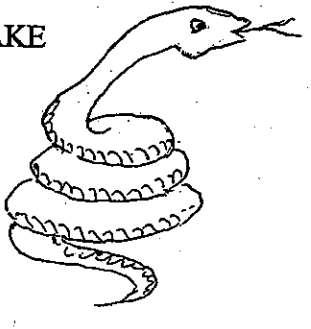
MONGOOSE





DOG

SNAKE



(4) Feeding and Natural feeds

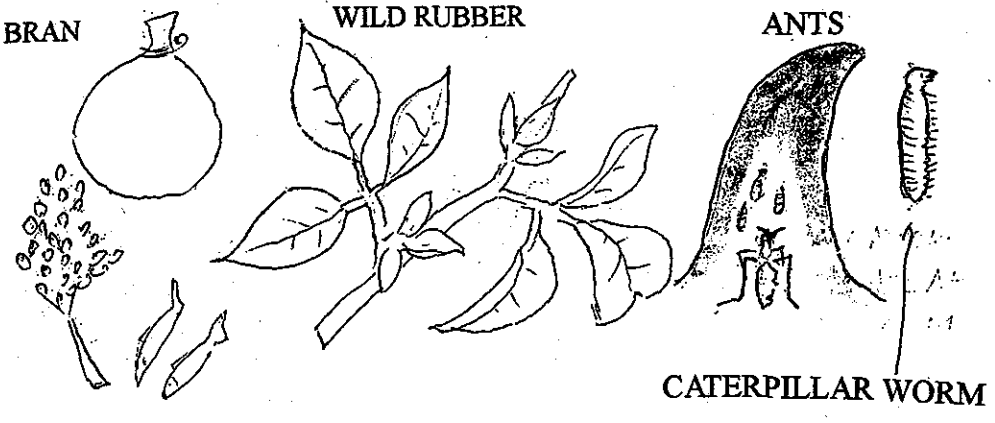
MAIZE BRAN

WILD RUBBER

ANTS

SORGHUM

FISH FLOUR



CATERPILLAR WORM

- Store feed to supplement the birds from December to March
- Egg production goes down due to lack of feed supplement
- Dry & store in a cool dry place

(5) EGGS

- Collect eggs where they are laid
- Leave, some 3-6
- Store in a cool dry place
  - Away from odour (paraffin, paint)
  - Handle them carefully
- Don't sore eggs in
  - Maize bran
  - Plastic bags
  - Tins with tight lids

(6) HATCHING

- Use hens
- Remove hen's eggs when brooding starts
- Introduce guinea fowl eggs
- Hen's eggs can be re-introduced after 7 days
- All eggs will hatch at 28 days
- Guinea fowls can hatch eggs (20-30) but will not lay up to next season

Difficult to manage the chicks without mother

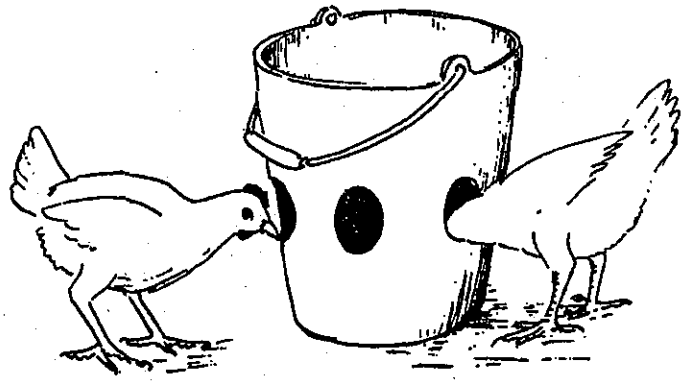
Vaccinate chickens against New Castle & other diseases to have a lot of foster mothers

(7) CHICKS/PULLETS

- Keep them in a cool dry place
  - Not too hot, not to cold
  - Use shallow water troughs to avoid drowning
  - Avoid water/rain in the Khola
- Ticks/fleas be controlled

(8) INNOVATED FEEDER

- Loss feed wastage
  The holes can be cut higher as birds grow



Innovated feeder

- Take care not to frighten them
  They fly to trees & stay there or disappear altogether!!

4. Goat Rearing

(1) Advantages

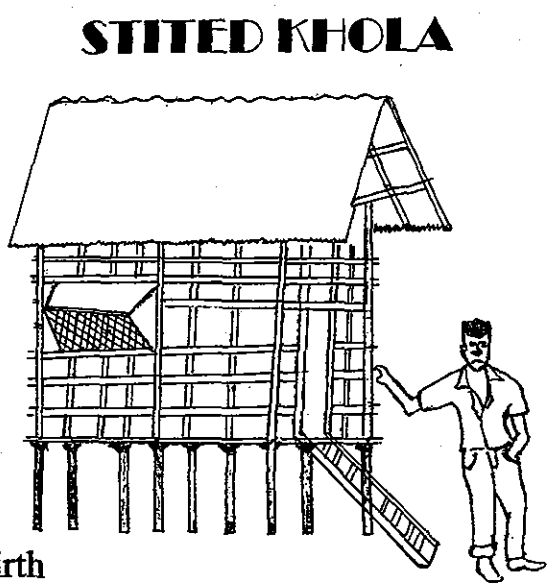
(a) Many advantages as compared to any class of livestock
(b) No need a large space for housing
(c) Very easy to keep and feed
(d) Provide with meat (protein) and skins

(2) Central care

(a) Clean dry well ventilated housing
(b) Clean water to the goats everyday
(c) People should always check the behaviour of their goat (sporting).

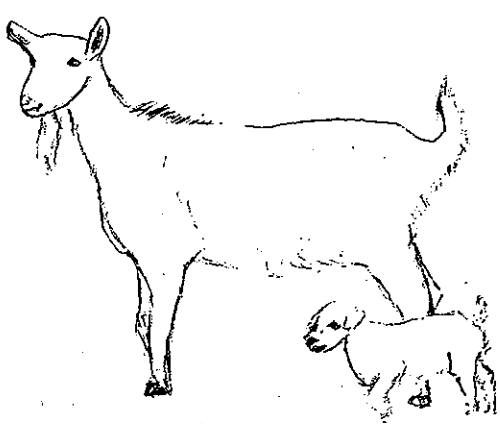
(3) Housing and type of kholas

(a) Housing is needed for goats
(b) Types of kholas according to farmers' wish
- Made of bricks and well thatched roof with grass
- Mud kholas and thatched roof with grass
- Poles and thatched roof with local grasses
- Pigeon type (raised khola)



(4) Kidding

Only a seven-month nanny (female) can give birth



(5) Type of feed and grazing

Goats bruise napier grass (Nsenjere) Madeya and maize stocks laucena on pastures

(a) Graze in upper-areas to avoid worm infestations during the rain season
(b) You can graze in dambos

Worms are very dangerous to your goat management because they cause disease by sucking blood damaging anaemia, diarrhoea and weight loss

(6) Signs of good health and ill health in goats

Good health	Ill health
-Active and alert	-Dull stands on its own
-Good appetite (eating well)	-Hangs its head down
-Chewing the cud	-Stops eating
-Smooth and shiny skin.	-Stops chewing the cud.
-Normal body temperature	-Rough skin (hairs stand up)
-Breathing hard.	-Fever
-Pink colour of eye conjunctive	Temperature over 40°

(7) Drugs to use

If goats fall sick, you can use the following medicines according to the signs that the sick goat is giving.

1) Laxisan or Ranox for worms
2) Oxteytetracycline for Anaplasmosis, foot not or redwater diseases.

(8) Dosing method

	NAME OF DRUG OR MEDICINE	ROUTE METHOD	DOSES/BODYWEIGHT	REMARKS
A	ANTI BIOTICS: Oxytetracycline HI-TET	Intra muscular Injection	1ml/10 kg	For anaplasmosis and foot rot diseases
	Tetracycline	*1-5 ml / 10kg*	*1 ml/10kg body weight*	*Red water*
B	ANTHELMINTICS A) Levisan B) Ranox C) Nalbazine	Drop	1 ml/4.5 kg live weight 3.5 mls/10 kg live weight 6mls/10 kg live weight	For round worms Liverflukes Nasal worms
C	LASOTA or Amidiostart for Newcastle diseases	Injection Drop	1ml/bird 1 teaspoon/5lts water	For every 3 months
D	Acaricide Dip Sudona 30	Spraying bath	20 mls =10 lts water	For killing fleas, lice and mange

(9) Goat rearing calendar

ACTIVITY	Month												REMARKS
	J	F	M	A	M	J	J	A	S	O	N	D	
Deworm Programme	■										■	■	Worms, Liverflukes abundant in all grazing areas/Dambos
Vaccination Programme or spraying planting Nsenjere	■	■	■	■								■	Many outbreaks of different diseases e.g. Anaplsmosis Lumpy skin, foot rot.
Hay/Silage making	■	■	■										Grasses are still fresh and available around all grazing areas.
Spraying period		■	■	■									Ticks, fleas lice available everywhere.
Residual collection			■	■	■	■	■	■	■				Harvesting period feeds for dry season

Part II MANUAL FOR TRAINING

Part II

PILOT STUDY
ON
COMMUNITY VITALIZATION AND AFFORESTATION
IN MEDDLE SHIRE
IN
MALAWI

MANUAL FOR TRAINING

SANYU CONSULTANTS INC.
PROJECT IMPLEMENTATION UNIT (PIU)

CONTENTS

1. NURSERY ESTABLISHMENT

1. NURSERY ESTABLISHMENT

1.1 INTRODUCTION

A tree nursery is an area, usually fenced, which is set aside for the production of tree seedlings. Success or failure of your tree planting starts in a nursery. A successful programme depends upon size of nursery to withstand field planting conditions.

1.2 HOW TO CHOOSE RIGHT LOCATION?

When choosing the site of your nursery, a number of factors need to be considered and these are discussed in more details below:

1.2.1 Area Required

The size of your nursery will depend on the anticipated total number of trees which are required and whether the seedlings (transplants) are to be grown in beds, boxes or individual pots (polythene tubes).

1.2.2 Water

A constant, adequate and easily accessible supply of water is essential when choosing a nursery site (nearby river or stream). The water requirement during the hotter months of October, November and December can be considered 30 litres per day per 1000 seedlings.

1.2.3 Climate

The climate conditions, including the altitude, should be as similar as possible to the conditions to which the plant will grow well after out-planting i.e. the plants should be acclimatised.

1.2.4 Soil

The ideal soil for a nursery (seedlings) should have the following characteristics:

(1) Light sandy loam
(2) Good quality (crumb structure)
(3) Free from stones

1.2.5 Slope/Aspect

The ideal site for a nursery is on a gentle slope which is not facing towards east, (in order to avoid the adverse effects of the morning sun rays, when watering). The gentle slope will ensure free drainage of water.

1.2.6 ACCESS/PROXIMITY

Transportation of seedlings will be by wheelbarrow, bicycle or ox-cart and consequently consideration must be given to the case from the nursery site to the planting site.

1.2.7 PREPERATION OF SITE

Levelling and terracing

After determining the size of the nursery, the first task is to terrace the slope if it is more than 10 degrees. Make terraces at least 5m wide for 2 beds including access path. After levelling the site remove all large stones and compress the soil prior to constructing the nursery beds.

1.3 TRANSPLANTING (PRICKING OUT) OF SEEDLINGS (PRACTICAL)

1.3.1 PURPOSES

There are three main purposes for transplanting:

- To reduce excessive crowding of seedlings on a seedbed which may result in thin, weak and sickly plants which would be very prone to fungal attack.
- To reduce competition for moisture and mineral salts which are necessary for growth, (late germination seedlings may be suppressed)
- To reduce competition under ground level which may retard shoot development.

1.3.2 KEY POINTS

Key points in transplanting are mentioned in below,

- Keep the seedlings moist
- Keep them out of direct sunlight
- Handle them by leaves only
- Make sure to firm around the roots after transplanting

(a) Before transplanting, water the seedlings in the seed bed as well as the pots (full of soil).
(b) Use "dibble stick" (small point stick) to loosen the soil around the seedling.
(c) Uproot the seedling very gentry. Hold the seedlings by the leaves and not by the stem.
(d) If the seedling is carried some distant or you have a lot of seedlings put them in liquid mud or a pot (small tin) half full with water, so that the roots do not dry out.
(e) Use the dibble stick to make a hole in the soil of the (or transplant bed) big enough for the seedling to go for the seedling to go in. The hole should be deep and wide enough to take roots without bending them.

(f) Place the seedlings roots in the hole (with the roots collar at the soil level) taking care not to damage them or bend them upwards. Make sure that all of the roots are inside the hole. Close the hole by inserting the stick into the soil beside the plant and forcing the hole shut. Ensure that the hole is fully and firmly closed throughout.

(g) Press the soil gently around the root of the seedlings. Water the seedling to wash the soil around the roots to ensure that all of the roots are in close contact with the soil (i.e. there should be no air space around the root of the seedlings).

(h) The seedlings should be lightly and regularly watered and shaded until it is established (i.e. it is growing well). This is common practice for Eucalyptus species.

1.3.3 AVOIDANCE

The following must be avoided

- Planting too high-exposing roots
- Too low-burying stem/shoot
- Leaving air space around roots
- Bending of roots, forcing the plants into a shallow hole
- Planting not vertical.

1.4 SHADING

1.4.1 PURPOSES

The purposes of shading are:

- To provide the correct amount of light for each species
- To protect seeds or seedlings from getting damage of strong solar heat, wind, hail and raindrops.
- To reduce excessive transpiration by the action of wind and sun.
- To reduce excessive soil moisture loss.

1.4.2 FACTORS AFFECTING THE DEGREE OF SHADE

(1) SPECIES

In general most species required shade up to stage when they have become established in pots, following pricking out. Pines are an exception as they do not need shade, they require light for their optimum growth.

(2) LOCAL CONDITIONS

Difference in soil, altitude, temperature, and rainfall all affect the shading required by any given species.

(3) TYPES OF SHADE

The shading may be made from either temporary or permanent material. Shading should be at least 60cm above the tallest plant. Temporary shading materials are made from grass or reeds.

1.5 WATERING

The objective of watering in a nursery is to provide moisture to ensure optimum growth of the plants. This is done by keeping the soil moist to the depth of penetration of the roots. The soil must be permanently moist, but never water logged. Proper watering assists the plants in producing a short and bushy root system consisting mainly of lateral roots while discouraging tap root formation. (Seedlings produce a tap root in order to search further down in the soil for water, this tap root is long and unbrached and not of any great advantages to the plants).

1.5.1 FACTORS AFFECTING FREQUENCY OF WATERING

- The current weather conditions (warm and sunny (dry season) or overcast and cloudy days (rainy season).
- Whether it has been raining or not (i.e. if rains came recently).
- The type of soil. Light and sandy soils have free drainage, and need more watering than heavier loamy soil.
- The age, size and species of the plants affect watered.
- The presence or absence of shade.
- The presence or absence of mulch.

1.5.2 WATERING GUIDELINES

- Watering must always be done in the morning or evening to keep the soil moist. Never water under the heat of midday sun because rapid evaporation from the soil and transpiration cause scorch damage.
- Do not over water, this causes water logging. It causes damping-off root rot and oxygen starvation of roots.
- Check frequently that sufficient water is penetrating into the soil.
- Ensure that small and dedicate seedlings are watered with a fine nozzle only the holes of which have not been enlarged with a nail.

1.6 WEEDING AND CULTIVATION

1.6.1 WEEDING OF POTTED SEEDLINGS:

The purpose of weeding is to eliminate competition from weeds by removing them from around the tree seedling.

Long and intensive labour is taken for weeding but it can be minimized by:

- Frequent cultivation of the soil especially during the nursery period.
- Avoid grass seed on the nursery materials (e.g. do not use seed bearing grass for shade).
- Using the nursery and surrounding area completely free of seedling weeds throughout the year.
- Prevent in the entry of wind-borne seeds by planting hedges or building walls.

1.6.2 ROOT PRUNING

The purpose of root pruning is to force the plants to produce short, compact fibrous roots consisting of mainly lateral roots and to discourage the growth of a long tap root. Since the roots of plants should not be bent when planting, it is advantageous to keep roots short and dense.

1.6.3 TREATING SEEDS BEFORE SOWING

Some seed will need preparation or pre-treatment before they are ready for planting. This is often true because the methods by which seeds are scattered and "planted" in the wild involves their being first chewed, eaten and passed through the digestive system of animals or subjected to soak, scrape, acidity or burn seed before germinating e.g.

(a) Soaking seeds in hot water (general recommendation for of seeds i.e. Azanza garikeana)
(b) Soaking seeds in cold water (for hard coated seeds e.g. F. albida)
(c) Scarification (Nick). F. albida, Pterocarpus angolensis
(d) Remvoeal/cracking of outer coat/shell e.g. combretum apiculatum (kadale) zizphuz mucronata (kakhande).

1.7 ROOT PRUNING OF POTTED SEEDLINGS

When seedlings have reached to a certain size, 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 system there.

Once the root system develops under the ground, it is hard to move the pots, and if the roots are cut, 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 species rate of growth and local weather conditions. Regular root pruning, or undercutting of transplants grown in polythene tubes or pots is essential to prevent roots growing into the soil beneath the base of the tubes and to encourage the development of a fibrous root system within the tubes. The operations should commence as soon as root tips are seen to be protruding below the tubes. Root pruning should be done once a week after germination until time for out-planting. Always soften the soil by watering to make cutting easier. To minimise the effects of stress, prune early in the morning or in the evening when evapotranspiration is low to reduce risk of wilting. The final pruning should be done 3-4 weeks before out-planting to allow recovery within this period.

1.7.1 METHOD OF ROOT PRUNING OF POTTED SEEDLINGS

The following are the methods to be used during root pruning:

(1) MANUAL

This simply involves lifting of each tube /pot from the ground /terrace and replacing it after the protruding roots have broken off in the process of lifting. The tubes must be lifted vertically to prevent roots being wrench sideways giving later deformations.

(2) TENSIONED STEEL WIRE

The tensioned steel wire method requires a root pruning frame, usually made of tubular steel. This is slightly wider than the rows of transplants and pulls the tensioned wire under the tubes at ground level, severing/cutting any protruding roots. Root pruning by this method should be repeated every 2 weeks for Eucalypts.

(3) PINCHING

This is also one of the possible methods. Lift up each pot/tube and the protruding part of the tap root and pinch it off using finger nails and or knife. This is a very time consuming method if seedlings to be root pruned are so many.

(4) UNDERCUTTING BY PANGA KNIFE

This method is applied where seedlings are lined up in rows ensuring that the width of the rows should not be more than twice the length of the knife's blade. Hence, the knife is placed parallel to the ground and moved /run the blade along the underside of the pots from one end of the bed to another.

1.7.2 ALTENATIVES TO ROOT PRUNNING

(1) EARLY OUT-PLANTING

This method is best applied to seedlings that are susceptible to disturbance/shock like the faidherbia albida (Nsangu). For such tree seedlings species out-planting should be done 4-6 weeks after germinating before the roots protrude from underneath the tube.

(2) AIR PRUNING

Seedlings raised in open-ended containers are placed on platforms elevated off the ground. By so doing, the roots cease growing as soon as they come in contact with air upon reaching the bottom of the tube. But frequent watering should be encouraged mainly if done in dry and hot areas.

1.8 HARDENING OFF

Hardening off 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. In this way, they can prevail the sunnier, hotter and dryer conditions. This also reduces the effects of SHOCK.

1.8.1 METHODS FOR HARDENING OFF

(a) When the seedlings grow and reach a certain size actually within 3-4 weeks after germination the shade should be removed slightly to expose them to the heat of the sunshine. After 2-3 weeks it should be removed completely and during the last weeks in the nursery, expose seedlings fully to the condition they will face after out-planting.

(b) Before planting-out, root pruning should be carried out frequently. Once the roots penetrate into the ground the plants get extra nutrients and water from there and develop delicate and soft tissues, so these seedlings can not survive in the field.

(c) Reduce the quantity or frequency of watering to expose/insure the plant against the drought.

(d) Arrange the seedlings pots in one or two lines to harden their roots.

1.9 DRYLAND TREE SEEDLING PLANTING VERSUS RAIN WATER HARVESTING TECHNIQUES

1.9.1 MICRO-CATCHMENTS FOR TREES

There are several different micro-catchment systems for trees that have run off collecting pits in which, or close to which, the trees are planted. Some micro-catchments are completely enclosed by bunds. Others have open-ended bunds. They are normally laid out in a staggered pattern.

(1) V-SHAPED BUNDS

These are small earth bunds used to enclose diamond shaped micro - catchments have an infiltration pit in the lowest corner where run off concentrates. The Technique was developed in the Neger desert in Israel where they are also known as Negarim micro-catchments and used for growing trees and shrubs. They can be effective in areas with as little as 150mm rain per year. Soils should be 1.5-2m deep for root development. The ground slope can range from flat up to 5% and micro-catchments size can vary from 10-100m^2 per unit. Bund height should be at least 25cm to avoid overtopping and bund base width at least 75cm with side slopes of 1:1. Tree seedlings are planted in the bottom of the pit or to one side, depending on the height of the seedling and the risk of watering or sedimentation in the pits.

(2) CRESCENT SHAPED BUNDS (DEMI-LUNES)

This is a modified systems which requires less labour whereby a pit is dug for the tree 60 cm square by 60cm deep and crescent shaped bunds are made extending 3-5m on either side to trap run off and guide it to the pit. To prevent small seedlings from being submerged in water or sediment, they can be planted just above the pit or just below the bund. In either situation they will get access to the water which is collected in the pit. For this system, it is not necessary to totally enclose each catchment with bunds as is done with Negarims, which are most suitable to the driest areas where it is essential to trap all runoff.

1.9.2 RETENTION DITCHES AND BASINS

(1) RETENTION DITCHES

These are 50cm wide and 50cm deep. The bottom of the ditch may be made level to retain a uniform depth of water. They are dug along the contour lines.

(2) BASINS

These are circular, rectangular or square basins surrounded by small earth bunds. These have been adopted by many tree planters in Malawi mainly in dry areas.

The larger the basin the more the rain water is captured. This method has shown a success in that tree survival rate in areas that practice the system has improved tremendously. These basins are spaced according to the tree planting spacing chosen and done. They are not the same as other water harvesting systems as they do not add water from a catchment area to augment the rainfall but they do concentrate rain water in the centre of the basin. Well rotted manure or compost is placed in the basin to improve soil structure, facilitate rapid infiltration and promote growth of the tree.

1.10 FIREBREAKS

A Fire break is a natural or artificial break devoid of any ground vegetation in order to break off fires should they occur. There are three main types of firebreaks.

1.10.1 EXTERNAL FIREBREAKS/PERIMETER FIREBREAKS

These firebreaks run along and encompass the entire perimeter of the forest/woodlot in order to exclude all fires from outside trying to enter the woodlot. Some of the methods adopted here in maintaining break are as follows:

(a) A strip 30 m to 60m wide encircling the woodlot/forest is early burnt in June and July depending on the local climatic condition of the area under strict control.
(b) The strip is delimited by a clean hoed trace on either side of the break 2 to 3 metres wide.
(c) The area outside the hoed trace of the firebreak should be early burnt if the surrounding fire hazard is likely high.

1.10.2 MAJOR FIREBREAKS

These are mainly applied in large forests/plantations and are not viable in small woodlots. A major firebreak is a very wide normally about 200m in width. It divides the forest into areas of about 1,215 ha. The idea is to restrict fires into blocks or areas mainly if a crown fire occurs. In this case early burning is done in the middle part of every block. Areas included in a major firebreak are rocky, hilly, mountainous, swampy, dam, riverine areas including roads and forest villages.

1.10.3 INTERNAL AND MINOR FIREBREAKS

These are firebreaks which restrict in a forest into much smaller areas. Such firebreaks make ideal boundaries of compartments and since most compartment boundaries are converted into roads, then the roads serve as internal firebreaks. Streams are also natural features for internal firebreaks.

1.10.4 PREPARATION AND MAINTENANCE OF FIREBREAKS

Making and preparation must be considered in advance. This means that firebreaks must be planned before actual planting is carried out. This exercise is called **COMPARTMENTATION.** Similarly maintenance of firebreaks must be carried out depending on area of the forest/woodlot, climatic conditions and type of vegetation. Ideally, all makings, maintenance and preparation should be completed by the end of May. The only firebreak operation that should remain could be the early burning. Several methods are used in preparing firebreaks.

(1) WEEDING/SCREENING

This is a method of taking ground vegetation off and thereby leaving the breaks bare. Ideally the whole planted area should be screened but for economic and time limit matters, screening is limited to small areas and the remaining parts being done by other methods. But when trees are in their 1st and 2nd years of planting, complete screening/weeding is ideal than early burning.

(2) BURNING /EARLY BURNING

Every precaution should be taken when early burning is carried out as a firebreak maintenance option. Where the grasses are tall/high they should first be slashed before burning. Slashing can also be done throughout the entire planted area or by strips. Above all, observation should be there on all forest burning rules or rules of controlled early burning and mopping-up operations should be conducted efficiently.

(3) FIRE ARRESTER BELT

These are the trees planted along the firebreaks in order to stop or trap any hot sparks from bush fires. The tree species chosen for this function should have the following qualities:

(a) Capability of growing faster than the main crop if planted at the same time.
(b) Its growth should be higher than the main crop.
(c) Capability of quick suppression of ground vegetation so as to stop any surface bush fires.
(d) It should be ever green so that it can arrest the hot sparks of fire during dry season e.g. Eucalypts and Gmelina.
(e) It should also be fire resistant.

(4) FARMING ACTIVITIES

This is the use of firebreaks with an agricultural crop. The whole of the firebreak depending on suitability may be put under the crop. By cultivating the crop the break is kept clean of the grass and thereby stopping any fires.

One should however be careful with species that look evergreen but which in fact harbour a lot of fire hazard e.g. sugarcanes and Bananas.

(5) GRAZING

This is making use of animals such as cattle or sheep but not goats to feed along the firebreaks. With their wastes/droppings soil fertility is increased.

(6) CHEMICAL

This is the application of some chemicals on a firebreak by removing the vegetation. Shell chemicals and Agricultural Trading Company supply such chemicals. But some of these chemicals are dangerous and should therefore be used with caution.

(7) SUMMER GREEN GRASS

This is the planting of grass that remains green during the fire danger season. It is not a common method in the country but worth trying especially for amenity purposes in areas of high forestry tourism potential.

1.11 MEASURES TO PREVENT AND CONTROL TERMITE ATTACK IN THE NURSERY AND FIELD

More than 2000 species of termites are distributed mainly in the tropics. But the common termites are seen in semi arid areas nest in the ground or dead wood and infest seedlings through the tunnels in the surface soil. They eat roots and stems of seedlings of many tree species. Eucalyptus species are mainly susceptible to termite.

1.11.1 CONTROL AND PREVENTION

Termites can be controlled by several methods which are:

(1) Silvicultural Methods
(2) Chemical Methods
(3) Biological Methods
(4) Herbal formulation

(1) SILVICULTURAL METHODS

(a) Choice of termite free tree species

The tree species that are not prone to termite attack and they include Afzelia quauzensis, Azadirachta indica, Melia azedarach, Terminalia sericea, Gmelina arborea and senna tree species.

(b) Beating-up

Extra tree seedlings should be raised or reserved in the nursery for planting in all areas that have been attacked by termites and have lost the planted stock.

(c) Form factor

Out-planted seedlings should show vigorous. To maintain vigour means the seedlings should be healthy, have well established fibrous root system and fully hardened.

(d) Pitting and Exclusion of Trash

In semi arid areas where termites are a menace, planting pits should be big enough i.e. 60cm by 60cm and when re-filing all the trash present should be removed promptly.

(e) Timing in Out-planting

It is technically ideal to plant seedlings during the first heavy rains when the soils are soaked to the depth of not less than 30cm.

(f) Complete Screening

A planted site should be completely screened from the first year to the 3rd year while making sure that all the trash/debris are taken out of the site as they might invite termites.

(g) Nursery Hygiene

The nursery should look tidy/clean all the time and.where possible a broom should be used to sweep inside and around the fence to remove any trash that may invite termites.

(h) Use of live Poles in Fencing

When fencing our nursery it is advisable to use poles that can coppice e.g. moringa oliefera. Eucalyptus poles and others can invite termites because they are prone to decay.

(i) Proper and adequate watering

Watering should mainly match the atmospheric condition of a particular day. Thus when it is too hot and dry seedlings need much water but when watering is less in such a condition obviously termites will invade the nursery stock.

(2) CHEMICAL METHODS

(a) Using ash together with soil mixture in potting. The mixture rate of ash and soil should be 1:5.
(b) Putting a thin layer of ash (2-3 cm thickness) on a lining out bed, thus where the pots or tubes of seedlings will be placed. However, the effectiveness of the ash can not last long. Periodical application is recommended.
(c) During out-planting, the refilled soils in the planting holes should be mixed with ash.
(d) Rinsing polythene tubes in soapy water or solutions from rinsed neem leaves or any insecticide solution before using them.
(e) Mixing potting soils with powder made from dried neem leaves and barks and also leaves of melia azedarach
(f) Apply a mixture of ash and chicken droppings around the planted tree seedlings. This process should be repeated often.
(g) Pouring of used oil into termite colonies.
(h) Using chemicals such as:
    1) Dieldrin
    2) Aldrin
    3) Dursban
    4) Fastac
    5) Marshal Suscon
    6) Gammexane
    7) Carbosulfan

But use of chemical insecticides to exterminate all the termites say in a colony is of course much effective but costly and dangerous. The following precaution should be adhered to when using chemical insecticides.

(a) Never touch chemicals directly
(b) Remember to wear a mask not to breathe sprayed chemicals
(c) Wash hands clean after using chemicals
(d) If any part of your body happens to touch chemicals you must completely wash that part immediately.
(e) Change and wash your clothes well after using chemicals
(f) If you feel bad during or after using chemicals you must consult a doctor as soon as possible.

(3) BIOLOGICAL METHODS

(a) Digging out queens of near by colonies (termites hills) is said to be easy and effective. However, it is necessary to observe a colony after picking out the queens since there are some species that substitute the lost queen with their daughter and recover their activeness
(b) Planting of cuttings from Euphorbia tree species in strategic sequence in the woodlot would help scare away termites as it is toxic.
(c) By practicing companion planting whereby wild basil is deliberately introduced in a woodlot to act as an insect repellent

(d) Another way is by trapping the termites using a well prepared green grass bundle squeezed into a termite hole. Termites get attracted by the grass juice and stick to it by stinging. After removing the bundle of green grass with termites another fresh bundle is put in.
(e) Introduction of termite eating birds e.g. Guinea fowls to termites prone areas is also another remedy to deal with termites.

(4) HERBAL FORMULATION METHODS

(a) Crush Neem leaves and its barks that have been dried at room temperature. Rinse them in a sealed bucket of water for 14 days till they start producing bubbles. Apply 100-200gm of the solution per planted tree. This process should be repeated every 40 days. This solution acts also as liquid manure.
(b) Crush senna siamea, Neem leaves /Melia azerdarach leaves and Tithonia diversifolia leaves that have been dried at room temperature. Rinse them in a sealed bucket of water for 14 days till they ferment. Apply 100gm only of the solution per planted tree. This process should be repeated every 40 days and in this way termites are scared off. This solution also acts as the best liquid manure that improves soil fertility.
(c) Crush fresh leaves of Aloe graminicola,melia azedarach, Neem and senna siamea and apply onto the planted stations. This crushed mixture acts as a repellent to termites.
(d) Mashed garlic (allium sativum) mixed with few cups of water is stored in a bottle. To be used, ½ cup of the mixture is saturated with 5 cups of water and applied by using insecticides sprayer onto the planted stations.
(e) Mashed mixture of one handful part of garlic, two handful parts of chillies, 20ml of laundry bar soap liquid and 20ml of paraffin is put in a container. Then 5 containers of 5 litres each are filled with boiled water and 40ml of the mashed mixtures is added into each of the 5 containers. Then they are sealed and left a side without interference for a week (7days). On the seventh day the mixture is sieved using mesh cloth and then applied using an insecticide sprayer onto the surface of the planted stations.

NB: The Author welcomes any additions wherever the reader and implementer observes some shortfalls.

2. STRATEGIES FOR COMMUNITY MOBILISATION IN LOCAL FORESTRY PROGRAMMES

2. STRATEGIES FOR COMMUNITY MOBILISATION IN LOCAL FORESTRY PROGRAMMES

2.1 FOREWORD

For any extension agents to succeed in mobilising the rural communities to take part in community forestry programmes, they have to understand at first that it is necessary for people to commit themselves fully. It means they will have to forego some or most of their daily domestic chores. This means that any community participatory programmes that have to be introduced must show quick results in order to gain the confidence of the people which motivates them more to take part actively.
It has to be noted that before we start our programmes, it is paramount importance to study the community well and identify the influential persons first so that they be our entry points.

2.2 CROSS CUTTING ISSUES THAT AFFECT PARTICIPATION

2.2.1 GENDER

This is a factor that needs to be respected in any participatory development programmes as it plays a role in increasing participation by focussing on right groups to particular activities.

2.2.2 COLLABORATION

One person can not have enough impact. Accept the role of other stakeholders to avoid duplication.

2.3 WHAT IS COMMUNITY PARTICIPATION

To succeed in mobilising any community towards any activity, one needs to understand what community participation is. It is a process (over a period of time) by which people are made aware that they have the abilities and energies including some resources to take initiatives to improve their own lives. In this context, the resources are land and the remaining are tree regeneration.

2.4 HOW TO COME UP WITH A PROJECT

The best way to mobilise the community to identify and come up with a forest micro project or any other programme is through **(PRA)**: Participatory Rural Appraisal is an extension method which is a process of identifying needs together with the local community in order to come up with a development project that can actually improve their livelihood. These days the devastation of our natural forests through charcoal business and firewood for brick burning as

well as for incomes has resulted in the scarcity of fuel wood for domestic purposes, Poles and timber for construction. Women in most villages travel longer distances to fetch firewood and this keeps them away from their homes for longer hours depriving their little children from their attention. Many streams run for kilometres without riverine vegetation as a result a lot of siltation in the rainy season raises the stream /river bed hence flooding occurs. In dry seasons, most rivers and streams become dry and people have to struggle to fetch water for their vegetable gardens (Dimbas). By identifying such issues with villagers and their root causes, it is easy to convince them to take part in reversing the situation. Three key principles to transform our extension surveys and appraisal methods exist as follows:

(1) Accepting that local communities have information and knowledge, but in needs to be reorganised. This information is what can assist us to plan a programme well for them. This can be possible by use of listening skills to acquire new information.

(2) Local leadership is needed.

Extension staff have to regard and respect local leaders as partners in development planning as both sides have knowledge the other has not got. This is best achieved by building trust with them. To build trust, patience and time are required and so one must never be in a hurry. Since every community has its leadership it respects, whatever we do must be based on the local leadership. Institutionalisation of leadership is important. Therefore every community must have a committee so that what ever they agree upon must have a foundation and a programme implementation.

(3) Bottom up approach

This is the best way of bringing change in a community. Communities know and understand their needs and have to be accommodated in decision making. Activities planned from below, get implemented easily than when officers decide for the communities.

PRA Steps must be followed:

(a) Site selection

This involves target village and group identification.

(b) Preliminary Visits

Done to get geographical details, to identify and know leaders for briefing. They are also done to understand conflicts and seasonal calendars.

(c) Launching

This involves holding a public meeting under formal procedures. The community is briefed, questions asked and answered.

(d) Actual date gathering

Required in the formation of the programme.

(e) Data analysis and synthesis

(f) Preparation of community action plan

(g) Community action plan implementation

(h) Participatory monitoring and evaluation

Note:
Organising and maintaining a committee is a key factor in ensuring local forest governance and this assists to develop trust with the community as well as to develop trust within the community.

2.5 ORGANISING AND MAINTAINING A COMMITTEE

(1) Organising a meeting: Both men and women must attend meetings geared towards initiation of participatory forest programmes. It has to be noted that community forestry programmes often succeed when women are included as they form the major percentage of our communities and therefore their roles have to be recognised. Discuss the present situation and explain what you can do to help them and explain that the focus of community forestry activities will be participatory although individual efforts will also be encouraged.
(2) Explain that a participatory self help group is made up of like minded people who work together for a common purpose with as much involvement as possible. Ask them what they would expect to achieve by working together.
(3) Start with natural social groups. If the group is a cross section of the community, be sure that women are represented in appropriate numbers.
(4) Selection of the committee must have a democratic basis and voluntary acceptance. People decide who should form the committee.
(5) Responsibilities of the group (Committee and each member) must be clearly defined.
(6) Usually 10 to 20 people are a manageable size.
(7) Rules and regulations:
Committee members should develop rules and regulations (a constitution) and agree to obey it. The constitution defines the rights and responsibilities of the committee. To avoid problems, explain duties of the chairperson, Secretary and the treasurer and when their deputies can act on their behalf.

2.6 HOW CAN ORGANISATION AND MOBILISATION OF A COMMUNITY BE ACHIEVED

If there is no proper participatory decision making and effective problem solving, any group will stress and eventually fail. It is therefore important to develop trust and effective communication within the group or committee. This is the best achieved through regular meetings.

2.6.1 TRUST

If there is no trust, there can never be unity, cooperation and team spirit. The development of trust can be hindered by lack of respect for others, lack of sensitivity to other peoples' feelings and lack of awareness and acceptance of other limitations.

2.6.2 EFFECTIVE COMMUNICATION

This is essential within a committee and community as the greater quality of relationships brings the ability by the members to express their feelings, communication must be two ways.

2.6.3 COOPERATION

This exists amongst members if there is trust confidence and good communication, committee members that cooperate with each other effectively mobilise their community members. Tasks are therefore implemented within the given time as there is interest and concern per the group's goals.

2.6.4 GROUP MEETINGS

The use of such meetings is to have collective decision making and group participation in the discussion of issues. Monitoring and Evaluation of activities is done. And also members socialise and interact to share information.

2.7 FACTORS WHICH CAN AFFECT THE LEVELS OF PEOPLES PARTICIPATION

(1) If technology that has been adopted is user friendly by the ordinary man then there will be enthusiasm. Great care must be taken in the introduction of any new technology. The best way is to fuse scientific and indigenous technologies.
(2) Programme flexibility: It has to fit to the peoples daily work calendars so that their other tasks are also looked into and attended to.
(3) Resources: There must always be adequate resources to be used in implementing programmes so that there is no break of work as planned to avoid them from becoming bored (not interested)

2.8 ROLE OF EXTENSION WORKER:

The extension worker acts as an advisor and facilitator. One must be charismatic and be able to motivate people even at difficult times.

3. BEST SPECIES ON AGROFORESTRY AND THEIR INVERSION TECHNOLOGIES

3. BEST SPECIES ON AGROFORESTRY AND THEIR INVERSION TECHOLOGIES

3.1 MIXED TREE INTERCROPPING

At this technology trees are planted at a close spacing with crops to improve soil fertility and crop yields. Properly managed, this practice sustains farm productivity over the long term and provides other useful products.

Followings are the series of answers you need to bare in mind on these practices:

→What are the recommended tree types on this practice?

•The trees are Gliricidia sepium and Senna siamea.

→Why these are important for this practice?

•They improve soil fertility and crop yields

•They provide high quality fodder for dry season feeding.

•They supply fuel wood and building materials for household use.

→How can these trees (Gliricidia and senna spectabilis) be planted in the crop field?

•Dig the planting holes before the rains begin at the recommended spacing of 1.8m by 0.9m. (Planting holes should be 60cm by 60cm by 60 cm)

→How can you prune and manage pruned materials?

• Prune trees or branches with a clean, upward slanting cut, 30cm from the ground, by using a sharp knife. See the diagram below.

• Prune trees after crop harvest, two weeks, of crop planting and lastly after 6 to 8 weeks if shading or competition become apparent.

→ how can you apply leaves in the field?

• Apply two handfuls of leaves (green or dry) at each planting station or split the ridge and apply in the groove and bury.

NOTE:

The application of biomass can be done before and after planting of the crop. The first application can be done straight at the planting station and the second application at the two sides of the crop using the same two-handful measurement.

The leaves can be dried under the shade and can be used for the next season or second application around the germinating crop.

3.2 DISPERSED SYSTEMATIC INTERPLANTING

This system involves planting trees with crops at a wide spacing to improve soil fertility and crop yield. Properly managed this practice sustains farm productivity over the long term and provides other useful tree products. This practice is popular because of its traditional agroforestry practices.

→Which are common species recommended at this system?

•The species are faildherbia albida (msangu), Acacia polyacantha (mthete), and acacia galpinii (nkhungu).

→Why faildherbia albida is special on this practice?

•It is particularly beneficial for soils and crops from its unique feature of dropping nutrient-rich leaves when the rains start. Its bare canopy and leaf fall during the growing season offer soil and light conditions ideal for good crop growth.

•It can increase maize production under mature trees from 50% to 250 % higher than outside the canopy.

•It also provides fuel wood; building material, shade during the hot dry season, and high quality fodder from its nutritious pods.

(Good shade, and fodder from its pods to livestock and honey from its trunk or branches.

→How can plant Failherbia albida in my field together with crops?

• Dig planting holes (60cm by 60cm by 60cm) before first rains at the space of 5m by 5m.

NOTE: Thinning will be done as the trees grow in size to prevent overcrowding and provide wood and fodder according to the below table.

Tree canopy radius	Recommended Spacing	Recommended Density
5 meters	10 by 20 meters	50 trees per ha
8 meters	20 by 20 meters	25 trees per ha
> 10 meters	Selective thinning	15-20 trees per ha

Against livestock invasion, erect a protective fence around each seedling. Use a stake or peg to clearly mark or identify the location of each seedling and planting.

3.3 UNDERSOWING TEPHROSIA VOGELII WITH MAIZE

→ Why tephrosia vogelii is important for this practice?

•It improves soil fertility and crop yields

•It controls soil run off and erosion.

•It suppresses weeds to reduce loss of soil moisture and nutrients.

•It suppresses striga (Witch weed), a parasitic weed of crops.

•It controls common pests such as stalk borers, aphids, leaf eaters, termites, weevils and fleas.

•It produces abundant fuel wood.

CAUTION: Tephrosia is a host to root knot nematodes, so do not under sow or grow it in rotation with tobacco or tomatoes or eggplants since these crops are susceptible to nematode attack.

→ When and how can I sow this plant in my field?

•Sow seed directly into the top of every ridge with the start of the rains at or immediately after crop planting.

→At what spacing should I use and how much seed per station?

•Plant two stations 30cm apart between maize stations and sow 3 seeds per station. This should be done on every ridge. The seeds should be sown at a depth of 1.5 to 2 cm.

→When am I going to harvest tephrosia biomass?

•Harvest biomass at the time of land preparation, or just before the start of the rains in October or November.

→How can I harvest and use tephrosia biomass?

•Cut down at ground level with sharp panga or hoe.

•Lay the cut material uniformly over the soil surface.

•After a few days of sun drying, shake the leaves off and remove woody branches for fuel.

•Bury leaves and small twigs if harvested before October to minimize loss of quality from long exposure to hot dry conditions.

•Spread leaf biomass on the surface if harvested in October or November, this helps protect the soil from runoff, erosion, weeds, and moisture losses.

→NOTE THIS:

•Continue planting tephrosia every year under sow with maize when the rains start.

•If the canopy dense becomes poor it can be left in the garden in the 2nd season as a fallow crop and as a seed bank.

•If the plans to leave fallow, leave the trees in the second year with no crops to increase biomass production. Cut the trees down just before the outset of the 3rd season continue planting crops up to 4th year and the 5th year repeat the cycle of planting the trees.

→Lastly:

The author wishes all the readers to play a role in agroforestry practices and not let the world rough at you as you fail to play your role while all the resources are at your disposal. Good luck.

4. GOAT REARING

4. GOAT REARING

Goats have many advantages as compared to any other livestock and play an important role for those who care them e.g. they don't require a large space for housing and also very easy to keep and feed them, very profitable. Goats provide us meat (protein), manure and skin.

4.1 HOUSING

There is a need to housing our goats because they are like any other animals or human beings, they need good housing for protection against predators, escape and rains. Before rearing goats, any farmer must consider about the materials for housing like which types of kholas should be constructed or build and where to get the materials, (Will it be found locally or bought?). These are some of the questions a farmer should look into, before bringing the goats to his place.

4.2 TYPES OF KHOLAS

There are many types of kholas for goats and its up to the farmer to choose one or two types of kholas according to his wish.

(1) Bricks and well thatched with (grass)
(2) Mud kholas and thatched with grasses.
(3) Poles and thatched with local grasses.
(4) Pigeon type (raised khola).

These kholas have got more advantages than disadvantages.

- Very cheap to construct even a poor farmer can manage because the materials are locally found.

4.3 FEEDING

Goats are ruminant and the word ruminant comes from their feeding habit and swallowing the food. Goats almost don't chew feeds and swallow them and sometime comes back the food into the mouth (cud) to chew accurately and then swallowed again into the stomach for digestion, so in this case goats must have free access to good food and very clean water to avoid diseases. For goats to produce enough and good quality milk they must take supplementary feeds mixing with salt.

4.4 KIDDING

The first and the most important feature of goats is their short reproductive cycle accompanied by multiple births twin s (2) or triplets (3) so goats are very profitable and easy to manage compared to cattle. Only a 7-month nanny (female) can give birth.

4.5 TYPES OF FEED

Goats are bruised and the word bruises that means goats graze on pastures (grasses) napier grass (Nsenjere) Madeya, maize stocks laucena.

4.6 GRAZINGS

People graze their goats on upper areas during the rain seasons to avoid worm infestations which are greatly abundant in dambos during this time of the year, and during the dry seasons they can use the dambos because of green pastures or grasses available and hence less worm infestations. Worms are very dangerous to our goat management because they cause diseases by sucking blood damaging anaemia, diarrhoea and weight loss are the main signs of worm infestation in goats.

4.7 DISEASES

Common diseases such as diarrhoea and pneumonia can directly lead to death of young stock (Kids). Goats, like any other animals or human beings, have their own diseases which attack them mainly during the rain season and when there is poor management for rearing them e.g. Anaplasmosis and foot rot are very common.

4.8 CAUSES OF DISEASES

Most diseases are caused by the invasion of parasites into the body. This is called infection.

4.9 SIGNS OF GOOD/ILL HEALTH IN GOATS

Good Health	Ill Health
-Active and alert	-Dull stands on its own
-Good appetite (eating well)	-Hangs its head down
-Chewing the cud	-Stops eating
-Smooth and shiny skin.	-Stops chewing the cud.
-Normal body temperature	-Rough skin (hairs stand up)
-Breathe hard.	-Fever
-Pink colour of eye conjunctive	-Temperature over 40°C

4.10 DRUGS TO USE

If goats fall sick, you can use the following medicines according to the signs that the sick goat is giving.

(1) Laxisan or Ranox for worms
(2) Oxteytetracycline for Anaplasmosis, foot rot or redwater diseases.

DOSING METHOD

	NAME OF DRUG OR MEDICINE	ADMINISTRATION	DOSES/BODYWEIGHT	REMARKS
A	ANTI BIOTICS: Oxytetracycline HI-TET	Intra muscular Injection	1ml/10 kg	For anaplasmosis and foot rot diseases
	Tetracycline	1-5 ml / 10kg	1 ml/10kg body weight	Red water
B	ANTHELMINTICS (a) Levisan (b) Ranox (c) Nalbazine	Drop	1 ml/4.5 kg live weight 3.5 mls/10 kg live weight 6mls/10 kg live weight	For round worms Liverflukes Nasal worms
C	LASOTA or Amidiostart for Newcastle diseases	Injection Drop	1ml/bird 1 teaspoon/5lts water	For every 3 months
D	Acaricide Dip Sudona 30	Spraying bath	20 mls =10 lts water	For killing fleas, lice and mang

4.11 GOAT REARING CALENDAR

ACTIVITY	Month												REMARKS
	J	F	M	A	M	J	J	A	S	O	N	D	
Deworm Programme	▬										▬	▬	Worms, Liverflukes abundant in all grazing areas/Dambos
Vaccination Programme or spraying planting Nsenjere	▬	▬	▬	▬								▬	Many outbreaks of different diseases e.g. Anaplsmosis Lumpy skin, foot rot.
Hay/Silage making	▬	▬	▬										Grasses are still fresh and available around all grazing areas.
Spraying period		▬	▬	▬									Ticks, fleas lice available everywhere.
Residual collection			▬	▬	▬	▬	▬	▬	▬				Harvesting period feeds for dry season

5. NURSERY ESTABLISHMENT AND MANAGEMENT FOR SWEETPOTATO

5. NURSERY ESTABLISHMENT AND MANAGEMENT FOR SWEETPOTATO

The following factors need to be considered when establishing a sweet potato seed nursery:

5.1 SITE

A good site is the one where following resources are accessible:

5.1.1 Water

Water is a very important resource because apart from being a solvent of soil nutrient, it is element of life to all crops.

5.1.2 Topography

Stony, hilly and water-logging areas etc. should be avoided.

5.1.3 Distance

The seed nursery needs to be close to the farmer's home as much as possible for easy management. This also include nearness to a water source so that the farmers do not get much trouble in the travelling from his house to the nursery site as well as to the water source.

5.1.4 Soil

A good nursery requires fertile and well-drained soils for proper establishment.

5.1.5 Protection

Against livestock invasion, the nursery should be fenced to protect it from animals.

5.1.6 Accessibility

The nursery should be accessible in all seasons.

5.2 FACILITIES

5.2.1 Seed

Use of improved or recommended varieties need to be encouraged so that farmers should achieve high yields in the production field.

5.2.2 Labour Force

The farmer can use his family or hired labour force to manage the nursery.

5.2.3 Input

Where soils are not fertile, fertilizers or manure can be applied to boost the development of the plants on the nursery.

5.2.4 Equipment

Watering canes, hand hoe, kitchen knives etc.

5.3 CULTURAL PRACTICES (NURSERY)

Land Preparation:

5.3.1 Tillage

The land should be tiled before beds are made to improve soil structure and texture.

5.3.2 Bed Size

Prepare beds of 1m by any length depending on the size of land.

5.3.3 Fertilizing

Where soils are poor, e.g. sandy soil, apply well rotten manure at the rate of 20 litre tin per bed of 1m x 10m and incorporate the manure with the soil before planting. Fertilizers could be applied before planting by broadcasting method or using drilling method along the rows after the crop has established. Urea or CAN be used as nitrogenous fertilizers or compound fertilizers like 23:210 or DAP can be used at the rate of 200kg/ha.

5.3.4 Spacing

Where a rapid multiplication technique is used, the row spacing should be 10-15cm and plant spacing should also be 10-15cm apart. Ministem cuttings of 3-4 nodes are used when using the mature part of the vine. 2-3 nodes are inserted deep in the ground leaving one node above the ground. Make sure that 2/3 cutting is inserted into the ground.

5.3.5 Watering

Depending on the prevailing method, watering may be done 2-3 times a day plants be hardened off as they grow.

5.3.6 Weeding

'Weeding should be done as soon as weeds appear in the field especially within the 3 weeks after planting.

5.3.7 Field Hygiene

Sweet potato: Vines are ready in 3-4 months time. Harvesting is by ratooning at the base of the vines. Ratooning can be done 3-4 times a year. Do not harvest tube if more seed is required. After ratooning, water the beds and apply fertilizers to boost growth.

5.4 SWEETPOTATO MULTIPLICATION RATIO

The phrase multiplication ratio refers to the increase in planting material over what is planted. Sweet potato is a vegetatively propagated crop with low multiplication ratio of 1:24. The ratio is low compared with that of a maize plant which is 1:300.

5.5 PLANT POPULATION OF NURSERIES AND PRODUCTION FIELDS

- Rapid multiplication technique is used i.e. 2-3 node cuttings of vines.
- Planting is on beds of 1m width and varying lengths.
- Spacing between plants is 10cm x10cm
- The plant population from 1m x 1m bed is therefore 100. Using the ratio of 1:24, a $1m^2$ plot gives 2,400 cuttings of 25-30cm long.
- Sweet potato plant population/ha for root production is 37,000 planted at 0.9m x 0.3m spacing.
- Sixteen beds of $1m^2$ are therefore required to get seed material enough for a hectare of sweet potato production.

Note: This amount of seed can be obtained under optimum conditions e.g. fertilization, frequent weeding, irrigation and full plant population.

6. BUSINESS MANAGEMENT TRAINING (BMT)

6. BUSINESS MANAGEMENT TRAINING (BMT)

Business management training is a very important course to both people that are doing business and that intend to start business. Entrepreneur have to manage their businesses profitably and to be trained for about two weeks, so that they acquire knowledge how to write a business plan, which may help them get financial assistance (Loan) from institutions. Also they know how to project the cash flow in their businesses. Followings are some topics in a short course and also according to target group e.g. already in business.

6.1 THE CONCEPT OF BUSINESS

What is a business?

It is an activity to make profits undertaken by people.

Who is an entrepreneur?

An entrepreneur is a person who undertakes to invest ones time, effort, money and other resources to start and operate a legally accepted business with an aim of making a profit.

6.2 CHARACTERISTICS OF AN ENTREPRENEUR

An entrepreneur must have;

(a) Good organisational ability to interpret a business task into a business plan and a series of meaningful business activities and schedules.
(b) Adequate knowledge about the business to be undertaken and its implications.
(c) Courage and confidence to take risks (they must not be afraid to try new approaches).
(d) Creativity in entering to new markets and should capitalise on their weaknesses.
(e) Good relationship with customers, suppliers and fellow entrepreneurs.

6.3 WHY DO PEOPLE ENTER INTO BUSINESS?

Because of the following reasons:

(a) To earn income.
(b) To find a means of self-employment.
(c) To build business skills and self-development.
(d) Provide Employment to others
(e) Assisting communities by selling services and products within their villages thereby reducing the travelling distance to towns.
(f) Above all small businesses bring positive change in people's lives.

6.4 MARKET RESEARCH

What is a market?

A market is a number of potential customers in a particular area who are able and willing to buy the product of a particular business.

What is market research?

Market research is the study of the market, which is carried out by the owner of the business to find out the possibility of creating or expanding the market of a particular product or service.

6.5 IMPORTANCE OF MARKET RESEARCH

It is important to conduct a market research because it helps to determine size of demand by establishing potential sales volume of new or existing product.

6.6 AREAS OF FOCUS IN MARKET RESEARCH

(a) Determining the demand for the product.
(b) Competition.
(c) Distribution.
(d) Promotion.
(e) Packaging

6.7 COSTING AND PRICING

6.7.1 COSTING

Costing is one of the most important elements in business. Many business people do not know all the costs of their businesses hence do not cost properly.

Definition:
It is a method of calculating costs incurred in production of a product or provision of a service.

When to do costing?

The best time to do costing is before and after production.

Importance of costing

(a) Determination of the selling price so that a profit is made in the end.
(b) Find out which inputs are more expensive and possibilities of cost reduction.

(c) Costing information assist business people to make a right decision on whether to continue producing and selling a product or not depending on the profitability and competitors.
(d) Costing information assist business people to compare profitability of different products and hence decision to select a product, which makes more profits, can be made.

6.8 TYPES OF COSTS

There are two types of costs, one is Direct cost and other is Indirect cost.

(a) Direct costs are those costs that are directly related to the product or service e.g., raw materials, direct labour. Direct costs may also be defined as costs that are directly attributed to the product or service.
(b) Indirect costs are not directly related to the product e.g. transport, wages for the supervisors, rental costs. Indirect costs can also be defined as those cost that are not directly attributed to the product or service.

6.9 HOW TO CALCULATE THE COST OF A PRODUCT/SERVICE

(a) Find the total direct cost, which includes the cost of raw materials and direct labour.
(b) Find the total of all indirect cost and all other overheads.
(c) Add the total direct costs to the total indirect costs and then divide the total costs of production by the total number of finished products including damages if at all there are any. (Unfinished products or Work in progress should be valued separately and cost in the same way as we have explained above).

The simple formula for cost price of the finished product is:

(Total Direct costs + Total Indirect costs) / Total number of products

6.9.1 PRICING

Definition

Pricing is the process of setting the amount of money a customer has to pay for a product or service.

Factors that affect pricing

There are two main factors that influence the price at which to sell a product or service.

(1) Cost of production

If production costs are high the selling price will be high too.

(2) The existing market price

Apart from knowing the production costs it is important to know what others are offering on the market.

-Check the competitor's prices for the product
-Find how much customers are prepared to pay for the product.

Other factors are:
Quality
Quantity
Distribution
Capacity of demand and Supply
Government regulation
Mode of payment

How to calculate selling price?

- The cost plus method
- The comparative method.
- The market will bear method.

6.10 SWOT ANLYSIS

When analysing business performance individuals or group members naturally focus on internal factors of business. It is also important however to consider the external environment of a business. Understanding the external opportunities and threats and acting upon them can increase profits and reduce losses.

MEANING OF SWOT

S: STERNGTH
W: WEAKNESSES
O: OPPORTUNITIES
T: THREATS

Using SWOT will help an entrepreneur to realise whether their business are going to be sustainable or not and what action to take.

6.11 BOOK KEEPING

6.11.1 DEFINITION

This is the art of recording business transactions in the various books of accounts so that the financial status of the business can be readily known/seen. The books of accounts include cashbook, sales book, purchases book, stock records and many others.

6.11.2 IMPORTANCE OF BOOK KEEPING

- Plan for the future
- Know how to fair the business
- Know the amount of money received and spent and how it is spent.
- Assist the business people to know whether one is making a profit or loss.
- Assist the businessman to declare taxable profits
- In other businesses it is a legal requirement to produce financial statements at the end of the business year.
- Helps the business people to build trust from other external people who may be interested to invest in the business.
- Helps business people to build trust in financial services providers. i.e. Banks

EXAMPLES OF THE BOOKS

CASH BOOK

		CASH		BANK		BALANCE	
Date	Description	IN	OUT	IN	OUT	CASH	BANK

SALES BOOK

DATE	DESCRIPTION	CASH	CREDIT	TOTAL

PURCHASE BOOK

DATE	DESCRIPTION	CASH	CREDIT	TOTAL