World Vision
Uganda

A HANDBOOK
ON OUR ENVIRONMENT

A Guide for Teachers

Includes practical readings, messages, and units on activities

Published by the Farmer Managed Natural Regeneration Project, World Vision - Uganda

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The handbook includes content adapted from *Make Every Day an Arbor Day*, supported by the New York State Department of Environmental Conservation, a how-to work book for elementary or junior high school teachers committed to incorporating the concepts of tree planting and care into their classrooms.
Additional content was adopted from the PACE Uganda Manual - Promoting Environmental Education and Action in Schools, Tree Talk and Farm Talk - newspapers produced by Straight Talk Foundation on environment and natural resources targeting the youth.

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For more information about Farmer Managed Natural Regeneration (FMNR) visit the FMNR hub on www.fmnrhub.com.au.

FMNR
Farmer Managed Natural Regeneration

About the handbook

Farmer Managed Natural Regeneration (FMNR) is one of the World Vision Uganda'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; a reason as to why the FMNR Project in Uganda has spearheaded the development of this handbook; and the primary audiences targeted by the book are mainly teachers.

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 class rooms). 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 in order to increase learning about the theme of the lesson. The exercises can be done either during the session or carried separately. 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 at the same time engaging children in conservation efforts around the school. It is hoped that teachers and other users find it useful.

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Cotilda Nakyeyune
FMNR Project

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1 Theme One: Knowing Our Environment

Lesson 1: *Knowing our environment*

Objective: The learners will understand what the environment is, what causes destruction and degradation of the environment and what can be done to conserve the environment.

Materials: This is a practical lesson that requires learners to step out of the classroom and observe the surrounding while going through the reading materials.

Time: One lesson of 40 minutes.

Procedure: Divide the learners into two groups each with reading material on environment and illustrations of what the environment looks like. Each group finds a place where to sit. The groups select a leader and a group secretary to guide their discussions.

Ask each group to read the material (on this page) and observe keenly and write down what is surrounding them.

Each group must emphasize what is in the atmosphere, the living and non living things and if possible creatures in the soil.

After 20 minutes, the groups come together and each group leader presents what they have discussed for about 10 minutes. Give the groups the exercise on page 2 which should be accomplished in 10 minutes and marked by the teacher.

Result: Pupils will learn what is found in which part of the environment.

Reading material on environment.

"The environment is everything that surrounds us and how it affects the life, nature, behavior and growth of living organisms."

Types of Environment

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 soil we find earthworms, algae and reptiles.*

BIOSPHERE = *Space occupied by life. All living things, both plants and animals belong to this category of the environment.*

In the environment, we have both living and non-living things.

Living things are those that have life such as animals, plants, bacteria, fungi.

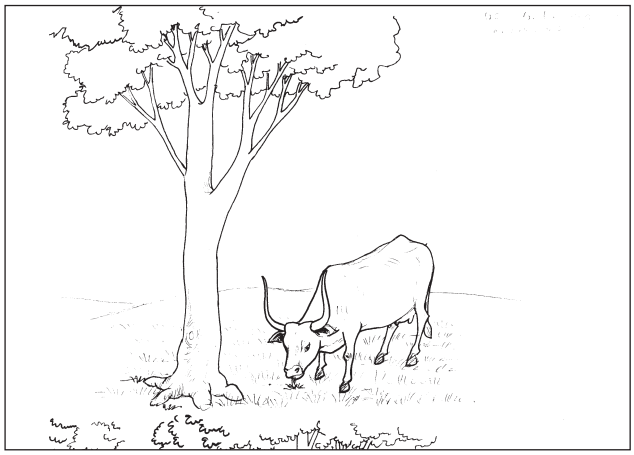
Non living things are those without life such as water, soil, light, rocks, stones, sand and many others.

Both living and nonliving things depend on one another in the environment.

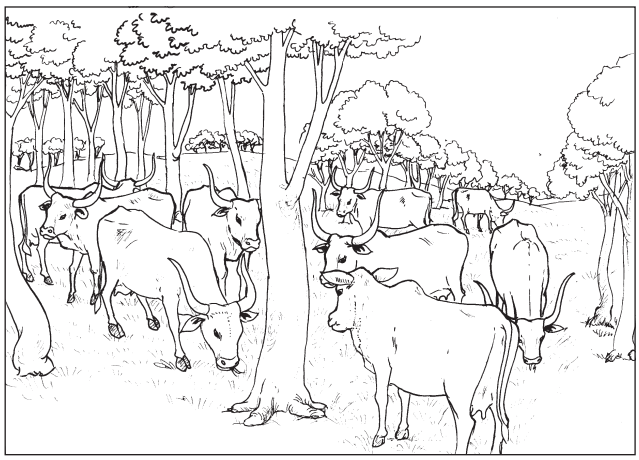
Why the environment is important

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 **individual living things** and how they relate. Here, we have **a cow** eating **grass** under **a tree**.



Then, we look at the **interaction** between the **many cows** and **many trees**. The cows need the trees for shade. The cow dung from the cows improves the fertility of the soil for the trees to grow

In life, the many living and non living things stay together benefitting each and depending on each other.

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)						

Lesson 2: *What makes up our environment ?*

Objective: Pupils will learn about the different animals, birds and insects found in the environment. They will also learn about the relationship between these animals, birds, and insects with the environment. The learners will also explore the habitat and environment for some animals, birds and insects that dwell within the environment and play a fun game together.

Materials needed: In addition to pencils and notebooks, this lesson will require an environment game sheet showing different animals, birds and insects (see here under).

Time: One lesson of 40 minutes.

Procedure: Introduce this lesson by asking pupils to name any animals, birds or insects that live in the environment and on trees. Make a list on the blackboard.

After that exercise, refers the learners to the Environment Game Sheet (see below). Ask the learners to work in groups of three learners.

For each of the box in the game sheet, let the groups of pupils do the exercise on page 4 based on the following questions:

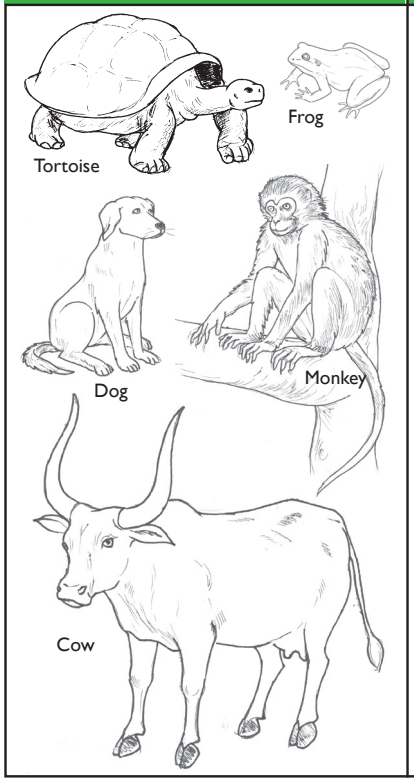
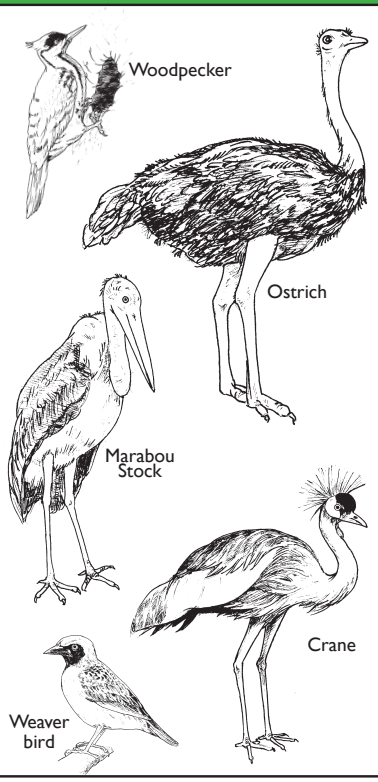
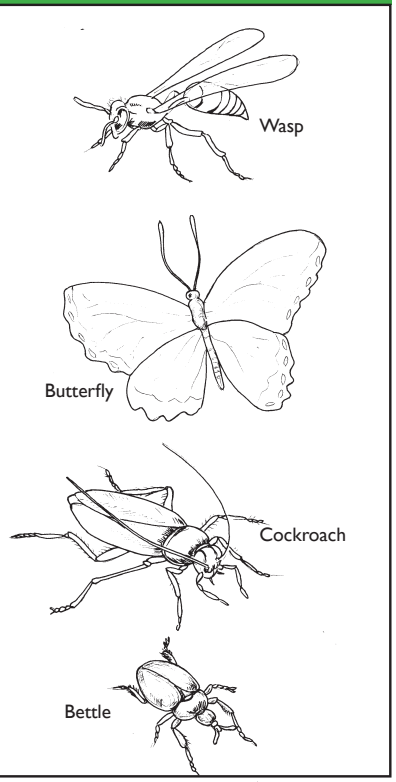
1. What does it look like?
2. What is its local name?
3. Where does it live?
4. What does it eat?
5. What climate does it prefer?
6. What species of tree does it prefer for its home or food?

Learners can share their findings with other group members and other classmates.

Results: Pupils will appreciate the diversity of life that can be supported by the environment.

Never forget:
Whenever you destroy one thing in your environment, you distort the relationship between the different things in the environment e.g you cut a tree, a cow suffers

Environment Game Sheet

Animals	Birds	Insects
		

Exercise: With reference to the environment game sheet on page 3, fill in the table below.

Animal	What does it look like?	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?

Activity: **Share your findings in the table above with your classmates, environment club members, brothers and sisters and parents at home so that they can know what is in our environment.**

Lesson 3: *Things destroying the environment: Charcoal burning*

Objective: Pupils will know that charcoal burning is one of the activities that destroys the environment in their locality and will be in position to propose what can be done to change the trend.

Materials needed for this lesson: Reading material on charcoal production and its impact on the environment.

Time: This lesson will require 1 hour.

Procedure: Instruct learners to read about charcoal and its impact on the environment. for about 20 minutes. After reading, organize a debate; where pupils test each other's intellectual ability. Form two groups; the **Proposers** and another group of **Opposers**. The motion for debate should be: "***Charcoal burning destroys our environment and therefore should be stopped immediately***".

Results: Pupils will appreciate the impact of charcoal burning on the environment and will be enlisted as change agents; changing people's attitudes on how to manage environment.

Reading material on charcoal production and its impact on the environment

Charcoal is a by-product of trees that is used for cooking. Charcoal is produced in many parts of Uganda. The major producing regions include central Uganda and parts of western and northern Uganda. Charcoal production is undertaken as a human activity in homesteads. This is in addition to other activities such as cultivation of crops, animal raring and trade.

Some people produce charcoal from trees cut down from areas where they want to grow crops. Some people purposely cut down many trees to produce charcoal for sale. Many cattle keeping communities also cut down trees to open up land for grazing and the trees are later converted to charcoal.

These are the major steps followed to produce charcoal.

Step I: Trees are cut into logs and pieces.

Step II: These are heaped together into either a circular or bus-shaped heap called a kiln.

Step III: The kiln is fired and left for some days for the logs and pieces of trees to burn into charcoal. This takes a number of days depending on the size of the kiln.

Step IV: When ready, the kiln is dismantled and the charcoal collected into heaps.

Step V: The charcoal is then packed into sacks ready for the market.

Charcoal production if often done by local people. Sometimes however, charcoal production is done by people coming from far away places. The following types of people are involved in charcoal production:

1. There are charcoal producers and these are the people that cut the trees and burn them into charcoal.
2. Then there are agents and these are the people who connect charcoal producers to market places
3. Charcoal transporters are the people that use bicycles, motorcycles or vehicles to transport charcoal
4. Charcoal sellers - these are the ones that sell charcoal to the people who use it.
5. Charcoal users - these are the ones who use charcoal for cooking.

Disadvantages of charcoal production

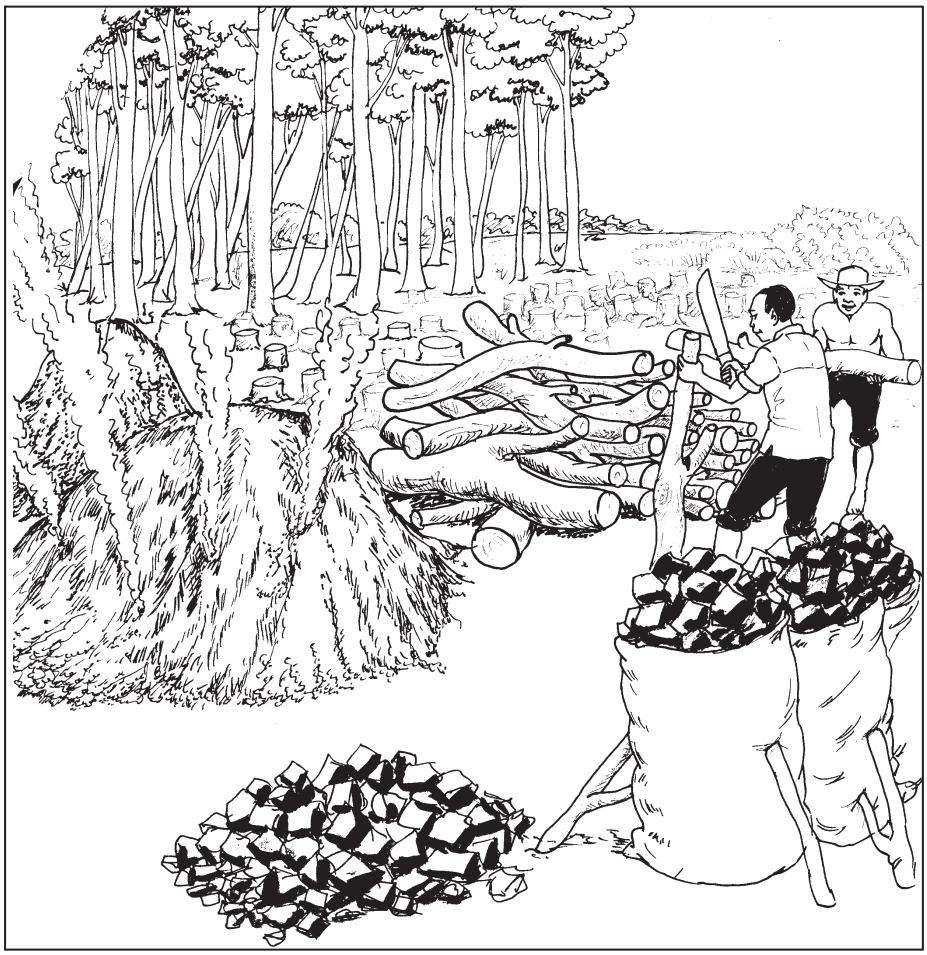
- It destroys trees that would be a source of oxygen and shade for other living things.
- It causes climate change which affects crop production.
- It spoils the soil where charcoal burning takes place.
- Many organisms in the soil die during the process of charcoal burning.
- Trees which are homes of animal are cut down and therefore these animals migrate.
- When trees are cut from an area, that area can be open to soil erosion.
- The process of charcoal burning releases carbon dioxide and other dangerous gases to the atmosphere resulting into high temperatures.

Advantages

- Charcoal is used for cooking food,
- Charcoal provides people with income,
- Useless trees and some mature trees are converted into charcoal which is useful,
- Charcoal sellers pay tax and the money is used 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 be encouraged to allow trees to grow from stumps, roots and those that generate on their own.
- People should use energy saving cook stoves that reduce the amount of charcoal used.



When making charcoal, many trees are cut down, causing many living things to migrate, a lot of gases and smoke are released to the atmosphere causing temperature to rise. Crop production becomes low, the health of the people is reduced and this is bad for our environment

Activity:

The teacher organizes a debate. The motion should be "Charcoal burning destroys our environment and therefore should be stopped immediately".

Lesson 4: *Activities that destroy our wetlands*

Objective: Learners will know that human activities in the wetlands destroy the environment in their locality.

Materials needed for this lesson: Photographs of human activities taking place in wetland.

Time: One lesson of 40 minutes.

Procedure: Explain what wetlands are. Explain the importance of wetlands. Use the photos to explain how bad the activity in each of the photos is to the environment. After that, give learners an exercise to to list activities in their locality that destroy wetlands.

Results: Learners appreciate the impact of human activities on wetlands and the environment. They become agents of change in their communities.

Teachers' notes on wetlands

What are wetlands?

Wetlands are areas where water is present either at or near the surface of the soil all year round. There are a number of plants and animals that live in the wetlands and each of them have a role in our environment. The Crested crane and Mud fish are some of the examples. Many of these plants and animals have specially adapted to living in wet places. There are many wetlands around Lake Victoria, Kyoga and River Nile.

Activities destroying wetlands

Construction of roads limits flow of water

Brick making leaves ponds that harbour 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

Importance of wetlands

- They are a source raw materials for cloths, mats, ropes, thatching
  material for houses and various art and craft materials.
- Fish, birds and animals in wetlands are good food source.
- Wetlands are important source of water for domestic use.
- They are a source of income for households through sell of raw materials.
- Wetlands absorb heavy rain reducing floods
- Wetlands also purify water because they filter out solid materials
- Wetlands are good for recreation such as boating, fishing, swimming, bird watching and hunting.
- Students visit wetlands for study purposes.
- They are homes to many plants and animals.

Markets in wetlands reduce space covered by wetlands

Exercise: List the human activities that destroy wetlands in the surrounding environment and propose how the activities can be reduced.

2 Theme Two: How To Conserve Our Environment

Lesson 5: *Improving soil fertility through composting*

Introduction: This practical lesson is about compost and how to make it and use it to improve soil fertility.

Objective: Pupils will learn ways of managing soil and soil fertility in their locality and contribute to conserving our environment.

Materials needed: Space within the school compound where the practical lesson can take place, reading materials (see teachers' notes below) and garden tools.

Time: Two sessions of a one hour each. In the first session, take learners through the process of making compost. The second session should be a practical session where the learners make compost themselves.

Procedure: Ask learners to gather in the school demonstration garden from where the lesson is conducted.

Teachers notes on 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. You can make it yourself, and add it to the soil to improve your crops, which is good for our environment.

- Compost is cheap and easy to make. It uses materials that are readily available such as leaves, fruit skins, kitchen waste and animal manure.
- Compost improves soil fertility by adding nutrients to the soil. This produces better crop yields.
- Compost improves the soil structure which also improves crop yield over a long period of time.
- Compost feeds the living creatures such as earth worms in the soil. Healthy soil life helps to improve soil structure, letting more air into the soil.
- Compost improves drainage and reducing soil erosion.
- Plants grown on soil that has compost can fight pests and diseases more easily.
- Every household can make compost because each household has agricultural wastes, remains of food and animal waste.
- Every school, too, can make compost for its school garden because the raw materials are available.

Activity:
How to make compost?

There are two methods provided here on how to make compost. For both methods, you will need:

- Slashers, rakes, fork, spade, watering can, wheelbarrow.
- Organic matter (grass, weed, leaves) ash from wood fires, household waste such as leftover food, leaves of vegetables, eggshells, top soil, manure (not human waste) among others.
- Wooden sticks about 2 meters.
- For the cover, a tin or plastic sheeting or dry grass or strong crop stalks such as maize stalks or banana leaves.
- Some large stones.

A) First method: A compost pit for dry conditions

Here is the procedure for establishment of a compost pit suitable for dry conditions:

1. Dig a pit. Its size depends upon how much material you have available but 1.5 metres x 3.5 metres deep is recommended.
2. Put layers of maize, rice stalks, banana leaves or other tough parts of plants which will take a long time to become rotten. After a few layers of different house hold waste products, you can add a layer of ash (not too much) or top soil. If you are using waste food from the kitchen, burry it well or you will attract rats and other pests.
3. Water each layer before adding the next, finishing with a layer of topsoil. Cover the pit properly.

Chop pieces of domestic waste and throw them into the compost pit according to the instructions above

Once every week, it is advisable to check the material. Turn the materials to allow quicker rotting.

B) Second method: Compost basket

Refer to the diagram on page 10 on how to construct a compost basket.

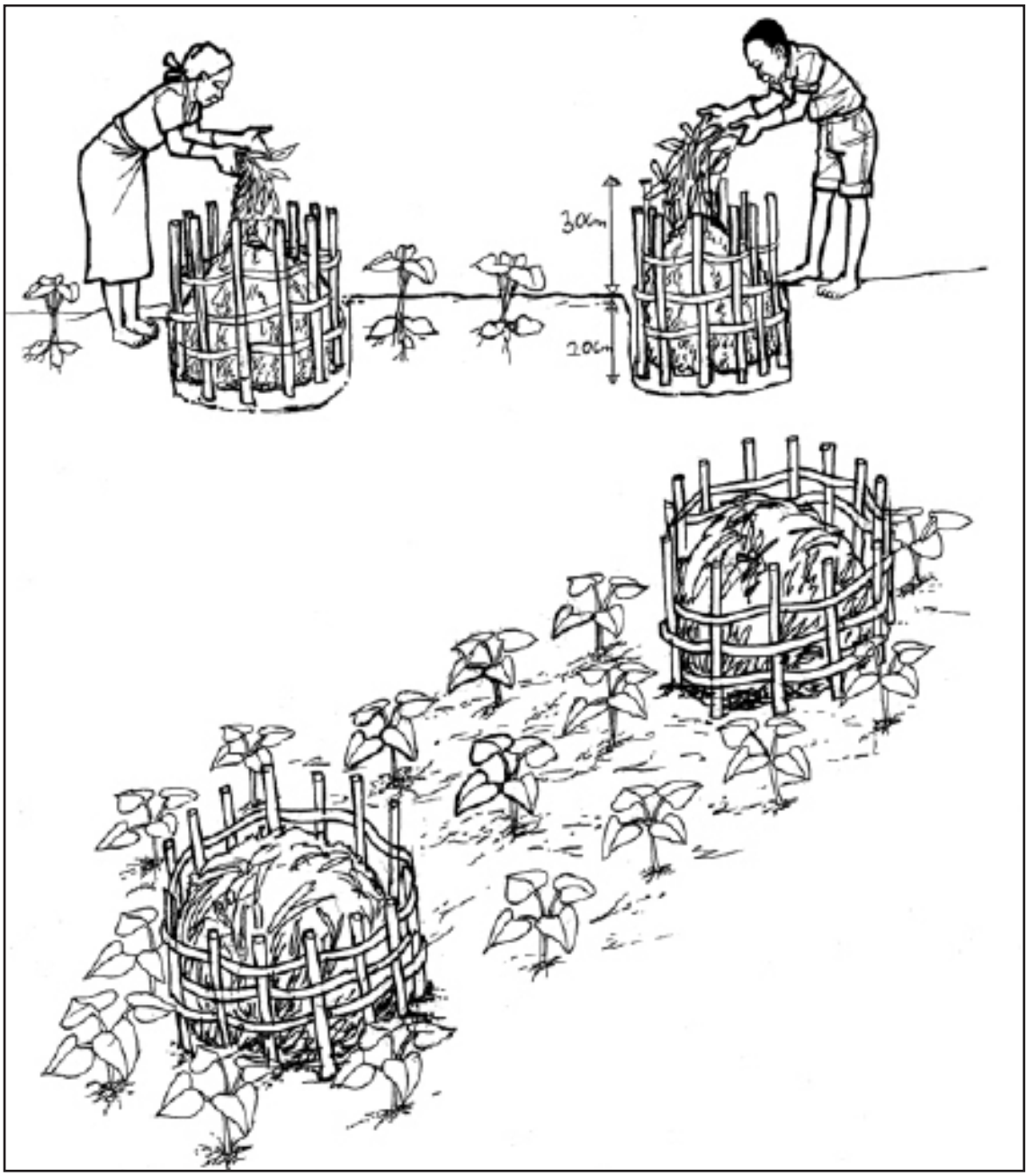
1. Use pegs to construct a circular basket fixed on the ground as shown in the illustration.
2. Add layers of waste products mixing them with top soil and ash. Remember to water every layer.
3. Make sure the waste does not spill out of the basket.
4. Cover the top properly to avoid moisture loss.
5. 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.

What happens inside the compost?

The bacteria inside the pit/mound/ basket breaks down the organic matter and release its nutrients into a form that can be used by the plants.

After 6-12 weeks, the compost in the heaps should have rotted and has become a dark, rich, lumpy mass. You should not be able to identify the original materials that were put on the heap.

The compost should not become smelly. If it does, turn it with a fork to allow air in and add more coarse materials like straw and leaves.



How to use the compost.

- Compost is often used close at home in the vegetable gardens behind the kitchen.
- In the urban areas, compost is used in the flower gardens so that flowers grow well.
- It is used when sowing seed in a nursery bed.
- An effective way of using limited supply of compost is to place them in small amounts of compost directly into the planting holes.
- When used in gardens, compost should be mixed with top soil to allow crops take nutrients from it.
- For crops such as banana and coffee, dig large pits and fill them with compost before planting the crop. It will grow well.
- Compost can also be used for mulching between crops or around trees.
- When using compost as mulch it should be covered with a thin layer of straw to avoid loss of nutrients due to direct exposure to sunlight and heat.
- Compost can also 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.

Lesson 6: *Mulching as a soil management approach*

Objective: Pupils will learn techniques for managing soil and how to control soil erosion in the garden and our environment.

Materials needed: A garden within which to demonstrate the practical lesson on mulching, reading materials (see teachers' notes below) and garden tools.

Time: Two sessions of one hour each. The first session should aim to take the pupils through the theory of mulching. The second session should be a practical session.

Procedure: The first session is conducted in the classroom. Use the teaching notes to conduct the lesson. For the second session, ask learners to gather in the school demonstration garden from where the lesson is conducted based on an activity on how to apply mulch (see page 12).

Teachers' notes on mulching.

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

If you look at the forest floor, it is covered by leaf litter that is full of nutrients, decaying leaves and branches feeding fungi, microbes and insects. This is a natural way of mulching.

- Mulching helps prevent soil erosion and helps improve the health of soil and crop plants.
- Mulch prevents rain from hitting the soil directly, reducing the impact of the water drops. Water soaks into the soil gradually instead of washing the soil away.
- Mulching adds organic matter to the soil as microbes decompose organic matter. The beauty of this natural nutrient cycle is that nutrients are released in harmony with the needs of the plants.

Mulching improves soil structure

- Mulch produces substances that help to form and stabilize soil structure. The extra organic matter is food for soil creatures. It creates channels through which air and water can infiltrate. In this way, mulching can help loosen up heavy clay soils, making it easier for the farmer to work, and making it easier for plant roots and shoots to push their way through.
- Mulching also prevents the soil from getting a hard outer layer known as crust. When raindrops hit bare soil in a heavy rainstorm, it breaks into smaller pieces. These pieces stick together and form a hard crust when the soil dries. This crust makes it difficult for water to soak through into the ground. It also makes it hard for young plants to push their roots through the soil crust.
- The nutrients in the mulch are gradually released and taken up by the crops. Mulching is cheaper than chemical fertilizers, and because it also improves soil structure, the nutrients will not be washed away or leached from the soil by heavy rain.

Mulch decreases water loss due to evaporation

- Mulch reflects a lot of the sun that otherwise beats down on the soil. This keeps the soil cooler and helps prevent evaporation. This is especially important in hot, dry climates.
- Also by slowing down the run off, mulch increases the amount of water that soaks into the soil. The loose soil structure helps hold water in the soil.

Problems associated with mulching.

- Mulches may provide a good environment for pests leading to losses in crop yield.
- Harmful insects, mice, rats, and snakes may turn it into habitat.
- Also, mulching can sometimes lead to a lack of nitrogen for crop plants.

However the benefits of mulching are more than the disadvantages.

Materials used for mulching

The common materials include:

- 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

Do not use the following materials for mulching

- Materials that do not add nutrients to the soil or improve its structure such as plastics and newspapers should not be used.
- Do not use remains of a given 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 as it can take a long time to decompose and can attract pests and fungal diseases.

Activity:
How to apply mulch

This is a practical activity to be conducted in the school garden. It is the second session of this lesson. Before undertaking this activity, the learners should collect enough of the following materials to be used in mulching the school garden. The materials are:

- 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

The teacher should guide the learners using the following:

1. For large plants, spread the mulch between the rows and around each plant.
2. For small plants 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

How thick should the mulch be?

If mulch is too thick, it might shade seedlings, so they will grow tall and weak. Too much mulch can also prevent airflow and encourage disease. This can be a problem in areas with a lot of rain.

Never forget: ***Mulching saves a gardeners 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

Objective: Pupils will learn about the environmental problems related to use of charcoal and firewood for cooking. They will also learn about ways to reduce these problems.

Materials needed for this lesson: Black board for the teacher and note books/pens for learners.

Time: A one hour session conducted in a classroom environment.

Procedure: This is an interactive lesson between the teacher and the learners. It should be a question and answer session (based on the lesson activity here below), followed by discussions between the pupils and the teacher.

Result: Learners appreciate why there is a need to reduce the volume of firewood and/or charcoals used while cooking in homes. It is one way to conserve our environment.

Activity: Sources of firewood or charcoal

- **Ask pupils about the source of firewood used for cooking in their homes.** The answers should be from a nearby forest, trees in the garden.
- **Ask pupils about the species of trees used for firewood. Ask if these trees were planted, grew on roots or stumps.** The teacher should explain later the need to plant trees for firewood and the need to leave trees to grow from stumps, roots or those that germinate on their own.
- **Ask how long (and how far) it takes to collect firewood, who collects firewood in their homes.** Later, the teacher explains to the learners that walking distance and time taken to collect firewood is increasing day by day as firewood becomes scarce. And that, it is women and children who have the burden to collect firewood. Therefore, there is need to grow trees to reduce the burden of collecting firewood but also reduce the impact on our environment.
- **Ask pupils about other materials used for cooking.** Learners leaving in trading centres will mention charcoal. Other answers will include small pieces of wood because it is no longer easy to have big pieces. Some learners will mention agricultural waste such as banana peelings, fibres and maize stalks. Among pastoralist communities, they will mention use of cow dung for cooking. Explain that this is because firewood has become scarce.

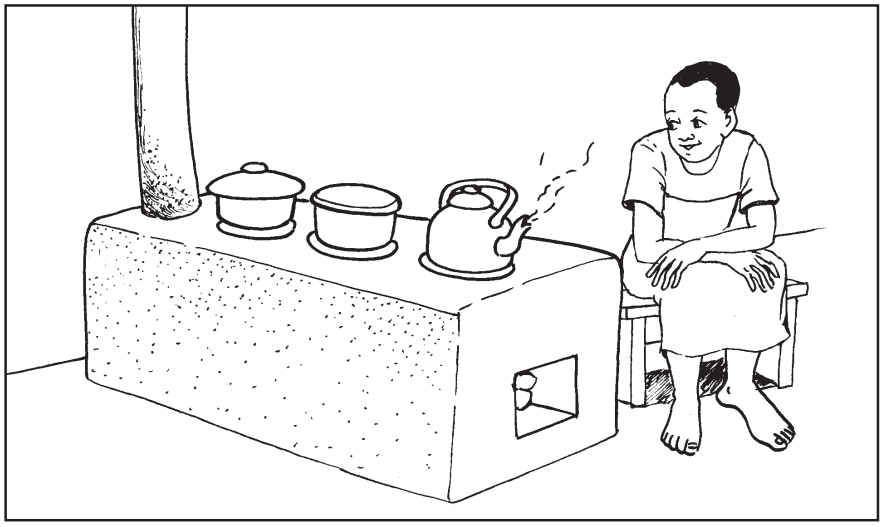
It is women and children who have the burden to collect firewood and this has to reduce too.

- **Ask pupils if their families buy firewood or charcoal. What quantity and at what price?** Explain that firewood and charcoal prices have been increasing as both charcoal and firewood become scarce as the population increases.
- **Ask pupils about the types of cooking stoves used in their homes and explain whether the method is wasteful or not.** The three-stone stove and traditional sigiri waste a lot of charcoal but all energy saving cook-stoves use less charcoal and less firewood. Conclude by recommending energy saving cook stoves. Refer to the illustrations on the next page.
- **Ask pupils about health problems related to cooking using firewood.** The health problems arise from the smoke in the kitchen. People involved in cooking normally have problems with their lungs, eyes and body smell. Explain that these can be avoided by using energy saving cook stoves that emit limited smoke.

Never forget:

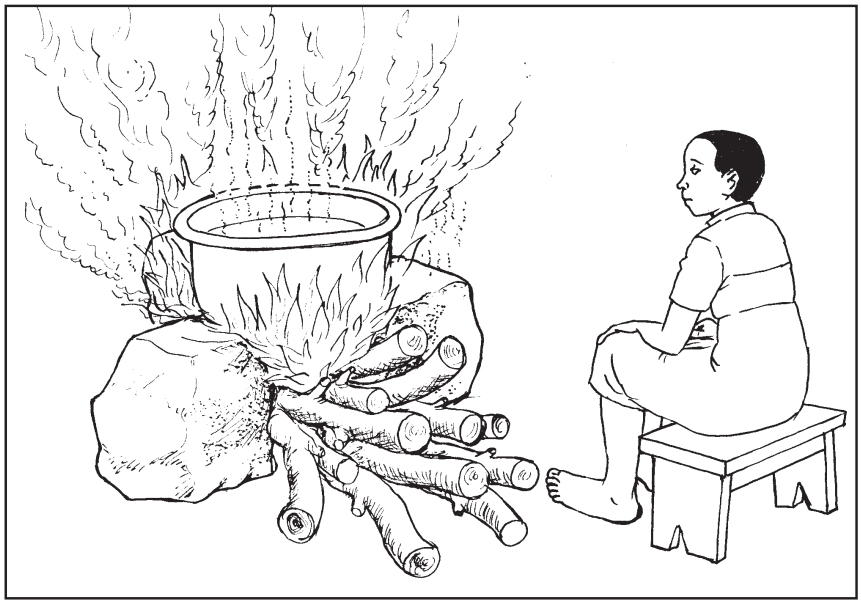
When you use an energy saving cook stove, you use less firewood or charcoal, you reduce deforestation, and you reduce disease. That way, you conserve our environment

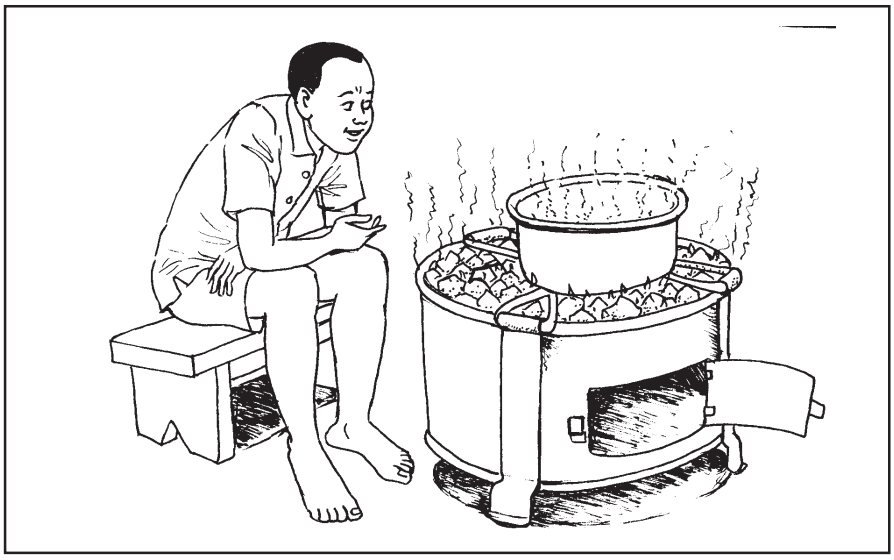
Choose the right stove for cooking



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

This is the 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 sigiri. In most cases, sigiri wastes a lot of charcoal unless it is made in such a way that it saves charcoal. A sigiri that does not save charcoal should not be used for cooking.

Never forget: ***By using an energy saving cook stove, you save many trees and in turn you save our environment. Everybody should use energy saving cook stoves.***

3 Theme Three: The Role Of Trees In Our Environment

Lesson 8: *Know your tree and its usefulness in the environment*

Objective: By the end of this lesson, learners will be able to state, name, outline, describe, demonstrate the different parts of the tree. They will become familiar with tree vocabulary and be able to articulate themselves on parts of a tree.

Materials needed for the lesson: A list of words that describe the different parts of trees, Crossword Puzzle exercise and Word Search Exercise (see page 18 and 19) and answers to the Crossword puzzle (see page 17).

Time: Two sessions of 40 minutes each. Session one should aim to introduce the concept of the environment and trees. Session two should aim to take the pupils through the two fun activities.

Introduction: This lesson introduces learners to words that describe different parts of trees and their usefulness to the environment and the community.

Procedure: The teacher introduces trees, shrubs and their usefulness to the environment. Ask learners what they know about trees and the environment. Write the responses on the blackboard and guide learners to differentiate trees from shrubs. Later introduce the tree vocabulary list and go through it together with the pupils.

In the second session, provide words describing the parts of trees and the Tree Crossword Puzzle (see page 18 and 19) for the pupils to fill in as they learn.

Results: Pupils will learn the different parts of tree and their usefulness to the environment and in the everyday life.

Teachers' reference notes

What is a tree?

A tree is a wooden plant with a long stem bearing branches and leaves. Some trees are good for making timber and are therefore called timber trees. Some trees produce fruits eaten by human beings and are therefore called fruit trees.

Palms, banana and bamboo are not classified as trees because their stems are not made up of wood.

What is a shrub?

A shrub is a plant that has several but short wood stems arising from one base, usually less than 6 meters. Many flowers planted on compounds that have woody stems are shrubs. Examples are hibiscus flowers, rose flowers and bougainvillea flowers.

How are trees and shrubs useful to the environment?

- They provide shade during excessively hot conditions.
- They are windbreaks for farms and homes.
- They reduce carbon dioxide from the atmosphere.
- 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.
- Trees give animals oxygen

The tree vocabulary list

The teacher should use this list to guide the learners to understand the tree terminology. The teacher is encouraged to use local language for the learners to appreciate the terminologies). The teacher should endeavor to add on the list words common to the pupils.

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 the 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 in which 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 help make food for the tree.

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.

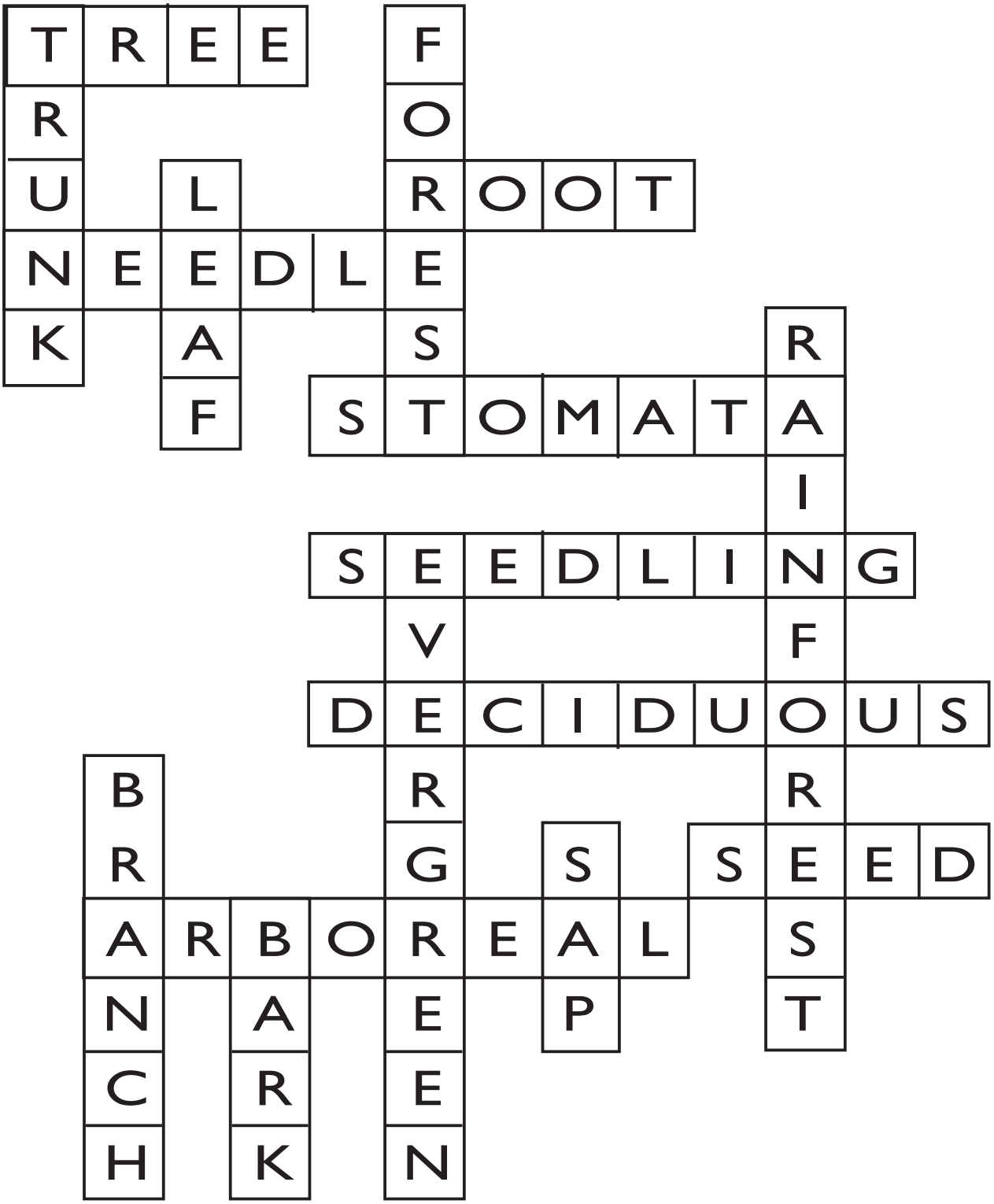
Shrub - A plant that has several woody stems.

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.

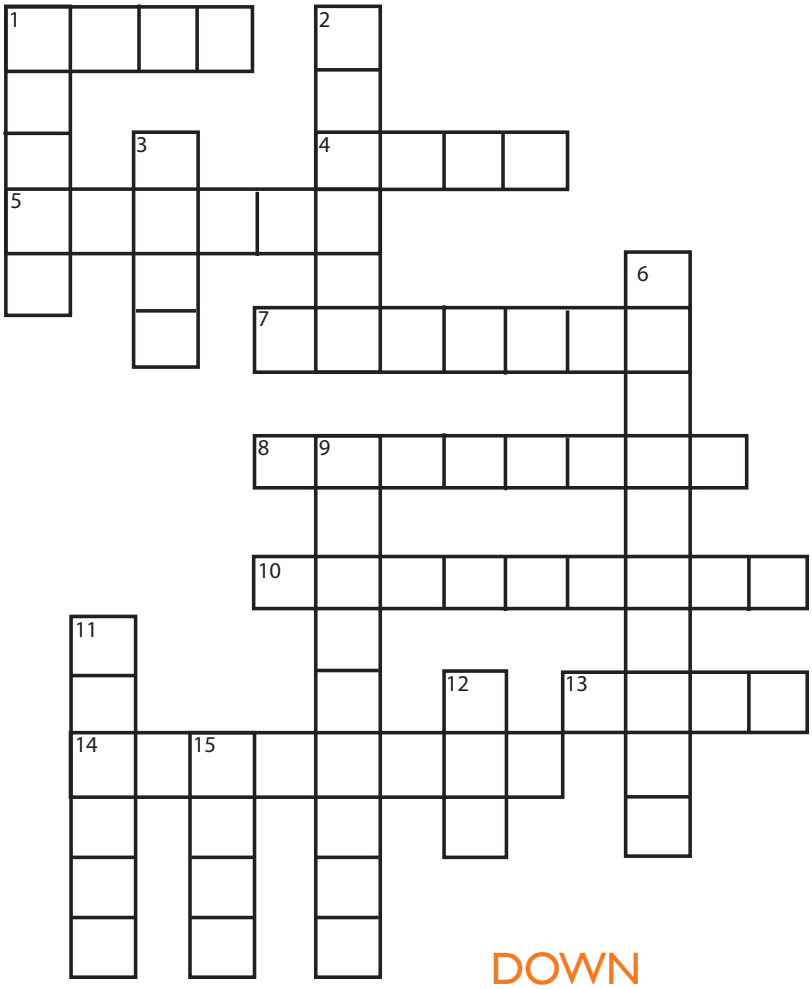
Tree - A large woody plant, usually with one main trunk, growing over 5 meters high.

Tree Crossword Puzzle (answer key)



Tree Crossword Puzzle

The teacher will have to introduce the cross word puzzle after going through the vocabulary list. He/she should build the skills of the children to fill the puzzle. Pupils will need a maximum of 15 minutes to accomplish the task. The teacher is encourage to mark and award marks to the learners. After that, the teacher should provide the learners with the correct answers provided on page 3.



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

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 parts of a tree

Tree Word Search

This is a game of looking for words that relate to the vocabulary of trees. The exercise is designed to take 15 minutes. The teacher will lead the pupils in searching for the first word and explains it meaning. Then he/she asks the learners to search for more words. The exercise should stop in 15 minutes. The teacher will ask the pupils to exchange notebooks for marking. He then leads them through the word identification exercise as the pupils mark one another. The best pupil should be rewarded by the teacher.

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*

Introduction: Using the teaching aids for this lesson, learners will get to understand the parts of a tree and their usefulness and understand a tree's life cycle. Learners will use the exercises given for this lesson to improve their knowledge of the parts of a tree and their usefulness and where possible ask questions.

Objective: Learners will be able to identify and name both the inner and outer parts of a tree and know their usefulness.

Materials needed for this lesson: Tree seedling (with root and shoot), seed container such as pods, pieces of cut firewood (showing annual rings) and drawings of the above parts (see page 21 and 22).

Time: Two sessions of 40 minutes. Session one will entail reading understanding the different parts. Session two will involve practical work.

Procedure: Divide pupils into two groups:

Group #1 Discusses parts of a tree (with reference to Worksheet 1 on page 21) and their usefulness to: a) people b) animals. This group also discusses why some trees loose their leaves while other do not. The teacher asks them to name (even in local language) those trees that loose leaves (known as deciduous trees) and those that do not loose leaves (known as evergreen trees) using Worksheet No. 2 on page 22.

Group #2 Discusses the drawings of different parts and sections of a tree (Worksheet 3 on page 22). The teacher explains the different parts and how they work together to support, feed and protect the tree.

The learners switch groups after 15 minutes and do what the other group has been doing.

Result:
Learners will know the different parts of the tree, how they function together, their uses (for people and animals) and the life cycle of a tree and will be able to use the proper terminology when talking about the parts when they are working on activities of the environment club.

Teacher's reference notes:

What are the uses of different parts of a tree?

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

Trunk - This is the main stem connecting between 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 giraffes. They also have medicinal value.

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

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

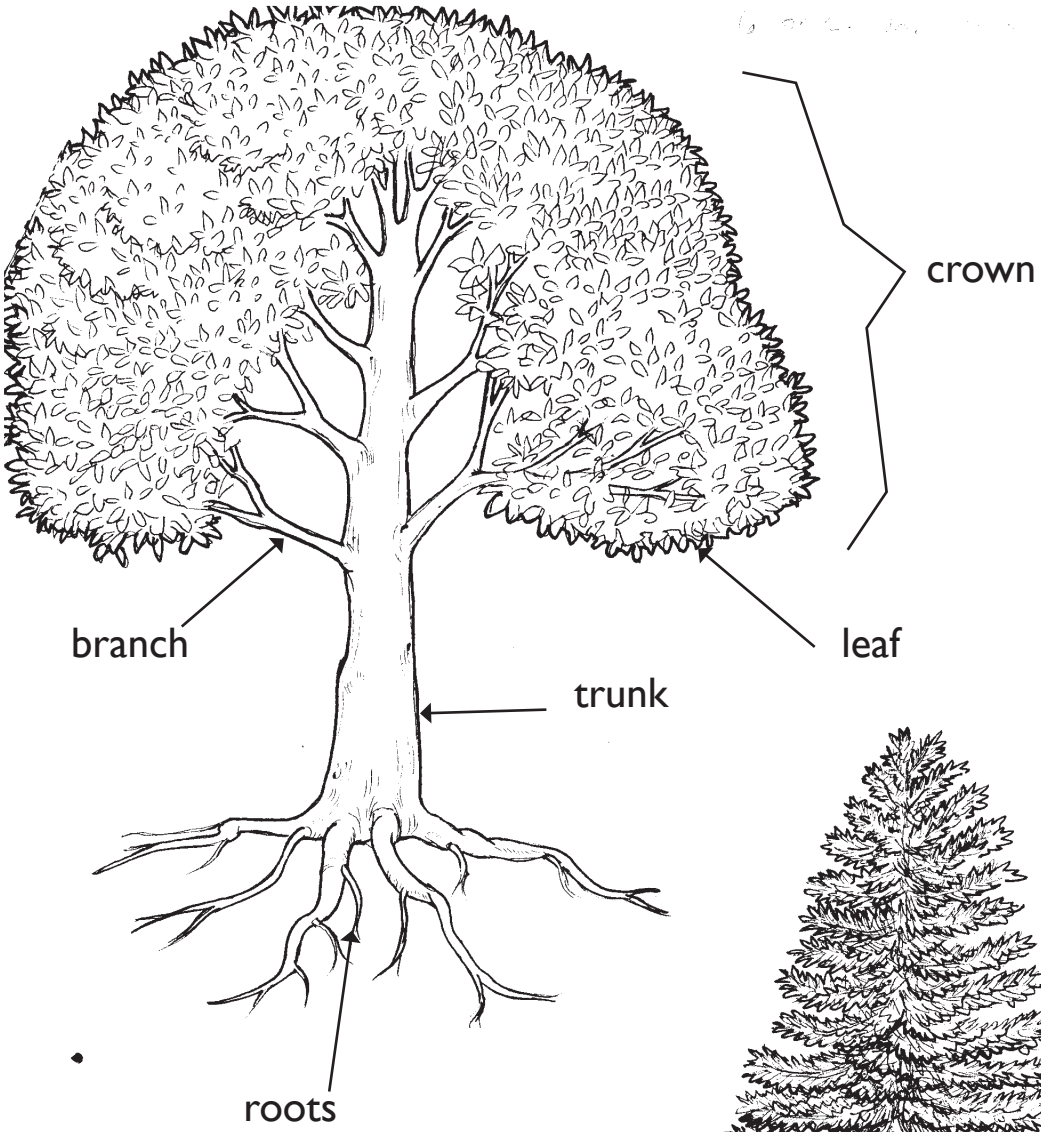
How do trees grow?

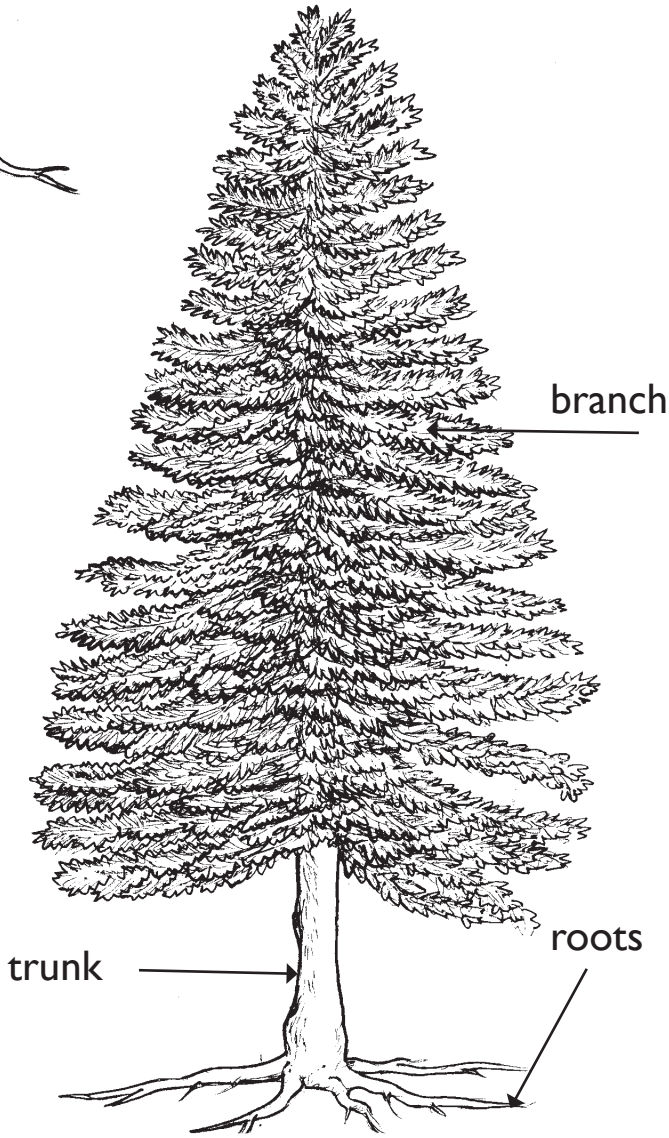
Trees grow from tree seed through a process known as germination or grow from stumps through a process known as regeneration. They manufacture their own food through photosynthesis.

Young trees less than 1.35 metres tall are called **seedlings.** When it is more than 1.35 metres but has not grown into an adult tree, it is called a **Sapling**.

Every year, a tree adds on a layer of skin (wood) represented as rings, as it grows (see cross-section of a stump on page 22. Those rings are used to estimate the age of the tree.

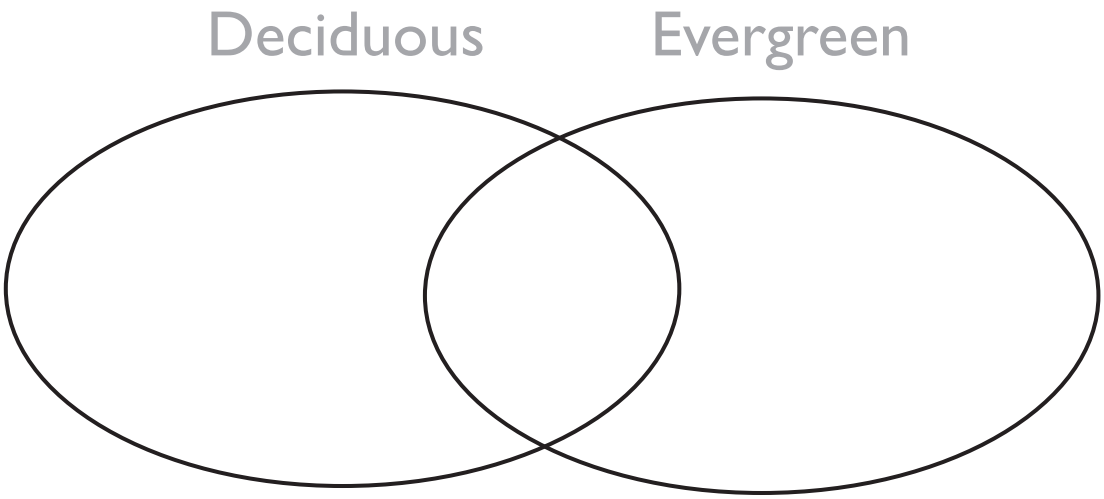
Parts of a tree Worksheet No. 1 (answer key)



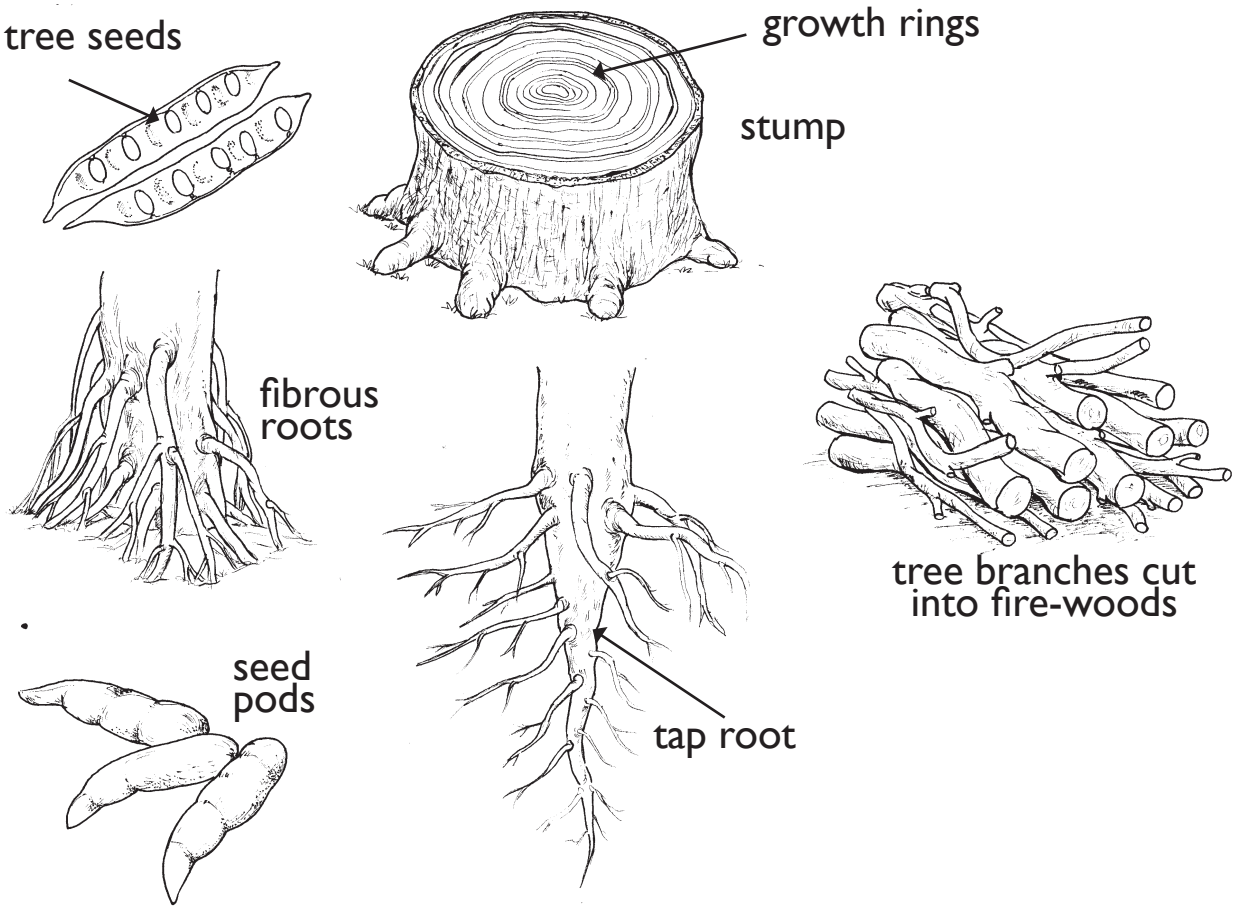


Parts of a Tree Worksheet No. 2 (Venn Diagram for deciduous and evergreen trees)

Using the Venn diagram, pupils give common examples of deciduous and evergreen trees in their environment. They can use local names in case they do not know the English and/or botanical names of the trees.



Parts of a Tree Worksheet No. 3 Sections of a tree



Lesson 10: *Start your own tree nursery*

Introduction: Many schools (and the communities surrounding them) want to plant trees but have no seedlings. The solution is to start their own nursery. Using potting materials, tree seed, a watering can and construction material, pupils are able to start their own nursery at school. The teacher in charge of environment should be able to use the content of this lesson to guide learners on how to start a nursery at their school.

Objective: Pupils will be able to demonstrate and/or describe the procedure for starting a nursery for seedlings and how to manage the seedlings in it.

Secondly, pupils will be expected to construct nursery beds, establish pots, sow seeds, water and observe the germination of tree seed. Use this as an opportunity to teach science lessons on germination. Once these grow, pupils will transplant them into gardens and observe their growth.

Materials needed for lesson 3: A hoe, tree seed, a panga, a knife, soil, potting materials and reading material about starting a nursery.

Time: Two sessions of 40 minutes each. In session one, take the pupils through the theory of starting a nursery. In session two, lead the pupils into a practical session involving the actual establishment of a nursery.

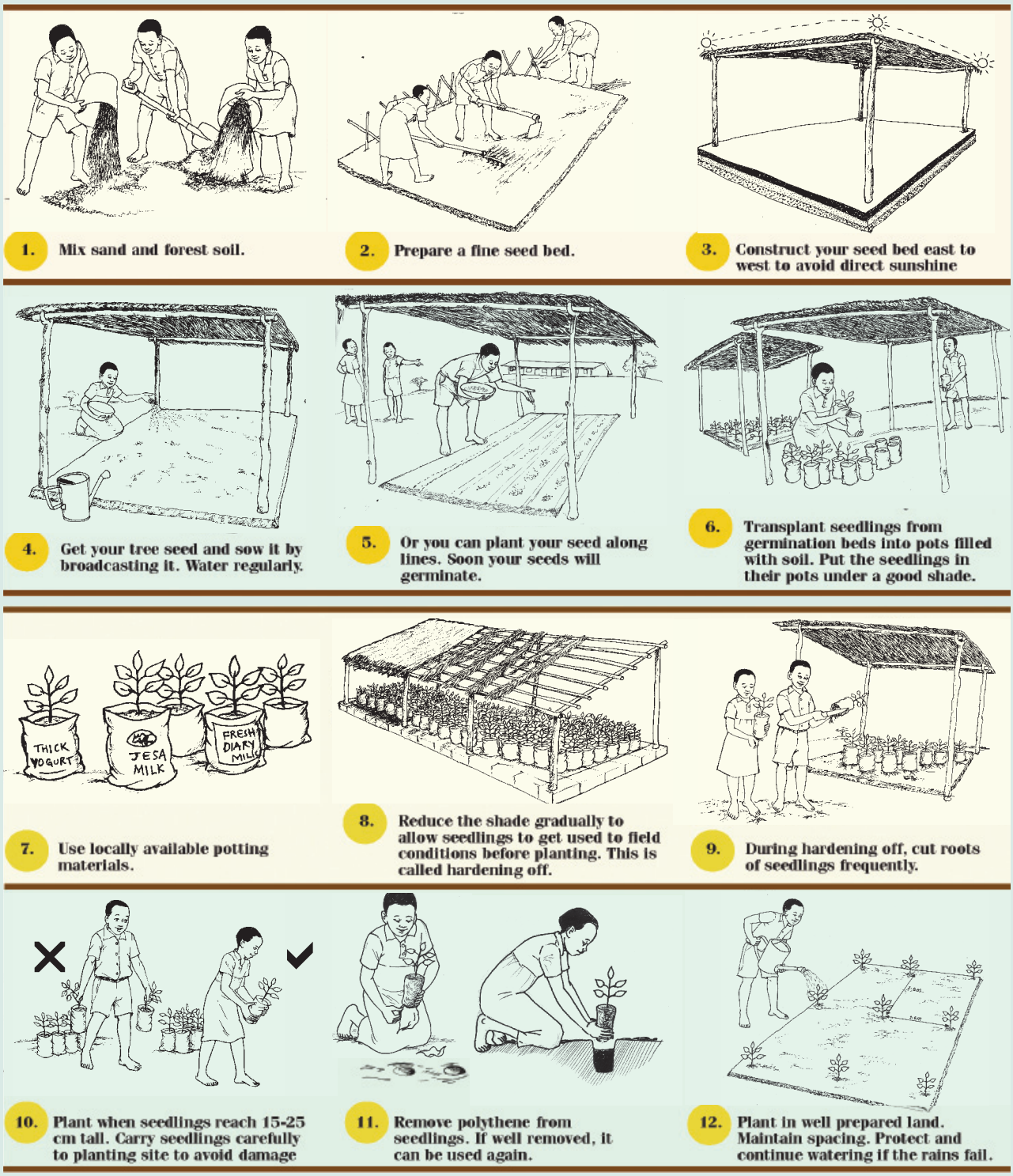
Procedure: Convene the pupils and explain in detail what a tree nursery is, confirming and/or correcting what the pupils already know. Help them go through the step-by-step illustration of how nurseries are set up (see teachers guide on page 24). Reserve the practical session for the second session.

A tree nursery

Teacher's guide on how to start a nursery

The teacher will use the nursery establishment chart below as a step-by-step to pupils during the two sessions of this lesson. He/she needs to read it before the lesson. First, the teacher introduces the concept of tree nurseries to the pupils through a question session, starting from what they know. By way of illustration, the teacher uses the chart guide the pupils through the steps of establishing a nursery.

Nursery establishment chart



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!*

Note to Teacher:

It is recommended that this lesson be taught when there is enough rain and after the pupils have raised their own seedlings in the nursery. This lesson will help the pupils understand how trees are planted and therefore can go out to the community to explain how trees are planted. It is important that each participating pupil plants his/her tree. If this is not possible, they should be paired up and tasked to look after the tree because this is important for Lesson 5.

Objective: Pupils will know the procedure for planting trees. They will also learn about the requirements for a tree to grow well.

Materials: Seedlings, hand hoes, pangas, tree planting guide, watering can.

Time: This lesson is a practical lesson estimated to last for one hour

Procedure: Select the area where to plant the trees. If it is bushy, slash or plough to remove the weeds and shrubs and to soften the soil. Choose the appropriate spacing between seedlings (usually 3 meters) and do the lining and digging of the holes. Each pupils should be encouraged to dig his or her own hole and plant his or her own tree. Pupils can also work in pairs if the seedlings are not enough.

Using a watering can, each pupil should be encouraged to water his or her seedling immediately after planting. They may repeat the watering in the course of the week to make sure the plant has sufficient water.

- Do not plant near buildings, on hard rock surfaces or under existing trees.
- Do not plant under utility lines.
- Do not plant in road reserves as the trees will be cut when the roads are expanded. Plant in a location that will receive direct sun and has good soil.

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 rain 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 orignal 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."

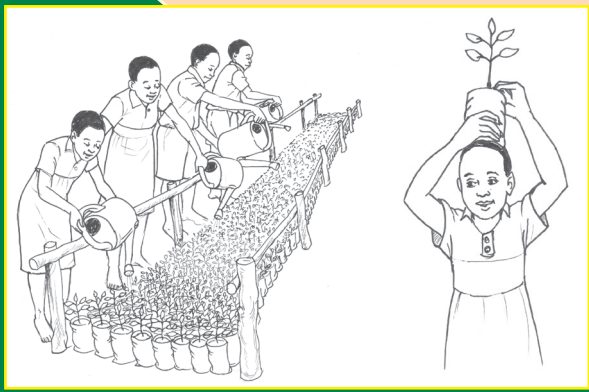
Ask a professional forester for guidance in case of any problem.

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, fribre for art and crafts, and honey.

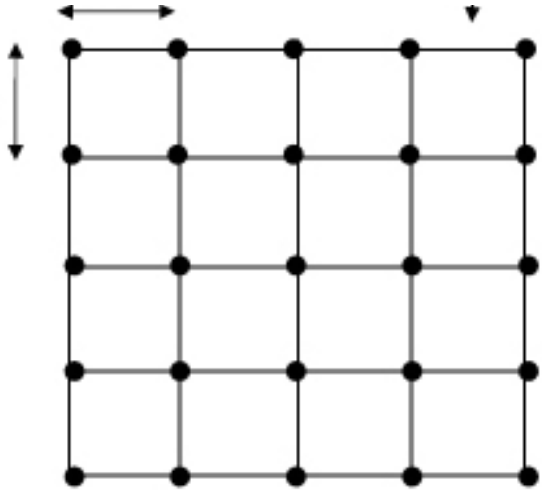
Forest products are traded for money and are important source of raw materials for industries.



Activities to be carried out during planting session

a) While in the planting field, the teacher reminds the learners about the basic rules for tree planting (see tree planting guide on page 25).

b) The teacher guides the learners to make proper lines using a string. A spacing of 1.5 to 3 metres by 1.5 to 3 metres between lines is recommended.

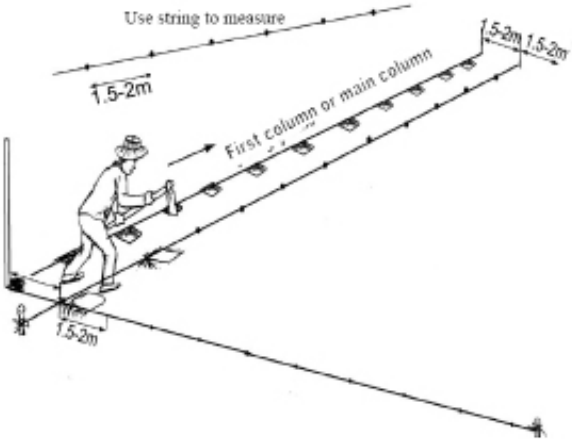


The reasons for planting in a straight line are:

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

Each pupil with a hoe and seedling, and ready in the field for the planting session the teacher reads point by point on what is required when planting trees. The points to emphasise are:

- Select a location which is not under shade because trees need the sun to grow.
- The soil should be loam soil in order for the seedling to establish quickly.
- Remove all weeds and grass from the site because they compete with the seedling for water, minerals and sunlight).
- Dig a hole of 15 centimeters across but along the line. This lets the roots spread as the tree grows.
- Turn the soil in your hole approximately 15 centimeters deep and break up any big chunks.



- Remove the seedling from the tube (also known as pot) and take the plastic wrapper off the roots. Make sure you do not leave the plastic material in the tree garden.
- Place the roots of your seedling just below the surface of the soil, so that the roots are completely covered.
- Make sure you do not plant the seedling too deep. About 3 centimeters of soil on top is plenty.
- Water the seedling and, if possible, cover your planting site with 6 centimeters of mulch. Do not let the mulch touch the seedling because this attracts diseases and termites.
- Water your seedling immediately after planting. Water it once or twice a week to avoid drying.

c) After planting and the pupils are back in the class, the teacher asks learners to do the following exercise.

Exercise

1. What do our trees need to grow?
2. What do we look for when choosing 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!*

Objective: Pupils will make sure that the trees planted grow well.

Materials: Hoes, slashers, panga, watering can.

Time: 15 minutes, once a week through out the year.

Procedure: Once every week, pupils go to the woodlot to inspect their trees and observe their growth. Each pupil will have a responsibility to make sure that the tree he or she planted grows. The teacher will make sure that each tree is named after the pupil who planted it. Each child will prepare a name tag for their tree.

Result: Pupils will learn how to look after their seedlings well and increase their survival rates.

Activities for this lesson

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

- Weed the seedlings. They 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 during the visit include lack of water, termites, roaming animals browsing on the leaves, caterpillars feeding on leaves or death of the seedlings.
- Water every seedling in case it has taken long to rain.
- Replace the dead seedlings
- Repair the fencing material (using thorny bushes) around the woodlot to stop roaming animals from accessing the woodlot and damaging the trees.
- Ring fence each of the seedlings
- Dig out the termite mounds to control termites.

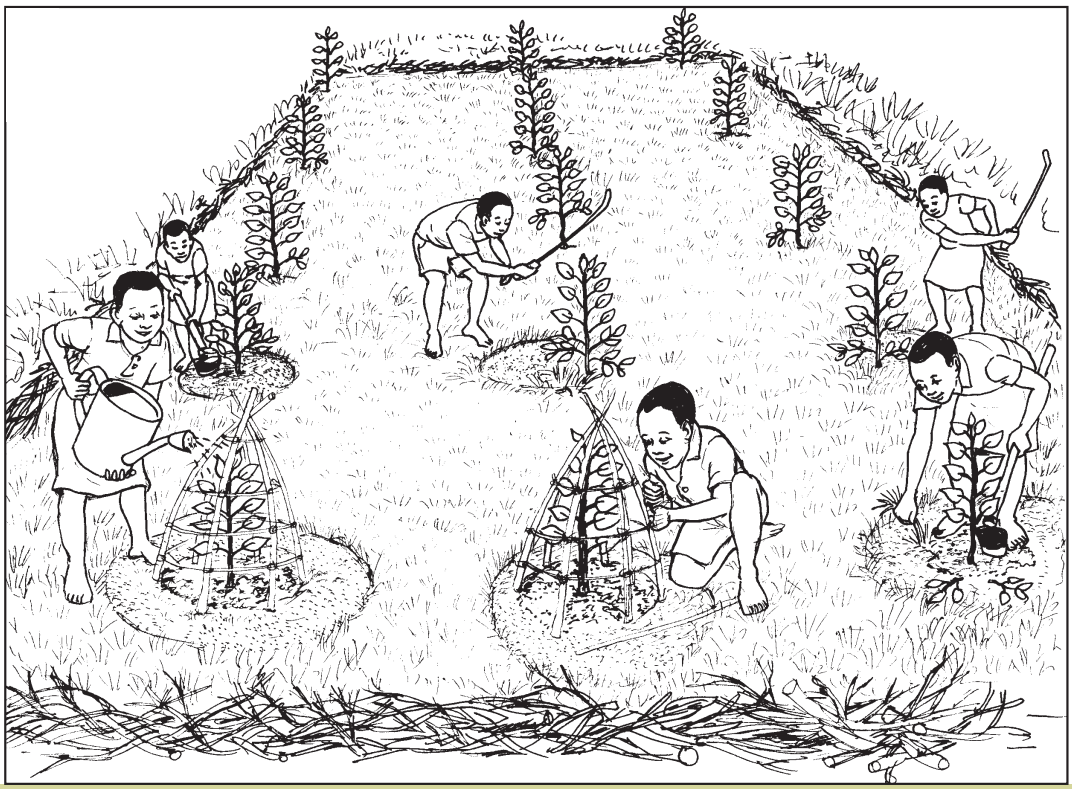
As the trees grow, it is important to remove unnecessary branches (a process known as pruning). This will help your tree to grow straight.

Never forget:

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

Objective: Learners will appreciate the importance of mixing trees with agricultural crops as an approach in conserving our environment.

Materials: Photographs showing gardens where trees are mixed with crops and reading notes on agro-forestry.

Time: One lesson of 40 minutes.

Procedure: Conduct this lesson in a classroom. The content for this lesson is provided in the reading notes here under. Using the photographs and the notes, explain the practice of agro-forestry and its usefulness in conserving the environment. Use the last 20 minutes to ask learners to do both activity and exercise on agro-forestry (below the photographs).

Result: Learners appreciate the usefulness of agro-forestry both economically and environmentally and express interest in practicing it in the school garden and at their homes.

Never forget:
Crops grown together with the right agro-forestry trees normally have very good yield.

Reading notes on Agro-forestry practices

- 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, decompose and provide manure.
- The practice helps landowners to have many products, markets, and income in addition to improving soils.
- It helps improve the diversity of living things on the farm while maintaining soil fertility for the future.
- Agro-forestry helps farmers to survive harsh climatic conditions and improve crop yield during either drought or floods.
- The trees planted together with crops also help to remove carbon dioxide from the atmosphere thus reducing the greenhouse gases.
- Trees such as Musizi (*Maesopsis eminii*) or Mugavu (*Albizia coriaria*) are good agro-forestry species. When trees are inter cropped with crops, it is important that this is done in clear lines (see photos below)

Photos of Agro-forestry gardens

Activity: **The teacher asks pupils to look at the above agro-forestry gardens in the photos and for each of the photographs, name the different types of crops inter cropped with trees. Draw maps of the gardens for each of the photographs indicating the major crops and trees.**

Agro-forestry trees exercise: The teacher asks pupils to list the different tree species that are normally inter-cropped with crops in your area. He also asks them to write their local names in case you do not know the common English names. The pupils should also indicate the crops they are mixed with.

Lesson 14: *Farmer Managed Natural Regeneration (FMNR)*

Objective: Learners will appreciate that FMNR is one way of growing trees and a cheaper approach to conserving our environment.

Materials: Reading material on FMNR, photographs and illustration on how to undertake FMNR.

Time: One lesson of 40 minutes.

Procedure: Conduct this lesson in a classroom based on the reading material on FMNR. Explains the practice of FMNR, how it is done, and the advantages of FMNR. Use the last 15 minutes to administer the FMNR exercise on page 30.

Result: Learners appreciate the practice and become change agents for the practice.

Reading material on FMNR.

Farmer Managed Natural Regeneration (FMNR) is a simple, method of looking after trees in gardens, or grazing areas or areas set aside for forests.

Trees are allowed to regrow from existing tree stumps and roots that sprout.
This approach also allows trees germinating from self-sown seeds in the soil to grow. This means no planting of fresh seedlings.

- The farmer selects the stumps or self-germinated trees he/she will utilise and decides how many stems will be allowed to grow based on what his/her needs.
- The excess stems are cut and used as firewood.
- The remaining stems are pruned after every six months.
- Pruning is extremely important for stimulating rapid growth of more valuable, straighter stems.
- Farmers are encouraged to leave natural trees in their gardens to provide little shade to control moisture in the soil as the plants grow (see picture below).

Left: A garden of *simsim* and maize with indigenous trees left standing with young trees growing from the ground. ***Right:*** Maize, Ocra, ground nuts with regenerating trees

Advantage of FMNR

- Low cost (stumps and sprouting roots are readily available in most areas).
- Trees growing from stamps grow very fast.
- FMNR is one way of conserving indigenous tree species.
- It is one way of conserving trees that are used to the local conditions of that particular place.
- Trees growing from stumps are rarely damaged by termites.
- It is also easy to gain skills required for its practice.
- FMNR allows a variety of tree species on the farm instead of one type of trees e.g pine.
- Trees grown under FMNR are usually multi purpose tree species providing for timber, medicine, fuel wood, soil conservation, fodder and bee forage among other things.
- A farmer can cover a wide area over a short period of time.
- In FMNR, a farmer does not buy seedlings.
- It increases the knowledge on trees that communities have.

FMNR exercise

Move around the school compound and identify the trees growing on stumps. Name them and count them. Indicate their local uses.

☐ _____	☐ _____	☐ _____
☐ _____	☐ _____	☐ _____
☐ _____	☐ _____	☐ _____
☐ _____	☐ _____	☐ _____
☐ _____	☐ _____	☐ _____
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Know more about FMNR:

Visit this website if you have internet:

www.fmnrhub.com.au.. ***When you see this logo, then you are on the right page and please continue reading.***

FMNR

Farmer Managed Natural Regeneration

Lesson 15: *Popularising FMNR in schools*

Introduction: In order for farmer managed natural regeneration to be appreciated, pupils and schools must be involved. This is because schools are centres where the minds and attitudes of pupils are shaped through generations. Once pupils appreciate the approach, they influence their parents to adopt it too. In addition, when parents visit schools, they are also able to copy what they see at school and replicate it in their homes.

Objective: To develop visual materials on the school compound that aid learning about FMNR in order for pupils to have constant reminder about the approach.

Materials needed: Sign posts on which to write messages, note books, identified sites on the compound where to install the sign posts with messages.

Time: Developing the messages requires a one hour session. It requires more time to put the messages on sign plates.

Procedure: Following from the previous lesson, review with the pupils the usefulness of FMNR. Also review the importance of trees to human beings. This guides learners to develop messages. Samples shown in the photographs here below should guide the learners.

Dedicate 20 minutes of the session to ask learners to complete the exercise on page 32

Exercise: The teacher should ask the pupils to look at the photos here below and develop two FMNR messages for each of the photos.

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.

4 Theme Four: Climate Change

Lesson 16: *Understanding climate change*

Objective: Pupils will be able to learn, understand and speak about climate change concerns and acquire knowledge and skills to address climate change impacts in their area.

Materials needed: Reading materials on climate change, illustrative material on ways what they youth can do to address climate change (see page 35).

Time: Two sessions of 1 hour each. In session one explain the theory of climate change. This session ends with Activity 1 on page 32. Session two begins with a discussion for actions by the youth and ends with a climate change exercise and essay writing competition (see Activity 2 and 3 on page 35).

Procedure: Pupils form groups within which they read about and discuss the meaning of climate change and the related vocabulary. Each pupil is then assigned to write an essay on climate change. It is important to reward the best essay writer.

Teachers notes on climate change.

Climate change is the change in weather patterns over a long period of time. It includes major changes in temperature, rainfall formation, or wind patterns, among other effects, that occur over several decades or longer.

Climate change ***is a result of global warming*** which is the rise in global average temperature above the earth's surface. The rise in temperature is caused by increasing concentrations of greenhouse gases in the atmosphere. The most common greenhouse gases are carbon dioxide and methane.

Greenhouse gases form a blanket and trap heat in the atmosphere, which makes the earth warmer. People are adding several types of greenhouse gases to the atmosphere through increased human activities such as industries, gases from vehicles and gases released when dry vegetation in burnt.

There are some ***natural causes of climate change*** include:
- Volcanic activity where excess heat from the ground is released to the atmosphere
- The sun's rays heating the atmosphere
- Heat released from the sun.

But ***human activity*** is the main cause. The most known human activities causing climate change are:
- Deforestation - because human beings are cutting trees to pave way for agriculture.
- Industries - they emit a lot of heat, smoke and gases into the atmosphere
- Increasing number of vehicles all over the world - they use petroleum products that release gases to the atmosphere.
- Burning of vegetation - which releases heat, smoke and gases into the atmosphere.
- Destruction of wetlands - human beings are reclaiming swamps to grow crops such as paddy rice.
- Poor waste management
- Poor agricultural practices
- Population increase where many people need more firewood.

The ***impacts of climate change*** are obvious:
- Snow on Mt. Rwenzori is disappearing because of rising temperatures
- There are many floods in Teso, Lango and Kasese destroying houses and crops.
- Dry areas such as Karamoja are becoming increasingly dry with low yield and animal deaths,
- There are landslides in Mt. Elgon conservation area that have destroyed houses and crops,
- Crop yield is becoming low across the country with looming famine.
- Increases in spread of disease across the country.

Whereas it is the responsibility of every Ugandan to take action, ***young people should be more concerned*** because they will surfer most. They need to do one of the following to safeguard themselves:

- Protect forests and grow new trees.
- Manage waste properly and recycle plastics/*buveera.*
- Use energy-saving cook-stoves.
- Conserve wetlands, and water sources.
- Harvest and use of rainwater.
- Use environmental resources while thinking about the future.
- Promote soil conservation methods.

School environment clubs can get involved in the managing climate change. Encourage people to plant trees, farmers to protect trees, harvest rainwater, protect wetlands and forests, recycle plastics and use energy-saving cook-stoves (see actions for the youth on page 35).

Activity #1: *The teacher helps learners to discuss and make notes on the following terms*

1. Weather
2. Climate change
3. Greenhouse gases (give examples)
4. Deforestation
5. Swamp reclamation
6. Floods
7. Landslides
8. Snow
9. Wetlands
10. Recycling
11. Conservation
12. Energy saving cook-stoves
13. Regenerating trees
14. Soil conservation

The pictures below show 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

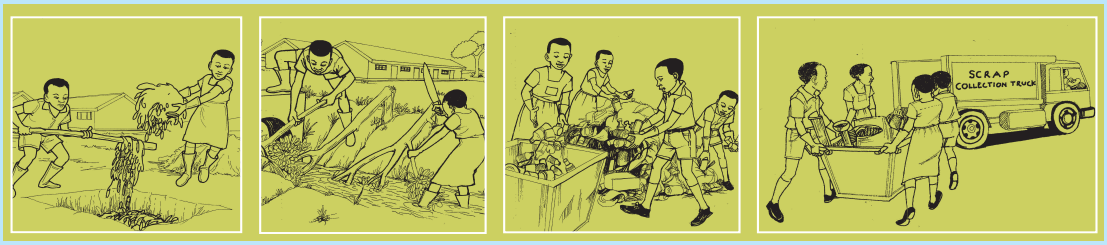
- Establish nurseries that will be sources of seedlings for your tree planting.
- Allow seedlings to get used to field conditions.
- Plant in well prepared land, maintain spacing and continue watering if rains fail.
- Schools can plant along lanes. Trees make the school environment better.

Rainwater harvesting

- Fit all roofs with gutters and collect all the water into a water 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.

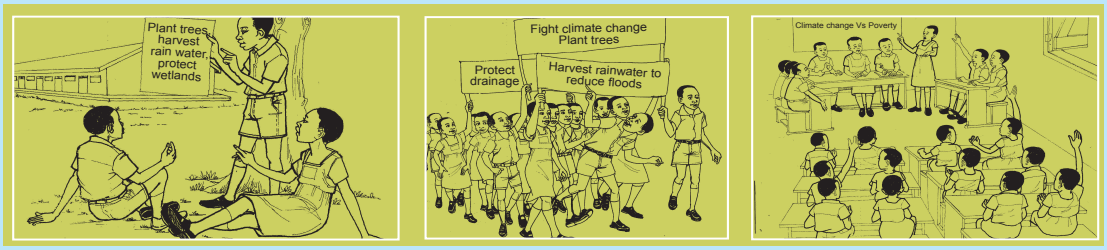
Waste management

- 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 landfil.



Raising awareness

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



Activity #2: *Climate change exercise*

The teacher asks pupils to list human activities that may cause climate change in their local environment.

Activity # 3: *Climate change essay competition*

The teacher asks pupils to write a story of not more than 500 words on climate change, its impacts and what should be done to reduce its impact.

Lesson 17: *Rainwater harvesting*

Introduction: Safe drinking water is increasingly becoming scarce at school and community level. Yet, there are schools and some members of the community have corrugated roofs from which water can be harvested. This lesson, in part, seeks to impart skills on rainwater harvesting but also create awareness about rainwater harvesting.

Objective: This lesson is intended to teach learners how to harvest and conserve water.

Materials needed: An illustration of rainwater harvesting from a roof and the reading notes provided here under.

Time: One session of one hour.

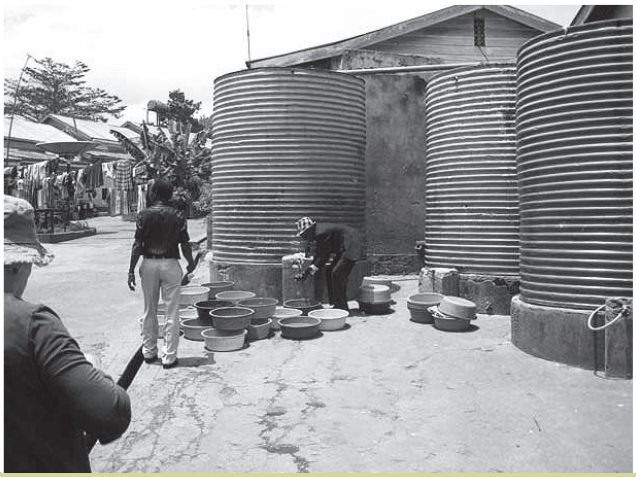
Procedure: This is an interactive lesson involving reading, explaining and having discussions between the teacher and the learners. After the interaction, ask the learners to write an essay on rainwater harvesting which should be marked. The teacher is encouraged to award the winner of the essay competition.

Reading notes on Rainwater harvesting.

Rainwater harvesting is the process of capturing or collecting rain water for immediate use or future use; especially during dry season.

People have been doing it for a long time. Rain that falls on trees has been collected using folded banana leaves as gutters and collected in pots and large drums or tanks.

It is important to know how to collect roof water and how to make it safe to drink.



How can rainwater harvesting help?

Rainwater harvesting can help:

- when there is no supply of good water.
- when it is hard to get clean water from wells
- when there is no water in the bore holes
- when there is no piped and/or tap water

It is easiest to harvest rainwater where there is regular rainfall to keep the tank topped up. However, in many parts of Uganda rainfall varies a lot throughout the year.

How much rainwater can be collected?

Rainwater harvesting can provide water for:

- individual homes with even big numbers of people.
- communities through community water harvesting schemes
- schools with large numbers of learners
- hospitals with lots of patients every day.

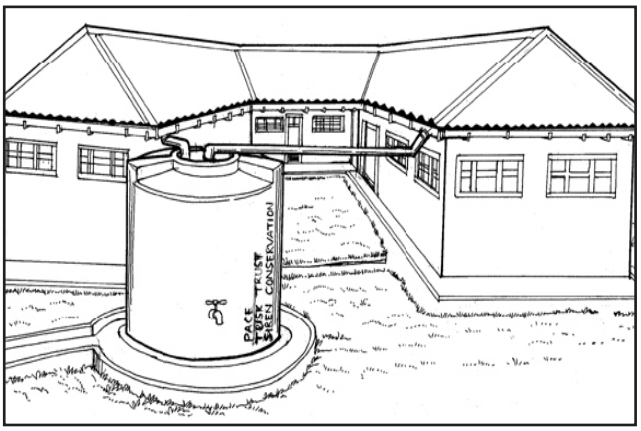
The amount of water you collect depends on the amount of rainfall in the area, the surface area from which water is collected and how much one can spend to construct, buy and maintain a rainwater harvesting tank.

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.

There are many ways farmers in dry areas can harvest rainwater to help irrigate their crops and provide water for their livestock. In Nakapelimoru, Kotido District, water is harvested into a valley dam surface, and used for domestic use, some for animals and some for micro-irrigation.



How do you collect rain water from a roof?

Note: Only collect water from roofs of iron sheet and not any other form of roofing materials such as lead-painted or asbestos surfaces. These can dissolve in the water, which could seriously harm your family or school.

The diagrams shown here show water harvesting approaches adopted by a number of schools. It is easiest to collect water from a tiled or corrugated iron roof, which should be clean. You can also collect water from tightly grass thatched or palm-leafed surfaces, but these may be harder to clean so the water may need more treatment to make it safe to drink.

To collect rainwater 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 to 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.

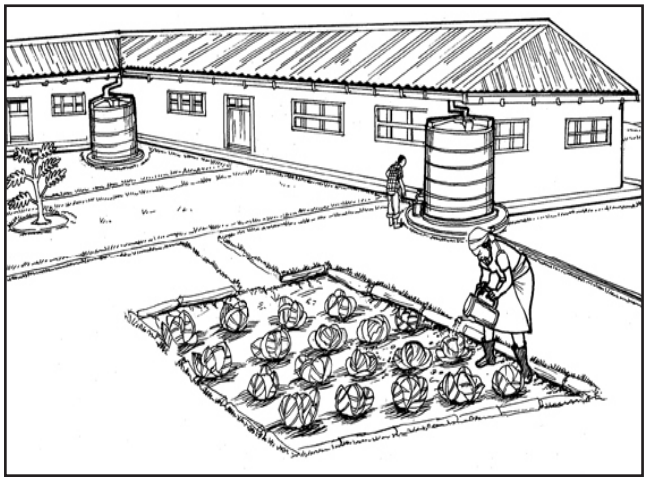
Make sure rainwater is clean and safe to drink.

- check if there are dissolved particles or small insects in it. Remove them immediately.
- if it is intended for drinking, it is important to keep the water in a clean and protected place.

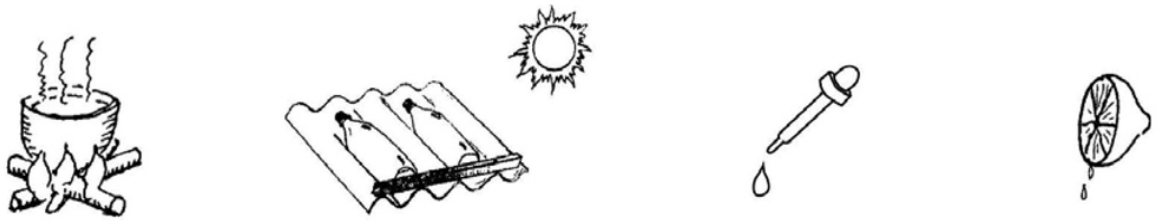
- Avoid collecting the fast volume of water coming off the roof as the rain starts because it has dust, leaves, droppings of birds, twigs and other forms of contaminants.

Use rainwater for irrigation.

This applies to people in urban areas that use piped water. You can collect water from the roof and use it to irrigate flowers gardens, backyard gardens. This will help you to cut costs on your water bills.



Methods of treating water before drinking it



Boiling … or … Solar disinfection … or … Adding chlorine … or … Adding lime or lemon juice

Essay writing. The teacher asks learners to write a story describing how rain water is harvested and treated before drinking it. The learners should also mention its uses.

Lesson 18: *Agriculture and irrigation – away to go in the era of climate change*

Introduction: Considering that climate change is affecting agricultural production in many homesteads in rural areas, it is important that learners are introduced to irrigation as one of the approaches to improve crop yield.

Objective: Pupils will be able to appreciate irrigation as an approach to fight climate change.

Materials needed: Reading material on agriculture and irrigation and illustrations that serve as a young farmers guide to drip irrigation (see page 39) based on a Young Farmer's Club visit to a farm institute.

This lesson will also require some seedlings of fruit trees to be planted around the school compound. It is on these fruit tree seedlings that drip irrigation will be applied.

The lesson also requires empty plastic water bottles and twenty (20) liters of water or more depending on the number of seedlings to be planted.

The lesson also requires pegs (sticks) and strings on which to hung the bottles for drip irrigation

Time: Probably two session of 1 hour each with one being a practical session.

Procedure: Conduct the first session in a classroom environment based on the reading material on agriculture and irrigation. The Second session is a practical session based on the young farmer's guide to drip irrigation

Reading material on agriculture and irrigation

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. It is done during periods when there is little rain or in areas that are dry. The water used for irrigation may come from the nearby lakes, rivers, wells, water taps or boreholes. The amount of water used in irrigation depends on the type of crop (or trees) that you intend to water. It is advisable not to flood the crops when irrigating. When crops are flooded, they die.

Water for irrigation can be brought to the garden using containers such as buckets or jerrycans. Sometimes, water is directed to the garden using dug canals or water pumps with pipes.

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

Surface irrigation – where farmers disperse water on crops or trees.

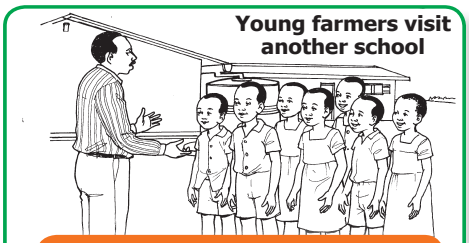
Sprinkler irrigation – this is when water runs through pipes over or on the ground and then sprayed onto the field.

Drip irrigation – used to water plants directly, the water container releases drops of water slowly on to the plant. It is one of the most efficient methods of irrigating crops.

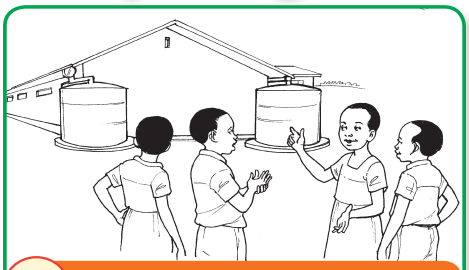
Climate change and irrigation

Because of climate change, many parts of Uganda do not receive enough rain. As a result, crops and trees planted often require to be irrigated especially in the dry season. Irrigation helps plants to grow faster and survive the harsh conditions of the dry season.

Young farmers guide to drip irrigation



1 **MR ODOKI:** You are welcome young farmers. We are to learn about drip irrigation. Okello can first take you around the school.

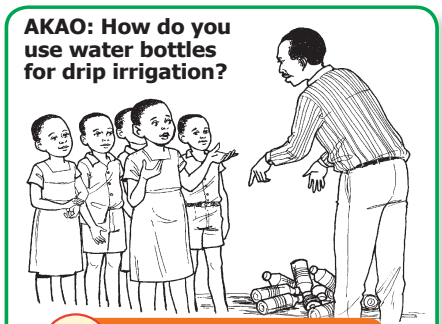


2 **APIO:** Okello, your school has two water tanks, what do you use them for?

3 **OKELLO:** They contain water for hand washing and drinking

4 **ANGEYO:** We also use the water to irrigate crops using drip irrigation technology.

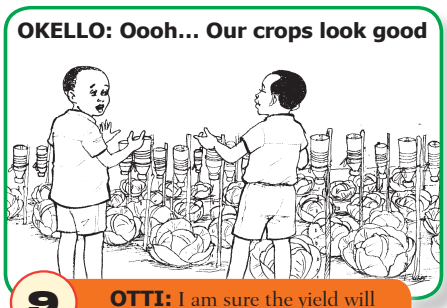
5 **OKAO:** But for us we tap running water and direct it into the pit for watering crops in the dry season.



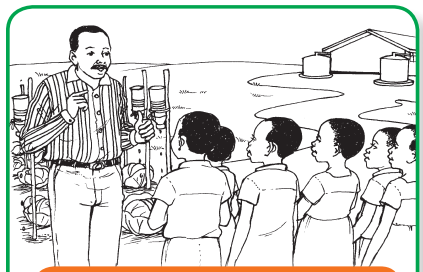
6 **MR ODOKI:** It's simple. Collect waste water bottles.

7 **MR ODOKI:** Make a small hole in the lid of the bottle, cut off the bottom and tie the bottles on small stick.

8 **MR ODOKI:** Put the stick in the ground near the crop. Fill the bottle with water everyday and let it drip drop by drop.



9 **OTTI:** I am sure the yield will also be good



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

Activity:

The teacher helps the pupils to go through the poster on Club's visiting to another school.
The teacher emphasizes that this is an activity that will help the pupils to understand drip irrigation
The teacher then asks pupils to go out and find seedlings of fruit trees
The pupils dig holes around the school compound within which to plant the seedlings
Pupils then erect pegs on each of the seedlings planted
Pupils then fill the empty bottle with water that has an outlet to allow water to drip.
The bottle is tied on the peg to allow water drip down to the seedling.
Pupils should fill the bottle with water daily; except when it rains.
Pupils should monitor the growth of the seedlings under drip irrigation and compare with those that are not irrigated.

Lesson 19: *Growing fruit trees on farm*

Objective: To help pupils appreciate fruit tree growing as away to conserve the environment and provide nutrition and balanced diet during extreme climatic conditions.

Materials needed: Diagrams on "fruits survive in dry conditions" (see page 41). Seedlings of fruit trees to be planted as an orchard. A cleared garden ready for planting.

Time: Probably two sessions of one hour each. The first session should be a classroom session based on the reading material provided and the diagrams on "fruits survive in hot season" (see page 41) with one being a practical session.

Procedure: Conduct the lesson in the class. After the lesson, ask learners to go and prepare the school garden for the practical session where they are required to plant their own fruit trees. Session two of this lesson is on planting fruit trees (Refer to lesson 11, page 25). At the end of the exercise, give the learners an essay competition

Reading Material on growing fruit trees in an orchard

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.

You can plant fruit tree seedlings that have directly germinated from seed. Or, you can plant grafted seedlings. Grafted fruits taste better and grow faster. Seedlings planted from geminated fruit tree seed take longer to grow than grafted seedlings.

Fruit trees also grow from existing stumps and roots. This process is known as copping.

Plant fruit trees in open sunny areas because they require 6 hours of full sunlight to grow strong and produce healthy fruits.

Do not plant fruit trees close to buildings and roads because the roots may affect the roads and buildings as the tree grows.

The soil where the tree is growing must not retain a lot of water because it may cause the roots to rot.

Fruit trees can be planted at any time of year as long as there is rain.

Add compost to the soil if necessary to make room for the tree's roots to begin growing. Do not dig a hole too deep.

Make sure that the fruit trees have enough space for themselves; usually 10 meters each. The more space you give them, the better.

Use compost manure to improve the soils. Fertilizers are usually expensive.

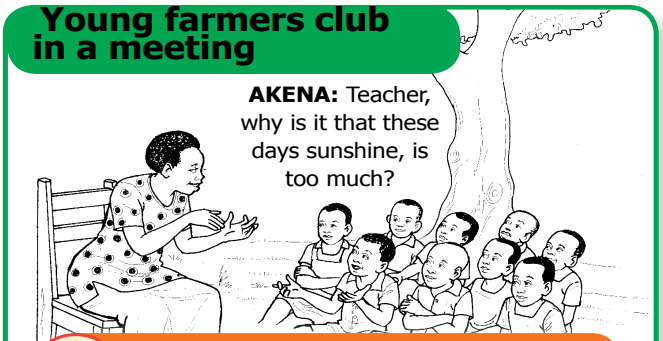
Covering the soil area with a layer of organic mulch helps in retaining the moisture in the soil and protect the roots. It will prevent grass and weeds from growing and competing for nutrients and water as well.

Decide on when to prune the excess branches. Protect the young seedling from excess heat, and control weeds.

Fruit trees are important to human beings because they improve nutrition by providing vitamins while some are medicinal. You can make juice out of some such as oranges and mangoes. In addition, they provide shade in homes and school compounds.

Fruits survive in hot seasons

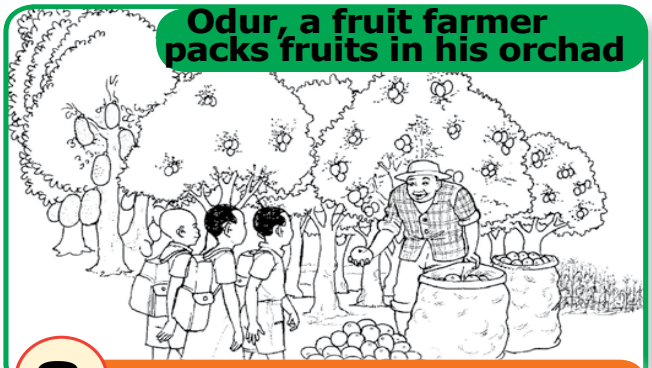
Young farmers club in a meeting



AKENA: Teacher, why is it that these days sunshine, is too much?

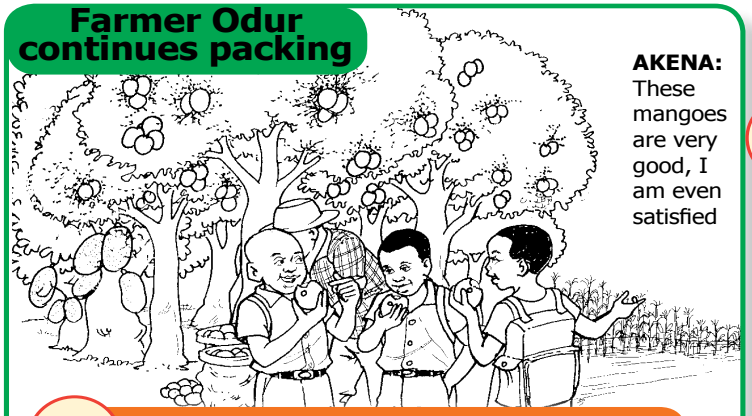
1 **TEACHER:** The climate has changed because of the bad ways we treat our environment such as cutting trees down.

Odur, a fruit farmer packs fruits in his orchad



2 Children, come and have some mangoes.

Farmer Odur continues packing

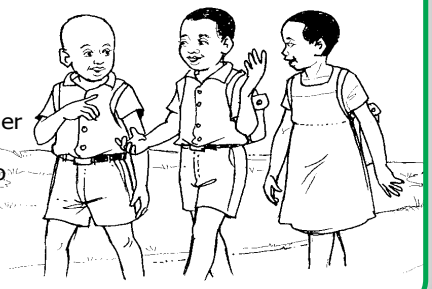


AKENA: These mangoes are very good, I am even satisfied

3 **ACAN:** Do you realize other crops are drying and only mangoes and jack fruit are surviving?)

On the way home

4



AKENA: The teacher said its hot due to change in climate.

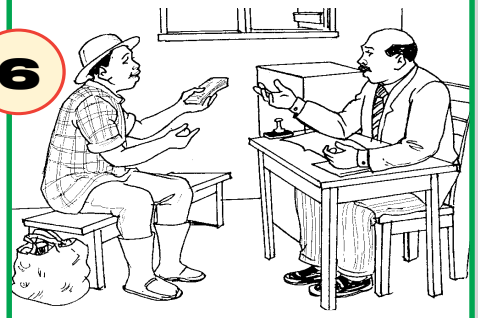
ODOCHI: She also said that fruits are resistant to drought compared to other crops

Odur off loads mangoes in the market

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

ODUR: Mr Kiteba, 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.

6



MR KITEBA: Good idea, Young Farmers Club will take it on next season.

ODUR: Mama, this is what I have bought out of the money from mangoes, I have also cleared Acan's fees

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

7

MR KITEBA: Mr Odur suggested growing fruits in the school.

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

8

Fruit tree exercise

The teacher helps pupils to list the different fruit trees in their local area.

☐ _____	☐ _____	☐ _____
☐ _____	☐ _____	☐ _____
☐ _____	☐ _____	☐ _____
☐ _____	☐ _____	☐ _____
☐ _____	☐ _____	☐ _____
☐ _____	☐ _____	☐ _____
☐ _____	☐ _____	☐ _____

Essay competition:

The teacher asks learners to write a composition of 200 words describing the importance of fruit trees in their area.

5 Theme Five: Expanding the Learning

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

There is no specific lesson planning for the teacher on this lesson. The idea is to expand the learning beyond the classroom, beyond the communities where the learners live.

The teacher should encourage upcoming farmers to get to know people who are doing similar things.

The learners should be encouraged to form groups within which to discuss what they do or for peer support. Schools can form environment clubs.

In these club, learners can do many things related to environment management. They can manage the school woodlot, debate among yourselves, visit neighboring villages and work with communities on environment issues such as planting trees or maintaining a farmer managed natural regeneration plot.

The teacher can also invite the district forest officer, the district agriculture officer or the national agriculture advisory services officer to talk to the learners. Ask the learners to inquire about the things you want to know about the environment.

Encourage learners to listen to radio programs on agriculture and the environment. These will help them understand issues on environment better.

Encourage them to read newspapers such as Farm Talk, Tree Talk and Harvest Magazine because these have a lot of information for them. Encourage them to ask whenever they do not understand certain terminologies.

Encourage them to write to their parents and friends in the neighboring school telling them about the good things they do school about the environment. This will improve their writing skills.

Activity: *Letter Writing*

The teacher asks pupils to write letters to people of their choice telling them about the good things they do to protect the environment.

The format of the letter should be as follows:

Name of the pupil writing the letter
Address of the pupil writing the letter

Date

Name of recipient of the letter
Address of the recipient of the letter.

Dear Sir/Madam

Ref: Our environment conservation activities at school

.....
.....
.....
.....
.....
.....
.....

Yours
Name of the pupils writing the letter

World Vision®
Uganda