

A Handbook on our ENVIRONMENT

With Practical Exercises For Learners
*Includes simple readings, diagrams,
messages and exercises*





About the handbook

Farmer Managed Natural Regeneration (FMNR) is one of the World Vision Zambia's models to address environmental degradation challenges. The model hinges on the ability of most indigenous tree species to regenerate or coppice naturally, if allowed to. World Vision seeks to use this as an entry point into creating awareness about environmental consciousness in schools; and the primary audiences targeted by the book are primary and secondary school children.

The handbook covers 5 thematic areas (knowing the environment, conserving the environment, the role of trees in our environment, climate change and expanding learning beyond classrooms). Within each thematic area, there are lessons designed in such a way that they provide practical exercises, which is

An opportunity to engage children in real action to increase learning about the lesson's theme. The exercises can be done during School club meeting days. The handbook has illustrations and drawings that relate to the theme of the lesson.

It also provides practical exercises that improve awareness about the environment and trees, while engaging children in conservation efforts around the school. It is hoped that teachers, learners and other users find it useful.

Acknowledgements:

Here is the proofread version with the inclusion of Bwalya Yamba as the graphics designer:

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Theme 1: Knowing Our Environment

Lesson 1: Knowing our environment

What does the term environment mean?

“The term environment is everything that surrounds us and how it affects growth of living organisms.”

There are two types of the environment:

1. **Natural environment** - this is the environment created by God such as natural forests, lakes, swamps and rivers.
2. **Man-made environment** – this is the environment created by human beings such as bridges, buildings, towns and forest plantations.

The natural environment includes:

Atmosphere : Space occupied by air above us. In the atmosphere there is air, dust, clouds and flying objects (birds, aeroplanes).

Hydrosphere: Space occupied by water and this includes lakes and rivers. Here we find fish, hippos, sea animals such as sharks, snails among others.

Lithosphere: Space occupied by soil and stones that make up the earth. In the soil, we find earthworms, algae and reptiles.

Biosphere: Space occupied by life. This includes all living things.

Exercise:

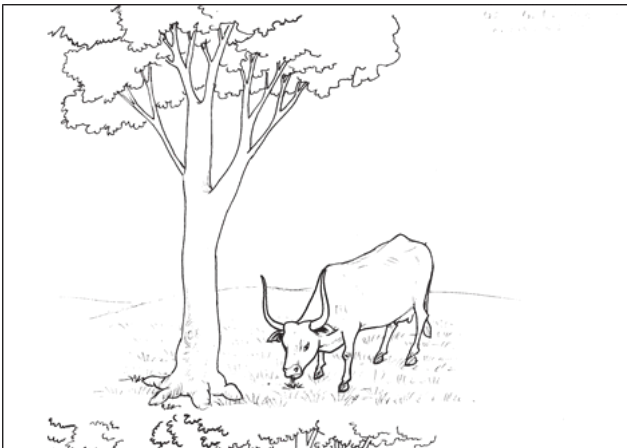
Identify 6 types of living things found in the parts of the environment in the table below

Part of the environment	Living things found in that part of the environment					
Atmosphere (the air above us)						
Hydrosphere (in water bodies)						
Lithosphere (in the soil)						
Biosphere (all living things)						

Why is the environment important to us?

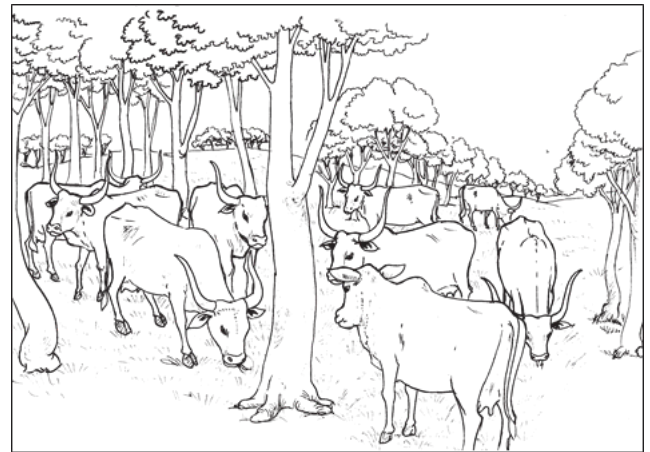
1. The environment is home for human beings.
2. It is where we breathe and eat.
3. In the environment, all living things depend on one another.
 - The sun provides light and heat for plants.
 - The plants are consumed by animals.
 - Some animals are consumed by fellow animals
 - Some animals are consumed by human beings.
 - Some animals eat human beings.
 - Plants and animals provide raw materials for construction and clothing.
 - Insects like bees pollinate plants.

Understanding our environment



Let us start by looking at one type of living thing and how they live with one another. Here, we have a cow eating grass under a tree.

Then, we look at how the many cows and many trees live together. The cows need the trees for shade. The cow dung from the cows makes the soil fertile for the trees to grow.













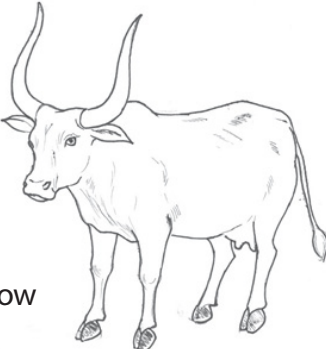



In life, the many living and non-living things stay together and benefit one another. Do you see how many living things are in this diagram? Name them if you can.

Never Forget

Whenever you destroy one thing in your environment, you destroy the way the living things live together. For example, if you cut a tree, a cow suffers because there will be no shade.

Lesson 2: What makes up our environment?

These are some of the things found in the environment

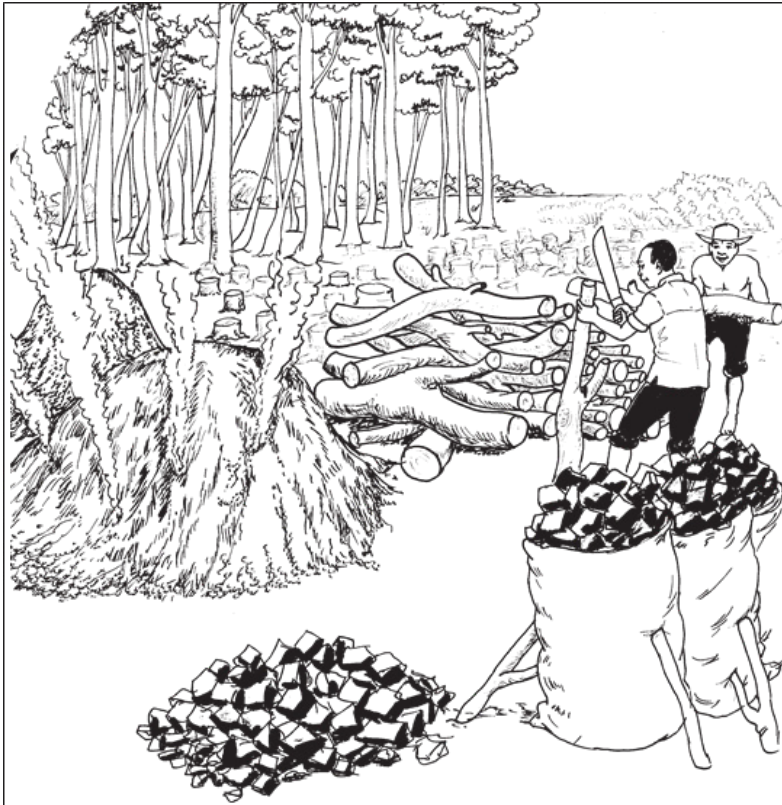
Animals	Birds	Insects
 Tortoise  Frog	 Woodpecker  Guinea Fowl	 Wasp
 Dog  Monkey	 Maraboo Stock  Crane	 Butterfly
 Cow	 Weaver bird	 Cockroach  Beetle

Exercise:

Using the animals, birds and insects shown above, fill in the table below.

Animal or Bird or insect	What is its local name?	What does it eat?	Where does it live?	What kind of weather does it prefer?	What kind of tree does it prefer for its home or food?

Lesson 3: How charcoal burning destroys our environment!



Activity

Read about charcoal burning because you will use this information during the debate organized by the teacher. The motion will be, "Charcoal burning destroys our environment and therefore should be stopped immediately".

What is charcoal?

Charcoal is a product of trees that is used for cooking. Charcoal is produced in many parts of Zambia. Charcoal burning is an economic activity in many homes. It is a source of income.

How is charcoal produced?

Step I: Trees are cut into pieces.

Step II: They are put together and covered with grass and soil for burning.

Step III: Leave the pieces to burn for some time to make charcoal.

Step IV: When ready, the soil is removed and charcoal collected into bags.

Step V: It is then ready for selling.

Disadvantages of charcoal production

- It destroys trees that would be a source of oxygen and shade for other living things.
- It spoils the soil where charcoal burning takes place.
- The heat from charcoal burning kills organisms in the soil.
- Trees are a home for many animals and when they are cut down, these animals move away.
- When trees are cut down in an area, that area can be open to soil erosion.

- Charcoal burning releases carbon dioxide which is a dangerous gas to the environment because it causes climate change.
- People engaged in charcoal burning normally suffer from various diseases.
- Crop yield also becomes low.

Disadvantages of charcoal production

- Charcoal is used for cooking food,
- Mature trees and trees that do not make good timber are converted into charcoal, which is useful,
- Charcoal sellers pay tax, and the money is used by government to buy medicine in hospitals and pay salary for teachers.
- Money from charcoal is used to buy food, sugar, clothes, soap and other necessities in homes.

What can be done to reduce impacts of charcoal burning?

- People should be encouraged to plant trees.
- Farmers should allow the trees that were cut down to sprout and grow back into bigger trees.
- People should use energy saving cook stoves that reduce the amount of charcoal used.

Lesson 4: Activities that destroy our wetlands

What are wetlands?

Wetlands are areas where water is present at or near the soil's surface all year. Several plants and animals live in the wetlands. wetlands. The bull frog and mud fish are some of the examples. Examples of wetlands in Zambia are the Lukanga Swamps, Kafue Flats, and the Baroste Plains.

Importance of wetlands

- They are a source of raw materials for mats, ropes, thatching material for houses and various art and craft materials.
- Fish, birds and animals in wetlands are a good source of food.
- Wetlands are important source of water for

domestic use.

- They are a source of income for households through sale of raw materials.
- Wetlands absorb heavy rain reducing floods
- Wetlands also purify water by removing solid materials
- Wetlands are good for recreation such as boating, fishing, swimming, bird watching and hunting.
- Students visit wetlands for study purposes.
- They are home to many plants and animals.

The pictures below show things people do that destroy our wetlands



Construction of roads in wetlands limits flow of water.



Brick making leaves ponds that harbor mosquitoes



Growing crops such as rice in wetlands



Trees in wetlands are cut for brick burning.



Constructing houses in wetlands.



Grazing reduces number of plants



Markets in wetlands reduce space covered by wetlands

Exercise:

List the things people do that destroy wetlands and suggest how they can be stopped.

Theme 2: How To Conserve Our Environment

Lesson 5: Improving soil fertility through composting

What is compost?

Compost is organic matter (bits of plant and animal) that has been left to rot with the help of bacteria and other creatures. Compost adds manure to the soil.

How is compost used to improve soil fertility?

- It is used to add manure in the vegetable gardens.
- It is also used to add manure in flower gardens so that flowers grow well.
- It is used when sowing seed in a nursery bed.
- Compost should be mixed with top soil to allow crops take nutrients from it.
- Compost can also be used for mulching between crops or around trees.
- Compost can be mixed with soil and used for raising tree seedlings and can be used as fish feed.
- Compost can be mixed with water and used as a compost tea as a quick boost for indoor plants.

There are two ways to make compost

A) First method: A compost pit for dry conditions

This is how to make a compost pit suitable for dry conditions:

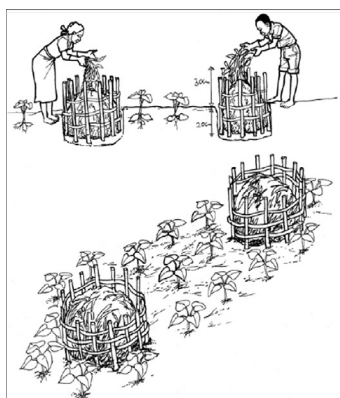
1. Dig a pit which is about 1.5 metres long, 1.5 metres wide and 2 feet deep.
2. Put layers of maize and rice stalks, banana leaves or parts of plants which will take a long time to become rotten.
3. After a few layers of different waste products, you can add a layer of ash (not too much) or top soil. If you are using kitchen waste, cover it well or attract rats and other pests.
4. Repeat Step 2 and 3 until the pit is full
5. Water each layer before adding the next, finishing
6. with a layer of topsoil. Cover the pit properly.
7. Pour plenty of water on the mound/pit under the cover once a week, this is to prevent overheating
8. The compost is wet enough when your hands stay damp after squeezing a handful. If the water runs out it is too wet.



B) Second method: Compost basket

Refer to the diagram below on how to construct a compost basket.

1. Use hard sticks to construct a circular basket fixed on the ground as shown in the illustration.
2. Add layers of waste products which can rot and mix them with top soil and ash. Remember to water every layer.
3. Make sure the waste does not run out of the basket.
4. Cover the top with banana leaves and dry grass to avoid moisture loss
5. You are advised to construct the compost basket within the garden so that as the manure gets out of the compost basket, the plants use it immediately.
6. Water the basket regularly.



Activity

Ask your teacher to guide you on how to make compost.

Lesson 6: Mulching as a way of protecting our soil

What is mulching?

A mulch is a layer of old leaves, dry grass, small branches of trees or manure put on the soil around plants to protect them and help them grow.

Mulching helps prevent soil erosion and adds manure to the soil. This makes the soil more fertile and reduces weeds in the garden, keeping the soil moist.

The materials used for mulching are:

- Crop stems and stalks.
- Dry banana leaves and leaves of other plants.
- Leftover crop such as banana and sweet potato peelings.
- Compost and manure.

The materials used for mulching are:

- Plastics and polyethene bags should not be used.
- Remains of the same crop to mulch the same crop in order to prevent spreading disease. For example, remains of maize to mulch a maize garden.
- Green vegetation is not normally used to mulch because it attracts pests and fungal diseases.

These are the materials required:

- Crop stems and stalks
- Dry banana leaves and leaves of other plants
- Leftover crop residues such as banana and sweet potato peelings
- Compost and manure

Follow the following steps to mulch the school garden.

1. For large plants, such as cassava spread the mulch between the rows and around each plant.
2. For small plants (such as cabbages) or seedlings apply it between the rows and not directly around the plants (see illustration below). In this way, you will not encourage diseases but will reduce weeds and add organic matter to the soil.
3. Try different thicknesses of mulch to see which works best for your crops.
4. Always apply mulches to a warm but wet soil.

Mulch applied to a dry soil will keep the soil dry.

5. Renew your mulch after every 6 months.

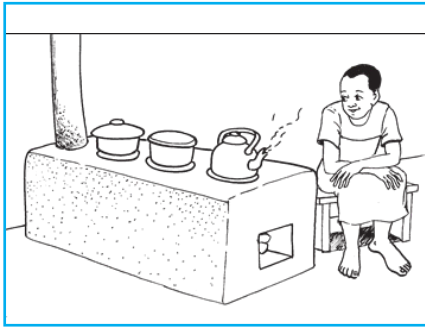


Never Forget

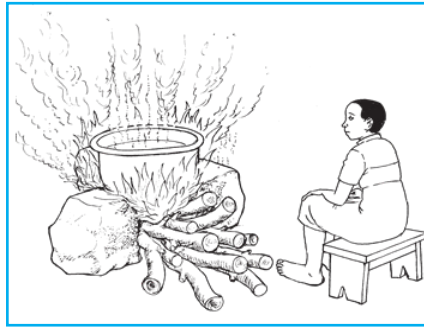
Mulching saves a gardener's time and work in the long run. You will spend less time weeding, digging in a loose soil. Mulching prevents water from evaporating from the surface of the soil and less watering is necessary.

Lesson 7: Reducing volume of firewood and charcoal for cooking

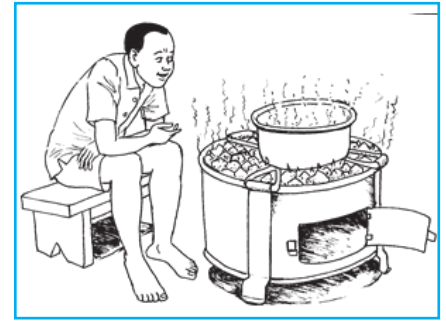
Our homes use a lot of firewood and charcoal for cooking, meaning that many trees are cut down. This must stop because it destroys our environment.



This is a Lorena energy saving cook stove. With one source of fire, you can cook using three saucepans at a go and save a lot of firewood. All households should have and use this stove for cooking.



This is a three stone cooking stove. It is wasteful because it uses a lot of firewood and most heat goes into space. People should be discouraged from using this stove.



This is a charcoal stove called mbaula in local languages of Zambia. It wastes a lot of charcoal unless it is made in such a way that it saves heat. A mbaula that does not save charcoal should not be used for cooking.

Activity

Answer the following question on firewood and charcoal

Where do you get the firewood that you use for cooking at home?

From which trees do you get firewood?

Are they planted or grew on their own?

How many hours does it take you to collect firewood?

Apart from firewood, what other materials are used for cooking in your home?

Do your parents buy firewood? At what price?

What type of stoves do you use for cooking in your home?

What health problems are related to cooking using firewood?

How far from your home from where you collect your firewood?

Theme 3: The Role of Trees In Our Environment

Lesson 8: Know your trees and their usefulness in the environment

What is a tree?

A tree is a wooden plant with a long stem with branches and leaves. Trees are used for making timber. Some trees produce fruits eaten by human beings.

What is a shrub?

A shrub is a plant that has several short stems usually less than 6 meters.

How are trees and shrubs useful to the environment?

- They provide shade.
- They are windbreaks for school buildings and homes.
- Trees and shrubs are important in the rain making process.
- When their leaves fall on ground, they improve soil fertility.
- Small animals live under or on the trees.
- Trees and shrubs control climate change.

Know the tree vocabulary

Annual rings - Circles in the middle of a tree trunk that indicate a tree's age; one circle for each year.

Arboreal - describes a living thing that lives in trees (birds, small animals).

Bark - The outside "skin" of a tree.

Branch - The part of a tree that grows outward from the stem.

Bud - The place on the stem or branch where flowers or leaves will come from.

Carbon Dioxide - The gas that is released by humans and other animals when they breathe; plants need it to live and manufacture their food through a process called photosynthesis.

Chlorophyll - A green substance in plants which enables them to use sunlight in order to grow.

Cone - This is a structure that contains tree seed like the seed of pine trees.

Conifer - Trees that grow cones with seeds, such as pines.

Deciduous - The name for trees that lose their leaves in the dry season. Examples are Mvule trees.

Evergreen - Trees that keep their leaves all year long and therefore appear green all year round.

Flower - The part of a plant that produces fruits.

Forest - A large area covered with trees. Usually, this area should be more than 40 acres.

Fruit - A seed container that develops from a flower; some examples are oranges, mangoes, jack fruit among others.

Habit - The shape of a tree.

Habitat - The natural environment where trees and other living things live.

Leaf - The green part of a tree where food is created for the tree through photosynthesis.

Lobe - The part of a leaf that "sticks out".

Needle - A long, narrow leaf, sometimes pointed, like those on a pine tree.

Nursery - A place where young trees are raised.

Oxygen - The gas that is produced by plants; humans and animals need it to live.

Photosynthesis - The way plants make their own food using sunlight, water, carbon dioxide and chlorophyll.

Rainforest - An area with a thick cover of trees, covering a very large area and receives very high annual rainfall of at least 1000 millimeters.

Root - The underground part of a tree that holds it in the soil; roots also take in water and nutrients to make food for the.

Sap – The fluid inside of a plant that distributes food and water to various parts of the plant.

Sapling - A young tree less than 3 feet tall.

Seed - The part of a tree that will produce new trees when planted and it germinates.

Seedling - A very young tree.

Shrub - A plant that has several woody stems.

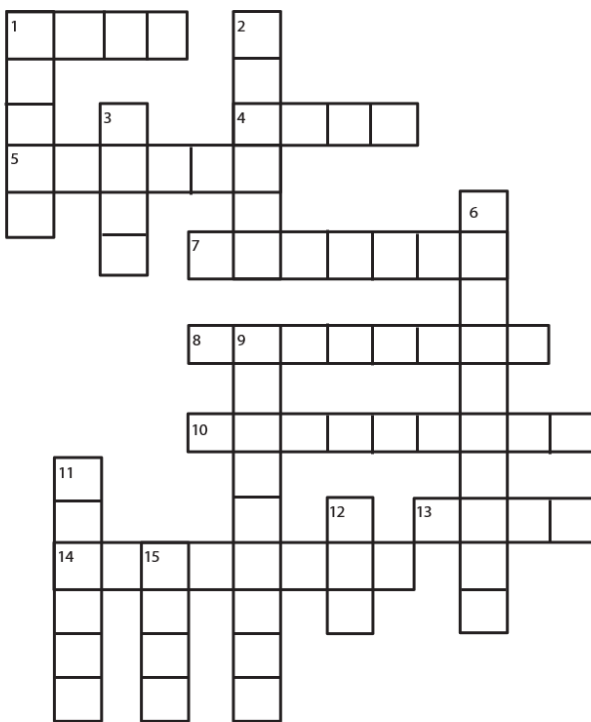
• **Species** - A single type of tree, like the eucalyptus or Mvule tree.

• **Stomata** - Tiny holes on a leaf where carbon dioxide goes in, and oxygen comes out.

• **Tree** - A large woody plant, usually with one main trunk, growing over 5 meters high.

Tree Crossword Puzzle

Using your vocabulary for trees, fill in the following crossword puzzle



DOWN

- 1 The main stem of a tree
- 2 A large area covered with trees
- 3 The green part of a tree where food is created for the tree and oxygen is produced
- 6 An area with many trees in a hot climate with very high annual rainfall
- 9 Trees that keep their leaves all year long
- 11 The part of a tree that grows outward from the trunk
- 12 The fluid inside of a plant that distributes food and water to various parts of the plant
- 15 The outside "skin" of the woody

ACROSS

- (1) A large woody plant, usually with one main trunk, growing over 5 meters high
- (4) The underground part of a tree that holds it in the soil
- (5) A long, narrow leaf, sometimes pointed, like those on a pine tree
- (7) Tiny holes on a leaf where carbon dioxide goes in and oxygen comes out
- (8) A very young tree
- (10) The name for trees that lose their leaves in the dry season.
- (13) The part of a tree that will produce new trees when planted
- (14) Living things which live in trees

Tree Word Search

This is a game of looking for words that relate to the vocabulary of trees. Search for the tree words that you now know from your tree vocabulary

C	O	N	I	F	E	R	K	R	A	B
R	Y	E	M	E	N	O	C	B	S	R
O	G	E	U	J	W	O	L	U	A	A
W	T	D	I	N	T	T	O	D	P	N
N	A	L	B	F	R	U	I	T	X	C
U	R	E	M	S	D	N	W	T	T	H
Y	B	F	A	I	I	I	O	H	R	D
P	O	A	C	E	G	O	D	T	E	M
O	R	E	V	E	R	G	R	E	E	N
N	E	L	F	P	C	U	S	L	U	B
A	A	O	A	Z	N	R	Y	Q	S	V
C	L	T	J	K	O	X	Y	G	E	N

Arboreal
 Bark
 Branch
 Bud
 Canopy
 Cone
 Conifer
 Deciduous
 Evergreen
 Fruit

Leaf
 Needle
 Oxygen
 Root
 Sap
 Seed
 Tree
 Trunk
 Twig



Lesson 9: Parts of a tree and their use

Roots – This is the part of a tree that attaches into the ground to obtain and store nutrients. Some tree roots such as cassava are edible and some have medicinal value.

Trunk - This is the main stem connecting the roots and the branches. It is used for timber and firewood.

Branch - This connects the leaves to the trunk. Many birds sleep on tree branches. Branches are a source of firewood.

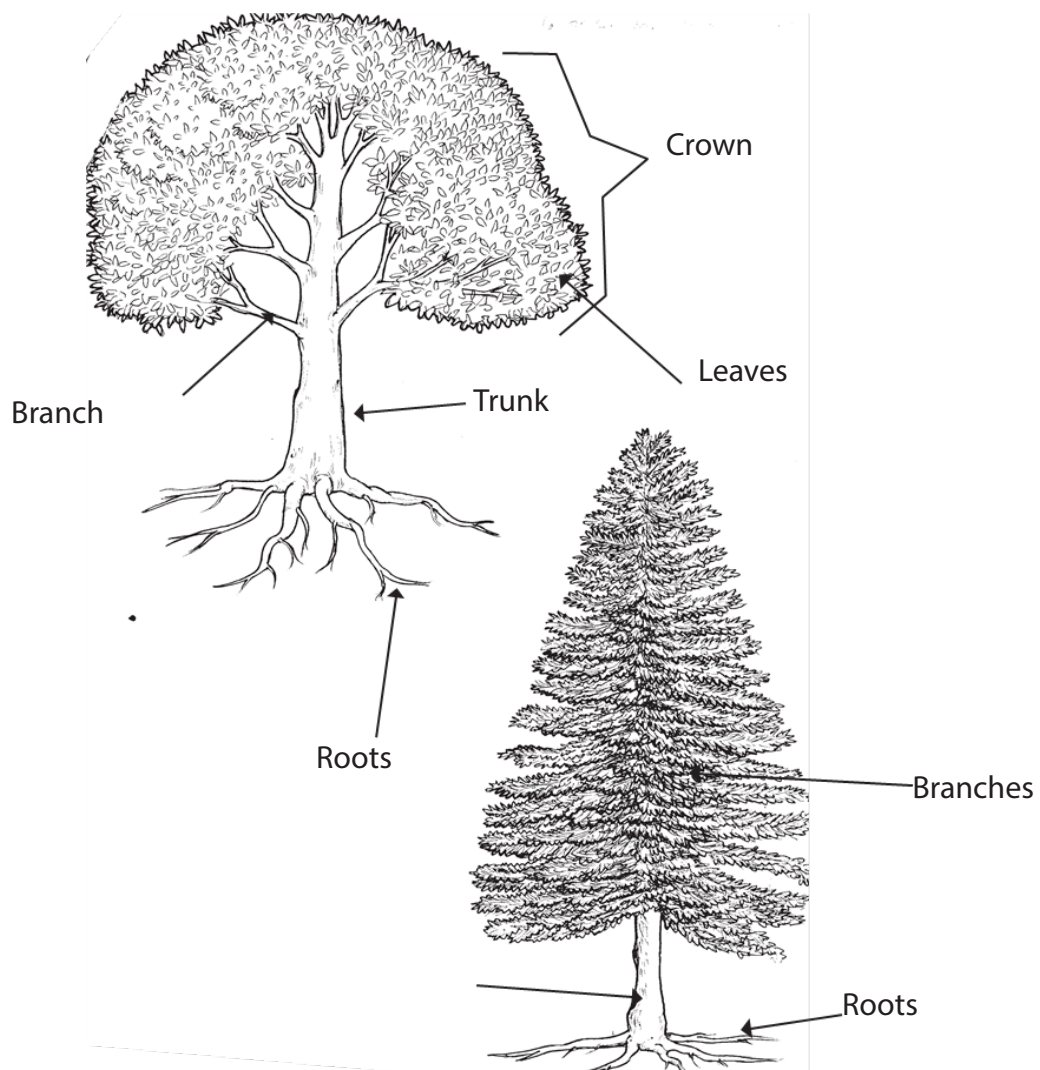
Crown - This is a combination of branches, leaves, and flowers connected together from the main stem. This provides shade and are rest places for animals such as lions.

Seed - This is the reproduction unit of a plant through germination. Many seeds of trees are edible by both people and animals.

Leaf - This is a flat but green part attached to the branches. It is the main organ for photosynthesis and transpiration for the plant. Leaves of trees are eaten by animals such a giraffe. They also have medicinal value.

Evergreen trees - these are trees that do not shade off leaves during the dry season.

Deciduous trees - these are trees that shade off their leaves during the dry season such as Mubuyu tree.

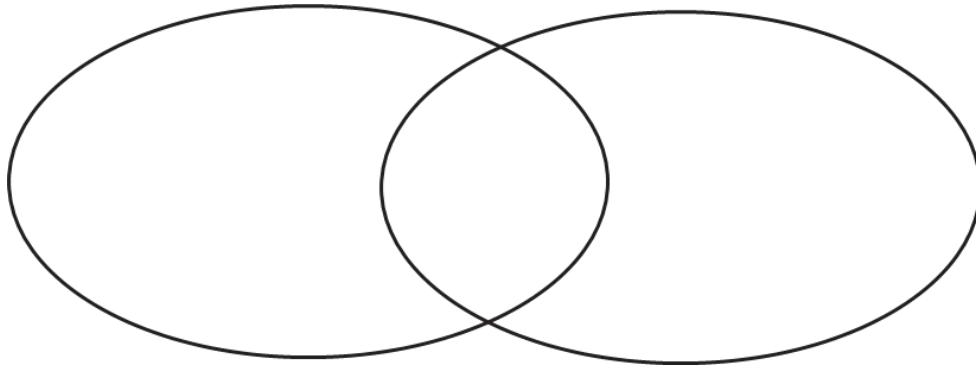


Venn Diagram exercise on deciduous and evergreen trees

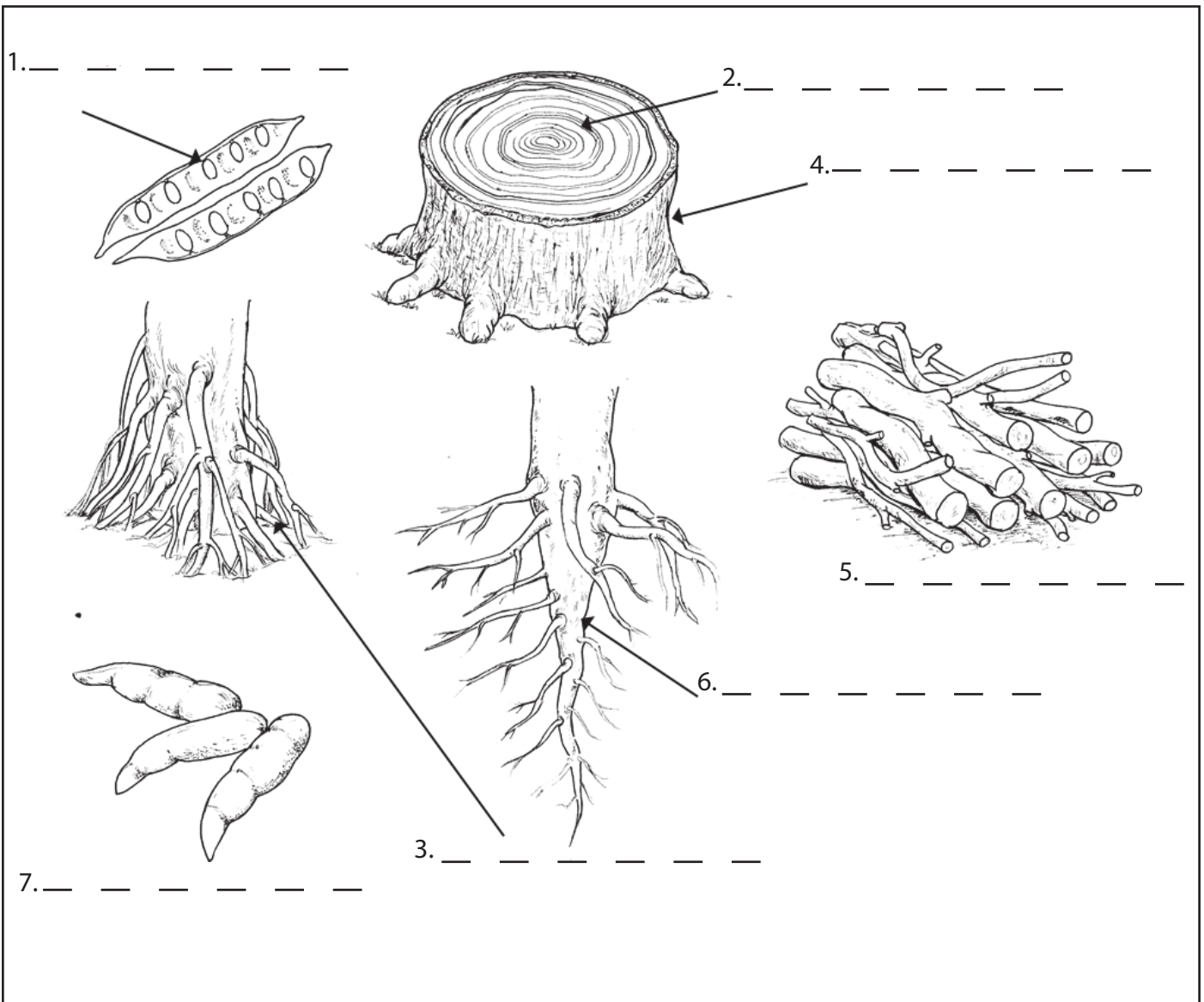
Using the Venn diagram below, give common examples of deciduous and evergreen trees in your environment. Use local names in case you do not know the English and/or scientific names of the trees.

Deciduous

Evergreen



Name the following parts of a tree



Lesson 10: Start your own tree nursery

What is a tree nursery?

A tree nursery is a place where young trees are raised until they are ready to be transplanted into the garden.

What is the most important feature of a tree nursery?

The most important feature is the shade where young trees called seedlings grow.

Is it necessary to choose the right site?

Yes:

Why?

Because:

- We need to reduce death of seedlings;
- We need to make it easy to look after the seedlings
- We need to produce enough good seedlings for planting

How do I choose a good site?

Tree nursery needs to be near to an adequate supply of water but also:

- not on a very steep slope;
- on loam soil;
- where there is shelter; and
- easy to reach when transporting the seedlings for planting.

Why is it important to have water?

- Plants need water to grow especially in the dry season;
- The water should be clean with no toxic materials or soil particles dissolved in it;
- The water should be free or cheap, because tree seedlings need a lot of water.

Can a school establish a tree nursery?

Together with the school administration, pupils can start a nursery, learn how to manage them and produce seedlings for planting. Follow the guide on the next page to start one at your school.



A tree nursery

How to start a nursery

Activity:

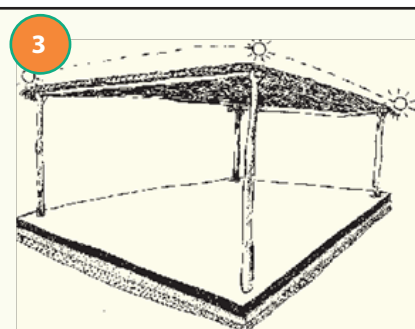
Read the following steps and ask your teacher to guide you on how to start a school tree nursery



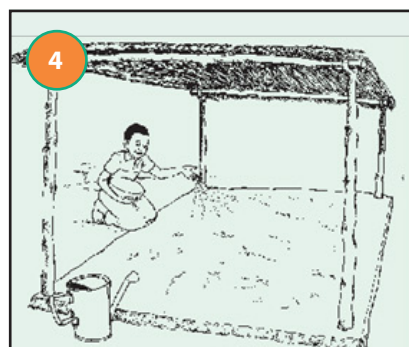
Mix sand and forest soil.



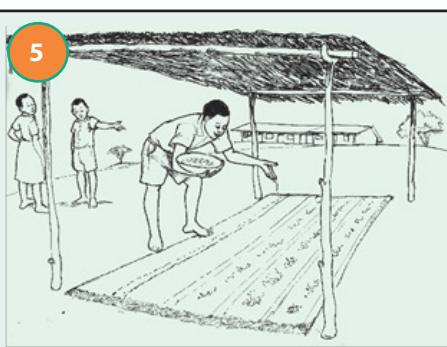
Prepare a fine seed bed.



Construct your seed bed east to west to avoid direct sunlight.



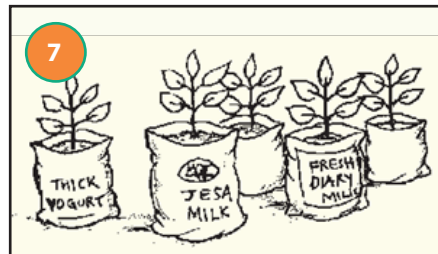
Get your tree soil & sow it by broadcasting it. Water regularly



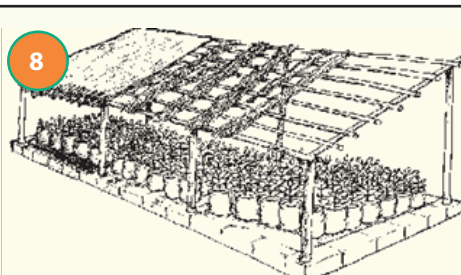
Or you can plant your seed along lines. Soon your seeds will germinate



Transplant seedlings into pots filled with soil. Put the seedlings in their pots under a good shade.



Use locally available potting material.



Reduce shade gradually to allow the seedlings to get used to field conditions before planting. This is called hardening off.



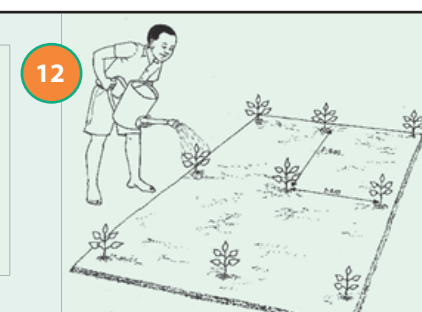
During hardening off, trim the roots of the seedlings frequently.



Plant when seedlings reach 15-20cm tall. Carry seedlings carefully to the planting site to avoid damage.



Remove polythene from seedlings. If well removed, it can be used again.



Plant in well prepared land. Maintain spacing. Protect and continue watering if the rains fail

Remember

A nearby source of water is important. After you have planted in the field, take care of your small trees. Water them. Protect them from livestock and children playing by putting up a fence or other protection. Destroy termite mounds.

Lesson 11: Planting a tree

Planting procedure for trees?

You can reduce death of trees planted by planting and handling seedlings carefully. Seedlings need care, fertile soil, good moisture, no weeds and control of pests and diseases.

Seedlings too, do not require excessive heat, wind or water logging. Clear the bushes, do lining and pitting using good spacing and choose the right species to plant for the right purpose

Basic rules for tree planting



- Plant during the rainy season.
- Plant trees on a cooler day - not a hot sunny day.
- Protect seedlings during transportation!
- Store seedlings properly if immediate planting is not possible.
- Treat seedlings properly at the planting site to avoid deaths.
- Use your hands and hoe when planting seedlings.
- Plant seedlings at least to the original level planted while in the nursery.
- Plant straight seedlings as needed because you get better results with straight seedlings.
- Protect your young trees from animals, weed and fire.
- Check the survival of your seedlings (300 trees per acre is recommended).

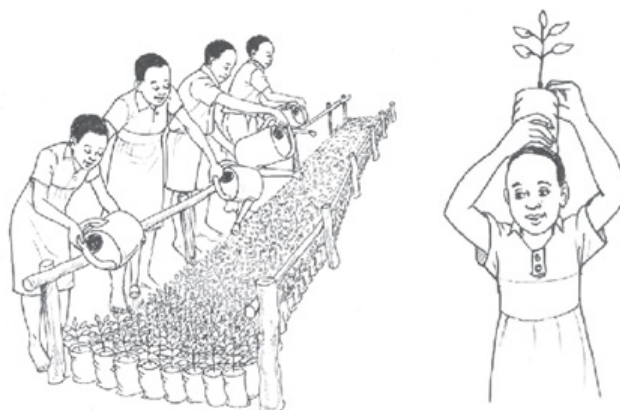
"It is better not to have planted, than to have trees planted incorrectly."

Ask a professional forester for guidance in case of any problem.

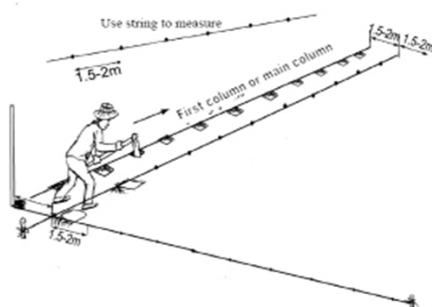
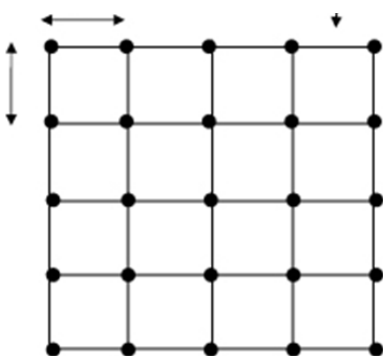
A tree planting guide

Every child at school can grow trees. Trees maintain the local climatic conditions and fight climate change. They hold soil by preventing rain from washing and taking it away. They maintain soil nutrients and structures.

Communities living near forests depend on forests for food, fruits, medicine, fodder for their animals, firewood, charcoal, poles for construction of homes, timber, fiber for art and crafts, and honey. Forest products are traded for money and are important source of raw materials for industries



Make proper lines using a string. The space between the two lines should be 3 metres by 3 metres. Sometimes it is 1.5 metres by 1.5 meters as shown in the diagram below



The reasons for planting in a straight line are:

- Trees look good when they are in a straight line.
- Trees also grow straight and produce good poles
- It is easy to weed them when they are in a straight line.

Exercise

1. What do trees need to grow?
2. What shall we look for when we choose a place to plant a tree?
3. Give at least three ways in which planting a tree helps the environment.
4. What are the rules for planting trees?

Lesson 12: Watch it grow!

You need to know how to look after the trees you have planted and here is the guide. You must put this in practice.

Once a week, the class will visit their woodlot to do the following:

- Weed the seedlings. You may weed the entire woodlot or weed around the seedling.
- Identify the problems that the trees may be facing. Some of the problems to look out for include lack of water, termites, roaming animals eating off the leaves, caterpillars feeding on leaves or death of the seedlings.
- Water in the morning and evening when the sun is not too hot.
- Replace the dead seedlings.
- Repair the fencing material (using thorny bushes) around the woodlot to stop roaming animals from entering the woodlot and damaging the trees.
- Ring fence each of the seedlings
- Dig out the termite mounds to control termites.

As the trees grow, it is important to remove unnecessary branches (a process known as pruning).

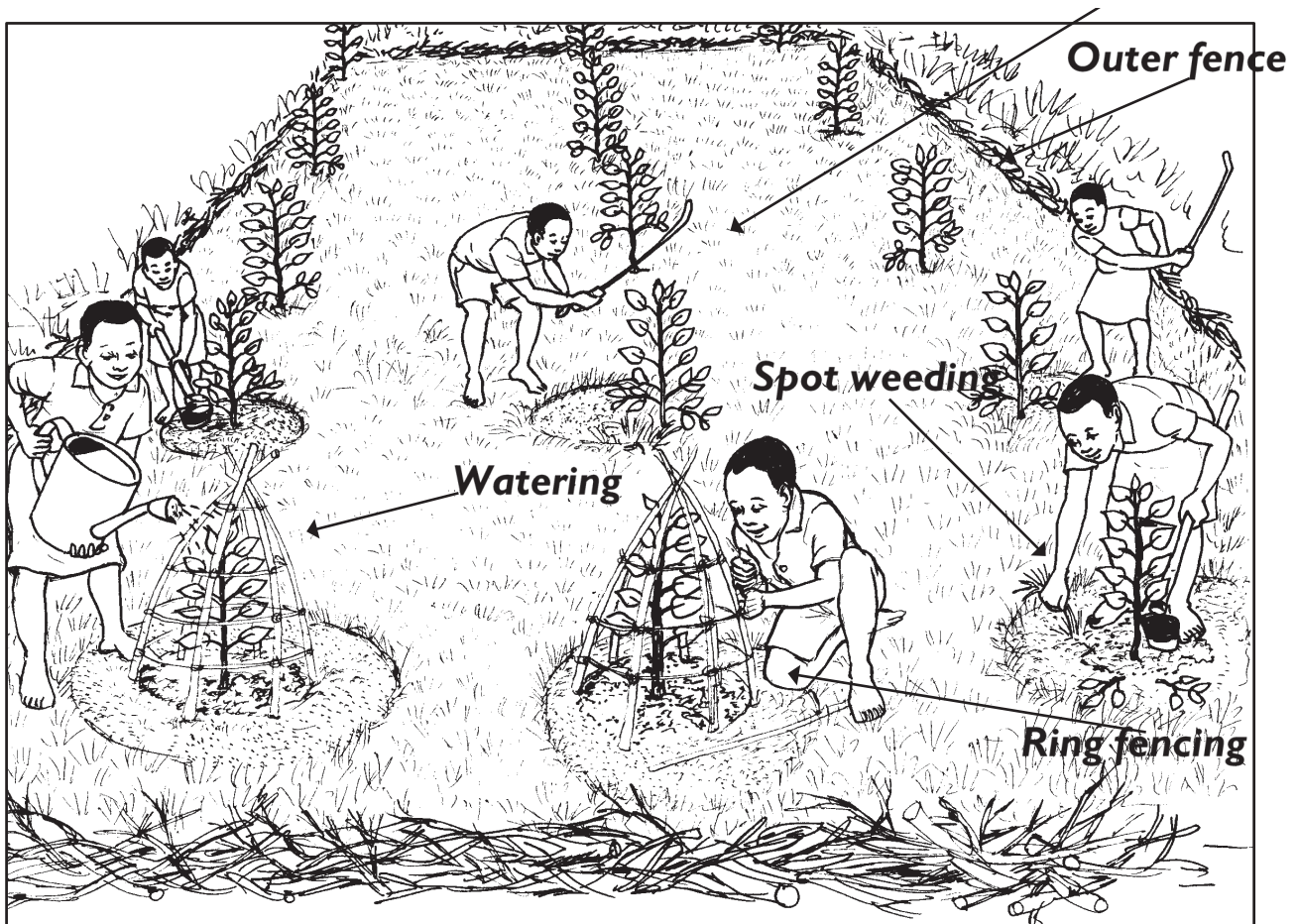
This will help your tree to grow straight.

Remember

Trees grow much slower than crops such as maize. Be patient as you watch your trees grow.

Exercise

List ten things you need to do to make sure your tree grows well and fast.



Lesson 13: Agro-forestry; mixing trees and crops

This is what you need to know about agro-forestry

- Agro-forestry is the practice of combining trees with crops. The trees benefit from the crops through weeding while the crops benefit from the trees when the leaves fall down and become manure.
- It helps farmers to have many living things on the farm and makes soil fertile for future use.
- Agro-forestry trees help plants to survive very dry conditions and improve crop harvests by providing shade and manure from falling leaves
- Trees such as Musangu (Gliricidia Sepium) or Sesbania Grandflora are good agro-forestry species.
- When trees are inter cropped with crops, it is important that this is done in clear lines.

Photos of Agro-forestry gardens

Note: Please share any Agro-forestry pictures from the SLaR project, if any.



Exercise

List the different types of trees that are normally grown with crops in your area. Write their local names in case you do not know the common English names. Write the crops they are grown with.

Exercise

Observe the photos here below and develop an FMNR messages for each of the photos. Fill the message in the dotted lines below each photo.



Never Forget

It is less costly to grow trees from stumps, or looking after those that germinate on their own. Therefore regenerate more trees to get a lot of benefits.

Theme 4: Climate Change

Lesson 16: Understanding climate change

Climate change is the change in weather patterns over a long period of time and includes changes in temperature, rainfall, or wind patterns, among other effects. It is caused by both natural and human causes.

The natural causes are:

- Heat from the ground that is released to the atmosphere
- Direct heat from the sun
- Heat released from the sun.

Things that people do that cause climate change are:

- *Deforestation* - cutting trees for firewood and
- Clearing land for agriculture.
- Burning vegetation which releases heat, smoke and gases into the atmosphere.
- Use of petroleum products that release gases to the atmosphere.
- Growing crops such as rice in swamps.
- Littering waste everywhere.
- Poor agricultural practices.

The effects of climate change are:

- There are floods in many places destroying houses and crops.
- Low yield and animal deaths, droughts.
- Landslides and soil erosions in many places
- Increases in the spread of disease such as malaria across the country.
- Poor agricultural practices.

You need to fight against climate change by:

- Planting and growing new trees.
- Remove and stop throwing plastics in our Environment.
- Encourage parents to use energy-saving cook-stoves.
- Stop growing crops in swamps.
- Harvesting rain water and use rainwater.

Causes of climate change



Deforestation



Increased use of firewood and charcoal



Pollution of the atmosphere/air



Cultivation of crops in wetlands

Actions for the youth clubs to address climate

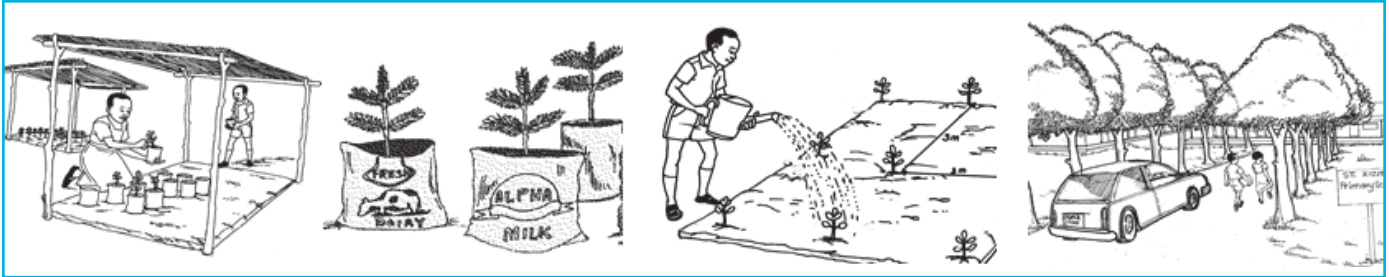
Tree planting

Establish nurseries that will be sources of seedlings for your tree planting.

Allow seedlings to get used to field conditions.

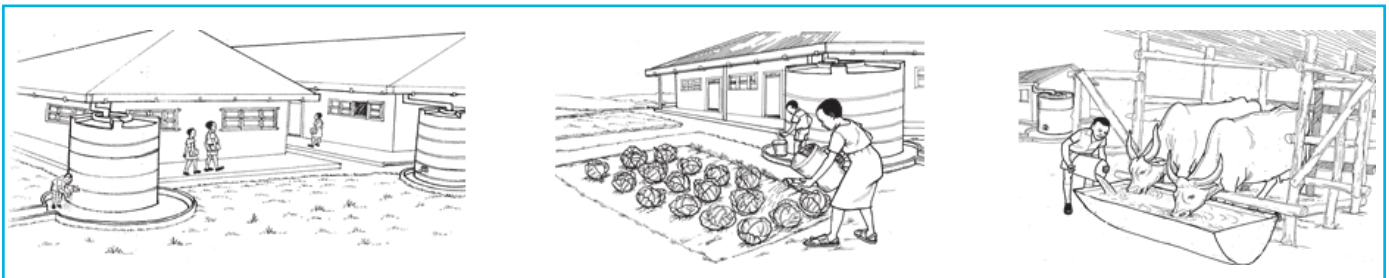
Plant in well prepared land, maintain spacing and continue watering if rains fail.

School can plant along lanes. Trees make the school environment better.



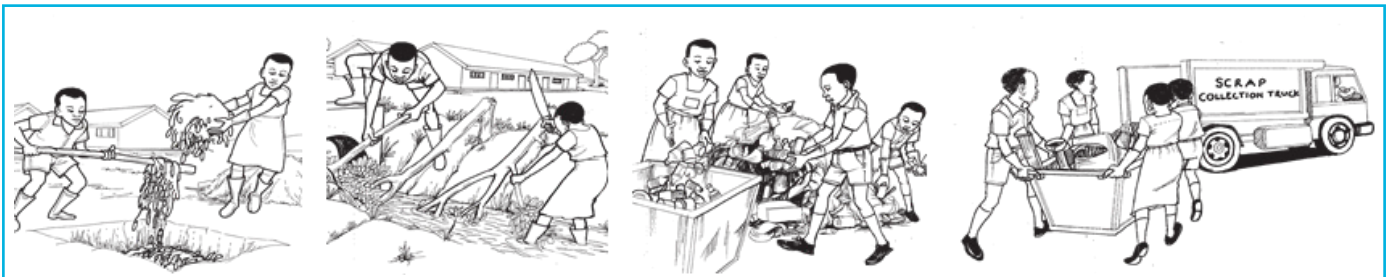
Rainwater Harvesting

- Fit all roofs with gutters and collect all water in a tank.
- Use the collected water to irrigate crops, wash clothes and cars. Treat the water for domestic use.
- Animals can also consume the same water.



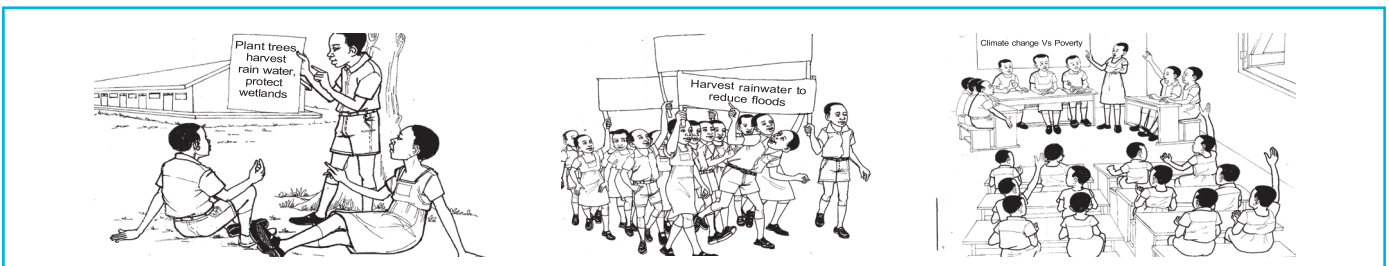
Waste Management

- Establish garbage and compost pits to make manure from bio-degradable waste.
- Collect all plastic bottles and kavera in a rubbish container.
- Make sure the garbage is taken away for disposal in a landfill.



Raising Awareness

- Talk to your peers about the causes of climate change.
- Hold public rallies and peaceful demonstrations.
- Hold debates to improve your understanding of climate change.



Never Forget

The future of our environment depends on our actions today. Young people can save the environment by taking action. Get involved.

In the space below, write a composition of not more than 500 words on climate change, its impact and what should be done to stop it.

A large grid of dashed lines for writing an essay, consisting of 20 rows and approximately 25 columns.

Lesson 17: Rainwater Harvesting

Rainwater harvesting is the process of capturing rain water for domestic use. It is commonly from the roof of a house.

How does rainwater harvesting help?

- We get a lot of water when there is no water in the taps and boreholes.
- We get clean water yet there is dirty water in the wells.
- It helps save money because it is free.

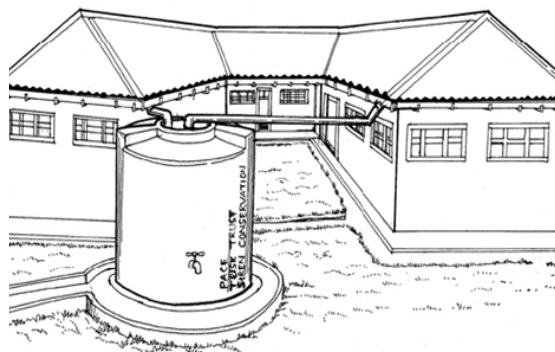
Rainwater harvesting can provide water for:

- homes with even big numbers of people.
- schools with large numbers of learners
- hospitals with lots of patients every day.

How do you collect rain water from a roof?

- Make a gutter either on the entire house or the side of the house from which you want to collect water.
- Contact an expert on how to fix the gutters and knowing the right sizes gutters.
- Connect the gutters directly into the tank.
- You can also use large saucepans, jerrycans, drums, large plastic containers in case you do not have money to buy a large tank.
- Ensure that mosquitoes are kept out of the container where water is stored.
- Seal the tank to reduce the risk of diseases

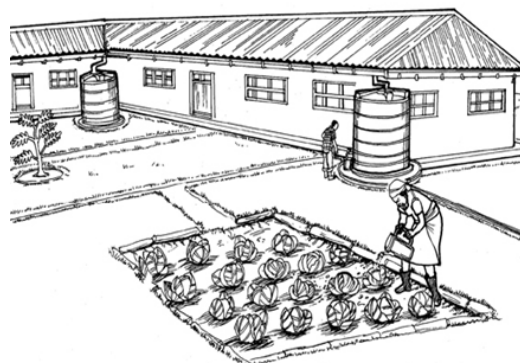
such as malaria.



What can rainwater be used for?

Rainwater can be used for:

- Washing clothes and household utensils.
- Irrigating crops and flowers both at schools and households
- Cleaning toilets (this applies to urban areas)
- Drinking if it is kept clean.
- Cooking food.



Practical Exercises

Treating harvested rainwater for drinking

OPTION 1: Boiling water

STEP 1: Using a clean piece of cloth, filter harvested rain water into a clean container.

STEP II: Put filtered water into a sauce pan and boil for over 20 minutes.

STEP III: Let the water cool and store it in a clean container that must be covered. This water is safe for drinking.



Boiling

OPTION II: Using the sun's rays

STEP 1: Using a clean piece of cloth, filter harvested rain water into a clean container.

STEP II: Put filtered water into clean plastic bottles and expose to direct sunlight for more than 7 hours.

STEP III: After 8 hours, store the water in a safe container and let it cool. The water is now safe for drinking.



Solar disinfection

Always repeat the steps whenever you need safe drinking water.

Lesson 18: Agriculture and irrigation – a way to go in the era of climate change

Agriculture: is the growing of crops. Crops grow well when the soils are fertile. An area without trees will be less fertile. Farmers are encouraged to leave some trees in their gardens. Gardens that have scattered trees always produce better yields.

Irrigation is the artificial application of water to the land or soil or plants. It is used to assist in the growing of crops and watering of trees during dry season.

Methods of irrigation

There are many methods of irrigating farmlands, crops or trees. These include:

1. **Surface irrigation** – where farmers disperse water on crops or trees.
2. **Sprinkler irrigation** – this is when water runs through pipes and is sprayed onto the field.
3. **Drip irrigation** – where a water container releases drops of water slowly on to the plant. Because of climate change, crops and trees planted often require to be irrigated especially in the dry season.

Young farmers guide to drip irrigation

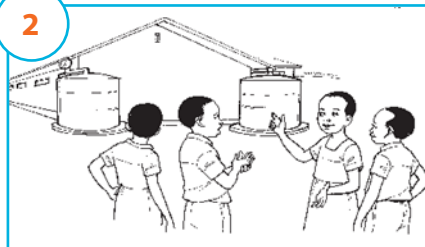
1

Young farmers visit another school



MR SAKALA: You are welcome young farmers. We are here to learn about drip irrigation. Sitali can first take you around the school.

2



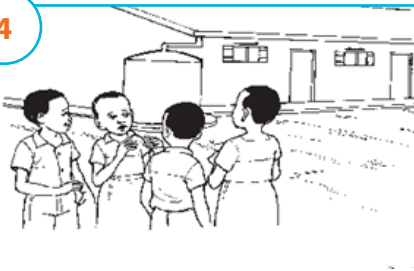
NATASHA: Sitali, your school has two water tanks, what do you use them for?

3



SITALI: They contain water for hand washing and drinking.

4



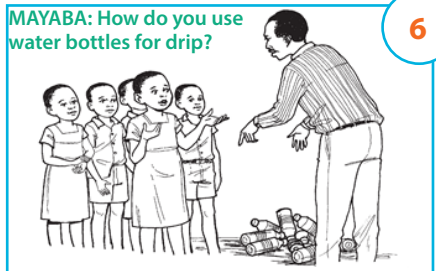
MUTALE: We also use the water to irrigate crops using drip irrigation technology.

5



MAYABA: But for us we tap running water and direct it into the pit for watering crops in the dry season.

MAYABA: How do you use water bottles for drip?



MR SAKALA: It's simple. Collect waste water bottles.

7



MR SAKALA: Make a small hole in the lid of the bottle, cut off the bottom & tie the bottle to a small stick.

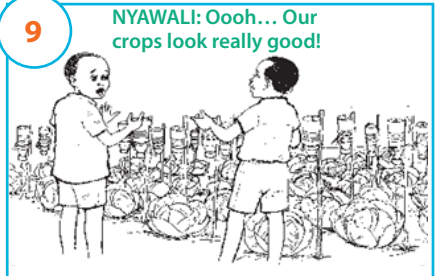
8



MR SAKALA: Put the stick in the grounds near the crop. Fill the bottle with water every day and let it drip drop by drop.

9

NYAWALI: Oooh... Our crops look really good!



SITALI: I am sure the yield will also be good

10



MR SAKALA: Water is important for crop production. Every farmer should adopt irrigation to produce throughout the year.

Activity

1. Find seedlings of fruit trees and dig a hole in which to plant the seedlings.
2. Erect pegs (stick) on the seedlings planted.
3. Fill the empty bottle with water that has an outlet to allow water to drip. Tie the bottle on the peg to allow water drip down to the seedling. Fill the bottle with water daily.

Lesson 19: Growing fruit trees on farm

Fruit trees produce fruits that are eaten by people and animals. Some fruit trees grow on their own such as tamarind. Others are grown in gardens and compounds (such as avocado, guava, pawpaws, mangoes, oranges, apples, among others).

Fruit trees are easy to grow. When selecting which fruit trees to grow, choose those which grow well in your environment.

Fruits survive in hot seasons.

Young farmers club in a meeting

1



TEACHER: The climate has changed because of the bad ways we treat our environment such as cutting trees down

Mwewa, a fruit farmer picks fruits in his orchard

2



Children, come and have some mangoes.

Farmer Mwewa continues

3



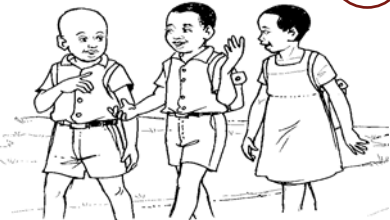
These mangoes are very good, I am even satisfied

TEMBA: Do you realize other crops are drying and only mangoes and jack fruit are surviving?

On the way home

4

MANGANI: The teacher said it is hot due to change in climate.



MUTINTA: She also said that fruits are resistant to drought compared to other crops

MWEWA offloads mangoes in the market

5



IREEN: Mr Odur, you arrived at the right time. We had very few fruits in the market

6



MWEWA: Mr Katebe, I have just gotten this money from selling mangoes. Your school should start growing fruits trees. Children will have what to eat and you can sell some.

7



Busiku: I have realized fruit growing is profitable. They are not even affected by drought a lot like other crops, we should widen our orchard.

Mwewa: Mama, this is what I have bought out of the money from mangoes,
MR KATEBE:

8



MADAM SIACHOOKA: Ooh yes, drought is also hitting hard our crops yet fruits are resistant to drought and can be sold.

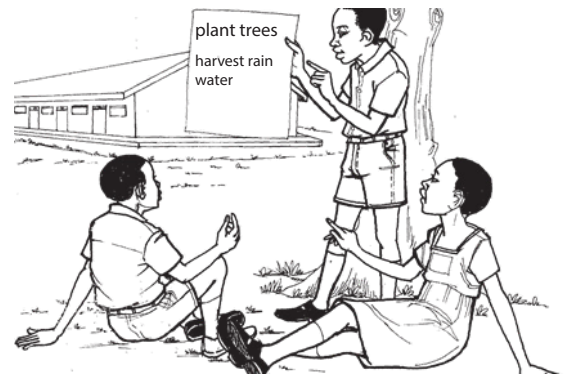
MR KATEBE: Mr Mwewa suggested growing fruits in the school garden.

Theme 4: Expanding the Learning

Lesson 20: Listen to the radio, read newspapers, write letters

As a young person, you need to keep learning more about the environment. You can learn more by forming a discussion group. In the group, you discuss issues concerning the environment. The topics to discuss include managing the environment, planting trees, protecting wetlands, harvesting rain water and many others.

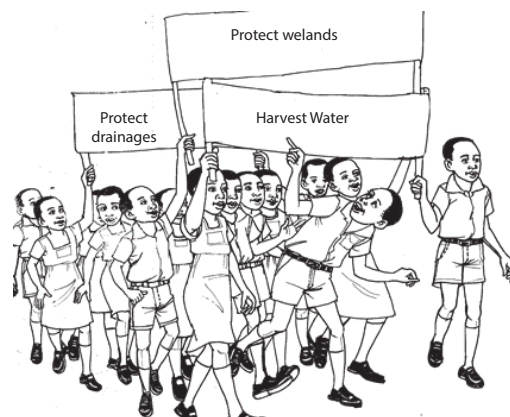
The FMNR/Environment Club of your school can also create awareness among communities neighboring your school through demonstrations. The picture below shows pupils walking within the communities telling people to plant trees, harvest rain water and protect drainages. You can do that too.



Form a Debating Club. You can select opposers and proposers to discuss topics of your choice. In order to be able to debate well you need to read or listen to radio about the topic to be debated.



Write to friends and relatives in different schools and tell them about your environment club, your trees planted at the school and all the things you have learnt about the environment. When you do this, more people will know more about the environment.



Letter Writing

Write a composition of 100 words describing the importance of fruit trees in your area.

World Vision Zambia is a Christian relief, development and advocacy organization dedicated to working with children, families, and their communities to reach their full potential by tackling the root causes of poverty and injustice.