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Introduction

Why the curriculum has been reformed

The Malawi primary school curriculum has been reformed so that it is in line with the Policy Investment Framework (PIF) with special attention to assessment practices. This is consistent with the recommendation that was made by the Ministry of Education Science and Technology September 1999.

Rationale for agriculture

Agriculture is important to Malawi. It contributes more than 60% to the economy of the country. In addition, over 80% of the population in Malawi is fully involved in farming for a living.

As a result of the role it plays in the economy of this country, agriculture is one of the subjects taught in primary schools. As a school subject, agriculture is a prerequisite for both individual and national development. In addition, it contributes to the physical and intellectual development of the learner.

Since primary education is terminal for the majority of children, it is important that learners are equipped with relevant and appropriate agricultural knowledge, skills and positive values for them to function as responsible and productive citizens in the society. The knowledge, skills and values that learners will acquire in agriculture will help them to conserve the environment, sustain improved crop and animal production and market their products for maximum profit.

The present primary school agriculture curriculum prepares learners, not only for farming careers, but also for academic needs of those learners who proceed to secondary education.

Development outcomes

The Development outcomes are over-arching; they are what the learner is expected to achieve by the end of the primary cycle both in and outside the school. These outcomes apply to the Learning Areas and they have been derived from Malawi's Constitution, Vision 2020, PRSP, PIF and other education policy documents including global agreements to which Malawi is a signatory as well as from the PCAR Needs Identification Report. That is, the learners should be able to:

- Communicate completely, effectively and relevantly in a variety of contexts and in multiple languages
- Apply mathematical concepts in science, technological, socio, environmental, cultural and economic contexts to solve problems
- Produce product and solutions through Agriculture, Science and Technology a creative way and demonstrate respect for their environment to solve problems

- Demonstrate how communities are affected by diseases such as cholera
- Observe, interact and understand an environment in appreciative mode
- Demonstrate a positive attitude with the acceptability of change
- Make use of basic skills for personal advancement
- Apply an imaginative mind to initiate and develop ideas for the benefit of the self and society

Core elements

The core elements are:

Farm business

The learner will be able to manage farm business and manage small enterprises.

Agricultural environment

The learner will be able to identify factors which influence the environment such as water, and modify them.

Farm tools, machinery and equipment

The learner will be able to use improved agricultural tools and equipment to increase productivity.

Crop production

The learner will be able to produce crops profitably.

Livestock production

The learner will be able to keep goats and cattle profitably.

- Demonstrate health promoting behaviour in their personal lives as well as their communities and wider environment with particular attention to prevalent diseases such as malaria, sexually transmitted infections and HIV and AIDS¹
- Observe, interact with the natural and physical environment in order to understand and make use of their interrelationship in a responsible and appreciative manner
- Demonstrate appropriate moral, ethical and healthy behaviour in accordance with the acceptable norms and values of the society
- Make use of basic knowledge and skills necessary for life-long learning, personal advancement, the development of society and the nation
- Apply an imaginative, creative mind, vocational and managerial skills in order to initiate and participate in a productive manner that will serve the individual and society

Core elements and their outcomes

The core elements and outcomes for agriculture are as follows:

Farm business and marketing

The learner will be able to apply basic knowledge and skills of farm business and marketing to increase the profitability of agricultural enterprises.

Agricultural environment and soil science

The learner will be able to demonstrate an awareness of the environmental factors which influence agricultural production with emphasis on soil and water, and modify and conserve them for sustainability.

Farm tools, machinery and technology

The learner will be able to use and maintain farm tools and machinery, apply improved agricultural technology and observe safety rules to increase farm productivity.

Crop production

The learner will be able to grow selected field crops, vegetables and flowers profitably.

Livestock production

The learner will be able to rear farm animals such as poultry, fish, rabbits, goats and cattle profitably.

Agroforestry

The learner will be able to incorporate agroforestry concepts and skills to improve crop and livestock production for environmental sustainability.

Outcomes-based education (OBE)

The philosophy of outcomes-based education is the foundation of the primary school curriculum. Outcomes-based education focuses on the results that are expected at the end of each learning process. These are called the outcomes. They refer to knowledge, skills, values and attitudes within particular contexts. Outcome based education also emphasizes the processes that will take learners to these end products. To teach in an outcome-based way, you need to:

- identify the outcomes of your lesson or set of lessons.
- apply a variety of participatory teaching and learning methods.
- provide inputs and activities that allow learners to achieve the outcomes.
- use appropriate methods to assess or find out whether the learners have achieved the outcomes.
- use the results of the assessment to plan the next cycle of teaching and learning process.

Teaching, learning and assessment methods

Agriculture is a practical subject. It provides a conducive environment for gaining knowledge, acquiring skills and for improving attitudes. To achieve these criteria, a variety of teaching, learning and assessment methods can be used.

Term-by-term work

The term-by-term work in the syllabus has been suggested to help the teacher in planning schemes of work.

The topics have been arranged in such a way that some core elements reoccur, that is, the same core elements appear in terms 1, 2, and 3. This has been organized according to the level of difficulty, length of the teaching and learning resources. For example, there are some topics that require a lot of time. Others require a lot of crop life.

About this teachers' guide

This teachers' guide forms part of a series of primary agriculture teachers' guides for Standards 5 to 8. The guides are based on the new Malawi primary school syllabuses for agriculture.

Organisation of the units

This teachers' guide has 30 units. The units cover the 6 core elements and their outcomes in the syllabus. Each unit has the following sections:

Unit number and title

Each unit has a serial number and a title, for example: *Unit 1: Factors of production*. The titles are sequenced according to their levels of difficulty in the core elements they belong.

Time allocation

This is the suggested number of periods of 35 minutes each that will be spent on the unit. However, you may spend more or less than the suggested time depending on what the learners and you will be involved in. Note that the time allocation for agriculture for Standard 6 is 5 periods per week.

Introduction

This gives the justification for teaching the unit. You should have in mind the reasons why you are teaching the unit to the learners. The main idea is to make agriculture more meaningful and relevant to the learners' everyday life. It also reminds you of what you taught in the previous units and tells you what you will teach in the new units.

The introduction also reflects the primary outcomes and assessment standards to be achieved. The primary outcomes give a specific focus to the knowledge, skills, values and attitudes that learners should achieve by the end of the primary education cycle. Assessment standards describe the minimum level, depth and breadth of what learners should demonstrate in their achievement of each learning outcome. They state the knowledge, skills, values and attitudes required for learners to achieve the learning outcomes.

Glossary

This section contains clear statements of specific learning outcomes that learners should achieve after successfully doing the unit activities.

Developmental areas

This has the following subsections:

SKILLS

This is a list of skills which learners are expected to practice and develop as they do the activities. The list of the skills is not exhaustive.

CONCEPTS AND KNOWLEDGE

This subsection indicates what concepts and knowledge the learners are expected to learn as they do the activities.

ATTITUDES AND VALUES

This is a list of some of the attitudes and values which learners are expected to learn as they do the activities. The list of attitudes and values is not exhaustive.

Background information

This gives the teacher brief information on the content. The information is not meant for the teacher to copy and give wholesale as notes to the learners. This is because the level of language used is meant for the teacher and not the learners. You are advised to study the background information to update knowledge on the content of the unit.

Activities

Each unit has a number of activities. The teacher should decide the number of periods to be spent on each of the activities in light of the time allocation for the unit. Each activity has the following subsections:

Resources

This is a list of suggested materials, resource persons and other types of resources needed to do the activity. Ensure that the resources are made available before the activity is conducted.

Instructions

This is a list of steps to be followed in order to conduct the activity.

Summary

This section gives the main ideas that have been taught and learned from the activities. This can form part of the learners' notes.

Review exercise

This section contains a set of questions that can be used to assess or find out the learners' attainment of the success criteria. The questions can be done in class or as homework. You may come up with additional questions wherever necessary.

Glossary

This section contains words or phrases found in the unit which require definitions or explanations.

References

This is a list of reference books that were used during the development of the unit. Refer to the books wherever possible for more information on the unit.

Acronyms and abbreviations used in this teachers' guide

AIDS	Acquired Immune Deficiency Syndrome
CAN	Calcium Ammonium Nitrate
CIDA	Canadian International Development Agency
DFID	Department for International Development
FINCA	Foundation for International Community Assistance
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
MIE	Malawi Institute of Education
MOEST	Ministry of Education, Science and Technology
OBE	Outcomes-based education
PIF	Policy Investment Framework
VCT	Voluntary Counselling and Testing
PRSP	Poverty Reduction Strategy Paper
PIF	Policy and Investment Framework
PCAR	Primary Curriculum and Assessment Reform
HIV	Human Immuno deficiency Virus

UNIT 1 Factors of production

Time allocation: 8 periods

Introduction

In Standard 6, the learners learnt how to produce some crops and animals. Farming as a business, aims at increasing agricultural production for profit. There are many factors affecting production. It is important for the learners to know such factors so that they can use them properly for increased production.

In this unit, the learners will learn what these factors are and how they affect production. This will help the learners to use the factors for high yield.

Success criteria

By the end of this unit, the learners must be able to:

- describe factors of agricultural production

Developmental areas

Skills

Ensure that the learners develop skills such as decision making, observing, recording and reporting.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of the factors of production.

Values and attitudes

Ensure that the learners acquire values and attitudes to appreciate the different factors of production.

Special needs education

Ensure that the activities are adapted for the learners with special educational needs. Observe and record their performance. This will help them to access the curriculum with ease, develop their potential and become self-reliant.

Background information

Meaning of the term “factors of production”

Factors of production are the resources that are used to produce crops and livestock.

Major factors of production

The major factors of agricultural production are shown below:

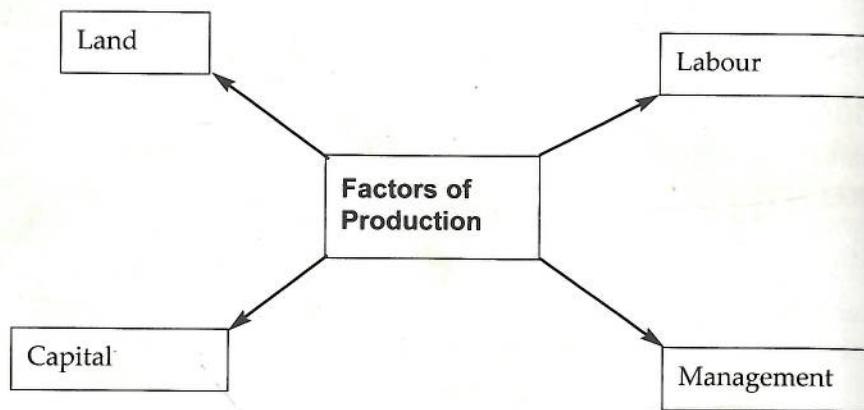


Figure 1.1: Major factors of production

Land

This is where most of the farming activities take place.

Characteristics of land that affect agricultural production are shown in figure 1.2.

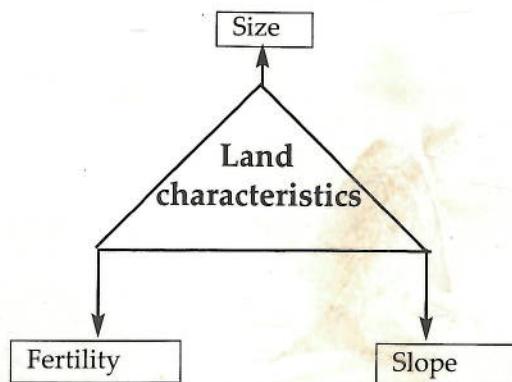


Figure 1.2: Characteristics of land that affect agricultural production

The characteristics of land that affect agricultural production are size, fertility and slope. If a farmer cultivates a big area, the total yield will be more than from a tiny land. A fertile land has enough nutrients, air and moisture for crop growth. Such land will yield more crops. Land with a gentle slope maintains its top soil because it is not easily eroded. Such land supports plant growth.

Labour

This is the effort of people in doing farm operations or work done by people.

In farming, many operations have to be completed in time, otherwise a crop can be lost. In order to carry out farm operations timely, there is need to have enough people who are healthy, able and willing to work.

The more labour a farm has, the more work will be done, the greater the agricultural production.

Capital

This refers to materials available on the farm for production. Such materials may be live or dead stocks. Examples include cash, farm inputs, equipment, tools, buildings and livestock as shown in figure 1.3 below

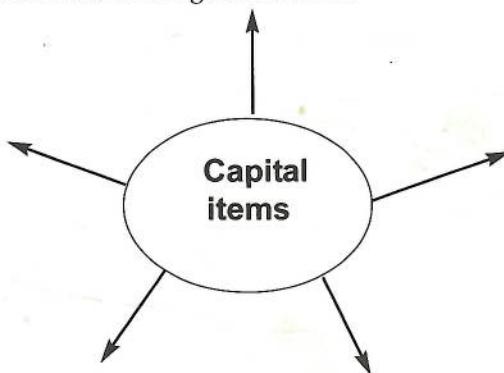


Figure 1.3: Capital items

If farmers have enough money they can pay for more labour to do more work and increase production. More money can also enable farmers to buy more equipment/machinery, fertilizers, feeds, seeds, pesticides and livestock. They can also construct more farm buildings (*kholas*, *nkhokwes*, tobacco barns). All these can help in increasing production.

Management

This refers to the farmer's knowledge and skills in performing farm operations.

Farm management involves:

- planning the farm work
- controlling the use of land, labour and capital
- supervising the work

- making farming decisions
- budgeting for farm activities
- organizing the land, labour and capital

The farmer's managerial skills ensure that the land, labour and capital on the farm are used well for increased agricultural production.

Activities

Activity 1 Discussing the meaning of the term "factors of production" (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- local agricultural environment

Instructions

- 1 Organise the learners into groups.
- 2 Let them brainstorm the meaning of the term "factors of production".
- 3 Let them discuss the meaning of factors of production.
- 4 Let them record their agreed responses in a notebook.
- 5 Let them report their findings to the class.
- 6 Summarise the meaning of the term "factors of production".

Activity 2 Discussing major factors of production (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- local agricultural environment
- chart showing factors of production

Instructions

- 1 Let the learners be in groups.
- 2 Let each group brainstorm the resources used for agricultural production.
- 3 Let each group discuss the resources used for agricultural production.
- 4 Let each group record their responses.
- 5 Let each group report their responses to the class.
- 6 In plenary categorise the resources into land, labour, capital and management.
- 7 Let the groups discuss the meaning of each factor of production.
- 8 Let each group complete table 1.1 below.

Table 1.1 Me

Factors of pr
Land
Labour
Capital
Management

- 9 Let each group
- 10 Consolidate

Activity 3 D (1)

Suggested teach

You will need th

- learners' exp
- local environ

Instructions

- 1 Let the learn
- 2 Let the learn
- 3 Let the learn
- 4 Let the learn

Table 1.2 H

Characteris
Size
Fertility
Slope

Table 1.1 Meaning of each factor of production

Factors of production	Meaning
Land	
Labour	
Capital	
Management	

- 9 Let each group report their responses.
- 10 Consolidate the meaning of each factors of production.

Activity 3 Discussing how land affects agricultural production (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- local environment

Instructions

- 1 Let the learners be in groups.
- 2 Let the learners study figure 1.2 on the characteristics of land that affect agricultural production.
- 3 Let the learners discuss how each feature of land affects agricultural production.
- 4 Let the learners record their responses by completing table 1.2 below.

Table 1.2 How land characteristics affect agricultural production

Characteristics of land	How it affects agricultural production
Size	
Fertility	
Slope	

- Let each group report their findings to the class.
- Summarize how land affects agricultural production.

Activity 4 Discussing how labour affects agricultural production (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- Learners' experiences

Instructions

- Let the learners be in groups.
- Let each group brainstorm how labour affects agricultural production.
- Let each group discuss how labour affects agricultural production.
- Let each group record their responses in a notebook.
- Let each group report their responses to the class.
- Summarize how labour affects agricultural production.

Table 1.3: How some capital items affect agricultural production

Capital item	How it affects agricultural production
Cash	
Inputs	
Farm machinery	
Farm buildings	
Livestock	

- Let each group report their responses.
- Summarize how capital affects agricultural production.

Activity 5 Discussing how capital affects agricultural production (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences

Instructions

- Let the learners be in groups.

- 61
- 2 Let the learners study figure 1.3.
 - 3 Let the learners identify the examples of capital items shown.
 - 4 Let each group name other examples of capital items.
 - 5 Let each group discuss how the capital items in the table 1.3 below affect agricultural production.
 - 6 Let each group complete the table below.

Activity 6 Discussing how management affects agricultural production (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- resource persons

Instructions

- 1 Let the learners be in groups.
- 2 Let each group discuss how management affects agricultural production.
- 3 Let each group record their responses in a notebook.
- 4 Let each group report their responses to the class.
- 5 Consolidate how management affects agricultural production.

Activity 7 Visiting a nearby farm to observe how the factors are used (2 periods)

Suggested teaching, learning and assessment resources:

You will need the following resources:

- learners' experiences
- local farm
- observation checklists

Instructions

- 1 Organise a visit to a nearby farm.
- 2 Organise the learners in groups.
- 3 Let the learners visit the farm to observe how each of the factors of production is used.
- 4 Let each group record their responses by completing a table as shown below.

Table 1.4 Applying factors of production

Factors of production	How it is used on the farm
Land	
Labour	
Capital	
Management	

- 5 Let each group report their responses to the class.
- 6 Summarize the use of various factors of production.

Summary

Factors of production are the resources that affect the output of a farming business. The major factors of production are land, labour, capital and management. Each of the factors affects agricultural production. If each of them is sufficient in quantity and quality, agricultural production will be high.

Review exercise

Let the learners do the exercise on page 6 of their Books.

Glossary

Stock	: materials available
Budget	: a financial statement showing expected expenses and income for a business
Feature	: property or characteristic
Managerial skills	: abilities that enable a person to run a business successfully

Time allocation

Introduction

In Standard 6, the unit involves many functions since they affect each other.

In this unit, the learners will learn what these are, what they do and how learners to market their products.

Success criteria

By the end of this unit, learners will be able to:

- describe marketing functions
- conduct market research

Developmental skills

Ensure that the learners can record, classify and analyse information.

Knowledge and skills

Ensure that the learners understand the marketing functions.

Values and attitudes

Ensure that the learners have positive attitudes towards marketing functions.

Special needs

Ensure that the learners with special needs are accommodated in the curriculum without discrimination.

Background

Meaning of marketing

Marketing functions are performed in order to make sales.

UNIT 2 Marketing functions

Time allocation: 11 periods

Introduction

In Standard 6, the learners learnt how to market chickens and eggs. Marketing involves many functions. It is important that the learners know these activities since they affect the profitability of the enterprise.

In this unit, the learners will learn the meaning of the term marketing functions, what these are, what each involves and why it is important. This will help the learners to market their farm produce efficiently, at a profit.

Success criteria

By the end of this unit the learners must be able to:

- describe marketing functions
- conduct marketing functions

Developmental areas

Skills

Ensure that the learners develop skills such as decision making, observing, recording, classifying, reporting and evaluating.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of the meaning of marketing functions and the tasks involved in each marketing function.

Values and attitudes

Ensure that the learners acquire values and attitudes to appreciate different marketing functions.

Special needs education

Ensure that the activities are adapted for the learners with special educational needs. Observe and record their performance. This will help them to access the curriculum with ease, develop their potential and become self-reliant.

Background information

Meaning of the term “marketing functions”

Marketing functions are activities conducted by producers or intermediate buyers in order to make profit and satisfy the needs of customers.

Marketing functions

Some people think that marketing only involves buying and selling. However, marketing involves many activities. These include:

- buying
- selling
- processing
- grading
- packaging
- advertising
- storage
- transporting
- market research

Some of the activities are shown in figure 2.1 below.



a. selling mangoes



b. advertising eggs



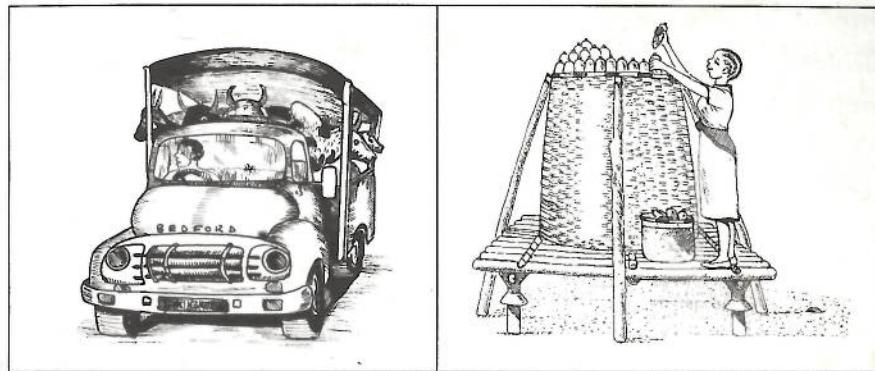
c. trans-

Buying

This means paying for goods. It becomes the owner of the goods. It shows different activities.

6 Collecting the goods for use

5 Paying for goods



c. transporting cattle

d. storing maize

Figure 2.1: Some marketing functions

Buying

This means paying for goods to own them. It is important because the buyer becomes the owner of the goods in order to use them when needed. Figure 2.2 shows different activities involved in buying.

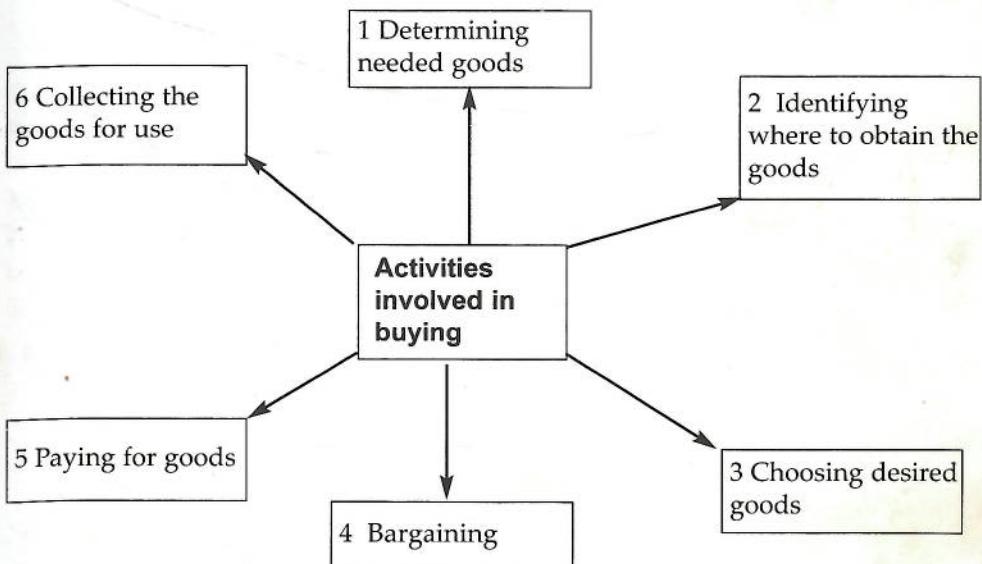


Figure 2.2 : Activities involved in buying

Selling

This involves the following activities:

- deciding where to sell (roadside market, village market, town/city market, ADMARC, Dairiboard)
- displaying products to attract customers
- pricing products (placing price tags on the goods)
- issuing or offering the produce to the customer
- collecting payment (getting the money for the produce)

Selling produce is important because it enables the farmer to obtain a reasonable income which can be used to buy inputs for the farm business or to satisfy personal needs.

Processing

Products from agriculture are usually in a form of raw materials. For these raw materials to be more useful, they have to be changed into finished products.

Processing means changing the raw materials into finished products. Processing increases the value and usefulness of agricultural products. Figure 2.3 below shows some agricultural raw materials and their finished products.

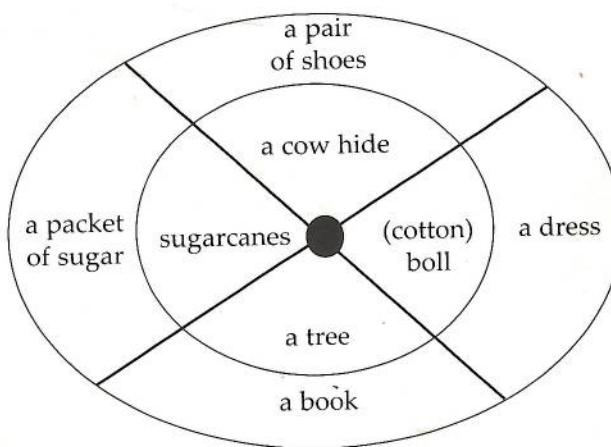


Figure 2.3 : Agricultural raw materials and their processed products

Transporting

This involves carrying the agricultural produce to the market. Produce can be taken to markets in various ways as shown in figure 2.4 below.

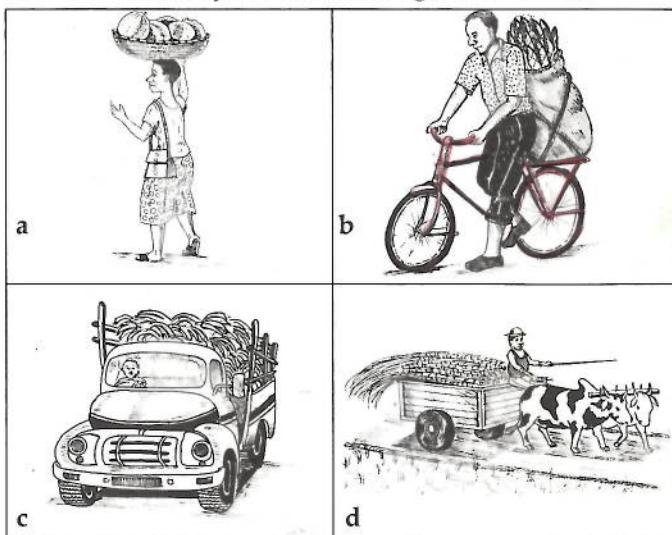


Figure 2. 4 : Ways of transporting produce to markets

Transporting goods to the market place is important because goods are made readily available to customers; the farmer can also easily sell the produce, at a better price since many customers at the market will compete to buy the produce.

Market research

This involves finding out prices of various products in different markets. Such information can be obtained from friends, other farmers, ADMARC, other markets, Agricultural offices, radios or newspapers.

Market research helps the farmer in deciding what to produce and where to sell it. A good farmer produces what the customer needs.

No one should ever start a farm business without doing market research. He or she may end up producing a commodity with no one to buy.

Grading

This involves sorting out produce to ensure uniformity in quality. Different types of agricultural produce are graded differently depending on certain factors. The factors to be considered are shown in figure 2.5 below.

Packaging makes
choose and carry
Storage
This involves keep

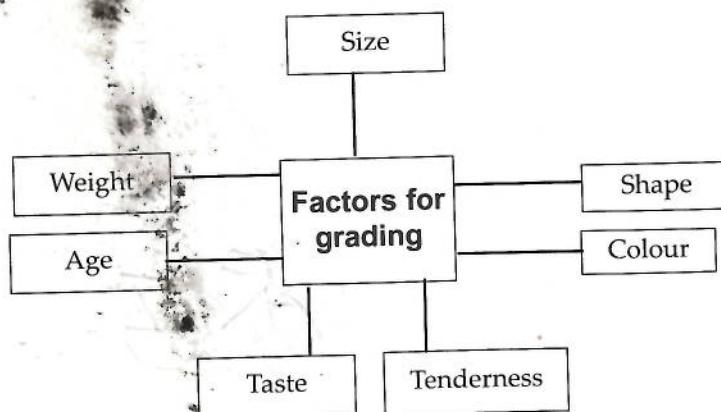


Figure 2.5 Factors considered for grading farm produce

Grading helps in pricing the produce. It also enables the farmer to get more money for produce of high grade. This encourages the farmer to aim at producing quality products.

Packaging

This involves placing the produce into appropriate containers as shown in figure 2.6 below

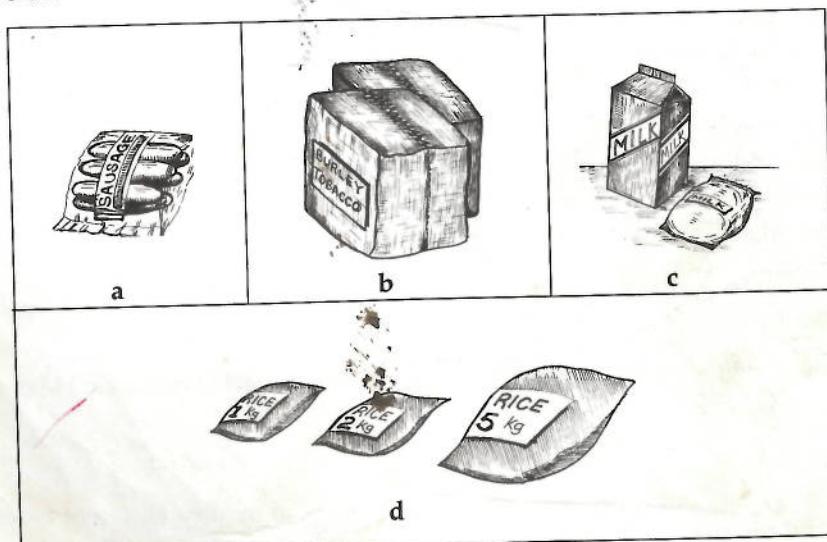


Figure 2.6: Ways of packaging agricultural produce

Storage is an imp
produce. It also m
helps the farmer t

Advertising

This involves telli
may be best for th

Advertising can b
done through the
attracting, persuad

Packaging makes pricing the produce easy. It also makes it easy for customers to choose and carry produce in quantities suitable for their needs.

Storage

This involves keeping the produce in a safe place as shown in figure 2.7

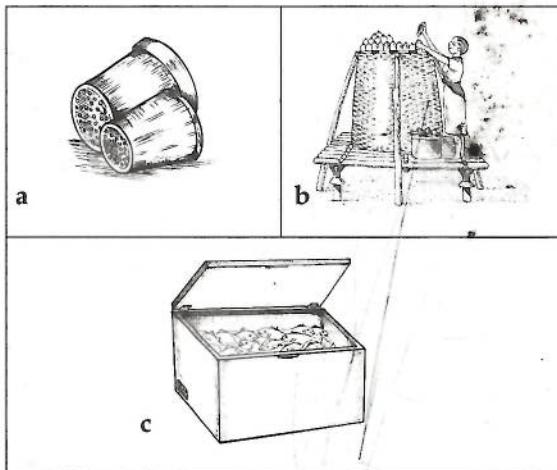


Figure 2.7: Storage of some produce

Storage is an important marketing function because it preserves the quality of the produce. It also makes the product available when customers need it most. This helps the farmer to sell at a better price to increase profit.

Advertising

This involves telling people about a product, letting the customers know why it may be best for them to buy it.

Advertising can be done verbally (face to face or house to house). It can also be done through the radios or newspapers. Advertising helps in increasing sales by attracting, persuading and convincing customers to buy the product.

Table 2.1: Activities for each marketing function

Marketing function	Activities involved
Buying	Deciding where to sell, displaying products, pricing, issuing product, collecting payment
Selling	Determining needed goods, identifying where to buy, choosing desired goods, bargaining, paying for goods, collecting the goods
Processing	Grinding, pounding (milling), cleaning, shelling, boiling, sieving, winnowing, drying, slicing, salting
Grading	Sorting, weighing
Packaging	Wrapping, sealing, labeling, weighing
Advertising	Displaying, attractive wrapping, labeling
Transporting	Assembling, identifying mode of transport
Storage	Application of chemicals, cleaning storage facility, stocking
Market research	Interviewing people, recording responses, interpreting information

Activities

Activity 1 Discussing the meaning of the term 'marketing functions' (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources

- learners' experiences

Instructions

- 1 Organise the learners into groups.
- 2 Let the learners brainstorm the activities that are carried out to a product from harvesting to selling.
- 3 Let the learners discuss the activities that are carried out to a product from harvesting to selling.
- 4 Let the learners study figure 2.1.
- 5 Let the learners identify marketing activities shown.
- 6 Let them record the responses in a notebook.

- 7 Let them report
- 8 Consolidate the
- 9 Let the learners "marketing fun
- 10 Let the them re
- 11 Consolidate the

Activity 2 Visiting

(2 p)

Suggested teaching

You will need the

- local market
- learners' experie
- interview sche

Instructions

- 1 Organise a visit to the marketing functions.
- 2 Show the learners the
- 3 Let the learners interview a few
- 4 Let the learners observe the

Activity 3 Dis

fun

Suggested teaching

You will need the

- learners' experie
- reports on a vi
- charts or post

Instructions

- 1 Organise the
- 2 Let the learner
- 3 Let each grou
- 4 Let each grou

- 7 Let them report their findings to the class for discussion.
- 8 Consolidate the activities involved in marketing functions.
- 9 Let the learners in pairs suggest the meaning of the term "marketing functions".
- 10 Let them report to the class.
- 11 Consolidate the meaning of marketing functions.

Activity 2 Visiting a market to observe some marketing activities (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- local market
- learners' experiences
- interview schedule

Instructions

- 1 Organise a visit to a nearby market for learners to observe some marketing functions.
- 2 Show the learners how to use the interview schedule.
- 3 Let the learners visit the local market to observe some marketing activities and interview a few sellers and buyers.
- 4 Let the learners record their findings and submit a report on the marketing activities observed, for discussion.

Activity 3 Discussing the activities involved in each marketing function (4 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- reports on a visit to the local market showing marketing activities observed
- charts or posters on activities for some marketing functions

Instructions

- 1 Organise the learners into groups.
- 2 Let the learners study and complete figure 2.2.
- 3 Let each group discuss the activities involved in each marketing function.
- 4 Let each group copy and complete table 2.1

- 5 Let each group report their findings to the class.
- 6 Consolidate the lesson by summarizing the activities involved in each marketing function.

Activity 4 Discussing the importance of each marketing function (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences

Instructions

- 1 Organise the learners into groups.
- 2 Let each group discuss the importance of each of the marketing functions.
- 3 Let each group copy and complete the table 2.2 of the Learners' Book.
- 4 Let each group report their findings for comments.
- 5 Summarize the importance of each marketing function.

Activity 5 Displaying the marketing functions (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- checklist
- local environment

Instructions

- 1 Organise the learners in small groups.
- 2 Let the learners draw or model marketing functions.
- 3 Let the learners display the drawn and modelled marketing functions.
- 4 Let the learners evaluate the marketing functions.
- 5 Let the learners report their work to the class.
- 6 Consolidate the displaying of the marketing functions.

Activity 6 Conducting some of the marketing functions (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- checklists
- ADMARC or local market

Instructions

- 1 Let the learners draw or model marketing functions.
- 2 Let the learners evaluate the marketing functions.
 - a. flowers
 - b. rabbits
 - c. agroforestry
 - d. vegetables
- 3 Let the learners draw or model marketing products.
- 4 Evaluate the marketing products.
- 5 Let learners conduct some of the marketing functions in the market.
- 6 Consolidate the marketing functions.

Table 2.3: Marketing functions

Function
Selling
Buying
Processing
Grading
Packaging
Storage
Transporting
Advertising
Market research

Note: Put Yes

Put No

Summary

Marketing functions meet the needs of customers.

Instructions

- 1 Let the learners brainstorm the activities they need to carry out in order to market flowers, rabbits, agroforestry products and vegetables they produced.
- 2 Let the learners be in groups to organize the marketing of:
 - a. flowers
 - b. rabbits
 - c. agroforestry products
 - d. vegetables.
- 3 Let the learners conduct some of the marketing functions for the above products.
- 4 Evaluate the market functions conducted using a checklist.
- 5 Let learners report to the whole class the successes and the weaknesses in how the marketing functions were conducted.
- 6 Consolidate the activity.

Du,-

Table 2.3: Checklist for evaluating marketing functions conducted

Function	Flowers	Rabbits	Agroforestry products	Vegetables
Selling				
Buying				
Processing				
Grading				
Packaging				
Storage				
Transporting				
Advertising				
Market research				

Note: Put Yes or Tick for the conducted marketing functions.

Put No or Dash for the marketing function which was not conducted.

Summary

Marketing functions are activities conducted by producers or middlemen to satisfy the needs of customers or consumers at a profit. Marketing functions include

UNIT 3

Time allocation

Introduction

In Standard 6, the learners will learn about animals and humans, wells and rainfall.

In this unit, the learners will help the farmers to grow their crops properly.

Success criteria

By the end of the unit, learners will:

- describe the water cycle
- draw the water cycle

Developmental outcomes

Skills

Ensure that the learners can communicate effectively.

Knowledge and understanding

Ensure that the learners understand the processes involved in the water cycle.

Values and attitudes

Ensure that the learners value the processes of the water cycle.

Special needs

Ensure that activities are suitable for all learners.
Observe and record the progress of each learner in the curriculum with regard to the following:

Background knowledge

Meaning of words

The water cycle
surface of the earth
solid (hail stones)

UNIT 3 Water cycle

Time allocation : 3 periods

Introduction

In Standard 6, the learners learnt about sources and importance of water to crops, animals and human beings. Some of the sources of water are rivers, lakes, dams, wells and rainfall. All these sources are linked through a water cycle.

In this unit, the learners will learn about the stages of water cycle. This knowledge will help the learners to appreciate the movement of water in nature and use it properly.

Success criteria

By the end of this unit, the learners must be able to:

- describe the water cycle
- draw the water cycle

Developmental areas

Skills

Ensure that the learners develop skills such as observing, drawing, recording, communicating and reporting.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding on processes involved in the water cycle.

Values and attitudes

Ensure that the learners acquire values and attitudes to appreciate the importance of the water cycle.

Special needs education

Ensure that activities are adapted for the learners with special educational needs. Observe and record their performance. This will help them to access the curriculum with ease, develop their potential and become self-reliant.

Background information

Meaning of the term “water cycle”

The water cycle is the continuous movement of water on above and below the surface of the earth in different forms. These forms can be liquid, gas (vapour) or solid (hail stones). Since it is a cycle, there is no beginning or ending.

Processes and stages of water cycle

There are various processes and stages in a water cycle. Some of them are evaporation, transpiration, condensation, precipitation, surface run-off and infiltration.

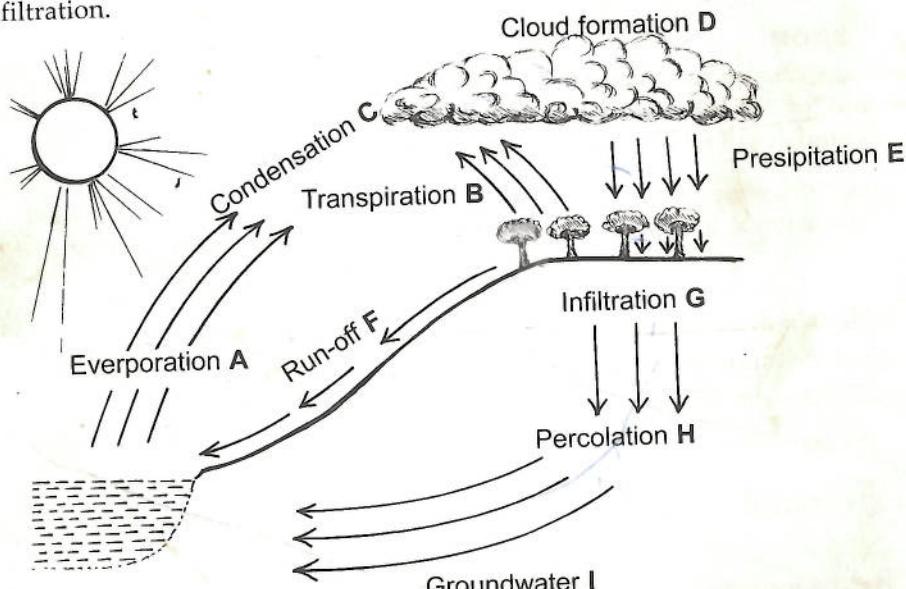


Figure 3.1 : Various processes and stages of water cycle

Evaporation

Evaporation is the loss of water from soil and water bodies into the atmosphere in form of vapour. In this way, water moves from oceans, lakes, rivers and even from the ground to the atmosphere. This is shown by letter A in the illustration.

Transpiration

It is the loss of water from plant leaves into the atmosphere through plant opening in form of vapour. This is shown by letter B in the illustration. The combination of evaporation and transpiration is called Evapotranspiration. Therefore, evapotranspiration is the loss of water from the soil, oceans, lakes, rivers and plants into the atmosphere as vapour.

Condensation

It is the process by which water vapour in the atmosphere is changed into droplets. When there is an accumulation of water droplets clouds are formed. Condensation is shown by letter C and clouds are shown by letter D in the illustration.

Precipitation

It is the falling of water from the atmosphere to the earth in form of rain and hail. It is also called rainfall. See letter E in the illustration.

Surface run-off

This is the water that flows over the surface. The water ends up in rivers and lakes.

Infiltration

It is the entry of water into the soil. The water may move downwards through the soil. This is called percolation.

Ground water

This refers to large amounts of water stored in the soil. Boreholes, wells and dams are used to extract this water. I in the illustration shows groundwater.

Open water bodies

This refers to water bodies such as oceans, seas and dams. The amount of water is very large.

Activities

Activity 1 Dissemination

(1 p)

Suggested teaching

You will need the following:

- learners' experience
- charts showing the water cycle

Instructions

- 1 Let the learners draw the water cycle.
- 2 Display the water cycle chart.
- 3 Let the learners identify the processes in the water cycle.
- 4 Let the learners explain the processes.
- 5 Let the learners draw the water cycle.
- 6 Let the learners identify the processes in the water cycle.
- 7 Summarize the water cycle.

Activity 2 Dissemination

(1 p)

Suggested teaching

You will need the following:

- learners' experience

Surface run-off

This is the water that flows on the soil surface following the slope of the land. This water ends up in rivers, lakes or oceans. See letter F in the illustration.

Infiltration

It is the entry of water into the soil. See letter G in the illustration. Some of the water may move deeper in the soil increasing the amount of ground water. This is called **percolation**. See letter H in the illustration.

Ground water

This refers to large amounts of water stored below the earth's land surface. Boreholes, wells and springs draw water from the ground water sources. See letter I in the illustration.

Open water bodies

This refers to water existing on the land surface such as rivers, lakes, ponds, oceans and dams. The amount of water in these open water bodies depends upon the amount of water flowing into and out of them. See letter J in the illustration.

Activities

Activity 1 Discussing the meaning of the term "water cycle" (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- charts showing water cycle

Instructions

- 1 Let the learners be in groups.
- 2 Display the water cycle chart.
- 3 Let the learners study figure 3.1 in their books.
- 4 Let the learners brainstorm the meaning of the term "water cycle".
- 5 Let the learners discuss the meaning of the term "water cycle".
- 6 Let the learners report their findings to the class.
- 7 Summarize the meaning of the term "water cycle".



Activity 2 Discussing the processes and stages of the water cycle (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences

Time allocation**Introduction**

In unit 3, the learners
a number of processes
and precipitation.

In this unit, the learners
also learn ways
and make it safe.

Success criteria

By the end of this unit, the learners will be able to:

- describe ways to make water safe.

Developmental skills

Ensure that the learners
investigating, communicating
and problem solving skills are
safe.

Knowledge and understanding

Ensure that the learners understand
water can be polluted and
safe.

Values and attitudes

Ensure that the learners
appreciative of the environment
and safe.

Special needs

Ensure that the learners
needs. Observe the
curriculum with the
learner's needs.

Background information**Meaning of water**

Water is used for
increase in crop yield.

- chart showing drawing of the water cycle **Instructions**

- 1 Let the learners be in groups.
- 2 Let the learners brainstorm the processes and stages of the water cycle.
- 3 Let the learners discuss processes involved in the water cycle.
- 4 Let the learners record their findings in their notebooks.
- 5 Let each group report its responses to the class.
- 6 Summarise by discussing with the learners the processes involved in the water cycle using the diagram of the water cycle.

Activity 3 Drawing the water cycle (1 period)**Suggested teaching, learning and assessment resources**

You will need the following:

- learners experiences

Instructions

- 1 Let the learners be in groups.
- 2 Let each group copy the water cycle from their book and label the processes properly.
- 3 Let each group display their drawings in the classroom.
- 4 Let the learners go round observing and making comments on the displays.
- 5 Let the best group summarise the water cycle processes.
- 6 Summarise by showing the learners the water cycle chart.

Summary

Water cycle is the continuous movement of water on, above and below the surface of the earth in different forms. The water cycle involves a number of processes and stages. Some of them are evaporation, transpiration, condensation, precipitation and infiltration.

Review exercise

Let the learners do the exercise on page 15 of their books.

Glossary

Process : several events that happen in a sequence and end in natural changes.

Stages : separate parts that form a process.

UNIT 4 Water pollution

Time allocation: 8 periods

Introduction

In unit 3, the learners learnt that water circulates in nature. The circulation involves a number of processes and stages such as evaporation, condensation, transpiration and precipitation. As water moves from one stage to another it can be polluted.

In this unit, the learners will learn the ways in which water is polluted. They will also learn ways of keeping water safe. This will help the learners to protect water and make it safe for use.

Success criteria

By the end of the unit, learners must be able to:

- describe ways in which water can be polluted

Developmental areas

Skills

Ensure that the learners develop skills such as observing, recording, reporting, investigating, communicating, planning and decision making.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of ways in which water can be polluted, effects of water pollution and methods of keeping water safe.

Values and attitudes

Ensure that the learners acquire values and attitudes to be curious, cooperative and appreciative of the importance of good health, good behaviour and keeping water safe.

Special needs education

Ensure that the activities are adapted for the learners with special educational needs. Observe and record their performance. This will help them to access the curriculum with ease, develop their potential and become self-reliant.

Background information

Meaning of water pollution

Water is used for domestic use, animal production and crop production. An increase in crop production, animal production and human population has lead to

serious water contamination. Pollution is the contamination of the environment with harmful and poisonous substances arising from human activities.

Causes of water pollution

Water pollution is mostly caused by:

- disposal of human wastes such as feaces and urine into water bodies
- constructing pit latrine close to water bodies such as boreholes, wells and rivers
- disposal of domestic, industrial and hospital wastes into rivers, streams and other water bodies
- siltation of water bodies due to soil erosion
- use of poisonous herbs and chemicals when catching fish.
- application of fertilizers, herbicides and pesticides to crops in the field these chemicals are eroded together with soil into nearest water bodies

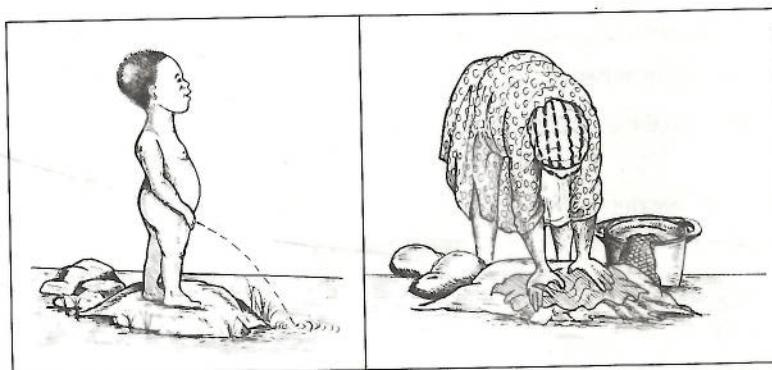


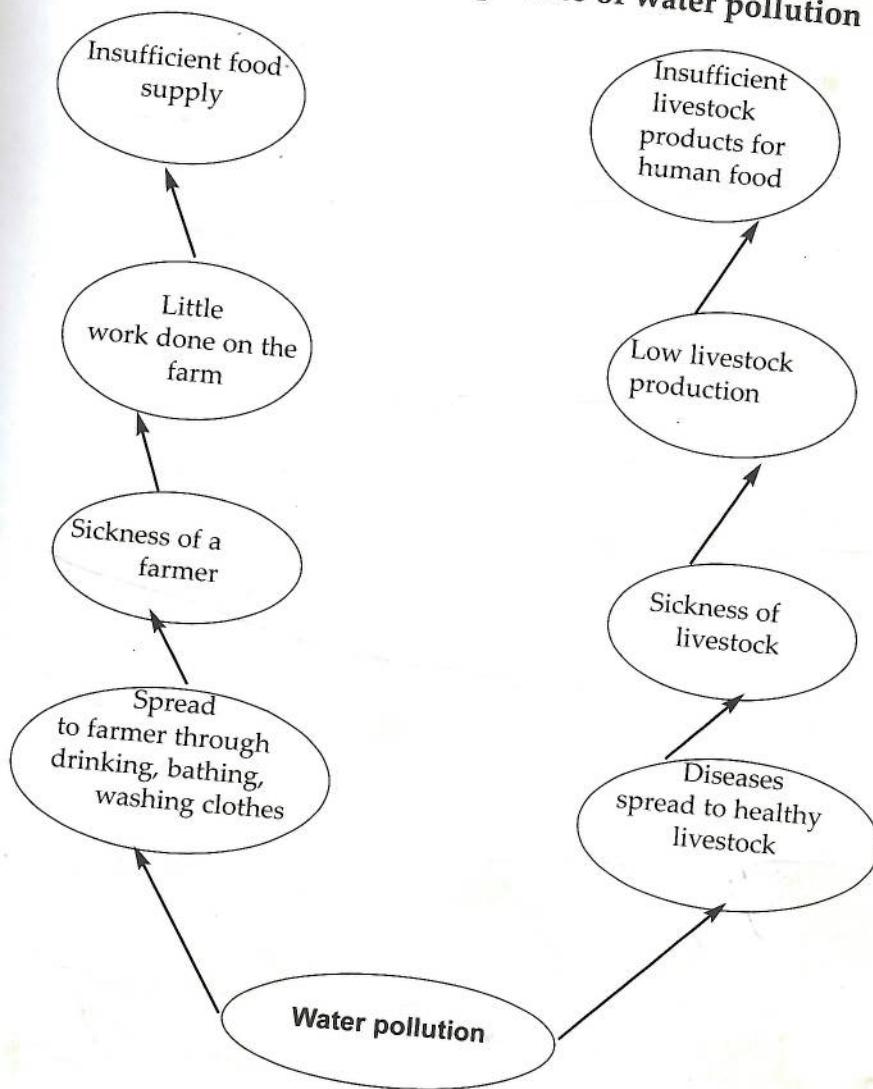
Fig. 4.1: Water pollution

Effects of water pollution on agricultural production

Pollution of water bodies results in:

- reduced work done by the farmer – if a farmer drinks polluted water the farmer falls sick and stops working on the farm
- death of plants – polluted water may contain poisonous substances which can kill crops eg herbicides
- death of livestock – water contained with infected animal droppings may transmit diseases to healthy livestock, this may cause death of livestock
- blocking irrigation pipes – water containing soil particles and debris tend to block pipes used for irrigation
- shortage of water for irrigation – siltation results to drying up of water bodies

Future's wheels showing consequences of water pollution



- avoid urinating in water which is
- avoid dangerous
- protecting
- provide good

Ways of keeping water clean

There are several ways:

- boiling
- adding chlorine
- filtering
- protecting
- siting pit latrines

Activities

Activity 1

Suggested teaching activities

You will need:

- learners' exercise books
- poster or picture of water bodies

Instructions

- 1 Organise the class into groups.
- 2 Let the learners draw what they know about water bodies.
- 3 Let the learners draw what they know about water pollution.
- 4 Let the learners draw what they know about the effects of water pollution.
- 5 Let the learners draw what they know about ways of controlling water pollution.
- 6 Let learners share their drawings with the class.
- 7 Summarise the discussion.

Activity 2

Suggested teaching activities

You will need:

- posters of polluted water bodies
- pictures of unpolluted water bodies
- checklist

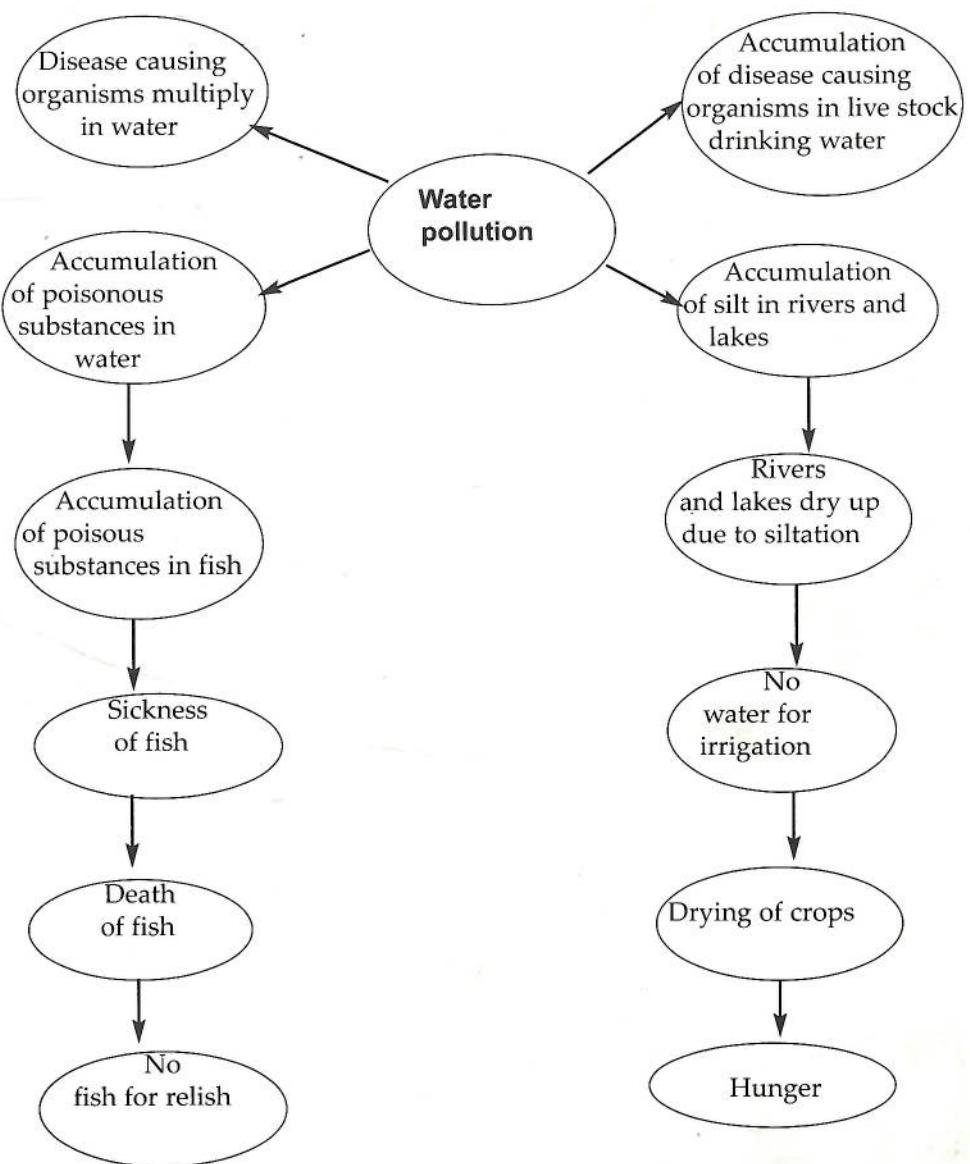


Figure 4.2: Future's wheels on consequences of water pollution

Ways of controlling water pollution

Water pollution can be controlled by:

- building proper and well located pit latrines
- using recommended chemicals in proper amounts for agricultural activities

- avoid urinating, defecating, bathing, washing clothes and dishes in water which is used for drinking, animal production and irrigation
- avoid dumping kitchen, industrial and hospital wastes in water bodies
- protecting wells and boreholes by fencing them and cementing the floor.
- provide ground cover to prevent siltation.

Ways of keeping water safe

There are several ways of keeping water safe. The following are some of them:

- boiling
- adding chemicals such as chlorine or waterguard
- filtering
- protecting boreholes and wells
- siting pit latrines away from water sources.

Activities

Activity 1 Discussing ways in which water is polluted (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- poster or pictures of people bathing, urinating, defecating and washing clothes in water bodies

Instructions

- 1 Organise the learners into groups.
- 2 Let the learners study figure 4.1 in their books.
- 3 Let the learners identify activities that lead to water pollution.
- 4 Let the learners discuss the meaning of the term "water pollution".
- 5 Let the learners record their responses.
- 6 Let learners report their findings to the class.
- 7 Summarise ways in which water is polluted using posters, pictures or charts.

Activity 2 Developing future's wheels on effects of water pollution (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- posters of people urinating, washing, bathing in water bodies
- pictures of water bodies polluted with different waste materials
- checklist

Instructions

- 1 Let the learners be in groups.
- 2 Let the learners develop a future's wheel.
- 3 Let the learners use water pollution as a central problem.
- 4 Let the learners identify the immediate effects of water pollution.
- 5 Let the learners place the immediate effects around the central problem.
- 6 Let the learners use the immediate effects to become the centre of the next wheel.
- 7 Let the learners continue developing the effects until it shows how their lives are affected.
- 8 Let the learners connect the related effects using arrows.
- 9 Let them discuss how their lives are affected by the effects of water pollution.
- 10 Let them display and report their future's wheels.
- 11 Consolidate the effects of water pollution.

Activity 3 Discussing case study on water pollution (1 period)

Suggested teachings, learning and assessment resources

You will need the following resources:

- learners' experiences
- a case study text

Instructions

- 1 Ask the learners to be in their groups.
- 2 Let them read the story in their books.

Mulatho village had a lot of people. The people used to cut down trees and grass for firewood, poles, thatch and opening new gardens. This left the land bare as time went by. When rain fell, a lot of water was running on the ground. The running water washed away mud, faeces, pieces of plastic papers and other materials from the bare ground. All the materials which were washed away were deposited in Nunkha river. The water in the river became dirty, smelled bad and was unsafe to drink. The river was filled up with deposits. The water started drying up. Fish and other water animals started to reduce in number.

- 3 Let the learners answer the following guiding questions:
 - a. What made the water unsafe for drinking?

- b. What could be done?
- c. Why did the water become dirty?
- d. What were the effects of water pollution?
- e. What lesson can we learn from this?

- 4 Summarise by the learners.

Activity 4 Role play

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- chart of future's wheels

Instructions

- 1 Let the learners act as different characters.
- 2 Display the chart of future's wheels.
- 3 Ask each group to act out their wheel.
- 4 Let the learners act as different characters.
- 5 Give time to the learners to act out their wheels.
- 6 Let the selected groups act out their wheels. The effects are drawn on the board.
- 7 Ask the rest of the class to guess the characters in the role play.
- 8 Summarise by the learners.

Activity 5 Visit to a local environment

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- local environment

Instructions

- 1 Organise a visit to a local environment.
- 2 Let the learners observe the environment.
- 3 Let the learners draw the environment.
- 4 Let the learners write about the environment.
- 5 Let the learners summarise what they have learned.

- b. What could happen if people drunk the water from Nunkha river?
 - c. Why did the river dry up?
 - d. What were the effects of drying up of the Nunkha river?
 - e. What lesson do you get from this case study?
- 4 Summarise by discussing the implication of the with the learners.

Activity 4 Role playing on effects of water pollution (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources

- learners' experiences
- chart of future's wheels on effects of water pollution

Instructions

- 1 Let the learners be in groups.
- 2 Display the chart of future's wheels on the wall.
- 3 Ask each group to select a trend to role play.
- 4 Let the learners select interested members to role play the effects of water pollution.
- 5 Give time to the selected learners to prepare for the role play.
- 6 Let the selected learners conduct the role play in such a way that the intended effects are dramatically clear to the class in turn.
- 7 Ask the rest of the class to record the effects of water pollution as they observe the role play.
- 8 Summarise by discussing each of the effects of water pollution.

Activity 5 Visiting a nearby polluted water body to observe causes and effects of water pollution (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experience
- local environment

Instructions

- 1 Organise a visit to a nearby polluted river, dam or well.
- 2 Let the learners observe how the water body is polluted.
- 3 Let the learners record their observations.
- 4 Let the learners be in groups.
- 5 Let the learners discuss their or group findings.

Review ex

Let the learner

Glossary

Contamination

Siltation

Debris

- 6 Let the learners report their observations to the class.
- 7 Summarise the causes and effects of water pollution.

Activity 6 Discussing methods of keeping water safe (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- charts or pictures of well sited pit latrine, protected boreholes
- chlorine or waterguard

Instructions

- 1 Organise the learners in groups.
- 2 Let them discuss methods of keeping water safe.
- 3 Let them record their responses.
- 4 Let one member from each group report their responses to the class.
- 5 Summarise the learners' responses and show learners pictures or posters of well sited pit latrines, protected boreholes and chlorine or waterguard.

Activity 7 Discussing ways of controlling water pollution (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- charts or pictures showing some ways of controlling water pollution

Instructions

- 1 Let the learners be in pairs.
- 2 Let the learners brainstorm ways used to control water pollution in their communities.
- 3 Let the learners discuss ways used to control water pollution in their communities.
- 4 Let the learners record their findings.
- 5 Let the learners report their findings to the class.
- 6 Consolidate the different ways of controlling water pollution.

Summary

Most water sources are polluted by human activities. Some of the activities are fertilizer, pesticides and herbicides application, bathing and washing dishes in water sources. Pollution of water makes it unsafe for domestic uses as well as agricultural use. Water sources have to be cared for and protected.

Review exercise

Let the learners do the exercise on page 19 of their books.

Glossary

Contamination : making water dirty or no longer pure

Siltation : accumulation of soil in water bodies (rivers, lakes, dams)

Debris : pieces of wood, metal, brick, etc that are left after something has been destroyed

UNIT 5 Water conservation

Time allocation: 8 Periods

Introduction

In Standard 6, the learners learnt about sources of water and its importance in crop, animal production and domestic use. Water should be conserved in order to be available for agricultural and domestic use.

In this unit, the learners will learn how water can be conserved for domestic purposes and agricultural production. This knowledge will enable the learners to conserve water in their communities.

Success criteria

By the end of this unit, the learners must be able to:

- describe ways of conserving water
- conserve water.

Developmental areas

Skills

Ensure that the learners develop skills such as recording, reporting, observing and communicating.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of ways of conserving water.

Values and attitudes

Ensure that the learners acquire values and attitudes to appreciate different ways of conserving water.

Special needs education

Ensure that the activities are adapted for the learners with special educational needs. Observe and record their performance. This will help them to access the curriculum with ease, develop their potential and become self-reliant.

Background information

Meaning of water conservation

Water conservation refers to the ways of reducing water loss from soil allowing more water to infiltrate in the soil and collecting surface run-off for future use.

Ways of conservation

There are many ways of conserving water:

- use of vegetative cover

This is done by planting trees and shrubs which reduces the amount of water lost through evaporation.

Reduces evaporation by covering the soil surface with a layer of organic material.

Reduces evaporation by covering the soil surface with a layer of organic material.

Reduces evaporation by covering the soil surface with a layer of organic material.

- Application of mulches

Organic mulches include straw, woodchips and bark.

- Mulching

This involves covering the soil surface with a layer of organic material.

Plant. The plant has a root system that sinks into the soil.

which absorbs water.

- Use of containers

These are used to collect rainwater and allow it to sink into the soil.

Ways of conserving water

There are many ways of conserving water. Some of the ways are:

- use of vegetative cover

This is done by planting cover crops, trees and grass to cover the ground. This reduces the speed of surface run-off and allow water to sink into the soil. It also reduces evaporation of water from the soil. Figure 5.1 represents a piece of land with cover crops.

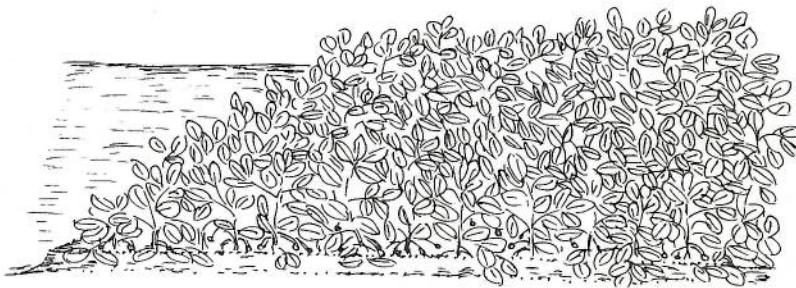


Figure 5.1: Cover crops

- Application of organic matter

Organic matter decompose to form humus. Humus is spongy, hence, absorbs water and keep it in the soil.

- Mulching

This involves placing dry grass, leaves or any other plants material around a plant. The mulching material reduce the speed of water and give it more time to sink into the soil. When the mulching material decays it becomes humus which absorbs water and keeps it.

- Use of contour ridges, bunds and box ridges

These are structures constructed in the garden in order to hold water and allow it to sink into the soil.

- Maintaining

This reduces water bodies shallow

Water harvesting

During the rainy season, rainwater can be collected and stored for use.

Sometimes the water is used for growing crops such as bananas. This can be done using techniques from

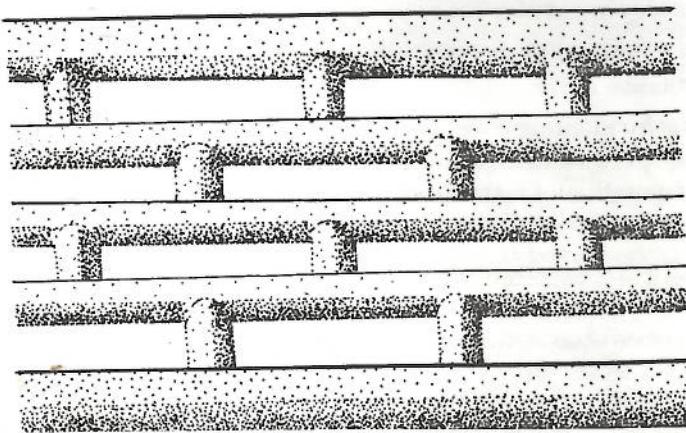


Figure 5.2 shows piece of land with box ridges

- Dams

This is a big bank constructed across a stream. It holds a lot of water which can be used for domestic purposes, irrigation and fish farming. Fig 5.3 shows a dam made across a stream



Figure 5.3 : A dam across a stream

- Removing silt and other material that accumulate in water bodies
This will allow the water body to hold more water than when filled with other materials.
- Making ridges across the slope
This reduces the speed of water run-off and allows it to sink.



Activities

Activity 1 Dams

Suggested teaching

You will need the following:

- learners' experience
- pictures of dams
- charts showing how dams work
- charts showing how dams are built
- water source

Instructions

- 1 Organise the class into groups of four or five students.
- 2 Let the learners draw a dam across a stream.
- 3 Let the learners explain how the dam works.
- 4 Let the learners draw a cross-section of the dam.

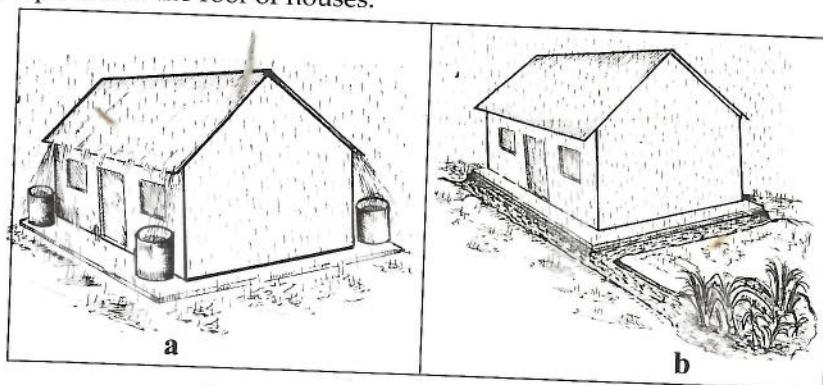
- Maintaining vegetative cover along river bank

This reduces soil erosion which results to accumulation of soil that make water bodies shallow.

Water harvesting

During the rainy season, a lot of water is lost from roofs. This water can be collected and stored in tanks to be used during the dry season. Surface run-off can be collected by constructing check dams in gardens.

Sometimes the water from the roof can be led into a pit where water loving crops such as bananas and sugarcane are planted. Figure 5.4 and 5.5 show harvesting techniques from the roof of houses.



Figures 5.4: Water harvesting techniques

Activities

Activity 1 Discussing ways of conserving water (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- pictures of crop fields with cover crops, mulched garden, strip cropping
- charts showing boreholes, protected wells, dams
- charts showing contour ridges, contour bunds, box ridges
- water sources

Instructions

- Organise the learners in groups.
- Let the learners discuss ways of conserving water used in their communities.
- Let the learners study figures 5.4 and figure 5.5.
- Let the learners identify the conservation ways shown.

- 5 Let the learners record their responses.
- 6 Let each group report their responses to the class.
- 7 Summarise ways of conserving water.

Activity 2 Visiting nearby water conservation structures to observe ways of conserving water (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- local environment

Instructions

- 1 Organise a visit to nearby farm.
- 2 Let the learners observe and find out from the community how water is conserved.
- 3 Let the learners record their findings as individuals.
- 4 Let the learners compile their individual reports in their notebooks.
- 5 Let the learners report their findings to the class.
- 6 Summarise water conservation structures.
- 7 Collect learners' reports for assessment.
- 8 Display well written reports and commend job well done.

Activity 3 Drawing some water conservation structures (1 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- chart papers
- pencils or pentel markers
- crayons

Instructions

- 1 Let the learners be in their groups.
- 2 Let the learners draw diagrams of water conservation structures measures.
- 3 Let the learners display the drawings.
- 4 Let the learners make a gallery walk to observe and comment on the drawings.

Activity 4 Practicing ways of conserving water (4 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- local environment
- school garden
- hoes
- mulching materials

Instructions

- 1 Organise the learners to go to the school to observe ways of conserving water.
- 2 Let the learners report their findings to the class.
- 3 Let the learners draw the structures.
- 4 Ask the learners to display their drawings.

Summary

Water can be conserved in many ways. It can be collected in tanks. It can be used for irrigation of fields.

Review exercises

Let the learners answer the following questions.

Glossary

Damping : to make something less active or effective.

Decomposition : the process by which dead plants and animals are broken down by bacteria and fungi.

Sink : enter a hole or depression.

Cover crops : plants grown to protect the soil and prevent erosion.

- learners' experiences
- local environment
- school garden
- hoes
- mulching material

Instructions

- 1 Organise the learners in groups.
- 2 Let the learners construct box ridges and planting ground cover crops in the school to conserve water.
- 3 Let the learners mulch the school garden to conserve water.
- 4 Ask the learners to apply the water conservation activities in their homes.

Summary

Water can be conserved to make it available for domestic and agricultural uses. It can be conserved by construction of dams, contour ridges, box ridges and contour bands. It can also be conserved by planting ground cover and mulching crops in the fields.

Review exercise

Let the learners do the exercise on page 22 of their books.

s)

Glossary

Damping : careless throwing

Decomposition : decaying/rotting

Sink : enter

Cover crops : crops grown on a piece of land in order to reduce the speed of surface run-off and protect the soil from erosion

UNIT 6 Soil texture

Time allocation: 5 periods

Introduction

In Standard 6, the learners learnt about the composition of soil. One of the soil components is inorganic matter. Inorganic matter determines soil texture.

In this unit, the learners will learn the meaning of soil texture and classify different types of soil according to their textural classes. This knowledge will help learners to identify suitable soils for different crops.

Success criteria

By the end of this unit, the learners must be able to:

- classify soil according to their textures

Developmental areas

Skills

Ensure that the learners develop skills such as observing, experimenting, recording, classifying, manipulating, reporting and communicating.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of the meaning of soil texture, characteristics of different types of soils and classifications of soils according to their textures.

Values and attitudes

Ensure that the learners acquire values and attitudes to appreciate the different soil textures.

Special needs education

Ensure that the activities are adapted for the learners with special educational needs. Observe and record their performance. This will help them to access the curriculum with ease, develop their potential and become self-reliant.

Background information

Meaning of soil texture

Inorganic soil component is made up of small rock particles which vary in size. The rock particles are classified as sand, silt and clay. These are found in different proportions in a soil. The percentage composition of sand, silt and clay in a soil is referred to as soil texture. It can also be defined as the coarseness or fineness of the

soil. The prop
soil.

Classification

There are three
soils. Each of t
clay. Sand soil
soil contains al
highest propor
different chara

Table 6.1: Cha

Class of soil
Sand
Loam
Clay

soil. The proportion of the different sized particles determines the textural class of soil.

Classification of soils based on texture

There are three main classes of soil based on texture. These are sand, clay and loam soils. Each of these classes of soil contains different proportions of sand, silt and clay. Sand soil contains a large proportion of sand compared to silt and clay. Loam soil contains almost equal proportions of sand, silt and clay. Clay soil has the highest proportion of clay, compared to sand and silt particles. Table 6.1 shows different characteristics of the main classes of soil.

Table 6.1: Characteristics of classes of soil

Class of soil	Characteristics
Sand	<ul style="list-style-type: none"> • Large particles • Feels coarse • Large air spaces • Holds little water • Little amount of nutrients • Easiest to till and ridge
Loam 6.0 6.3 6.2 6.5 7.5 <u>5.0</u>	<ul style="list-style-type: none"> • Medium particle • Feels fine and soft • Medium air spaces • Holds moderate amount of water • Holds medium amount of nutrients • Easier to till and ridge
Clay 37.0	<ul style="list-style-type: none"> • Small particles size • Feels sticky when wet • Small air spaces • Holds a lot of water • Contains high amount of nutrients • Difficult to till

Suitable crops for different soil classes

Crops grow well in different classes of soil. Table 6.2 below shows examples of crops suitable for different soil classes.

Table 6.2: Some crops suitable for different soil classes

Class of soil	Suitable crops
Sand	Cassava, groundnuts, Irish potatoes, sweet potatoes
Loam	Maize, groundnuts, beans, peas, pigeon peas, tobacco, okra, Irish potatoes, soya beans
Clay	Rice, sugarcane, cotton

Activities

Activity 1 Discussing the meaning of the term "soil texture" (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- different soil samples
- containers
- water

Instructions

- 1 Let the learners be in their groups.
- 2 Let the learners collect different soil samples.
- 3 Let the learners moisten each soil sample provided and feel a small amount of it between their fore finger and thumb.
- 4 Ask the learners the following guiding questions:
 - a. How does each soil feel?
 - b. Is it coarse or fine?
 - c. Why does it feel that way?
- 5 Let them discuss the meaning of the term "soil texture".
- 6 Let the learners record their findings.
- 7 Let the learners report their findings.
- 8 Summarise the meaning of the term "soil texture".

Activity 2 Dis-

Suggested teaching

You will need the

- learners' exper-
- soil samples la-
- containers
- water
- school garden
- hoes
- perforated tins
- clear plastic bo-
- rulers

Instructions

- 1 Let the learners
- 2 Provide them w
- 3 Let the learners of the soil samp
- 4 Let the learners
- 5 Let the learners following guid
 - a. Which soil
 - b. Which soil
 - c. Which soil
- 6 Let the learners water using the
 - a. Fill a $\frac{1}{2}$ litre
 - b. Pour the me
 - c. Pour $\frac{3}{4}$ litre
 - d. Collect the w
 - e. Pour the col
 - f. Measure the

Activity 2 Discussing different soil textures (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experience
- soil samples labeled sand, clay and loam
- containers
- water
- school garden or nearby gardens
- hoes
- perforated tins or funnels
- clear plastic bottles (1 litre)
- rulers

L4

Instructions

- 1 Let the learners be in groups.
- 2 Provide them with three classes of soil samples.
- 3 Let the learners carry out an experiment to determine the coarseness or fineness of the soil samples as in activity 1.
- 4 Let the learners compare the particle sizes.
- 5 Let the learners compare the different samples of soil by answering the following guiding questions
 - a. Which soil is fine?
 - b. Which soil is coarse?
 - c. Which soil has the largest particles?
- 6 Let the learners carry out the experiment to determine the ability of soil to hold water using the procedure given below:
 - a. Fill a $\frac{1}{2}$ litre bottle with each soil sample.
 - b. Pour the measured soil sample into perforated containers.
 - c. Pour $\frac{3}{4}$ litre of water into each container with soil sample.
 - d. Collect the water that comes through the holes of the perforated containers.
 - e. Pour the collected water into clear plastic bottles.
 - f. Measure the amount of the collected water from each of the soil samples.

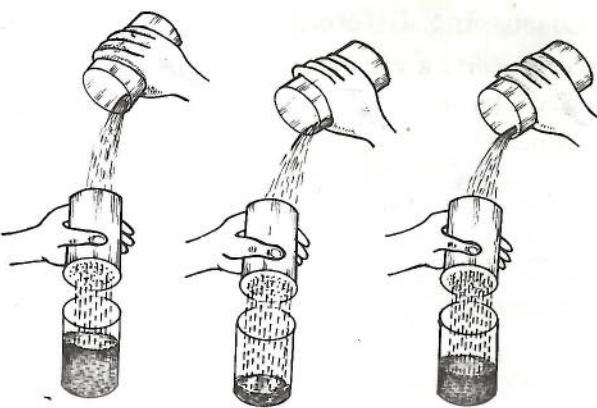


Figure 6.1: An experiment on soil textures

- Activity 3**
- 1 Let the learners answer the following questions:
 - a. Which soil sample has held (retained) more water than the others?
 - b. Which soil sample has lost more water than the others?
 - c. Which soil sample do you think has more nutrients than the others?
 - 2 Let the learners identify three spots with different classes of soil.
 - 3 Let the learners dig each of the three spots and answer the following questions:
 - a. Which soil is easy to dig?
 - b. Which soil is difficult to dig?
 - 4 Let the learners copy and complete table 6.1 in their books.
 - 5 Summarise the characteristics of different classes of soils.

Activity 3 Classifying soil according to textures (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- samples of soil of (sand, clay, loam)
- containers
- water

Instructions

- 1 Let the learners be in groups.
- 2 Give each group the samples of soils.
- 3 Let the learners design and carry out the feel method experiment to determine textures of each of the soil samples given.

- 4 Let the learners...
 - 5 Let the learners...
 - 6 Summarise b...
- texture.

Activity 4

(1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences

Instructions

- 1 Let the learners...
- 2 Let the learners...
- 3 Identify the three classes of soil:
 - a. Sand
 - b. Loam
 - c. Clay
- 4 Let them discuss...
- 5 Let them record...
- 6 Let them report...
- 7 Consolidate the findings.

Summary

Soil texture is the composition of sand, silt and clay. These characteristics...

Review exercises

Let the learners do the following exercises.

Glossary

Characteristics :

Proportion :

- 4 Let the learners record their findings.
- 5 Let the learners report their findings to the class.
- 6 Summarise by explaining to the learners the classes of the soils based on soil texture.

Activity 4 Discussing suitable crops for different classes of soil (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences

Instructions

- 1 Let the learners be in groups.
- 2 Let the learners brainstorm the crops suitable for each of the following classes of soil:
 - a. Sand
 - b. Loam
 - c. Clay
- 3 Let them discuss the crops suitable for the above named soil classes.
- 4 Let them record their findings.
- 5 Let them report their findings to the class.
- 6 Consolidate the suitable crops for different classes of soil.

Summary

Soil texture is the coarseness or fineness of the soil. It can also be the percentage composition of sand, silt and clay in a sample. Soils can be classified as sand, loam and clay. These classes of soil determine the type of crops to be grown.

Review exercise

Let the learners do the exercise on page 25 of their books.

Glossary

Characteristics : properties/qualities/features

Proportion : relative amount

Soil structure

Time allocation: 4 periods

Introduction

In unit 6, learners learnt the meaning of soil texture and classified the soils according to their textures. Soils also differ in terms of structure. It is important for learners to have knowledge about soil structure as it affects plant growth and development.

In this unit, the learners will learn the meaning of soil structure, describe the characteristics of each soil structure and classify soils according to their structures. This will help the learners in identifying the suitable crop for the different soil structures.

Success criteria

By the end of this unit, the learners must be able to:

- describe characteristics of different soil structures
- classify soils according to their structures

Developmental areas

Skills

Ensure that the learners develop skills such as observing, drawing, classifying, recording and reporting.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of the meaning of soil structure, characteristics of different soil structures and classification of soils according to their structures.

Values and attitudes

Ensure that the learners acquire values and attitudes to appreciate the different soil structures.

Special needs education

Ensure the activities are adapted for the learners with special educational needs. Observe and record their performance. This will help them to access the curriculum with ease, develop their potentials and become self-reliant.

Background

Meaning of soil

Soil is made up of together is referred arrangement of so

Characteristics

There are different crumb and compa

Loose structure

- the individual s
- it has large pore
- it loses water q
- it is very easy t
- the illustration l

Crumb structure

- the individual so
- it has medium po
- it breaks easily
- it holds moderate
- the illustration be

Background information

Meaning of soil structure

Soil is made up of many small particles. The way these soil particles are held together is referred to as soil structure. Soil structure can also be defined as the arrangement of soil particles to form different shapes.

Characteristics of different soil structures

There are different types of soil structures. Some of these soil structures are loose, crumb and compact.

Loose structure

- the individual soil particles are lightly held together
- it has large pore spaces between the particles
- it loses water quickly
- it is very easy to break
- the illustration below shows loose structure



Figure 7.1: Loose structure

Crumb structure

- the individual soil particles are moderately held together
- it has medium pore spaces
- it breaks easily
- it holds moderate amount of water
- the illustration below shows crumb structure

- learners' experience
- soil samples

Instructions

- 1 Let the learners observe the soil samples.
- 2 Distribute the soil samples to the learners.
- 3 Let them identify the soil structure.
- 4 Let them record their observations.
- 5 Let the learners compare their observations.
- 6 Consolidate the findings and discuss the soil held together.

Activity 2

Suggested teaching

You will need the following resources:

- soil samples
- hoes
- learners' experience
- containers
- magnifying glasses
- water.

Instructions

- 1 Let the learners observe the soil samples.
- 2 Provide the learners with hoes and containers.
- 3 Let the learners use the hoes to break up the soil samples.
- a. how the particles are held together
b. size of pores
- 4 Ask the learners to identify the soil structure.
- 5 Ask the learners to identify the soil structure.
 - Which soil has the largest pores?
 - Which soil has the smallest pores?
 - Which soil is more difficult to break?
 - Which soil holds more water?
- 6 Let the learners compare their observations.



Figure 7.2: Crumb structure

Compact structure

- the individual soil particles are strongly held together
- it has very small pore spaces
- it is difficult to break
- it holds high amount of water
- the illustration below shows compact structure



Figure 7.3: Compact structure

Activities

Activity 1 Discussing the meaning of the term "soil structure" (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- soil samples (block of clay soil and loose sand soil)

Instructions

- 1 Let the learners be in groups.
- 2 Distribute the soil samples to the groups.
- 3 Let them identify differences between the two soil samples.
- 4 Let them record their observations.
- 5 Let the learners report their findings to the class.
- 6 Consolidate the learners' findings by focusing on the way the soil particles are held together.

Activity 2 Discussing characteristics of different types of soil structures (1 period)

Suggested teaching, learning and assessment resources.

You will need the following resources:

- soil samples
- hoes
- learners' experience
- containers
- magnifying glass or clear plastic tubes or clear light bulb or clear bottle filled with water.

Instructions

- 1 Let the learners be in their groups.
- 2 Provide the learners with soil samples of different structures.
- 3 Let the learners observe the following:
 - a. how the particles are held together in each soil sample
 - b. size of pore spaces (using magnifying glass)
- 4 Ask the learners to break each soil sample and observe how easy or difficult it is to break.
- 5 Ask the learners to answer the following questions in their notebooks:
 - a. Which soil is easy to break?
 - b. Which soil has large pore spaces?
 - c. Which soil do you think would hold more water?
 - d. Which soil do you think would lose more water?
- 6 Let the learners record the observations.

- 7 Let the learners report their observations to the class.
- 8 Summarise the characteristics of the different soil structures.
- 9 Let the learners draw the different soil structures.

Activity 3 Classifying different soils according to their structures (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- soil samples
- hoes
- containers
- water
- funnels

Instructions

- 1 Give the learners different samples of soil.
- 2 Let the learners design and conduct their own experiment to identify the structure of their soil sample.
- 3 Let them record their findings.
- 4 Let them report the findings to the class.
- 5 Summarise the types of soil structure.

Summary

Soil structure refers to the way soil particles are held together. Some of the types of soil structure are loose, crumb and compact. This depends on the way the particles are arranged.

Review exercise

Let the learners do the exercise on page 27 of their books.

Glossary

Pore : small holes or openings

Time allocation:

Introduction

Soil is formed through a process, the soil has certain characteristics.

In this unit, the learners will learn about different layers of soil and suitable layer for growing plants.

Success criteria:

By the end of this activity, learners will be able to:

- describe soil particles
- describe suitable layers for growing plants

Developmental outcomes:

Skills

Ensure that the learners will be able to:

- deducing, inferring

Knowledge and understanding:

Ensure that the learners will be able to:

- soil profile and layers

Values and attitudes:

Ensure that learners will be able to:

- in a soil profile.

Special needs:

Ensure that activities will be:

- Observe and record
- curriculum with ease

Background:

Meaning of soil horizons:

A wall of a pit or trench is also called horizon.

UNIT 8 Soil profile

Time allocation: 8 periods

Introduction

Soil is formed when the parent rock breaks into small particles. During this process, the soil develops into different layers. These layers have different characteristics.

In this unit, the learners will learn the meaning of soil profile and characteristics of different layers of the soil. This knowledge will help learners to identify the suitable layer for crop production.

Success criteria

By the end of this unit, the learners must be able to:

- describe soil profile
- describe suitable layer for crop production

Developmental areas

Skills

Ensure that the learners develop skills such as observing, recording, drawing, deducing, inferring, concluding and reporting.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of the meaning of soil profile and layers of the soil profile.

Values and attitudes

Ensure that learners acquire values and attitudes to appreciate different soil layers in a soil profile.

Special needs education

Ensure that activities are adapted for learners with special educational needs. Observe and record their performance. This will help them to access the curriculum with ease, develop their potential and become self-reliant.

Background information

Meaning of soil profile

A wall of a pit or road side cut, shows various layers in the soil. These layers are also called horizons. Vertical section through the soil showing horizontal layers is

referred to as soil profile. The layers of the soil profile are top soil, sub soil weathered rock and parent rock. See figure 8.1

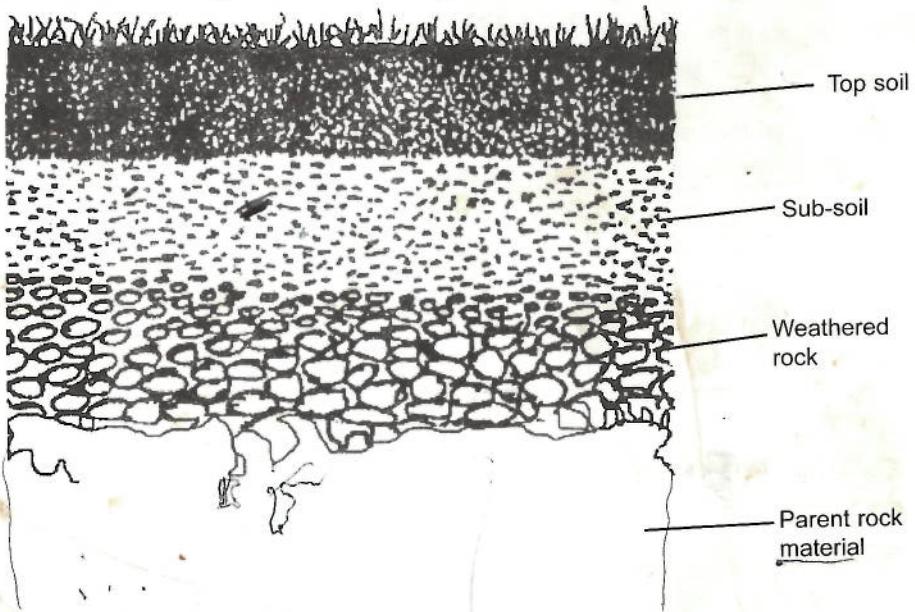


Figure 8.1 Soil profile

Layers of soil and their characteristics

Top soil

This is the upper layer of soil profile. Most living organisms are found in this layer. In fields that have not been cultivated or tilled, this layer has undecayed fresh litter (including leaves), partially decayed inorganic matter and decayed organic matter (humus) on the surface. Therefore, this layer has a high organic matter content. This gives the layer its dark brown or black colour, better aeration and high nutrient content. Crops are mostly grown in this layer. The characteristics of top soil make it suitable for crop production as shown in table 8.1 below.

Sub-soil

This layer lies below the top soil layer. This is why it is red or reddish brown in colour.

The layer contains fine particles which pass downward from the top soil layer. This causes leaching. Roots of plants penetrate this layer. It is more fertile than top soil.

Weathered rock

This layer lies below the sub-soil. This layer varies in thickness. The mineral content of the layer is variable.

Parent rock

This is a rock which is derived from bed-rock.

Activities

Activity 1 Dissection

(1)

Suggested teaching activities

You will need the following:

- learners' experience
- a dug-out road
- a chart showing soil profiles
- a pit

Instructions

- 1 Take the learners to a nearby road.
- 2 Let the learners observe the road.
- 3 Ask the learners to identify the different layers of soil.
- 4 Let the learners draw the soil profile.
- 5 Let each group present their drawing.
- 6 Let each group explain the characteristics of each layer.
- 7 Consolidate the information.

⑦ future tense
miss moyo will teach this class
this

Sub-soil

This layer lies below the top soil. There is less organic matter or humus in this layer. This is why the layer has a lighter colour than top soil. The colour may be red or reddish brown.

The layer contains some nutrients washed down from top soil. When water moves downward from top soil to the sub-soil, it carries with it some of the nutrients to the sub-soil. This washing down of nutrients from top soil to the sub-soil is called leaching. Roots of most crops do not reach this layer. Generally, the sub-soil is less fertile than top soil. However, some deep rooted crops such as trees may penetrate this layer.

Weathered rock

This layer lies below the sub-soil. It contains gravel, broken rocks. The colour of this layer varies. It depends on the mineral composition of the rock and moisture content of the layer.

Parent rock

This is a rock which has not been broken down to form soil. It is also called a bed-rock.

Activities

Activity 1 Discussing the meaning of the term "soil profile" (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources.

- learners' experiences
- a dug-out road-side embankment
- a chart showing soil profile
- a pit

Instructions

- 1 Take the learners to a roadside dug-out embankment or a pit.
- 2 Let the learners observe the layers of soil.
- 3 Ask the learners to count the layers of soil observed.
- 4 Let the learners be in groups to discuss the meaning of the term "soil profile".
- 5 Let each group define the term "soil profile" in their own words.
- 6 Let each group read out their definition to the whole class for comments.
- 7 Consolidate the meaning of the term "soil profile."

Activity 2 Observing the characteristics of layers of soil profile (4 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- school garden
- learners' experiences
- hoes/picks
- measuring tape/ruler

Instructions

- 1 Take the learners to the school garden.
- 2 Let the learners dig a pit at a selected site in the garden.
- 3 Let the learners observe the characteristics of different layers of soil profile.
- 4 Let the learners discuss the characteristics of different layers of soil profile.
- 5 Let the learners copy and complete table 8.1 below by ticking or crossing in the soil layer columns.

Table 8.1 Characteristics of different layers of soil profile

Characteristics	Top soil	Sub soil	Soil parent material
Colour			
Presence of animals			
Organic matter			
Plant roots			
Aeration level			
Presence of stones or broken rocks			
Depth of layer			

- 6 Let the learners report their findings to the class.
- 7 Summarise the characteristics of the different layers of soil profile.

Activity 3 Drawing and labeling a soil profile (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences

- rulers/measuring tape

Instructions

- 1 Let the learners draw a soil profile.
- 2 Let the learners label the different layers:
 - a. top soil
 - b. sub soil
 - c. weathered rock
 - d. parent rock
- 3 Ask the learners to explain each layer.
- 4 Let the learners draw a soil profile.
- 5 Consolidate the learners' drawings.

Activity 4 Identifying soil samples (1 hour)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- tins, water, materials
- soil samples from different parent materials
- strings, measuring tape
- ruler

Instructions

- 1 Let the learners identify the different soil samples.
- 2 Let each group identify the different soil samples accordingly as follows:
 - 3 Show the learners the different soil samples.
 - 4 Let the learners identify the different soil samples.
 - 5 Let the learners identify the different soil samples.
 - 6 Show the learners the different soil samples.
 - 7 Let the learners identify the different soil samples.
 - 8 Let the learners identify the different soil samples.

- rulers/measuring tape

Instructions

- 1 Let the learners individually draw the soil profile in their notebooks.
- 2 Let the learners individually label the following layers.
 - a. top soil
 - b. sub soil
 - c. weathered rock
 - d. parent rock
- 3 Ask the learners to exchange their notebooks for marking.
- 4 Let the learners compare the drawn soil profiles with figure 8.1.
- 5 Consolidate the work.

Activity 4 Identifying the suitable layer for crop production (1 period)

Suggested teaching, learning and assessment resources
You will need the following resources:

- learners' experiences
- tins, water, maize, seeds
- soil samples from different layers (top soil, sub-soil, weathered rock and soil parent material).
- strings, measuring tapes
- ruler

Instructions

- 1 Let the learners be in groups.
- 2 Let each group have three tins, each filled with one soil sample, and labeled accordingly as top soil, sub-soil and weathered rock.
- 3 Show the learners how to sow the maize seeds in each tin.
- 4 Let the learners sow three seeds in each tin and apply water daily.
- 5 Let the learners observe the growth of the seedlings in each tin.
- 6 Show the learners how to record the growth of the seedlings.
- 7 Let the learners copy table 8.2 and complete it.
- 8 Let the learners plot a graph on plant height.

Table 8.3 The characteristics of the three layers of soil

Growth characteristics	Top soil			Sub soil			Weathered rock		
	wk1	wk2	wk3	wk1	wk2	wk3	wk1	wk2	wk3
Plant height (cm)									
Leaf number									
Leaf colour									
Stem thickness (cm)									

9 Let the learners identify the most suitable layer for crop production based on the findings in the experiment.

10 Let each group report their findings to the class for.

11 Consolidate the activity.

Activity 5 Discussing how each of the characteristics of the identified layer promotes crop production (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences

Instructions

- 1 Let the learners be in groups.
- 2 Let each group list the characteristics which make the identified layer suitable for crop production (see activity 2).
- 3 Let each group discuss how each of the characteristics of the identified layer is suitable for crop production.
- 4 Ask each group to complete table: 8.3 below.

Characteristics
High nutrient content
Better aeration
Better water retention
Black colour
High humus content
Presence of soil organisms

5 Let each group report their findings to the class for.

6 Consolidate the activity.

Summary

Soil profile refers to the vertical arrangement of different layers of soil. Most soils have four main horizons. These are formed from the weathering of parent rock. The top layer is called the topsoil. It has a high humus content and presence of air, water and soil organisms.

The most suitable layer for crop production is the topsoil because it has a high nutrient content, good aeration and good water retention.

Review exercises

Let the learners do the following activities:

Glossary

Nutrients :

Soil horizon :

Embankment :

Table 8.3 The characteristics of top soil that promote crop production.

Characteristics	Importance for crop production
High nutrient content	Supplying adequate amount of plant food for growth
Better aeration	Supply air (oxygen) needed for seed germination and root respiration
Better water retention	Supply adequate water for seed germination and plant growth
Black colour	It helps the soil to absorb heat which provide warmth necessary for seed germination and seedling development
High humus content	Humus improves soil aeration, water retention and nutrient content of the soil
Presence of soil organisms	These help to improve soil aeration like earth worms

- 5 Let each group report their findings to the class.
- 6 Consolidate how each of the characteristics of the identified layer promotes crop production.

Summary

Soil profile refers to the vertical section through the soil showing horizontal layers. Most soils have four main layers. These are top soil, sub soil, weathered rock and parent rock. The layers differ in colour, humus content, nutrient content, and presence of air, water, living organisms and plant roots.

The most suitable layer for crop production is top soil. This is due to the better nutrient content, humus content, water retention and aeration.

Review exercise

Let the learners do the exercise on pages 31 and 32 of their books.

Glossary

Nutrients	:	plant food
Soil horizon	:	soil layer
Embankment	:	bank/edge

UNIT 9 Soil erosion and conservation

Time allocation: 8 periods

Introduction

In Standard 6, the learners learnt the importance of soil. If the soil is not well taken care of, it can be lost through erosion. Soil erosion is a serious problem in most parts of Malawi. It reduces agricultural production. It is therefore important for learners to know how soil is eroded and ways it can be conserved.

In this unit, the learners will learn the meaning of soil erosion, its causes and effects and ways of conserving it. This will help the learners to take good care of the soil for continued agricultural production.

Success criteria

By the end of this unit, the learners must be able to:

- describe how soil can be lost
 - conserve soil

Developmental areas

Skills

SKILLS
Ensure that the learners develop skills such as observing, drawing, classifying, recording, reporting and constructing soil conservation structures.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of the meaning of soil erosion, ways in which soil is lost; causes and effects of soil erosion and ways of conserving soil.

Values and attitudes

Ensure that the learners appreciate the significance of soil erosion and acquire values and positive attitude towards soil conservation.

Special needs education

Ensure the activities are adapted for the learners with special educational needs. Observe and record their performance. This will help them to access the curriculum with ease, develop their potentials and become self-reliant.

From Tom evolution to your player

I am
paint you see

Background

Meaning of t

Soil erosion is the commonest raindrops fall on and carried away

Causes of s

The following a

- Careless cutting
Trees protect
soil is easily washed away
 - Cultivation of land
Cultivation leads to soil loss
fast and carry away soil
 - Cultivation and
This clears the land
running water
 - Making ridge and
furrows

Effects of soil

There are many

- loss of fertile soil
 - reduced amount of water reduces infiltration
 - silting of rivers and lakes bodies can happen
 - formation of new islands
 - exposure of new land

Soil conservation

There are differ-

- Avoiding overgrazing which protects soil
 - Making terraces to stop soil from running away

Background information

Meaning of the term "soil erosion"

Soil erosion is the removal of top soil by the action of water and wind. In Malawi the commonest agent of soil erosion is the action of running water. When the raindrops fall on soil, which is not covered, the soil particles are easily displaced and carried away by the running water into rivers, dams or lakes.

Causes of soil erosion

The following are some of the causes of soil erosion:

- Careless cutting down of trees.
Trees protect the soil from the impact of rainfall. When they are removed, the soil is easily loosened and carried away by running water or wind.
- Cultivation on steep slopes
Cultivation loosens the soil and makes it easy for running water to move fast and carry soil down the slope.
- Cultivation along riverbanks
This clears the vegetation that protects the soil and loosens it. The running water easily carries the loosened soil down to the river.
- Making ridges along the slope

Effects of soil erosion

There are many effects of soil erosion. These include:

- loss of fertile soil resulting into low yields
- reduced amount of ground water as a result of fast moving water which reduces infiltration.
- silting of rivers, streams, dams, and lakes reducing the amount of water the bodies can hold and destroying aquatic life
- formation of gullies leading to reduction of land for cultivation
- exposure of plant roots causing lodging of crops

Soil conservation

There are different ways of conserving soil. These include:

- Avoiding overstocking – correct stocking rate prevents depletion of vegetation which protects the soil from erosion
- Making terraces on steep land – this conserves soil by reducing the speed of running water

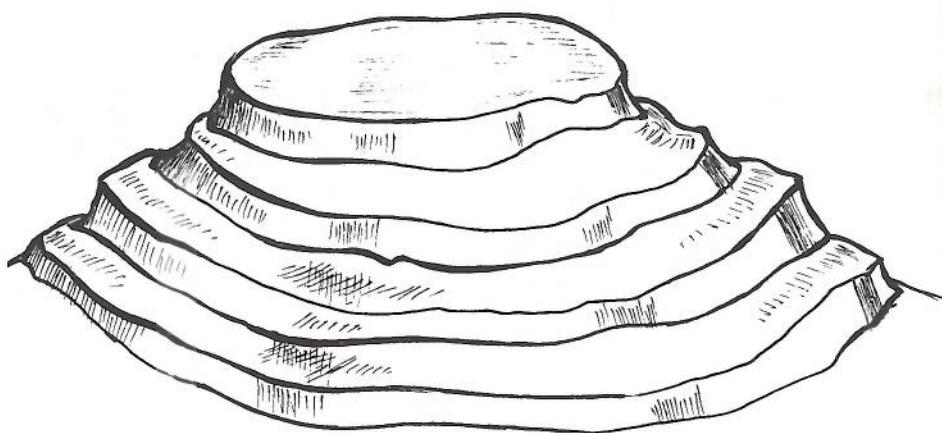


Figure 9.1: Terraces on steep slope

- Making ridges

- Mulching – mulching material reduces the speed of running water which can carry soil away

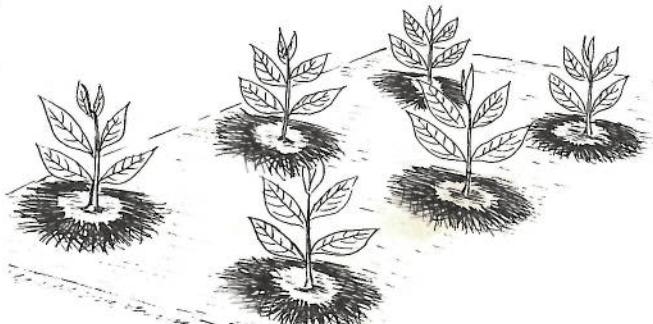


Figure 9.2: Mulching

- Making box ridges

- Correct spacing of crops – when crops are correctly spaced they provide enough ground cover to prevent the splashing of soil, reduce the speed of runoff and hold soil particles. It involves alternating strips of poor cover crops (maize) with good cover crops (groundnuts) across the slope. The soil that has been eroded from poor cover crops is trapped by good cover crops.
- Strip cropping – it involves alternating strips of poor cover crops (maize) with good cover crops (groundnuts) across the slope. The soil that has been eroded from poor cover crops is trapped by good cover crops

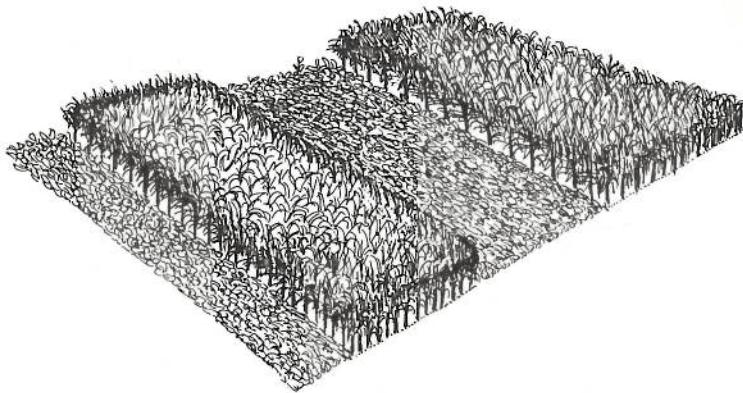


Figure 9.3: Strip cropping

- Making ridges across the slope – reduces speed of run-off

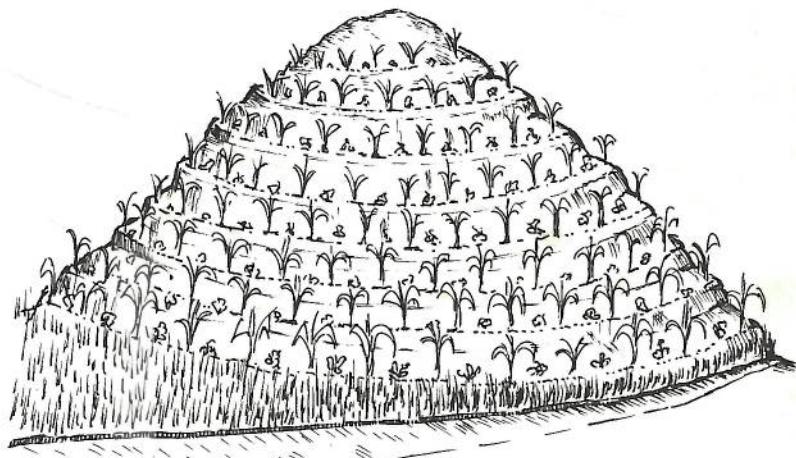


Figure 9.4 : Ridges across the slope

- Making box ridges – reduces amount of run-off by holding water in the boxes

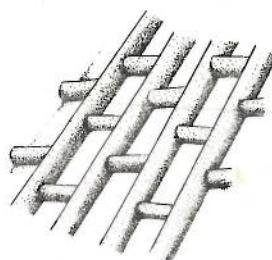


Figure 9.5 : Box ridges

- Making contour bands – holds water and reduces amount of run-off thereby controlling erosion

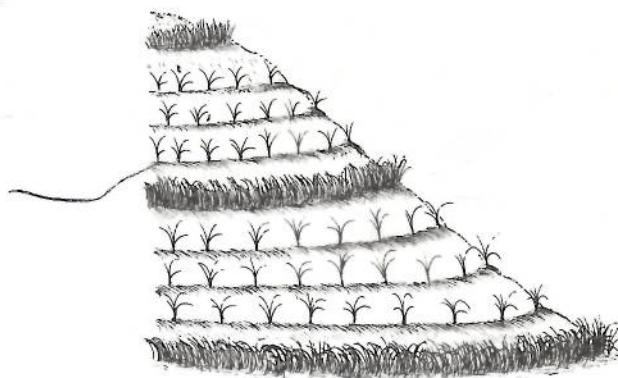


Figure 9.6 : Contour bands

Instructions

- 1 Let the learners draw a sketch of a hillside.
- 2 Let the learners identify the contour bands on the sketch.
- 3 Using soil erosion as a case study, let the learners follow the following steps:
 - a. Draw a sketch of a hillside on chart paper.
 - b. Identify the contour bands on the sketch up to the top of the hill.
 - c. Draw an arrow pointing from the sketch to the effects area.

Activities

Activity 1 Discussing the meaning of the term “soil erosion” (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- eroded area

Instructions

- 1 Organise a visit to an eroded area.
- 2 Ask the learners to observe characteristics of the area.
- 3 Ask them to record the observations in their notebooks.
- 4 Ask them to report the observations to the class.
- 5 Let the learners suggest the meaning of the term “soil erosion” using their observations.
- 6 Summarise the meaning of soil erosion.

Activity 2 Discussing the causes and effects of soil erosion (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- chart paper
- pencil markers
- learners' experience

Instructions

- 1 Let the learners get into groups.
- 2 Let the learners discuss the causes of soil erosion.
- 3 Using soil erosion as a central problem, ask the learners to draw future's wheels following the procedure below:
 - a. Draw a circle around the central problem (of soil erosion) on a piece of paper.
 - b. Identify the cause effects of soil erosion and progressively plot more effects up to the last possible effects as shown below.
 - c. Draw arrows to show the interrelationships between the problem and the effects as shown below.

Activity 3 D

Suggested teaching

You will need the

- water conserv
- learners' exper

Instructions

- 1 Ask the learner communities.
- 2 Let them discuss.
- 3 Let them record.
- 4 Let them report.
- 5 Ask the learners books.
- 6 Let them identify.
- 7 Let them record.
- 8 Let them report.
- 9 Summarise the s
- 10 Organise a visit
- 11 Let the learners c
- 12 Let them record
- 13 Let them report t
- 14 Demonstrate con
- 15 Let the learners p

Summary

Soil erosion is the re different causes of soil production. However effects.

Review exercise

Let the learners do the

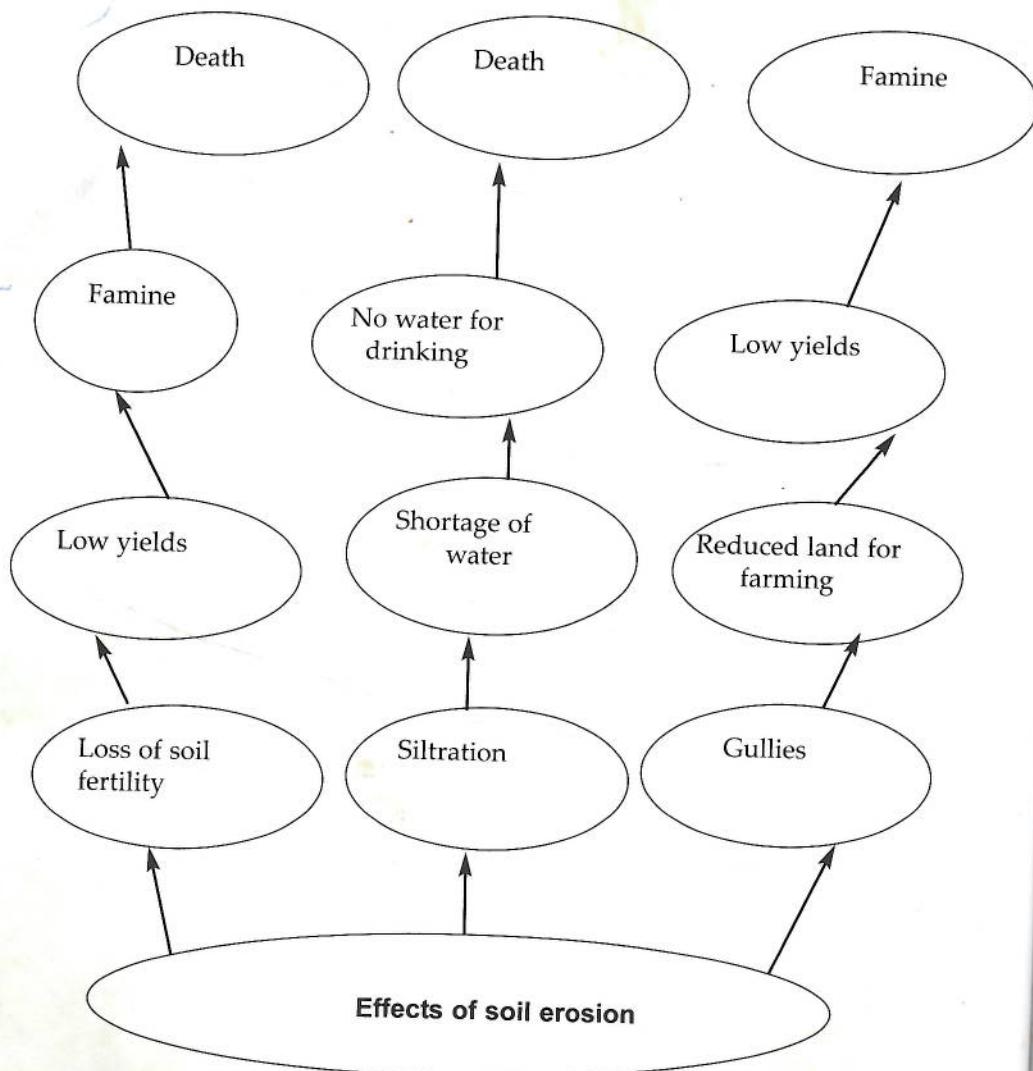


Figure 9.7: Future's wheel on effects of soil erosion

- 4 Ask the learners to write down lessons from the future's wheel drawn.
- 5 Let them report the findings to the class.
- 6 Organise a visit to eroded area visited previously.
- 7 Let the learners observe the causes and effects of soil erosion.
- 8 Let them record the findings in their notebook.
- 9 Ask the learners to report the findings to the class.
- 10 Summarise the causes and effects of soil erosion.

Activity 3 Discussing ways of conserving soil (4 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- water conservation structures
- learners' experiences

Instructions

- 1 Ask the learners to brainstorm ways of conserving soil practiced in their communities.
- 2 Let them discuss ways of conserving soil practiced in their communities.
- 3 Let them record the findings in their notebooks.
- 4 Let them report the findings to the class.
- 5 Ask the learners to study the diagrams shown in figures 9.1 to 9.6 in their books.
- 6 Let them identify the soil conservation measures shown.
- 7 Let them record the findings in their note books.
- 8 Let them report the findings to the class.
- 9 Summarise the soil conservation measures.
- 10 Organise a visit to an area practising soil conservation measures.
- 11 Let the learners observe soil conservation measures being practiced.
- 12 Let them record the findings in their notebooks.
- 13 Let them report the findings to the class.
- 14 Demonstrate construction of some soil conservation measures.
- 15 Let the learners practice some soil conservation measures.

Summary

Soil erosion is the removal of top soil by the action of water and wind. There are different causes of soil erosion. Soil erosion negatively affects agricultural production. However, practising soil conservation measures can reduce these effects.

Review exercise

Let the learners do the exercise on page 37 of their books.

UNIT 10 Fa

Time allocation: 1

Glossary

- Contour bands : large ridges to hold water in the field
Overstocking : keeping too many animals in a given area
Siltation : accumulation of silt (soil) in water bodies (rivers, lakes, dams)
Terraces : step like structures that reduce the speed of surface run-off

In Standard 6, learn

increasing rapidly. It population one way easier and faster. It machinery.

In this unit, they will help learners to unde

Success criteria

By the end of this unit,

- describe farm machinery
- use farm machinery

Developmental

Skills

Ensure that the learners are using farm machinery.

Knowledge and skills

Ensure that the learners know about farm machinery, their parts and uses.

Values and attitudes

Ensure that the learners have positive attitudes towards using farm machinery.

Special needs and support

Ensure that the activities meet the needs of all learners. Observe and support learners with special needs.

UNIT 10 Farm machinery and their uses

Time allocation: 10 periods

Introduction

In Standard 6, learners learnt about farm implements. In Malawi the population is increasing rapidly. In order to increase the food production to feed the increasing population one way is for farmers to use machinery. Machinery make the work easier and faster. It is therefore, important that learners know how to use these machinery.

In this unit, they will learn about farm machinery and how to use them. This will help learners to understand the importance of using farm machinery.

Success criteria

By the end of this unit, the learners must be able to:

- describe farm machinery
- use farm machinery

Developmental areas

Skills

Ensure that the learners develop skills such as observing, reporting, drawing and using farm machinery.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of different farm machinery, their parts and uses.

Values and attitudes

Ensure that the learners acquire values and attitudes to appreciate the importance of using farm machinery and have a positive attitude towards them.

Special needs education

Ensure that the activities are adapted for the learners with special educational needs. Observe and record their performance. This will help them to access the curriculum with ease, develop their potentials and become self-reliant.

Background information

Farm machinery and their parts

There are different machinery that farmers use. These include ploughs, ridgers and sprayers.

Uses of farm machinery

These have different uses depending on the type. Table 10.1 below shows the different uses of the farm machinery.

Table 10.1: Uses of farm machinery

Machinery	use
Plough	Tilling the soil
Ridger	Making ridges
Sprayer	Applying chemicals to crops and animals to control pests, parasites and diseases

The illustrations below show the different machinery and their parts.

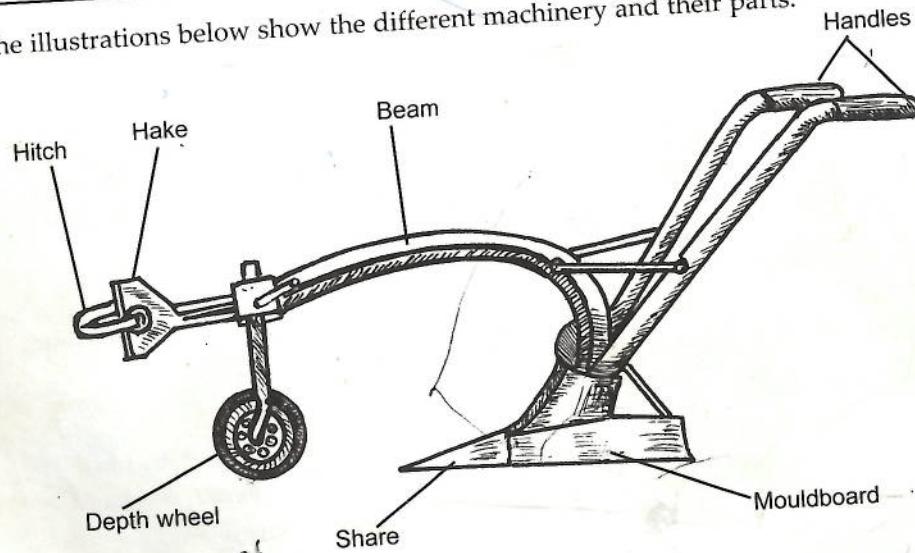


Figure 10.1a Parts of a plough

Uses of p
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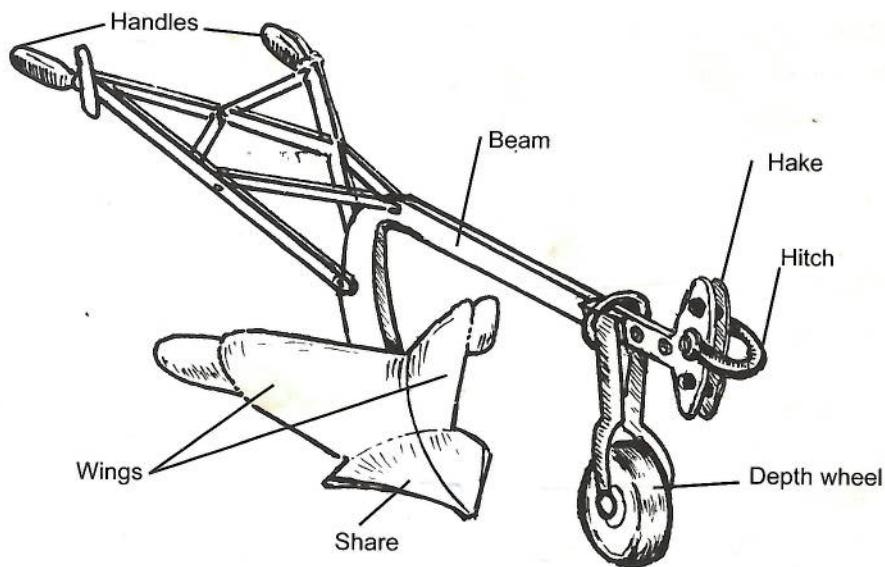


Figure 10.1b Parts of a ridger

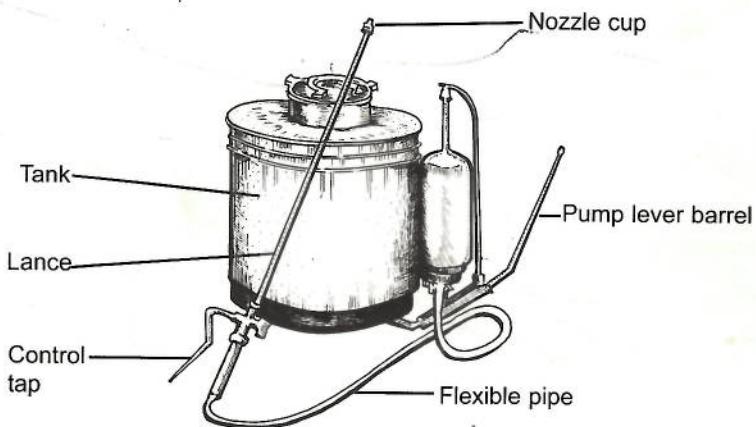


Figure 10.1c Parts of a sprayer

Uses of parts of farm machinery

The different parts of farm machinery have different uses. Tables 10.2 and 10.3 below show the uses of parts of a plough, ridger and sprayer.

*ganized sive goat because of poor
ganiza*

Activity 1 Identification (6 p)

Tables 10.2 and 10.3 below show the different parts of farm machinery and their uses.

Table 10.2 Use of parts of a plough and a ridger

Parts	Use
Handles	Enable the farmer to hold and guide plough or ridger
Beam	Holds all parts of a plough or a ridger
Share	Cuts the soil into thin layer
Hake	Sets the depth of ploughing
Depth wheel	Helps to move the plough or ridger and maintains depth
Hitch	Attaches the plough or ridger to the chain or axle
Mould board	Throws the soil cut loose by share to one side and turns it over (for plough)
Wings (for Ridger)	Pushes the soil to each side so that on the return run a complete ridge is made during ridging

Table 10.3: Uses of parts of a sprayer

Parts	Use
Plastic container	Holds the spray materials
Plain pump barrel	Creates pressure which forces the spray to come out through the lance
Lance	Delivers the spray
Nozzle	A hole through which the spray comes out
Control tap	Helps to control the amount of spray that comes out
Shoulder strap	For holding the sprayer
Sieve	Filtering the spray to avoid blocking the nozzle
Nozzle cups	Holds nozzle disc in position

Suggested teaching

You will need the following:

- learners' experience
- pictures or charts

Instructions

- 1 Ask the learners to identify the parts of a plough and a ridger.
- 2 Discuss with the learners the uses of the parts.
- 3 Ask the learners to identify the parts of a sprayer.
- 4 Let the learners discuss the uses of the parts.



one bad turn deserves
another.

Activity 1 Identifying farm machinery, their parts and uses (6 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- pictures or charts showing ploughs, ridgers and sprayers

Instructions

- 1 Ask the learners to name various farm machinery.
- 2 Discuss with the learners the different farm machinery.
- 3 Ask the learners to identify the farm machinery shown in figure 10.1a to c in their book.
- 4 Let the learners study the illustrations of farm machinery shown in their books.

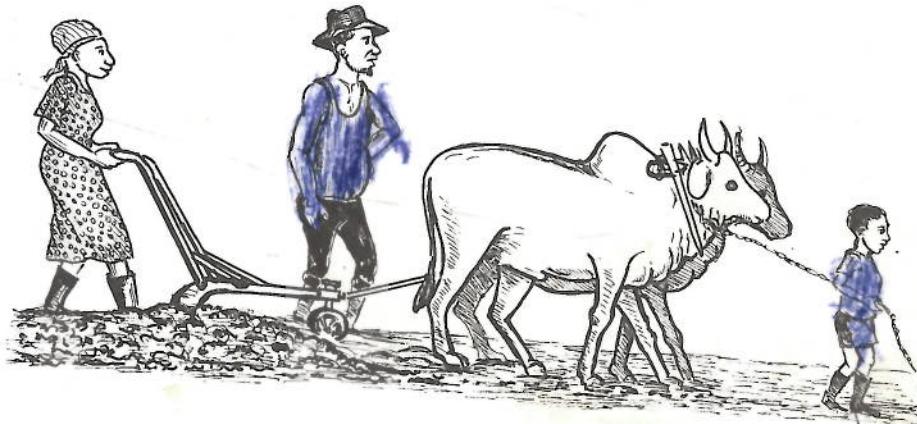


Figure 10.2a: Ploughing using an ox-drawn plough

Ten
ways to
use
oxen

71
ways to
use
oxen

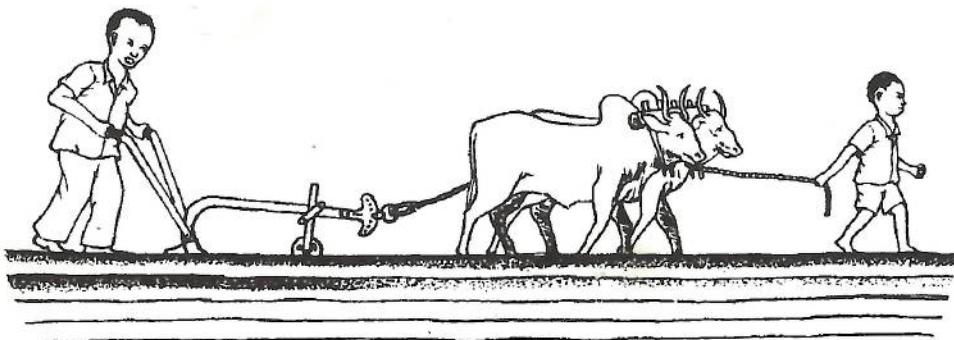


Figure 10.2b: Ridging using a ridger



Figure 10.2c: Spraying chemicals using a sprayer

- 5 Let the learners discuss in small groups what each machinery is used for in each illustration.
- 6 Let the learners copy and complete table 10.1 in their notebooks.
- 7 Ask the learners to suggest the names of the parts of farm machinery shown figure 10.1 in their book.
- 8 Discuss with the learners the parts of farm machinery shown in their book.

9 Let the learners plough, ridge shown in the

10 Ask the learners plough, ridge

11 Ask the learners

Activity 2 Using farm machinery

Suggested teaching approach
You will need the

- learners' experience
- plough
- ridger
- sprayer

Instructions

- 1 Organise a visit to a farm.
- 2 Demonstrate the use of the machinery.
- 3 Let the learners

Summary

There are different types of farm machinery. There are ploughs, ridgers and sprayers. These machines perform different functions when they are properly used.

Review exercises

Let the learners

- 9 Let the learners suggest the uses of the parts of the following farm machinery: plough, ridger and sprayer and let them copy and complete tables 10.2 – 10.4 as shown in their book.
- 10 Ask the learners to draw and label the parts of the following machinery: plough, ridger and sprayer.
- 11 Ask the learners to model the following machinery: plough, ridger and sprayer.

Activity 2 Using farm machinery (4 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- plough
- ridger
- sprayer

Instructions

- 1 Organise a visit to a nearby farm that uses machinery.
- 2 Demonstrate proper use of plough, ridger and sprayer.
- 3 Let the learners practice using plough, ridger and sprayer properly.

Summary

There are different types of farm machinery. Some of the machinery used in farms are ploughs, ridgers and sprayers. The farm machinery have different parts that perform different functions. To get high performance, the farm machinery must be properly used.

Review exercise

Let the learners do the exercise on page 41 of their books.

UNIT 11 Safety measures when using farm machinery

Time allocation: 5 periods

Introduction

The learners have learnt farm machinery and their uses. Farmers must properly use the machinery to ensure their own safety and that of the surrounding. It is important that the learners know the safety measures when using farm machinery.

In this unit, the learners will learn and practise safety measures when using a ridger, plough and sprayer. This will assist them to understand the importance of following the safety measures.

Success criteria

By the end of this unit, the learners must be able to:

- apply safety measures when using farm machinery

Developmental areas

Skills

Ensure that the learners develop skills such as observing, reporting and using ploughs, ridgers and sprayers.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of safety measures when using ploughs, ridgers and sprayers.

Values and attitudes

Ensure that the learners acquire values and positive attitude to appreciate the importance of observing safety measures when using ploughs, ridgers and sprayers.

Special needs education

Ensure that the activities are adapted for learners with special educational needs. Observe and record their performance. This will help them to access the curriculum with ease, develop their potentials and become self-reliant.

Background information
Safety measures
It is important for farmers to use farm machinery safely and effectively.

Ploughs and ridgers

Safety measures

- Ensure that the machine is well maintained.
- Soil must be fair and firm.
- There must be no stones or debris.
- The plough or ridge must be sharp.
- The nuts and bolts must be tight.

- Oxen used to pull the plough.
- The yoke must be well fitted.

Sprayers

Safety measures

- Keep the control handle firmly.
- Avoid sucking or blowing.
- Always wear protective clothing.
- Face away from the wind when blowing into the fan.

I will always love agriculture

Background information

Safety measures when using farm machinery

It is important for farmers to observe safety measures when using ploughs, ridgers and sprayers.

Ploughs and ridgers

Safety measures when using ploughs and ridgers

- Ensure that the machine is in good working order.
- Soil must be fairly moist when either ploughing or ridging.
- There must be no stumps or large stones in the field during ploughing ridging.
- The plough or ridger must be handled firmly and correctly.
- The nuts and bolts must be tight.

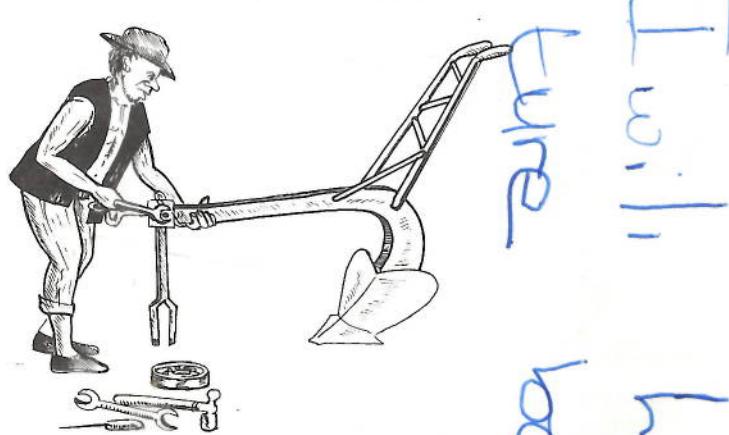


Figure 11.1 Tightening bolts and nuts

- Oxen used to pull the plough or ridger must be well trained.
- The yoke must be tied to the plough properly.

Sprayers

Safety measures when using sprayers

- Keep the control tap tight.
- Avoid sucking or blowing through the nozzles to prevent chemical poisoning.
- Always wear protective clothing when spraying.
- Face away from the wind side when spraying so that the chemicals are not blown into the face.



Figure 11.2: Wearing protective clothes when spraying

- Do not eat, drink or smoke while spraying
- The sprayer must be thoroughly cleaned after use
- Wash your body with soap after spraying
- Chemicals from the sprayer must be properly disposed of to avoid pollution of air, soil and water

Activities

Activity 1 Discussing safety measures when using farm machinery (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- plough
- ridger
- sprayer

Instructions

- 1 Ask the learners to study figures 11.1 a and b on page 42 of their book.
- 2 Let them describe what is happening in the illustrations.
- 3 Ask the learners to brainstorm safety measures when using a plough, ridger and sprayer.

- Let the learners discuss the use of a sprayer.
- Let them record their findings.
- Let them report their findings.
- Consolidate the safety measures.

Activity 2 Practising safety when using a ridge

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- plough
- ridger
- sprayer
- resource person

Instructions

- 1 Organise a visit to a farm.
- 2 Demonstrate safety measures.
- 3 Let the learners practice using a ridger and a sprayer.

Summary

The farmer must follow certain safety measures. These measures differ depending on the type of farm. Safety measures can ensure the safety of the farmer and the environment.

Review exercises

Let the learners do the following exercises.

- 4 Let the learners discuss the safety measures when using a plough, ridger and sprayer.
- 5 Let them record the findings in their notebooks.
- 6 Let them report the findings to the class.
- 7 Consolidate the safety measures when using a plough, a ridger and a sprayer.

Activity 2 Practising safety measures when using a plough, a ridger and a sprayer (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- plough
- ridger
- sprayer
- resource person

Instructions

- 1 Organise a visit to a farm that uses a plough, a ridger and a sprayer.
- 2 Demonstrate safety measures when using a plough, ridger and sprayer.
- 3 Let the learners practice some safety measures when using a plough, a ridger and a sprayer.

Summary

The farmer must follow all the safety measures when using farm machinery. The measures differ depending on the type of machinery being used. These measures can ensure the safety of the farmer and the surrounding environment.

Review exercise

Let the learners do the exercise on page 43 of their books.

UNIT 12 Maintenance of farm machinery

Time allocation: 6 periods

- set the machine correctly
- clean the machine
- grease all movable parts
- tighten nuts and bolts
- replace worn out parts

Introduction

In unit 11, the learners practised safety measures when using farm machinery. Farm machinery can be used for a long time if they are maintained regularly. It is important for the learners to acquire knowledge, skills and appropriate values about maintenance because it improves the performance of the machinery.

In this unit, the learners will learn practice how to maintain a plough, ridger and sprayer. This will help them to reduce farm costs and improve production.

Success criteria

By the end of this unit learners must be able to:

- maintain farm machinery

Developmental areas

Skills

Ensure that the learners develop skills such as observing, recording, judging, concluding.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of how to maintain a plough, a ridger and a sprayer.

Values and attitudes

Ensure that the learners acquire values and attitude to appreciate the importance of maintaining farm machinery.

Special needs education

Ensure that the activities are adapted for the learners with special educational needs. Observe and record their performance. This will help them to access the curriculum with ease, develop their potentials and become self-reliant.

Background information

Maintanance of a ridger, a plough or sprayer

Remember the following points or rules when caring for a ridger, plough, and sprayer.

- know the parts and how they work or function.

- transport a plough to the field
- fit the York and pull the York
- paint the machine
- keep the plough sharp
- use the machine correctly
- read the accompanying manual
- lift up or lay down the machine anyhow.

Activities

Activity 1 Maintaining farm machinery

Suggested teaching, learning and assessment

You will need the following materials:

- learners' experience
- ridger
- plough
- sprayer

- set the machine correctly for it to perform properly.
- clean the machines and dry them immediately after use to prevent rusting
- grease all movable parts to prevent friction between them.
- tighten nuts and bolts to prevent spoiling the threads on the nuts and bolts.
- replace worn out parts such as the share, mould boards, nozzle, handle.



Figure 12.1: A farmer maintaining a ridger

- transport a plough or a ridger properly in an ox-cart or by tying the handles to the yoke and pulling it on the depth wheel in reverse position.
- paint the machinery at the end of each growing season.
- keep the plough, ridger or sprayer in a dry store room or shed for safety.
- use the machine for purpose it was made.
- read the accompanying manual if available.
- lift up or lay down the machinery after use and avoid throwing them away anyhow.

Activities

Activity 1 Maintaining a ridger or a plough (4 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- ridger
- plough
- sprayer

- spanners
- grease (lubricants)
- nuts
- bolts
- local farm
- interview schedule

Instructions

- 1 Let the learners study figure 12.1 on page 44 of their book.
- 2 Let the learners describe what is happening in the figure.
- 3 Let the learners report their findings.
- 4 Organize a visit to a nearby farm to observe how a ridger or a plough is maintained.
- 5 Let the learners record their findings in their notebooks.
- 6 Let them discuss their findings in small groups.
- 7 Ask the group representatives to report to the class.
- 8 Consolidate maintenance of a ridge or a plough.
- 9 Demonstrate how to maintain a ridger or plough.
- 10 Let the learners maintain a ridger or a plough under your supervision.

Activity 2 Maintaining a knapsack sprayer (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- local environment
- water
- spanners
- sprayer
- resource person
- grease (Lubricant)

Instructions

- 1 Let the learners be in small groups.
- 2 Let the learners brainstorm how to maintain a sprayer.
- 3 Let them discuss how to maintain a sprayer.
- 4 Let learners record their findings.
- 5 Let them report their findings to the class.

- 6 Consolidate v
- 7 Invite a resou
- 8 Let the learner

Summary

Farm machinery I
However the farm
Such maintenance
parts such as nozzle

Review exercise

Let the learners do

- 6 Consolidate ways of maintaining a sprayer.
- 7 Invite a resource person to demonstrate how to maintain a sprayer.
- 8 Let the learners maintain a sprayer under your supervision.

Summary

Farm machinery helps to ease work and to complete farm operations in time. However the farm machinery needs constant maintenance to perform efficiently. Such maintenance includes applying grease to joints, replacement of worn out parts such as nozzles and shares, and keeping the machinery in dry places.

Review exercise

Let the learners do the exercise on page 45 of their books.

UNIT 13 Types and importance of flowers

Time allocation: 5 periods

Introduction

In Standard 6, the learners learnt some of the crops grown in Malawi and their importance. Apart from the crops learnt in Standard 6, people also grow flowers around their homes, schools, work places and business places.

In this unit, the learners will learn types of flowers and their importance. This will help them make a good choice of flowers to grow around the schools, at home and at their business places.

Success criteria

By the end of this unit, learners must be able to:

- describe types of flowers
- explain the importance of flowers

Developmental areas

Skills

Ensure that the learners develop skills such as observing, recording, reporting and decision making.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of types of flowers grown in Malawi, factors to consider when selecting flowers to grow and the importance of flowers.

Values and attitudes

Ensure that the learners acquire values and attitudes to appreciate different types of flowers and their importance.

Special needs education

Ensure the activities are adapted for the learners with special educational needs. Observe and record their performance. This will help them to access the curriculum with ease, develop their potential and become self reliant.

Background information

Types of flowers

There are different types of flowers based on how they grow.

Creepers or climber

These stems which climb ground. The flowers grow on fences. Examples

Ground covers

These flowers have low growing. The flowers produce flowers are geraniums.

Tree

These flowers have tall stems. The trees are grown for leaves. Examples

Shrubs

These have stems which produce many branches. Examples of such

Importance of flowers

Some of the important

- Decoration - flowers produce beautiful flowers and others have fragrance.
- Source of income - preserved flowers
- Source of medicine - Such flowers include those used in the treatment of diseases.
- Source of raw materials - of medicine, perfume, etc.

Creepers or climbers

These stems which need support because the stems are weak and grow along the ground. The flowers look beautiful when supported by a wall, strings trees and fences. Examples of the creepers are money plant, and bougainvillea.

Ground covers

These flowers have stems which do not grow tall. The stems do not need support. The flowers produce many side branches and cover the ground. Examples of such flowers are geranium, periwinkle, marigolds, zinnia, dahlia and ferns.

Tree

These flowers have stems that grow very big and tall. The stems are also tough. The trees are grown because they produce beautiful shapes, fruits, petals and leaves. Examples of such flowers are jacaranda, acasia and conifers.

Shrubs

These have stems which are thick and tough after first year of growth. They produce many branches which can be trimmed to a variety of shapes. Examples of such flowers are hibiscus, roses, fushsia and poinselta.



Figure 13.1: Types of flowers

Importance of flowers

Some of the importance of flowers include the following:

- Decoration - flowers make the surroundings look beautiful. Some flowers produce beautiful petals others have leaves of beautiful colour or shape and others have fruits with beautiful colour or shape.
- Source of income - some flower petals are cut and sold as fresh flowers or preserved flowers. potted flower seedlings are also sold.
- Source of medicine - some flowers are useful in the control of certain diseases. Such flowers include perinkle, aloe vera, dahlia
- Source of raw materials - Ssome industries use some flowers in their production of medicine, perfumes and dye for different purposes.

- Provide protection - some flowers are used as live-fences. As fences, they protect crops from farm animals and are used to mark boundaries e.g Dahlia
- Some flowers are grown to scare away harmful pests and other animals eg marigold and night queen.



Figure 13.2 Uses of flowers

- products to v
- charts showi

Instructions

- 1 Let the learner
- 2 Let the learner
- 3 Let the learner
- 4 Let the learner
of their books
- 5 Let the learner
- 6 Let the learner
- 7 Consolidate th

Summary

There are different types of flowers and trees. The flowers are important for decoration and for protection.

Review exercises

Let the learners complete the following exercises.

Glossary

Raw materials :

Activities

Activity 1 Discussing types of flowers (3 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences

Instructions

- 1 Organise the learners into small groups.
- 2 Let the learners name some of the flowers grown in the area.
- 3 Let the learners brainstorm characteristics of flowers which are grown in the area.
- 4 Let the learners discuss the characteristics of flowers which are grown in the area.
- 5 Let the learners study figure 13.1 on page 46 of their books.
- 6 Let the learners identify the flowers with the characteristics discussed.
- 7 Let the learners record their findings.
- 8 Let the learners report their findings.
- 9 Summarise the types of flowers grown in the area.

Activity 2 Discussing importance of flowers (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- flowers

- products to which flowers are part of composition (perfume, soap)
- charts showing different flowers

Instructions

- 1 Let the learners be in groups.
- 2 Let the learners list down importance of flowers.
- 3 Let the learners discuss importance of flowers.
- 4 Let the learners identify the importance of flowers from figure 13.2 on page 47 of their books.
- 5 Let the learners record their findings.
- 6 Let the learners report their findings to the class.
- 7 Consolidate the activity.

Summary

There are different types of flowers. These include creepers, groundcovers, shrubs and trees. The flowers differ because of their growth habits. Flowers are important for decoration, source of income, source of raw materials for industries and for protection.

Review exercise

Let the learners do the exercise on page 48 of their books.

Glossary

Raw materials : materials used to make something else

UNIT 14 Flower nursery establishment and management

Time allocation: 11 periods

Introduction

In unit 13, the learners learnt the types and importance of flowers. Some of the flowers are planted directly on the desired place while others are first raised in a nursery as seedlings which are later transplanted to the desired place.

In this unit, the learners will learn how to establish in flower nurseries and manage them. This will help learners to raise their own flower seedlings and manage them.

Success criteria

By the end of this unit, learners must be able to:

- establish flower nurseries
- manage flowers nurseries

Developmental areas

Skills

Ensure that the learners develop skills such as observing, recording, fence construction, nursery bed preparation, planting, watering and weeding the flower nurseries.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of activities involved when establishing and managing flower nurseries.

Values and attitudes

Ensure that the learners acquire values and attitudes to appreciate the proper way of propagating flowers and managing flower nurseries.

Special needs education

Ensure the activities are adapted for the learners with special educational needs. This will help them to access the curriculum with ease, develop their potentials and become self-reliant. Observe and record their performance.

Background

Establishment

Establishing a flower nursery involves sowing, weeding, watering, etc.

Site selection

The following factors are considered when selecting a site for a flower nursery:

- Should be close to water supply
- Should be close to market
- Loam soil - for better growth

Land preparation

This involves the following steps:

- Clearing the land to remove weeds smoothly.
- Constructing a fence in the area in order to protect the flower beds.
- Preparation of flower beds by digging and cuttings. Hand digging is done with a hoe.

Preparing nurseries

Preparation of nurseries

- a. Till the cleared land to a depth of 15 cm.
- b. Level the tilled land.
- c. Mark the boundaries of the flower beds to create a basic layout.
- d. Fill the marked flower beds with soil to facilitate easy rooting of flower seeds.
- e. Cover the topsoil with a thin layer of mulch to protect the flower beds from heavy rains and to produce healthy flower seedlings.

Preparation of flower seeds

- a. Small seeds like sunflower, marigold, etc. can be sown directly in the flower beds.
- b. Prepare soil mixtures of equal parts of sand, madeira/sawdust, and loam soil.

Background information

Establishment of flower nurseries

Establishing a flower nursery involves site selection, land preparation, planting or sowing, weeding, pest and disease control and hardening off.

Site selection

The following factors should be considered when choosing a site for a flower nursery:

- Should be close to water supply - for easy watering
- Should be close to home or office or fenced area - for protection
- Loam soil - for good drainage

Land preparation

This involves the following:

- Clearing the land - the bush is removed to allow other activities to be done smoothly.
- Constructing a fence - a fence of grass, bamboo, wire or live hedge is made in order to protect the nursery plants.
- Preparation of planting materials - most flowers are propagated using seeds and cuttings. However, some can be propagated using suckers, bulbs or leaves.

Preparing nursery beds

Preparation of nursery bed for cuttings

- a. Till the cleared site to break the hard subsoil so that water drains freely
- b. Level the tilled land to make the place flat
- c. Mark the bed 1 metre wide 5 cm high using bricks, soil or wood so as to create a basin for easy watering
- d. Fill the marked area with 15 cm depth of river sand for free drainage for easy rooting
- e. Cover the top of the prepared bed with a clear plastic paper. This will protect the bed from direct sun heat, too much water from rains and will produce heat that will make buds of cuttings to open quickly.

Preparation of nursery bed for seeds

- a. Small seeds can be established in trays with holes at the bottom, large seeds can be sown in the pots filled with soil
- b. Prepare soil to fill trays or pots by mixing topsoil rich in manure, sand and madea/sawdust rice husks in the ratio 2:1:1

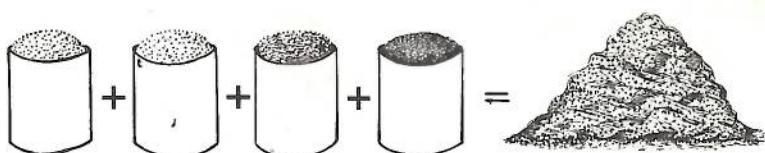


Figure 14.1 Preparation of soil mixture for flower nurseries

- c. Arrange the trays or planting pots on levelled land to form a 1 metre wide bed
- d. Fill the container with the soil

Planting

Planting cuttings

- a. Select planting materials from fresh clean stems to prevent carry over of pests and diseases
- b. Make a 15 cm long cutting by making the base flat and making the cut close to a node in order to easily identify the side to place in soil
- c. Cut the top of the cutting in a slanting manner to allow water to drain away
- d. Remove leaves from the cutting except 2 leaves at the top of the cutting for fast growth

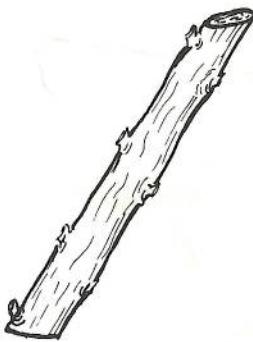


Figure 14.2: Planting cuttings

- e. water the planting bed adequately
- f. plant cuttings 7.5 cm deep and the correct way up and in a slanting manner
- g. avoid excessive watering to prevent damping off and leaching

Planting large seeds

- a. make a hole in the potted soil
- b. place the large seed in the holes
- c. water the pots adequately

Planting small seeds

- a. Make a drill i
- b. Sow small see
- c. Cover lightly
- d. Cover the tray
- e. Water the plan

Managing a flowe

The activities involve controlling pests and

- watering should be in the evening - avoid evaporation
- weed by uprooting
- pests and disease control
- hardening off - begin to expose seedlings to the sun so that seedlings will grow stronger

Activities

Activity 1 Discussing flower types

Suggested teaching, learning and assessment activities

You will need the following resources:

- learners' experience and knowledge

Instructions

- 1 Let the learners bring in their drawings of flowers.
- 2 Let them brainstorm the different types of flowers found in their environment.
- 3 Let the learners draw a flower of their choice in their sketchbooks.
- 4 Let the learners report on the different types of flowers they have drawn.
- 5 Let the learners report on the different parts of a flower.
- 6 Consolidate the activities by asking questions such as:

Activity 2 Preparing flower beds

Suggested teaching, learning and assessment activities

You will need the following resources:

- learners' experience and knowledge

Planting small seeds

- a. Make a drill in planting trays
- b. Sow small seeds in the drill thinly
- c. Cover lightly with soil
- d. Cover the trays with grass
- e. Water the planted trays

Managing a flower nursery

The activities involved in managing flower nursery include watering, weeding controlling pests and diseases and hardening off.

- watering should be done twice a day early in the morning and late in the evening - avoid excessive water to control damping of diseases
- weed by uprooting
- pests and diseases - should be controlled using appropriate measures.
- hardening off - before transplanting seedlings reduce frequency of watering so that seedlings withstand field conditions.

Activities

Activity 1 Discussing factors to consider when choosing site for a flower nursery (1 period)

Suggested teaching, learning and assessment resources

You will need the following resource:

- learners' experiences

Instructions

- 1 Let the learners be in groups.
- 2 Let them brainstorm factors to consider when selecting a site for flower nursery.
- 3 Let the learners discuss factors to consider when selecting a site for a flower nursery.
- 4 Let the learners record their responses.
- 5 Let the learners report their responses to the class.
- 6 Consolidate the activity.

Activity 2 Preparing land for nursery beds (3 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences

- manure, sand, rice husks, madea
- hoes
- pots/trays
- polythene tubes, chibuku packets, sugar packets
- ruler/measuring tape
- school garden

Instructions

- 1 Let the learners be in groups.
- 2 Let the learners brainstorm activities done when preparing nursery beds in their communities.
- 3 Let the learners discuss the activities done when preparing nursery beds.
- 4 Let them record their responses.
- 5 Let them report their responses to the class.
- 6 Consolidate the activities done when preparing flower nursery beds.
- 7 Demonstrate how to prepare flower nursery beds, trays and pots.
- 8 Let the learners prepare beds, pots and trays for flower nurseries.

Activity 3 Planting flower seeds and cuttings (3 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- flower seeds of different sizes
- flower stem cuttings
- school garden
- pots
- trays

Instructions

- 1 Let the learners be in groups.
- 2 Let the learners brainstorm procedures followed when planting small seeds, large seeds and stem cuttings.
- 3 Let the learners discuss the procedures followed when planting small seeds, large seeds and stem cuttings.
- 4 Let them record their responses.
- 5 Let them report their responses to the class.
- 6 Consolidate the activity.

- 7 Demonstrate H
- 8 Let the learner under your su

Activity 4 Ma

Suggested teaching

You will need the

- local commun
- flower nursery
- watering canes

Instructions

- 1 Ask the learner how they man
- 2 Let the learner
- 3 Let the learner a. The right ti b. The ideal m c. How to cor
- 4 Let the learner
- 5 Consolidate th
- 6 Demonstrate H
- 7 Let the learner

Summary

Some of the factors water supply prot nursery for flower planting cuttings to be cared for so tha

Review exerc

Let the learners do

- 7 Demonstrate how to plant small seeds and stem cuttings.
- 8 Let the learners practise planting small seeds, large seeds and stem cuttings under your supervision.

Activity 4 Managing flower nurseries (4 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- local community
- flower nursery
- watering canes

Instructions

- 1 Ask the learners to find out from their parents, gardener, book or community how they manage flowers in the nursery.
- 2 Let the learners be in groups.
- 3 Let the learners discuss the following:
 - a. The right time for watering plants in nursery
 - b. The ideal method for weeding plants in nursery
 - c. How to control pest and diseases in the nursery
- 4 Let the learners record and report their findings.
- 5 Consolidate the activity.
- 6 Demonstrate how to manage flower seedlings in a nursery.
- 7 Let the learners manage the flower nursery under your supervision.

Summary

Some of the factors to consider when selecting site for nursery include nearness to water supply protection and type of soil. Activities involved when establishing a nursery for flowers include fence construction, preparation of nursery beds, planting cuttings or sowing seeds. After sowing or planting cuttings, they have to be cared for so that they grow well.

Review exercise

Let the learners do the review exercise on pages 50 - 51 of their books.

UNIT 15 Site selection and land preparation for flower production

Time allocation: 7 periods

Introduction

In unit 13, the learners learnt the different types of flowers. The type of flowers to grow at a particular place depends on characteristics of the site as well as those of the flowers.

In this unit, the learners will learn factors to consider when choosing suitable site to grow a particular flower and how to prepare land for growing flowers. This will help the learners to choose suitable site and prepare land for growing flowers at the school and in their homes.

Success criteria

By the end of this unit, the learners must be able to:

- choose a suitable land for growing flowers
 - prepare land for growing flowers

Developmental areas

Skills

Skills
Ensure that the learners develop skills such as observing, recording, decision making, designing and land preparation.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of factors to consider when choosing site for growing flowers and preparing land for growing flowers

Value and attitudes

Ensure that the learners acquire values and attitudes to appreciate the different sites suitable for growing flowers.

Special needs and education

Ensure that the activities are adapted for the learners with special educational needs. This will help them to access the curriculum with ease, develop their potentials and become self-reliant. Observe and record their performance.

Background

Factors to consider

The following face
flowers:

- Type of flower walls for support.
 - Height of flower building and colour of flowers.
 - Colour of flower matching colour of flowers.
 - Colour of surrounding walls with colour of flower.

Land character

- Slope of the land
plant ground or
garden.



Figure

- Site of the bed
If flowers are to be used, choose shade

Land preparation

When preparing la-

- choose the site

Background information

Factors to consider when selecting site for growing flowers.

The following factors should be considered when selecting site for growing flowers:

- Type of flower - creepers need support therefore plant them along fences or walls for support
- Height of flower - plant tree flowers where they will not hide view of the building and destroy structures. Short flowers should be planted in front of tall flowers.
- Colour of flowers - flowers that are grown close to one another should have matching colors for example red flowers should be planted next to green flowers.
- Colour of surroundings - make contrast with colours of the surroundings like walls with colours of flowers.

Land characteristics

- Slope of the land - make use of land characteristics for instance, on steep land plant ground covers or make terraces for planting flowers, on rocks make a rock garden.

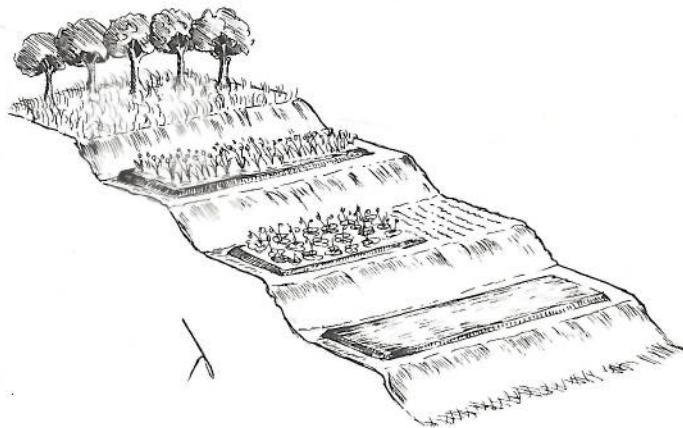


Figure 15.1: Flowers growing on different land characteristics

- Site of the bed - the site of the flower bed will affect the size and type of flower. If flowers are to be planted between gutter and wall, it may be a narrow bed and choose shallow rooted flowers to avoid damaging the structure.

Land preparation

When preparing land follow the following steps:

- choose the site for flower garden

- mark the bed according to the desired size and shape- A width of 1m is easy to manage.
- lay out the bed according to design - if it is a rocky garden arrange the additional rocks. If it is a steep slope, make terraces.
- dig the marked area to a depth equal to root depth of flowers-separate top soil from sub soil when digging the hole.

Table 15.1: Depth of hole for different types of flowers

Types of flowers	Depth of hole
Shrubs	30 cm deep
Ground cover	7.5 - 15cm deep
Trees	90cm deep

- cover the planting hole with the top soil first, then subsoil mixed with well decomposed manure.

Activities

Activity 1 Discussing factors to consider when choosing a suitable site for growing flowers (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learner's experiences
- chart paper

Instructions

- Let the learners be in groups.
- Let the learners brainstorm factors to consider when choosing a site for growing flowers.
- Let the learners discuss the factors to consider when choosing a site for growing flowers.
- Let the learners record their findings.
- Let the learners report their findings to the class.
- Consolidate the activity.

Activity 2 Selecting a suitable site for growing flowers (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- school environment
- flowers
- chart paper
- coloured pencils
- learners' experiences

Instructions

- Let the learners identify the best site for growing flowers.
- Let the learners draw the site.
- Let the learners plant the flowers.
- Let the learners care for the flowers.
- Let the learners evaluate the growth of the flowers.
- Consolidate the activity.

Activity 3 Discussing factors to consider when choosing a suitable site for growing flowers (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences

Instructions

- Let the learners be in groups.
- Let the learners identify the best site for growing flowers.
- Let the learners draw the site.
- Let the learners plant the flowers.
- Let the learners care for the flowers.
- Consolidate the activity.

Activity 4 Preparing a flower bed (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- hoes
- learners' experiences
- tape measure

- school environment
- flowers
- chart paper
- coloured pencils
- learners' experiences

Instructions

- 1 Let the learners visit the school surroundings to identify a suitable site for growing flowers.
- 2 Let the learners draw how the place looks like before planting flowers.
- 3 Let the learners draw how they want the place to look like after planting the flowers.
- 4 Let the learners display their drawings.
- 5 Let the learners discuss their findings and drawings.
- 6 Consolidate the activity.

Activity 3 Discussing activities involved in preparing land for growing flowers (1 period)

Suggested teaching, learning and assessment resources

You will need the following resource:

- learners' experiences.

Instructions

- 1 Let the learners brainstorm activities involved in preparation of land for growing flowers.
- 2 Let the learners discuss the activities involved in preparing land for growing flowers.
- 3 Let the learners record their findings.
- 4 Let the learners report their findings to the class.
- 5 Consolidate the activities involved in preparing land for growing flowers.

Activity 4 Preparing land for growing flowers (4 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- hoes
- learners' experiences
- tape measure

UNIT 16 T

Time allocation: 4

Introduction

In unit 14, the learners in the nursery are sowing seeds for a short time. After they have grown, they are transplanted to the field.

In this unit, the learners will learn how to prepare pots and field beds for transplanting flowers at home.

Success criteria

By the end of this unit, the learners will:

- transplant flowers at home

Developmental outcomes

Skills

Ensure that the learners will be able to:

Knowledge and skills

Ensure that the learners will know the steps for transplanting flowers at home.

Values and attitudes

Ensure that the learners will care for their environment.

Special needs and support

Ensure that the activities will meet the needs of all learners. This will help them to develop their potential and become successful.

Background information

Steps for transplanting flowers

The following steps are:

- watering the plants so that the leaves are full of water

UNIT 16 Transplanting flowers

Time allocation: 4 periods

Introduction

In unit 14, the learners learnt how to establish a nursery for flowers. The flowers in the nursery are sown on bed, trays or pots. In these places, the flowers are grown for a short time. After growing the seedlings to the desirable sizes they are transplanted to the field bed on selected sites.

In this unit, the learners will learn how to transplant flower seedlings into flower pots and field beds. This will help learners to transplant flowers at school and at home.

Success criteria

By the end of this unit, the learners must be able to:

- transplant flowers

Developmental areas

Skills

Ensure that the learners develop skills such as observing, recording, reporting and transplanting flower seedlings.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of the procedure for transplanting flower seedlings.

Values and attitudes

Ensure that the learners acquire values and attitudes appreciation and care of the environment.

Special needs education

Ensure that the activities are adapted for the learners with special educational needs. This will help them to access the curriculum with ease, develop their potential and become self reliant. Observe and record their performance.

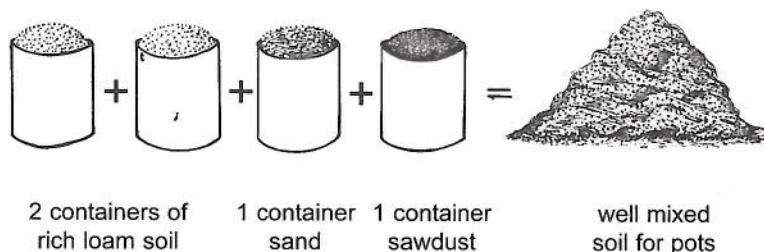
Background Information

Steps for transplanting seedlings into flower pots

The following steps should be followed when transplanting seedlings:

- watering the plants 3-4 hours before transplanting so that roots, stems and leaves are full of water as well as the soil around the roots

- Preparing soil for pot filling - mix rich loam soil sand and sawdust in the ratio of 2:1:1. This will make soil rich with nutrients and porous.



- filling soil in flower pots - Fill the mixed soil into pots up to $\frac{3}{4}$ full. The pots could be polythene tubes empty packets of chibuku or sugar or clay pots.
- making a planting hole - Using a stick make a hole in the potted soil deep enough to allow roots to go in without bending.



Figure 16.1: Making a planting hole as deep as root length

- lifting the seedlings with a hand trowel without damaging the roots-lift roots with soil round it.
- place the lifted seedlings into the hole made in the planting pot without bending the roots.

Fig

- cover the transp
- press the soil ar
- place potted pla
- water the transp

Steps followed

Transplanting should be done in the afternoon to reduce water loss.

- water the field before transplanting.
- dig a planting hole wide enough to accommodate the roots.
- place the pot in the hole.
- remove the plant from the pot, keeping the stem and roots intact.
- cover the plant with soil.
- press soil around the plant.
- water the transplant.
- mulch the seedling.
- water the plant every day.

Activities

Activity 1 Dissemination

Suggested teaching,

You will need the following:

- learners' experience



Figure 16.2 : Transplanted seedling with roots not bending

- cover the transplanted seedlings up to the collar neck
- press the soil around seedlings to make the seedling stand firm
- place potted plants under shed when it is hot season
- water the transplanted plants.

Steps followed when transplanting seedlings to field beds

Transplanting should be done on a cool day or early in the morning or late in the afternoon to reduce loss of water from the seedlings.

- water the field bed hole 3-4 hours before transplanting
- dig a planting hole - It should be equal to the length of the nursery pot and wide enough to allow the flower pot to fit in easily
- place the pot in he hole
- remove the planting pot by tearing on the side, this is to allow free growth of stem and roots later, circularation air and water.
- cover the plant with soil up to the collar neck
- press soil around the plant to make the seedling stand firm
- water the transplanted seedlings
- mulch the seedling to protect from excess sunlight
- water the plant every 4 days until it gets established.

Activities

Activity 1 Discussing steps for transplanting flowers (1 period)

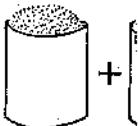
Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences

Instructions

- 1 Let the learners in pairs list down activities done when transplanting flowers
 - a. into flower pots
 - b. into field beds.
- 2 Let the learners report their responses to the class.
- 3 Let the learners in groups discuss the activities in relation to:
 - a. how each activity is done
 - b. reason for doing that activity.
- 4 Let the learners record their findings.
- 5 Let the learners report their findings to the class.
- 6 Consolidate the activity.



Activity 2 Transplanting flowers (3 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- hand trowel
- potted seedlings
- hoes
- watering canes
- flower pots (sugar packets, polythene tubes)
- mulch
- sticks
- local environment
- field beds, sand, sawdust, loam soil.

Instructions

- 1 Let the learners be in groups.
- 2 Let the learners study illustration 16.1 to 16.5 on pages 54-55 of their books.



Figure 16.1: Watering at noon

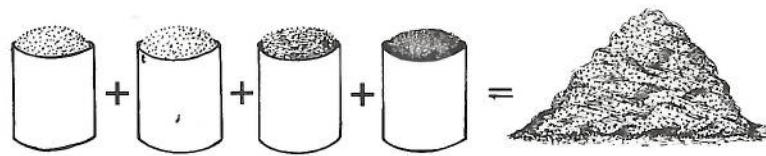


Figure 16.2: Materials for making nursery soil



Figure 16.3: Planting coiled roots in a small hole



Figure 16.4: Planting a seedling in a flower pot

Time allocation :

Introduction

Just like any other crop, flowers also require nutrients. These nutrients can be supplied through manure or fertilizer.

In this unit, the learners will learn how to apply manure and fertilizer application to flower beds. They will also learn how to add fertilizers to their flower pots.

Success Criteria

By the end of this unit, the learners will be able to:

- apply manure and fertilizer to flower beds.

Developmental Skills

Ensure that the learners will be able to identify the steps involved in applying manure and fertilizer to flower beds.

Knowledge and skills

Ensure that the learners will be able to demonstrate how to apply manure and fertilizer to flower beds.

Values and attitudes

Ensure that learners will be able to value the importance of applying manure and fertilizer to flower beds.

Special needs education

Ensure that the activities will meet the needs of all learners. Observe and adapt the curriculum with ease.



Figure 16.5: Placing soil after planting

- 3 Let the learners do the following:
 - a. Describe each activity in the illustrations.
 - b. Decide whether it is the correct way of doing it or not
 - c. Discuss how to do it correctly.
- 4 Let the learners arrange the illustrations in a meaningful order of activities done when transplanting by numbering them.
- 5 Let the learners identify omitted steps.
- 6 Let them report their findings.
- 7 Demonstrate how to transplant flowers.
- 8 Let the learners transplant flowers to the site they identified by using their already made design.
- 9 Let the learners draw a schedule for managing the flowers.

Summary

Transplanting flowers should be done on a cool day or in the morning.

Appropriate steps should be followed when transplanting flower seedling. These include watering the seedbed, preparing the site where seedlings will be transplanted. Flower seedlings can be transplanted to flower pots and flower beds.

Review exercise

Let the learners do the exercise on page 56 of their books.

Glossary

Pot filling : placing soil in flower pots

UNIT 17 Manure and fertilizer application in flowers

Time allocation : 3 periods

Introduction

Just like any other crop, flowers require nutrients in order to grow well. These nutrients can be supplied through manure and fertilizer application.

In this unit, the learners will learn different types and method of manure and fertilizer application in flowers. This will help the learners to apply manure and fertilizers to their flowers.

Success Criteria

By the end of this unit, learners must be able to:

- apply manure and fertilizer to flowers

Developmental areas

Skills

Ensure that the learners develop skills such as observing, recording, reporting and applying manure and fertilizer to flowers.

Knowledge and concepts

Ensure that the learners understand the importance of applying manure and fertilizer to flower correctly.

Values and attitudes

Ensure that learners acquire values and attitudes to appreciate the importance of applying manure and fertilizers to flowers.

Special needs education

Ensure that the activities are adapted for the learners with special educational needs. Observe and record their performance. This will help them to access the curriculum with ease, develop their potential and become self reliant.

Background Information

Fertilizer and manure application to flowers

Fertilizers and manure are applied to flowers to encourage growth. Different types of manure are applied such as compost manure and animal manure. Well decomposed manure should be applied. The manure can be mixed with soil before transplanting. When the flowers are well established, the manure can be spread

(broadcasted) in the flower beds. Where the flowers are planted in rows sparsely planted, the manure can be applied in grooves.

The common fertilizers applied in flowers are 23:21:0+4S and CAN. The fertilizers are applied using dollop, banding and broadcasting methods depending on how the flowers are planted. Apply 23:21: 0+4S soon after transplanting. When flowers are well established apply CAN.

Activities

Activity 1 Discussing manure and fertilizer application to flowers (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- resource person

Instructions

- 1 Let the learners interview flower growers on the following:
 - a. When fertilizer is applied to flowers
 - b. When manure is applied to flowers
 - c. Types of manure and fertilizers applied
 - d. Methods used to apply the manure and fertilizer.
- 2 Let the learners study figures 17.1 to 17.3 on page...of their book



Fig. 17.1 spreading manure or fertilizer using broadcasting method

Figure 1

- 3 Let the learners shown in the illu...
- 4 Let the learners
- 5 Let the learners
- 6 Consolidate the



Figure 17.2: applying fertilizer using dollop method



Figure 17.3 applying fertilizer using banding method

- 3 Let the learners identify the methods of fertilizer and manure application shown in the illustrations.
- 4 Let the learners record their findings in their notebooks.
- 5 Let the learners report their findings to the class.
- 6 Consolidate the activity.

Activity 2 Apply manure and fertilizer to flowers (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- shovels
 - flower beds
 - manure
 - containers
 - 23:21:0 + 4 S fertilizer

Instructions

- 1 Let the learners be in groups.
 - 2 Let the learners review how manure or fertilizer is applied in flowers.
 - 3 Let them select the appropriate method of applying manure or fertilizer in flowers.
 - 4 Let the learners volunteer to demonstrate how to apply manure or fertilizer in flowers.
 - 5 Let the learners suggest improvements on the application of manure or fertilizer in flowers.
 - 6 Demonstrate to the learners how to apply manure or fertilizer in flowers.
 - 7 Let the learners apply manure or fertilizer to the flowers they planted and water the plants in their groups.
 - 8 Consolidate the activity.

Summary

For flowers to grow well apply manure or fertilizers. It is important to apply well-decomposed manure. This manure can be compost or animal. These are mainly two types of fertilizer that are applied to flowers, these are 23:21+04S and CAN.

Review exercise

Let the learners do the exercise on page 59 of their books.

Time allocation: 3

Introduction

In standard 6, the life cycle of a plant is controlled.

In this unit, the learner will learn how to control them. The learner will learn how to identify and control them as well.

Success criteria

By the end of this unit

- weed flower garden

Developmental

Skills

Ensure that the learners are weeding in flower gardens.

Knowledge and

Ensure that learners

Values and attit

Ensure that the learner
when weeding in flower

Special needs ed

Ensure that the activity needs. Observe and curriculum with ease.

Background In

Common weeds

Some of the weeds include galisoga. A flower grows

Methods of weed

In a flower garden,

UNIT18 Weed control in flowers

Time allocation: 3 Periods

Introduction

In standard 6, the learners learnt some common weeds of crops and how to control them. Flowers like any other crops, get affected by weeds. These weeds must be controlled.

In this unit, the learners will learn about weeds in flower gardens and methods of controlling them. This will help them to identify the weeds in their flower gardens and control them appropriately.

Success criteria

By the end of this unit, learners must be able to:

- weed flower gardens

Developmental areas

Skills

Ensure that the learners develop skills such as observing, recording, reporting and weeding in flower gardens

Knowledge and concepts

Ensure that learners understand the process of weeding in flowers

Values and attitudes

Ensure that the learners appreciate the importance of using appropriate methods when weeding in flower gardens.

Special needs education

Ensure that the activities are adapted for the learner with special educational needs. Observe and record their performance. This will help them to access the curriculum with ease develop their potential and become self-reliant.

Background Information

Common weeds in flower gardens

Some of the weeds in flower gardens are star grass, datura, oxalis, chisoso, Tridax, galisoga. A flower garden has to be free from weeds for it to be beautiful.

Methods of weed control in flower gardens

In a flower garden, weeds can be controlled using the following methods:

- Hand weeding - it involves uprooting the weed
- Light hoeing - weeds are scraped off using a hoe
- Slashing - it involves reducing the height of weeds by using slashers
- Chemical weeding - it involves spraying herbicides to kill the weeds or prevent germination of weed seeds

Guide lines when weeding flower beds

The following guidelines should be observed when weeding flower gardens:

- Ensure that weeds are well controlled.
- Avoid destroying the flower plants.
- Ensure the garden is left neat.

When to use different methods of weeding

Method	When
Hand weeding	<ul style="list-style-type: none"> • when weeds are very close to plants • when flower plants are closely space
Light hoeing	<ul style="list-style-type: none"> • when space between flowers allows use of a hoe without damaging the flower
Slashing	<ul style="list-style-type: none"> • when flowers are widely spaced
Chemical weeding	<ul style="list-style-type: none"> • when controlling weed before they emerge killing the weeds using selective herbicides

Activities

Activity 1 Discussing methods of weed control in flower gardens (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- flower garden with weeds
- resource person

Instructions

- 1 Let the learners find out the following information from the community:
 - a. methods used when weeding
 - b. description of each method
 - c. when the methods are used.
- 2 Let the learners record their findings.
- 3 Let the learners study illustrations 18.1 - 18.3 on pages 60 - 61 of their books.



Figure 18.1 :

4 Let the learners

5 Let the learners

6 Consolidate the

Activity 2 Wee

Teaching, learning a

You will need the fo

- slashers
- handforks
- flower garden w
- hoes
- learners' experie



Figure 18.1 : Situation for hand weeding



Figure 18.2 : Situation for slashing



Figure 18.3 : Situation for light hoeing

4 Let the learners name the method of controlling weeds in each illustration.

5 Let the learners record and report their responses.

6 Consolidate the activity.

Activity 2 Weeding in flower gardens (2 periods)

Teaching, learning and assessment resources

You will need the following resources:

- slashers
- handforks
- flower garden with weeds
- hoes
- learners' experiences

UNIT 19 Test

Time allocation: 6

Introduction

In unit 18, the learners will learn how to care for gardens. Weeding is important to keep plants healthy and beautiful.

In this unit, the learners will learn about thinning and trimming trees to increase the safety and beauty of their forests.

Success criteria

By the end of this unit

- tend flowers

Developmental Skills

Ensure that the learners are communicating

Knowledge and

Ensure that learners
reasons and procedu

Values and attitu

Ensure that learners
and responsibility in

Special needs ed

Ensure that the active curriculum with ease.

Background in

Meaning of thin

Thinning is the removal

Reasons for thin

It is done to:

110

UNIT 19 Tending flowers

Time allocation: 6 periods

Introduction

In unit 18, the learners learnt about different methods of weeding in flower gardens. Weeding is done to keep flowers healthy and beautiful. Flowers can also be kept healthy and beautiful by tending them in different ways.

In this unit, the learners will learn some ways of tending flowers such as pruning, thinning and trimming. This knowledge will help them to maintain the healthy and beauty of their flowers.

Success criteria

By the end of this unit, the learners must be able to:

- tend flowers

Developmental areas

Skills

Ensure that the learners develop skills such as observing, reporting, manipulating and communicating

Knowledge and concepts

Ensure that learners develop knowledge and an understanding of the meaning, reasons and procedures for pruning, thinning and trimming flowers.

Values and attitudes

Ensure that learners acquire values and attitudes of unity, caring, resourcefulness and responsibility in taking care of flowers.

Special needs education

Ensure that the activities are adapted for learners with special educational needs. Observe and record their performance. This will help them to access the curriculum with ease, develop their potentials with and become self-reliant.

Background information

Meaning of thinning

Thinning is the removal of excess plants on a flower bed or field.

Reasons for thinning

It is done to:

- reduce competition between the plants for nutrients, air, water, space and sunshine.
- ensure healthy growth of the flowers
- maintain beauty of the flowers

Procedures for thinning

- water the flower beds to make the soil moist
- uproot weak, diseased or any excess plants leaving the correct number per station.

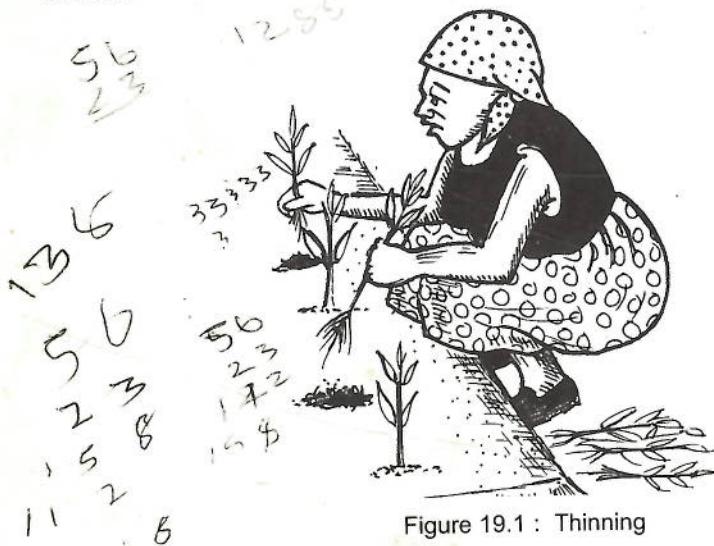


Figure 19.1 : Thinning

Meaning of pruning

Pruning is the removal of unwanted parts of a flower plant such as dead, old, excess and diseased branches, leaves and flowers.

Reasons for pruning

- improve quality of the flowers
- maintain plant health
- restrict growth
- train the plants

Procedure for pruning flowers

- remove dead, old and diseased leaves
- remove dead heads and fading flowers
- remove branches which are dead, trailing, diseased, excess and off shape by cutting them from the bottom upward to avoid tearing the flower plant. The cutting should be done at an angle to facilitate water drainage.



Figure 19.2 : Prunning

Meaning of trimming

Trimming is the cutting back of flower branches

Reasons for trimming

Trimming is done to:

- make a desirable shape
- make flower plants become less bushy
- restrict growth

Procedure for trimming

- measure the desirable height and mark
- cut back the branches to the intended height
- cut the branches to the desirable shape



Figure 19.3 : Trimming

Activities

Activity 1 Discussing thinning (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences

Instructions

- 1 Let the learners study figure 19.1.
- 2 Let the learners describe what they see.
- 3 Let the learners brainstorm the meaning of thinning.
- 4 Let the learners discuss the reasons for thinning and how to thin flowers.
- 5 Let the learners record their responses in their notebooks.
- 6 Let the learners report their findings to the class.
- 7 Summarise by explaining to the learners the meaning, importance and procedure for thinning.

Activity 2 Discussing pruning (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences

Instruction

- 1 Let the learners stu
- 2 Let the learners de
- 3 Let the learners br
- 4 Let the learners di
- 5 Let the learners re
- 6 Let the learners re
- 7 Summarise by ex
procedure for pru

Activity 3 Discuss

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- learners' experie

Instructions

- 1 Let the learners stu
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- 4 Let the learners di
- 5 Let the learners re
- 6 Let the learners re
- 7 Summarises by ex
procedure for trin

Activity 4 Practi

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Suggested teaching, la

You will need the follo

- learners' experienc
- panga knives
- secateurs
- bow saws
- watering cans
- check list
- water

Instruction

- 1 Let the learners study figure 19.2.
- 2 Let the learners describe what they see.
- 3 Let the learners brainstorm the meaning of pruning.
- 4 Let the learners discuss the reasons for pruning and how to prune flowers.
- 5 Let the learners record their findings in their notebooks.
- 6 Let the learners report their findings to the class.
- 7 Summarise by explaining to the learners the meaning, importance and procedure for pruning.

Activity 3 Discussing trimming (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences

Instructions

- 1 Let the learners study figure 19.3.
- 2 Let the learners describe what they see.
- 3 Let the learners brainstorm the meaning of trimming.
- 4 Let the learners discuss the reasons for trimming.
- 5 Let the learners record their findings in their notebooks.
- 6 Let the learners report their findings to the class.
- 7 Summarises by explaining to the learners the meaning, importance and procedure for trimming.

Activity 4 Practicing thinning, pruning and trimming flowers (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- panga knives
- secateurs
- bow saws
- watering cans
- check list
- water

ime allocation: 10

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inning and trimminthis unit, the learners
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controlling them.**uccess criteri**y the end of this un
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background inf

ests and disease

ests and diseases ca

pest and disease pr

Instructions

- 1 Take the learners to flower beds.
- 2 Explain to the learners how to thin, prune and trim flowers.
- 3 Demonstrate how to thin, prune and trim flowers.
- 4 Put the learners in small groups.
- 5 Distribute thinning, pruning and trimming materials to the learners.
- 6 Let the learners thin, prune and trim flowers.
- 7 Assess the learners using a check list.

Summary

Flowers have to be tended by thinning, pruning and trimming. This should be done using appropriate procedures and tools. If properly done, this will improve growth, maintain the health and beauty of the flowers.

Review exercise

Let the learners do the exercise on page 65 of their books.

Glossary

- Restrict : prevent fast growth
Tending : caring for

UNIT 20 Pest and disease control in flowers

Time allocation: 10 periods

Introduction

In unit 19, the learners learnt about tending flowers. They learnt how thinning, trimming and pruning can be done. They also learnt the reasons for pruning, thinning and trimming of flowers.

In this unit, the learners will learn about pest and disease control in flowers. This will help learners to identify pests and diseases of flowers and be able to find ways of controlling them.

Success criteria

By the end of this unit, the learners must be able to:

- describe pests and diseases of flowers
- control pests and diseases in flowers

Developmental areas

Skills

Ensure that the learners develop skills such as observing, collecting, recording and reporting.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of pests and diseases of flowers and how to control them.

Values and attitudes

Ensure that the learners acquire values and attitudes to appreciate the needs for controlling pests and diseases of flowers.

Special needs education

Ensure that the activities are adapted for learners with special educational needs. This will help them to access the curriculum with ease, develop their potentials and become self - reliant. Observe and record their performance.

Background information

Pests and diseases of flowers

Pests and diseases cause damage and loss to flower production. Early identification of pest and disease problems is essential in maintaining healthy flowers.

1 Pests of flowers

There are many pests that cause damage to flowers mealy bugs and aphids as shown in the illustrations below:

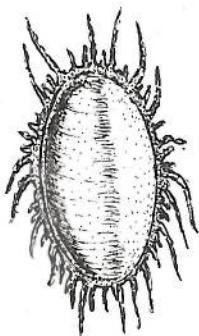


Figure 20.1: A mealy bug

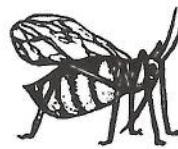


Figure 20.2: An Aphid

Mealy bugs

These are found on the undersides and axils of leaves and young shoots. They produce a sticky substance called honeydew on which grows a black mould. They live by sucking plant juices. They can be controlled by using clean planting materials.

Aphids

These cause twisting of leaves and flowers. They also produce sticky substances called honeydew that attracts ants. They can be controlled by using dimethoate or marathion, hot papper and garlic

Scaley insects

They are identified as bumps on stems and undersides of leaves where they produce substance called honeydew resulting in stunted growth. They live by sucking plant juices. They can be controlled by Marathion or Noadazinon.

White flies

They are found on the undersides of the leaves and produce sticky substance called honeydew where a black mould can develop. They live by sucking plant juices. They can be controlled by using clean planting materials

Spider mites

These are found on the undersides of leaves. They suck plant juices. They can be controlled by interplanting with strong smelling plants like marigold and using Dimethoate, Actellic and Rogor

Slugs or Snails

They are found around dark, moist, decaying matter. They eat leaves. They can be controlled by hand picking or use of sodium bicarbonate and common salt.

2 Diseases of

Some of the disease

Grey mould

This is caused by rot. It can be controlled also be controlled

Beech bark disease

This is a disease that penetrates inwardly into the tree to minimize

Giant polyporum

The disease is caused by attacks the roots.

Activities

Activity 1

Suggested teaching

You will need the following

- school or near
- pictures of pests
- pesticides
- charts of pests

Instructions

- 1 Let the learners draw the different types of pests.
- 2 Let them discuss the ways of controlling them.
- 3 Organise a visit to a garden to identify the pests.
- 4 During the visit, let the learners draw the pests.
- 5 Let the learners identify the pests.
- 6 Let the learners draw the illustrations in their exercise books.
- 7 Let the learners draw the illustrations in their exercise books.
- 8 Let the learners draw the illustrations in their exercise books.
- 9 Let them report on the pests.
- 10 Show the learners the different types of pests during the field trip.

2 Diseases of flowers

Some of the diseases which attack flowers are:

Grey mould

This is caused by fungus. It affects leaves, flowers and roots which wilt, die and rot. It can be controlled by cutting away the dead rotting part and burn it. It can also be controlled by applying fungicides.

Beech bark disease

This is a disease caused by fungus spread by scale insect. It affects the bark and penetrates inwards until the tree dies. It can be controlled by felling the infected tree to minimize the spread of disease.

Giant polypore fungus

The disease is caused by fungus. It usually affects mature or over-mature trees. It attacks the roots. It also can be controlled by cutting down the tree and burn it.

Activities

Activity 1 Controlling pests of flowers (5 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- school or nearby flower garden
- pictures of pests
- pesticides
- charts of pests of flowers

Instructions

- 1 Let the learners brainstorm common pests of flowers.
- 2 Let them discuss the common pests of flowers.
- 3 Organise a visit to a nearby flower garden.
- 4 During the visit let the learners collect some samples of pests of flowers.
- 5 Let the learners study figure 20.1 - 20.2 on page 65 of their books.
- 6 Let the learners compare the pests they collected with those shown in the illustrations in their books.
- 7 Let the learners identify the pests collected and those shown in the illustrations in their books.
- 8 Let the learners record their observations in their notebooks.
- 9 Let them report their findings to the class for discussions.
- 10 Show the learners a chart of pests to compare it with the pests they collected during the field visit.

- 11 Discuss with the learners the damage caused by each pest.
- 12 Let the learners discuss ways of controlling each pest.
- 13 Let the learners record their findings in their notebooks.
- 14 Let the learners report their findings to the class for discussions.
- 15 Summarise the damage caused and ways of controlling each pest.
- 16 Let the learners draw some pests of flowers in their note books.
- 17 Demonstrate to the learners how to control pests of flowers.
- 18 Let the learners control some pests of flowers under your supervision.

Activity 2 Controlling common diseases of flowers (5 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- school or nearby flower garden
- samples or pictures of diseased flowers
- learners' experiences
- fungicides or recommended chemicals

Instructions

- 1 Let the learners brainstorm in groups the common diseases of flowers.
- 2 Let them discuss the common diseases of flowers.
- 3 Organise a visit to a flower garden.
- 4 Let learners collect samples of diseased flowers.
- 5 Let the learners record their findings in their notebooks.
- 6 Let them report their findings to the class for discussions.
- 7 Discuss with learners the common diseases of flowers.
- 8 Let the learners discuss the damage caused by each disease.
- 9 Let the learners discuss ways of controlling each disease.
- 10 Let the learners record their findings in their notebooks.
- 11 Let the learners report their findings to the class for discussions.
- 12 Summarise the damage caused and ways of controlling each disease.
- 13 Demonstrate how to control the diseases of flowers.
- 14 Let the learners control some diseases of flowers in the school flower garden under your supervision.

Summary

Pests and diseases are dangerous to flower production because they cause a lot of damage and losses. There are a number of pests and diseases that attack flowers which a farmer needs to know. In order to protect and maintain healthy flowers

the farmer has to id

Review exercise

Let the learners do

the farmer has to identify these common pests and diseases early and control them.

Review exercises

Let the learners do the exercise on page 67 - 68 of their books.



UNIT 21 Harvesting flowers

Time allocation: 7 periods

Introduction

In unit 20, the learners learnt about pests and diseases of flowers and their control. Controlling pests and diseases helps to maintain the healthy and beauty of flowers. The flowers must be harvested when they are ready to avoid loss of quality.

In this unit, the learners will learn how to harvest and preserve flowers. This knowledge will help them to know when to harvest flowers and choose the best way of preserving flowers.

Success criteria

By the end of this unit, the learners must be able to:

- harvest flowers

Developmental areas

Skills

Ensure that the learners develop skills such as observing, harvesting and preserving flowers.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of how to harvest and preserve flowers.

Values and attitudes

Ensure that the learners acquire values and attitudes to appreciate the importance of harvesting and preserving flowers .

Special needs education

Ensure that the activities are adapted for learners with special educational needs. This will help them to access the curriculum with ease, develop their potentials and become self-reliant. Observe and record their performance.

Background information

Harvesting flowers

There are three products that can be harvested from flowers and shrubs.

- True seeds

Mature seeds are collected, dried and stored in a container for future use.

- Cuttings
Pruned h
in a soak
be used fo

- Real flow

These are

Procedure

The best stag

Generally, flo

The bud shou

Cut the flower
dried.

Use a pair of
materials sho
crushed. Crus
reducing thei

Preserving

Flowers may

- Air drying

Flowers ar
dry room t

- Pressing

Flowers ar
paper are p
board. The

- Dipping in

Flowers are
Freshly har
preservativ

- Drying in s

Silica gel ab
container w
should be s

Activities

Activity 1

Suggested tea

You will need t

- Cuttings

Pruned healthy branches can be used as seed for propagation. Wrap the cutting in a soaked hessian sack for storage. For most shrubs and trees the branches can be used for firewood and poles.

- Real flowers (cut flowers)

These are cut fresh for display or sale.

Procedure

The best stage to harvest/cut flowers for sale depends on the types of flowers. Generally, flowers must be harvested just before or as soon as they reach maturity. The bud should not be completely open.

Cut the flowers during the cool morning hours. At that time the dew should be dried.

Use a pair of scissors, garden share, secuture and knives to cut the flower. These materials should be kept sharp to ensure that stems are cut evenly and not crushed. Crushed stems restrict the ability of the flowers to take up water thereby reducing their life.

Preserving flowers

Flowers may be dried in several ways for bouquets or wreath arrangements.

- Air drying

Flowers are cut at uniform length and hang upside down in bunches in a dark, dry room to prevent fading of colour through sunlight

- Pressing

Flowers are pressed between newspapers. Alternating layers of flowers and paper are placed between two boards. A heavy object is then placed on the top board. The pressed flowers are usually stored in the stuck until needed.

- Dipping in a mixture of water and glycerine

Flowers are dipped in a solution of water and glycerine for two to three weeks. Freshly harvested flowers should be placed in luke warm water that has floral preservatives. The preservatives increase the flowers' life.

- Drying in silica gel

Silica gel absorbs moisture from flowers. Flowers are placed in a closed container with silica gel. It is recommended that flowers dried in this way should be stored and displayed in the closed containers to keep out moisture.

Activities

Activity 1 Harvesting flowers (4 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- school flower garden or nearby flower garden
- samples or pictures of mature flowers
- learners' experiences

Review exercise

Let the learners do

Glossary

bouquets : bunches

wreath : ring

Instructions

- 1 Let the learners work in groups.
- 2 Let them brainstorm flower products that can be harvested.
- 3 Let them discuss flower products that can be harvested.
- 4 Let them discuss how the flower products are used.
- 5 Let them discuss how cut flowers are harvested.
- 6 Let them record their findings in your notebooks.
- 7 Let them report their findings to the class.
- 8 Consolidate products and procedure for harvesting flowers.
- 9 Demonstrate how to harvest flowers.
- 10 Let the learners harvest flowers under your supervision.

Activity 2 Preserving flowers (3 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- school flower garden or nearby flower gardens
- preserving agents
- learners' experiences

Instructions

- 1 Let the learners be in groups and brainstorm ways of preserving flowers.
- 2 Let them discuss ways of preserving flowers.
- 3 Let them record their findings in their notebooks.
- 4 Let them report their findings to the class for discussions.
- 5 Consolidate the activity.
- 6 Demonstrate how to preserve flowers.
- 7 Let the learners preserve flowers under your supervision.

Summary

Flower products must be harvested at the right time using proper procedures. To keep the harvested products for a long time they must be preserved. This is done by air drying, use of glycerine, silica gel and pressing.

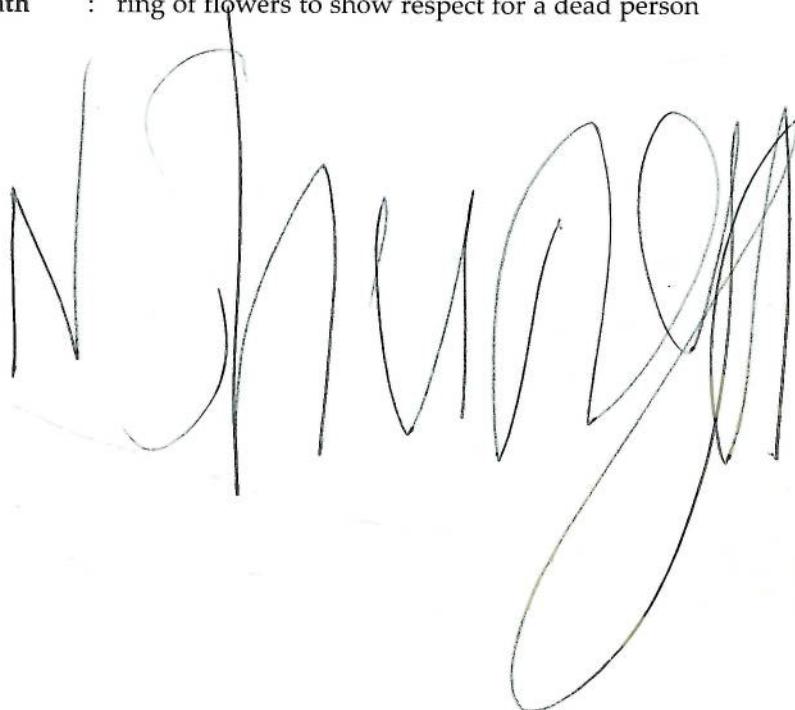
Review exercises

Let the learners do the exercise on page 70 of their books.

Glossary

Bouquets : bunch of flowers carefully and beautifully arranged

Wreath : ring of flowers to show respect for a dead person



UNIT 22 Types and importance of vegetables

Time allocation: 3 periods

Introduction

In Malawi, farmers grow different types of crops. These crops are grown for different purposes. Some of the crops grown are vegetables. Vegetables are important in many ways.

In this unit, the learners will learn types of vegetables and classify the vegetables according to their edible parts. They will also learn the importance of vegetables. This will help them to select and grow vegetables successfully.

Success criteria

By the end of this unit, the learners must be able to:

- identify types of vegetables grown in the area
- explain the importance of vegetables

Developmental areas

Skills

Ensure that the learners develop skills such as observing, drawing, classifying, recording and reporting.

Knowledge and concept

Ensure that the learners acquire knowledge and understanding of the indigenous and exotic vegetables, classification of the vegetables according to their edible part and importance of vegetables.

Values and attitudes

Ensure that the learners acquire values and attitudes to appreciate different types of vegetables and their importance.

Special needs education

Ensure that the activities are adapted for the learners with special educational needs. Observe and record their performance. This will help them to access the curriculum with ease, develop their potentials and become self-reliant.

Background information

Types of vegetables

There are two main types of vegetables. These are indigenous and exotic.

Indigenous vegetables
These are vegetables
include chisoso, mwani
ijerenjedza.

Exotic vegetables

These are vegetables
cabbage, rape, carrots

Classes of vegetables

Vegetables can be classified
of vegetables.

Leaf vegetables

Cabbage, mustard, beetroot

Root, bulb and tuberous

Carrot, European potato

Fruit vegetables

Tomatoes, Egg plant

Legume vegetables

Peas and fresh beans

Flower vegetable

Pumpkin flower, cauliflower

For some vegetables

The illustrations below



a

Indigenous vegetables

These are vegetables found naturally in a country for example Malawi. These include *chisoso*, *mwamnaaligone*, *luni*, *bonongwe*, *limanda*, *thugwi*, *chewe*, *bowa* and *njerenedza*.

Exotic vegetables

These are vegetables introduced in a country from else where. These include cabbage, rape, carrot, tomato, *bowa* and egg plants.

Classes of vegetables

Vegetables can be classified according to edible parts. The following are the classes of vegetables.

Leaf vegetables

Cabbage, mustard, bonongwe, rape and spinarch

Root, bulb and tuber vegetables

Carrot, European potatoes, onion, sweet potatoes and Beetroot.

Fruit vegetables

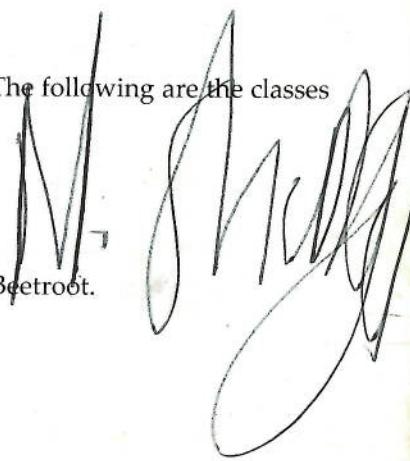
Tomatoes, Egg plants, Pepper, pumpkins, cucumbers

Legume vegetables

Peas and fresh beans, fresh cow peas

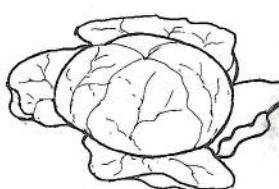
Flower vegetables

Pumpkin flower, cauliflower



For some vegetables the whole plant is eaten such as mushroom.

The illustrations below show classes of vegetables and their examples:



a



b



c



d

Figure 22.1: Classes of vegetables

Importance of vegetables

Vegetables are important in many ways. The following are some of the ways in which vegetables are important:

- Sources of food

Vegetables contain nutrients such as minerals, vitamins and proteins which are essential for good health. The proteins build and repair the body while vitamins and minerals protect it against diseases.

- Sources of income

Farmers get money when the vegetables are sold.

- Sources of employment

It is a way of earning a living. Some people are employed to work for other people while others work in their own vegetable garden.

- Sources of raw materials

Some local companies depend on vegetables as raw materials. Some vegetables are processed into different finished products eg tomato sauce, spice, tinned peas, jam.

Activities

Activity 1 Discussing types of vegetables (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- pictures
- sample of indigenous and exotic vegetables

Instructions

- 1 Arrange the learners into groups.
- 2 Let them brainstorm the types of vegetables grown in the area.
- 3 Let them discuss the indigenous and exotic vegetables grown in the area.
- 4 Give the learners samples of vegetables you have brought.
- 5 Let them put the vegetables into two groups using the table like the one on page 71 of their books.
- 6 Let them report their findings to the class.
- 7 Summarise the indigenous and exotic vegetables grown in the area.

Activity 2 Classifying vegetables according to their edible parts (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- samples of vegetables
- pictures of vegetables

Instructions

- 1 Arrange the learners into groups.
- 2 Provide them with samples of vegetables.
- 3 Let them observe the samples.
- 4 Let them classify the vegetables.
- 5 Let them record the names of the vegetables in the table like the one on page 72 of their books.
- 6 Let learners study the table.
- 7 Let them classify the vegetables.
- 8 Let them report their findings to the class.
- 9 Summarise the indigenous and exotic vegetables grown in the area.
- 10 Let them draw sketches of the vegetables.
- 11 Let the learners draw the vegetables.
- 12 Let the learners report their findings to the class.

Activity 3 Dissecting vegetables

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- bottles of processes
- pictures
- samples of vegetables
- local community members

Instructions

- 1 Arrange the learners into groups.
- 2 Let them brain storm the types of vegetables they know.
- 3 Let them discuss the types of vegetables.
- 4 Let them record the types of vegetables.
- 5 Let them report their findings to the class.
- 6 Let the learners draw sketches of the vegetables.

- learners' experiences
- samples of vegetables
- pictures of vegetables

Instructions

- 1 Arrange the learners into groups.
- 2 Provide them with samples of different vegetables.
- 3 Let them observe the samples of vegetables.
- 4 Let them classify the vegetables according to their edible parts.
- 5 Let them record their findings in their group exercise book in a table form like one on page 72 of their books.
- 6 Let learners study figure 22.1a-d on page 72 of their books.
- 7 Let them classify the vegetables according to their edible parts.
- 8 Let them report their responses to the class.
- 9 Summarise the classes of vegetables.
- 10 Let them draw some of the vegetables.
- 11 Let the learners display the drawings.
- 12 Let the learners go on gallery walk to evaluate the drawings.

Activity 3 Discussing the importance of vegetables (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- bottles of processed vegetables
- pictures
- samples of vegetables
- local community

Instructions

- 1 Arrange the learners into groups.
- 2 Let them brainstorm the importance of vegetables.
- 3 Let them discuss the importance of vegetables.
- 4 Let them record their findings in the group exercise books.
- 5 Let them report their findings to the class.
- 6 Let the learners study figure 22.2a in their books.

Time allocation:**Introduction**

In unit 14, the learners
Proper nursery beds
of good seedlings.

In this unit, the learners
vegetable nurseries
learners to establish

Success criteria

By the end of this unit,

- establish a vegetable nursery
- manage a nursery

Developmental outcomes**Skills**

Ensure that the learners
reporting, selecting, and

Knowledge and understanding

Ensure that the learners
for vegetable nurseries.

Values and attitudes

Ensure that the learners
and benefits of growing

Special needs

Ensure that the learners
Observe and record
curriculum with

Background information

Nursery establishment
Some of the activities
selection, seed sowing

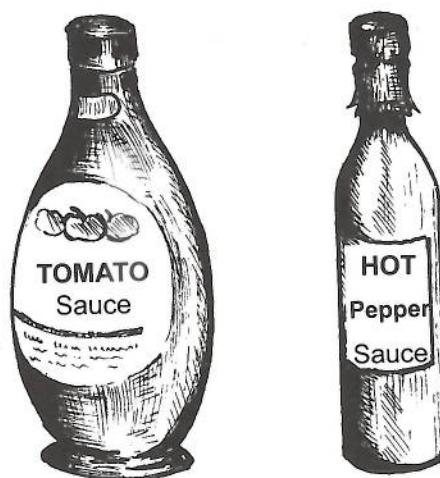


Figure 22.2 : Importance of vegetables

- 7 Let them name the products that can be made from the vegetables shown.
- 8 Summarise the importance of vegetables.

Summary

There are two types of vegetables, these are exotic and indigenous. Vegetables can be classified according to their edible parts. The classes are leaf, fruit, legume and bulb/root/tuber and flower vegetables.

Vegetables are important because they are a source of income, food, employment and raw materials.

Review exercise

Let the learners do the exercise on page 73 - 74 of their books.

Glossary

Edible : can be eaten

UNIT 23 Nursery establishment and management for vegetables

Time allocation: 6 periods

Introduction

In unit 14, the learners learnt nursery establishment and management for flowers. Proper nursery bed preparation, sowing and management will result into raising of good seedlings.

In this unit, the learners will learn activities done when preparing land for vegetable nursery and how to manage a vegetable nursery. This skill will help learners to establish and manage a vegetable nursery at home.

Success criteria

By the end of this unit, the learners must be able to:

- establish a vegetable nursery
- manage a nursery for the selected vegetable

Developmental areas

Skills

Ensure that the learners develop skills such as observing, measuring, recording, reporting, selecting and collecting.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of land preparation for vegetable nursery and vegetable nursery management.

Values and attitudes

Ensure that the learners acquire values and attitudes to appreciate the importance and benefits of proper nursery establishment and management.

Special needs education

Ensure that the activities are adapted for the learners with special education needs. Observe and record their performance. This will help them to access the curriculum with ease, develop their potentials and become self-reliant

Background information

Nursery establishment

Some of the activities involved in vegetable nursery establishment are: site selection, seed selection, seed bed preparation and sowing.

Site selection

A vegetable nursery should be near a water source near the home or school for easy management and on sandy loam soil for easy drainage.

Seed selection

It is important to select good seed for sowing to ensure high germination percentage and healthy strong seedlings. Seed can be selected from previous crop or bought. Check the expiry date to avoid buying seeds which have overstayed as this will lead to low germination percentage.

Nursery bed preparation

After selecting the site for a vegetable, it must be fenced. The land must be tilled to a depth of more than 15cm to loosen the soil and improve the drainage. The bed should be 1 metre wide and 15 cm high. A bed can be of any length. The bed must be flat to avoid run-off. Make a mixture of two parts of loam soil, one part manure and one part sand. Spread the mixture over the bed to a depth of 15 cm.

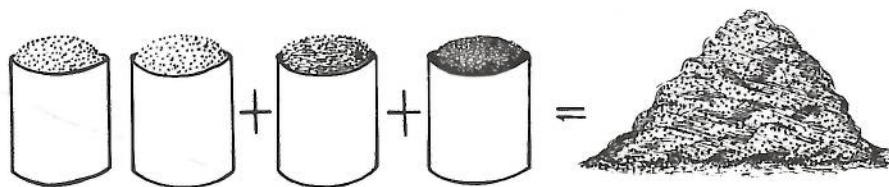


Figure 23.1: Soil mixture suitable for vegetable nursery

Sowing seeds

Large vegetable seeds such as those of pumpkins, peas, beans can be sown directly on the field beds. Small seeds should be sown in furrows (drills) 1.5cm deep and 10-20cm apart along the width of the seedbed in straight lines for easy management and extraction. Spread the seeds thinly in the furrows and cover lightly with soil.

Erect a raised mulch which will also serve as a temporary shade.

Nursery m...

Vegetable nur...
include water...

Watering

Water seedbe...
seedlings are
highest. Avoid...

Weeding

Weeding is ne...
nutrients, wat...
Hand weeding
the soil loose...

Thinning

Thinning can...
Seedlings ma...
this stage the
of roots of the...

Pest and di...

Seedlings ha...
seedlings are
summarises v...



Figure 23.2 : Raised mulch

Nursery management

Vegetable nursery management involves a number of activities. These activities include watering, weeding, thinning, pest and disease control and hardening off.

Watering

Water seedbeds in the morning and late in the afternoon every day until the seedlings are four weeks old. Avoid watering at midday when evaporation is highest. Avoid under-watering because it will result into wilting.

Weeding

Weeding is necessary to reduce competition between weeds and seedlings for nutrients, water, light and space. It also reduces the attack by pests and diseases. Hand weeding is recommended to avoid damaging roots. It is necessary to make the soil loose using a small, sharp stick or a hand folk.

Thinning

Thinning can be done when there are too many seedlings in the furrows (drills). Seedlings may be thinned to 20cm apart when they are about two weeks old. At this stage the seedlings have reached a good holding size and prevent destruction of roots of the remaining seedlings.

Pest and disease control

Seedlings have to be protected from pests and diseases. Some pests of vegetable seedlings are caterpillars, grasshoppers, nematodes and aphids. The table below summarises ways of controlling pest in a vegetable nursery.

Table 23.1 Pest control in vegetable nursery

Pest	Control
Aphids	<ul style="list-style-type: none"> • Spray marathion • Spray with tephrosia
Grasshoppers	<ul style="list-style-type: none"> • Spray Carbaryl
Cutworms	<ul style="list-style-type: none"> • Drenching the soil with actelic 1ml in 1 litre of water
Caterpillars	<ul style="list-style-type: none"> • Spray carbaryl at a rate of 85g in 14 litres of water

Spray with tephrosia liquid (soak 2 kg of crushed tephrosia in a pail overnight and spray the filtered solution the following day). Repeat the application 2-3 times a week.

All these pests can be controlled by spraying with tephrosia or using smelly mulching material like lemon grass, *mpungabwi* or plant strong smelling crops eg garlic.

Diseases

Dumping off is one of the common diseases in the vegetable nursery. It is caused by fungus and promoted by overwatering. It can be prevented by

- sowing at recommended spacing
- sterilising the soil before sowing
- dusting the seeds with a fungicide such as captain and thiram
- frequent weeding
- avoiding overwatering

Hardening off

This is the gradual reduction of frequency of watering to seedlings. This is done to prepare seedlings for the hot and dry condition in the garden. The temporary mulch should be removed in the second or third week after germination. Watering is reduced to once a day four weeks after germination.

Activities

Activity 1 Discussing steps to be followed when preparing land for vegetable nursery bed (3 periods)

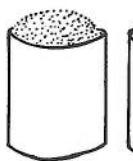
Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' ex
- measuring
- rope
- panga Knif
- pegs
- manure
- rublic
- hoes

Instructions

- 1 Organise th
- 2 Let them br
- 3 Let them di
- 4 Let them re
- 5 Let them re
- 6 Summarise
- 7 Let them st



- 8 Let them pr
- 9 Let them pr

- learners' experiences
- measuring tape/ruler
- rope
- panga Knife
- pegs
- manure
- rublic
- hoes

Instructions

- 1 Organise the learners into groups.
- 2 Let them brainstorm the steps to be followed when preparing land for vegetable nursery beds.
- 3 Let them discuss steps to be followed when preparing land for nursery beds.
- 4 Let them record their findings in their group exercise books.
- 5 Let them report their findings in the class.
- 6 Summarise the steps to be followed when preparing for vegetable a nursery.
- 7 Let them study the illustration below which is on page 75 of their books.

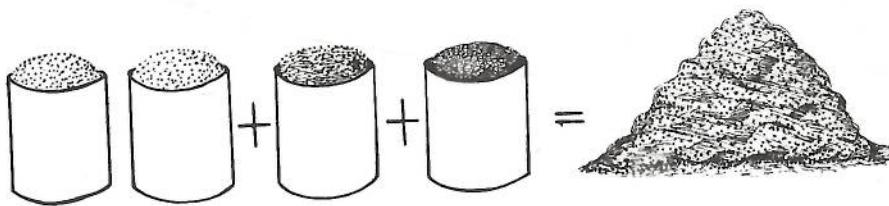


Figure 23.1: Soil mixture suitable for vegetable nursery

- 8 Let them prepare a soil mixture suitable for a vegetable nursery.
- 9 Let them prepare nursery beds for the selected vegetables under your supervision.

Table 23.2: A scoring rubric for assessing vegetable nursery establishment skills

Group number	Site selection	Seedbed preparation	Preparation of soil mixture	Sowing seeds
1				
2				
3				
4				

Scale: 1 - 4

- 1 for achieving 1 point (needs support)
- 2 for achieving 2 points (average)
- 3 for achieving 3 points (good)
- 4 for mastering the skill (excellent - needs enrichment)

What is expected on each skill

- a. Site selection
 - i. nearness to water supply
 - ii. near home or school
 - iii. sandy loam soil
- b. Seed bed preparation
 - i. illing the soil 15cm deep
 - ii. breaking soil lumps to fine tilth
 - iii. measuring width not beyond 1m
 - iv. leveling the soil
- c. Preparation of soil mixture
 - i. collecting sand manure and top soil
 - ii. using equal sized containers
 - iii. mixing the component in connect ratio 2 part top soil + past manure + 1 part sand
 - iv. adequate turning of the mixture
 - v. spreading mixture on the seedbed 15cm thick.

- d. Sowing the seeds
 - i. correctly
 - ii. digging holes
 - iii. covering seeds
 - iv. covering seeds

10 Assess the performance

Activity 2 Dissemination of knowledge

Suggested teaching and learning activities

- learners' experience
- hoes
- water
- checklist
- vegetable seeds
- measuring tape
- watering can

Instructions

- 1 Organise the learners
- 2 Let them brain storm
- 3 Let them discuss
- 4 Let them record
- 5 Let them report
- 6 Ask the learners

Fig. 23.3a :

- d. Sowing the seeds
- correct many of planting holes/drills
 - digging planting holes at correct depth
 - correct placement of the seeds
 - coverage of the seeds/farrow.

10 Assess the performance of the learners using your checklist.

Activity 2 Discussing steps to be followed when managing a vegetable nursery (3 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- hoes
- water
- checklist
- vegetable seeds
- measuring tape/ruler
- watering can

Instructions

- 1 Organise the learners into groups.
- 2 Let them brainstorm steps to be followed when managing a vegetable nursery.
- 3 Let them discuss steps to be followed when managing a vegetable nursery.
- 4 Let them record their findings in the group exercise book.
- 5 Let them report their findings to the class.
- 6 Ask the learners to study figure 23.2a and b on page 76 of their books.



Fig. 23.3a : Wrong method of weeding



b: Correct method of weeding

- 7 Let them identify who is properly weeding the nursery bed.
- 8 Summarise the management activities for a vegetable nursery bed.
- 9 Let them manage the nursery beds under your supervision.
- 10 Assess the performance of the learners using your checklist.

Summary

The main activities when establishing land for a vegetable nursery include site selection, land clearing, tilling, breaking of soil lumps and making soil mixture, and sowing.

Vegetable nursery management involves a number of activities. Some of them are watering, weeding, thinning, pest and disease control and hardening off.

Review exercise

Let learners do the exercise on page 76 of their books.

Glossary

Sterilizing : killing soil pests and weed seeds

Time allocation

Introduction

In unit 15, the learners will learn about growing flowers. Vegetables are also part of the curriculum. In this unit, learners will learn how to grow vegetables. They will learn about the different types of vegetables. They will also learn how to properly land for vegetables.

In this unit, the learners will learn about growing leaf vegetables. They will learn about the different types of leaf vegetables. They will also learn how to properly land for leaf vegetables.

Success criteria

By the end of this unit, learners will be able to:

- choose a suitable site for a vegetable nursery
- prepare land for a vegetable nursery

Developmental outcomes

Skills

Ensure that the learners can:

- identify the characteristics of a suitable site for a vegetable nursery
- identify the characteristics of a suitable land for a vegetable nursery

Knowledge and understanding

Ensure that the learners understand the following concepts:

- characteristics of a suitable site for a vegetable nursery
- characteristics of a suitable land for a vegetable nursery

Values and attitudes

Ensure that the learners have the following correct values and attitudes:

- respect for the environment
- appreciation of the importance of growing vegetables

Special needs

Ensure that the activities are accessible to all learners. Observe and record the progress of learners with special needs. Adapt the curriculum with special needs in mind.

UNIT 24 Site selection and land preparation for growing leaf vegetables

Time allocation: 8 periods

Introduction

In unit 15, the learners learnt site selection and land preparation for growing flowers. Vegetables like other crops need good soil and suitable climatic conditions. In addition, vegetables need well prepared land for them to grow well and give high yields.

In this unit, the learners will learn the characteristics of a suitable site for growing leaf vegetables and the activities done when preparing land for growing leaf vegetables. The knowledge and skills acquired will help the learners to prepare properly land for growing leaf vegetables.

Success criteria

By the end of this unit, the learners must be able to:

- choose a suitable site for growing the selected vegetables
- prepare land for growing selected vegetables

Developmental areas

Skills

Ensure that the learners develop skills such as observing, measuring, preparing land, reporting and recording.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of the characteristics of suitable site for growing leaf vegetables and activities involved in land preparation for growing leaf vegetables.

Values and attitudes

Ensure that the learners acquire values and attitudes to appreciate the benefits of following correct procedures when preparing land for growing leaf vegetables.

Special needs education

Ensure the activities are adapted for the learners with special educational needs. Observe and record their performance. This will help them to access the curriculum with ease, develop their potentials and become self-reliant.

Background information

Choosing a site for vegetable garden

There are many factors to be considered when choosing a site for a vegetable garden. The following are some of them:

Water supply

The site should have a permanent water supply nearby. It might be a river, a dam, a lake, a well, a tap or a borehole.

Type of soil

Most leaf vegetables grow best on well-drained sandy loam soils. Vegetables can also do well on other types of soils if they are improved by applying farmyard or compost manures.

Nearness to home or school

Vegetable garden must be near a home or a school for easy caring. People and animals can easily be prevented from destroying vegetables.

Nearness to market

A commercial vegetable garden should be near a market. This will make it easy for vegetables to be transported cheaply and sold while they still fresh and tasty. Many customers will also find it easy to buy the vegetables from the garden.

Land preparation

Land preparation for leaf vegetable growing include:

- clearing the site for field beds
- making a fence to protect the vegetables from animals
- tilling the land to a depth of 20cm

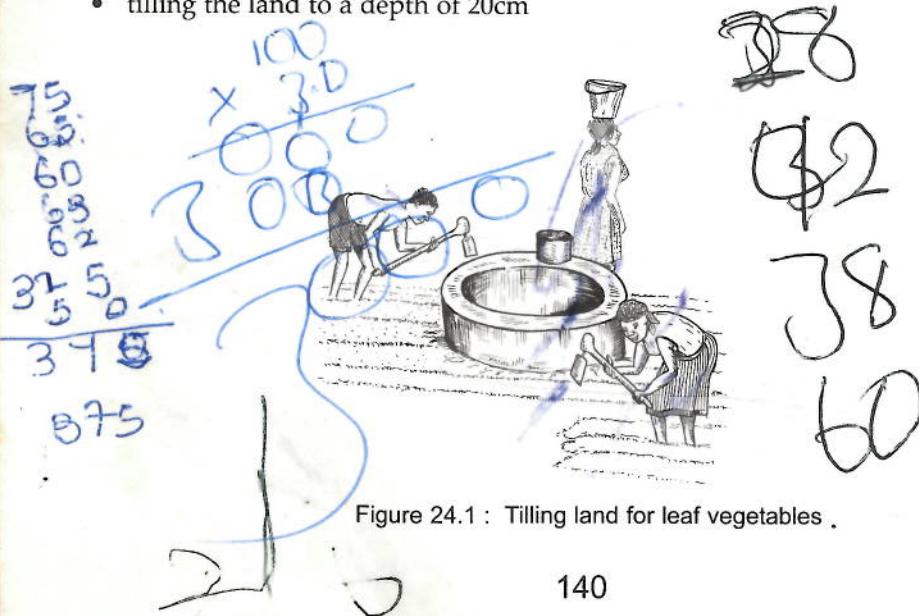


Figure 24.1 : Tilling land for leaf vegetables .

- breaking large stones
- marking out the boundaries
- The length of the boundaries to be produced
- spreading compost
- raking the manure
- leveling the ground

Activities

Activity 1 Designing a garden

Suggested teaching

You will need the following:

- learners' experience

Instructions

- 1 Organise the learners into groups.
- 2 Let them brain storm.
- 3 Let them discuss their ideas.
- 4 Let them record their designs.
- 5 Let them report their designs.
- 6 Summarise the designs.

Activity 2 Soil testing

Suggested teaching

You will need the following:

- learners' experience
- school gardener

Instructions

- 1 Organise the learners into groups.
- 2 Take the learners to a local garden to grow vegetables.
- 3 Let the learners take soil samples from different parts of the garden.
- 4 Let them select the best sample.
- 5 Let learners record the results for particular sites.
- 6 consolidate the results.

- breaking large lumps of soil
- marking out beds. A bed should be 1 metre in width. It can be of any length. The length of the bed depends on availability of land and amount of vegetables to be produced
- spreading compost or farmyard manure or fertilizer over the bed
- raking the manure and fertilizer into the soil
- leveling the ground

Activities

Activity 1 Discussing the characteristics of a suitable site for growing leaf vegetables (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences

Instructions

- 1 Organise the learners into groups.
- 2 Let them brainstorm the characteristics of a suitable site for growing vegetables.
- 3 Let them discuss the characteristics of a suitable site for growing vegetables.
- 4 Let them record their findings in the group exercise book.
- 5 Let them report their findings to the class.
- 6 Summarise the characteristics of a suitable site for growing vegetables.

Activity 2 Selecting site for growing leaf vegetables (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- school garden

Instructions

- 1 Organise the learners into groups.
- 2 Take the learners out to scout the school area to choose a suitable site for growing vegetables.
- 3 Let the learners review the characteristics of a suitable site.
- 4 Let them select the suitable site for growing vegetables.
- 5 Let learners report to the whole class why the groups have selected the particular sites.
- 6 consolidate the characteristics of a suitable site for growing vegetables.

Activity 3 Constructing a fence around the selected site (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- school garden
- panga knife
- strings
- measuring tapes/ rulers
- thatching grass
- poles
- bamboos
- kitchen knives
- reeds
- pegs

Instructions

- 1 organise the learners into groups.
- 2 Let the learners agree on the size of the fence they want to construct.
- 3 Let the learners suggest resources and quantities needed.
- 4 Let the learners measure and mark the boundaries of the fence.
- 5 Let them construct the fence.
- 6 Supervise the construction of the fence around the chosen vegetable site.

Activity 4 Discussing the activities done when preparing land for growing leaf vegetables (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources

- learners' experiences

Instructions

- 1 Organise the learners into groups.
- 2 Let them brainstorm the activities done during land preparation for vegetable growing.
- 3 Let them discuss the activities done when preparing land for vegetable growing.
- 4 Ask the learners to study figure 24.1 on page 78 of their books.
- 5 Let them identify the activity being illustrated.
- 6 Let them record their findings in the group exercise book.

7 Let them report

8 Summarise the

Activity 5 Preparing land for growing vegetables

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- hoes
- panga knives
- ppregs
- strings
- ruler
- measuring tape
- rake
- manure

Instructions

- 1 Organise the learners into groups.
- 2 Let the learners agree on the size of the fence they want to construct.
- 3 Let the learners suggest resources and quantities needed.
- 4 Let the learners measure and mark the boundaries of the fence.
- 5 Let them construct the fence.
- 6 Supervise the construction of the fence around the chosen vegetable site.
- 7 Consolidate the findings.

Summary

In order to obtain good yields, the following activities should be considered:
1. Permanent water source
2. Suitable soil. Mould the soil well before sowing.

Correct land preparation activities done when preparing land for vegetable growing include tilling, breaking up the soil, adding manure and fertiliser.

- ods)
- 7 Let them report to the class.
 - 8 Summarise the activities done during land preparation for vegetable growing.

Activity 5 Preparing land for growing leafy vegetables (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- hoes
- panga knives
- pegs
- strings
- ruler
- measuring tapes
- rake
- manure

Instructions

- 1 Organise the learners into groups.
- 2 Let the learners go to the selected site for vegetable growing.
- 3 Let the learners review the activities which are carried out when preparing land for growing vegetables.
- 4 Let the learners prepare land for growing vegetables.
- 5 Supervise the learners activities.
- 6 Let the learners assess other group's work and suggest improvement.
- 7 Consolidate the activity.

Summary

In order to obtain high yields in vegetable production there are some factors which should be considered when choosing a site. These factors include nearness to permanent water supply, nearness to home or school, nearness to market and suitable soil. Most vegetables do well on well-drained sandy loam soils.

ble
wing

Correct land preparation is also important in vegetable growing. The main activities done when preparing land for vegetable growing are land clearing, tilling, breaking large lumps of soil, leveling and spreading compost or farmyard manure and fertilizer.

Review exercise

Let the learners do the exercise on page 79 of their books.

Time allocation**Introduction**

In unit 16, the beds. Vegetable beds. Seedlings right size or h

In this unit, the and the correct to the field beds establish their

Success criteria

By the end of

- transplant

Development**Skills**

Ensure that the

Knowledge

Ensure that the to transplant

Values and attitudes

Ensure that the leaf vegetables

Special needs

Ensure the access Observe and curriculum w

Background**Transplanting**

Most leaf vegetables after sowing. height of 10 to 15 cm

UNIT 25 Transplanting leaf vegetables

Time allocation: 4 periods

Introduction

In unit 16, the learners learnt how to transplant flower seedlings on to the flower beds. Vegetable seedlings on a nursery bed have to be transplanted on to the field beds. Seedlings should be transplanted following proper procedures and at the right size or height.

In this unit, the learners will learn when and how to transplant vegetable seedlings and the correct spacing when transplanting the selected leaf vegetable seedlings on to the field beds. The knowledge and skills acquired will help the learners to establish their own vegetable garden.

Success criteria

By the end of this unit, the learners must be able to:

- transplant vegetables seedling at the correct spacing

Developmental areas

Skills

Ensure that the learners develop skills such as observing, recording, reporting.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of when and how to transplant leaf vegetable seedlings.

Values and attitudes

Ensure that the learners acquire values and attitudes to appreciate the growing of leaf vegetables.

Special needs education

Ensure the activities are adapted for the learners with special educational needs. Observe and record their performance. This will help them to access the curriculum with ease, develop their potentials and become self-reliant.

Background information

Transplanting vegetable seedlings

Most leaf vegetable seedlings are ready for transplanting in about 4 to 5 weeks after sowing. This is when most seedlings have reached the recommended size or height of 10 to 15 centimetres.

Seedlings should be transplanted late in the afternoon on a cool, cloudy or rainy day so that they do not wilt.

Seedlings are hardened-off before transplanting. Hardening-off is done by reducing the frequency of watering seedlings to once per day for a period of 1 to 2 weeks before transplanting. The seedlings can be left without watering for the last 2 to 3 days before transplanting.

The table 25.1 below shows the recommended spacing between rows and plants of some leaf vegetables.

Table 25.1 Recommended spacing for some leaf vegetables

Vegetable	Spacing (cm)	
	Between rows	Between plants
Cabbage	50	50
Rape	30	50
Bonongwe (Amaranthus)	30	30
Mustard	45	60
Chinese cabbage	45	60
Lettuce	30	30

The steps to follow when transplanting leaf vegetable seedlings are as follows:

- water the nursery beds thoroughly
- water the field beds thoroughly
- mark out the planting holes at the right distances in a straight line in the field beds
- dig holes in the positions marked
- lift the seedlings out of the nursery bed with as much soil as possible around the roots and place them in an open container as shown below:



Figure 25.1: Lifting a leaf vegetable seedling from a nursery

- place the seedling carefully into the planting hole without bending the roots.
- fill the hole with soil up to the collar mark of the seedling. Press the soil around the plant firmly and gently with fingers.
- mulch the beds
- Water the beds

Activities

Activity 1 Discussing when and how to transplant leaf vegetables seedlings (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources

- learners' experiences

Instructions

- 1 Organise the learners into groups.
- 2 Let them brainstorm when and how to transplant leaf vegetable seedlings.
- 3 Let them discuss when and how to transplant leaf vegetable seedlings.
- 4 Let them record their findings in their group exercise books.
- 5 Let them report their findings to the class.
- 6 Summarise when and how to transplant leafy vegetable seedlings.

Activity 2 Discussing the recommended spacing for the selected leaf vegetables (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- agricultural reference books

Instructions

- 1 Organise the learners into groups.
- 2 Let them brainstorm the recommended spacing for the selected leaf vegetables.
- 3 Let them discuss the recommended spacing for the selected leaf vegetables.
- 4 Provide the learners with agricultural reference books.
- 5 Let the learners compare their findings with information from the agricultural reference books .
- 6 Let them record their findings in their group exercise books using a table like table 25.1 on page 80 of their books.
- 7 Let them report their findings to the class.
- 8 Summarise the recommended spacing for the selected leaf vegetables.

Activity 3 Transplanting leaf vegetable seedlings at the recommended spacing (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- seedlings
- water
- watering cans
- trowels
- rulers
- strings
- pegs
- school vegetable garden

Instructions

- 1 Organise the learners into groups.
- 2 Let the learners review how to transplant vegetable seedlings.
- 3 Let the volunteers demonstrate how to transplant vegetable seedlings.
- 4 Let the learners suggest improvements.

- 5 Demonstrate how to transplant vegetable seedlings.
- 6 Let them transplant vegetable seedlings under supervision.

Summary

Vegetable seedling

When transplanting

Vegetable seedling

Vegetable seedling
cloudy or rainy day

Review exercises

Let the learners do the following:

Glossary

Collar mark :

- 5 Demonstrate how to transplant vegetable seedlings.
- 6 Let them transplant the selected leaf vegetable seedlings under your supervision.

Summary

Vegetable seedlings should be hardened off in preparation for transplanting. When transplanting, lift seedlings with as much soil as possible around the roots. Vegetable seedlings should be transplanted at the recommended spacing.

Vegetable seedlings should be transplanted late in the afternoon or on a cool, cloudy or rainy day to avoid wilting.

Review exercise

Let the learners do the exercise on page 82 of their books.

Glossary

Collar mark : a mark on a seedling stem just above the soil level in a nursery.

UNIT 26 Field management practices for leaf vegetables

Time allocation: 10 periods

Introduction

In unit 25, the learners transplanted vegetable seedlings. After transplanting, seedlings need to be well managed until they are harvested.

In this unit, the learners will carry out vegetable management practices. It is important for the learners to carry out vegetables management practices to ensure that there is high production and quality leaves.

Success criteria

By the end of this unit, the learners must be able to:

- manage vegetables in field beds
- harvest vegetables

Developmental areas

Skills

Ensure that the learners develop skills such as observing, drawing, recording, concluding, judging.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of the management practices for vegetable production.

Values and attitudes

Ensure that the learners acquire values and attitudes to appreciate the importance of proper management practices for leaf vegetables.

Special needs education

Ensure that the activities are adapted for the learners with special educational needs. Observe and record their performance. This will help them access the curriculum with ease, develop their potential and become self reliant.

Background information

Management practices for vegetables in field beds

The transplanted seedlings must be properly taken care of for them to survive and develop to maturity. The following are some of the management practices:

Mulching

Place the mulch from damaging

Importance

- reduces we
- conserves th
- decreases se
- controls the
- adds plant f
- reduces the
- particles tha

Watering

- Water the tra
- As seedlings
- During the d
- wilting of ve

Importance o

- Dissolves pl
- Makes the pl
- leaves
- Makes plants
- components

Mulching

Place the mulch at 5-7cm away from the seedlings to prevent termites or other ants from damaging the seedlings.

Importance of mulching

- reduces weed growth by suffocating its seedlings
- conserves the soil moisture by decreasing the evaporation of water from the soil surface.
- decreases soil erosion by protecting the soil surface from contact by raindrops
- controls the soil temperature
- adds plant foods to the soil when it decomposes
- reduces the spread of diseases by controlling the splashes (when it rains) of soil particles that contain disease causing organisms.

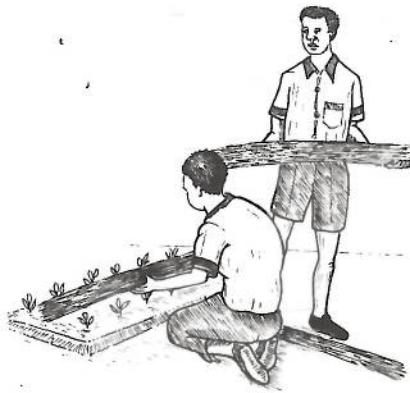


Figure 26.1: Mulching vegetable field beds

Watering

- Water the transplanted seedlings twice a day, in the morning and late afternoon.
- As seedlings are getting old reduce the frequency to once a day.
- During the dry season, frequency of watering should be increased to avoid wilting of vegetables.

Importance of watering:

- Dissolves plant food (nutrients)
- Makes the plants absorb the nutrients from the soil and transports them to the leaves
- Makes plants to manufacture their food since water is one of the main components required in the process of food making

Table 26.1 :

- Enables the plants to transport the manufactured food to all other parts of a plant
- Cools down the plants when it is hot through transpiration

Weeding

- Weed on a sunny day so that weeds can dry up and die
- Weeding can be done using trowel, handfolk or small hoes, weeds close the vegetable plants should be uprooted. Mulch beds after weeding to suppress weed growth

Importance of weeding

- reduces insect and disease attack
- reduces competition for plant nutrients, air, sunlight, water, space between vegetable plants and weeds
- promotes production of quality leaf vegetables
- loosens the soil allowing more water to infiltrate and air to circulate freely

Supplying

Replacement of dead vegetable plants should be done within a week of transplanting

Importance of supplying

Maintains correct plant population in order to increase productivity

Fertilizer/manure application

- Make holes at 5-10 cm away from the planting station
- Apply 8g of CAN or Urea fertilizer per station or half teaspoon per station

Importance of fertilizer or manure

- for development of green leaves
- for development of juicy leaves
- for fast growth of the vegetables

Disease and Pest control

Table 26.1 shows disease that attack leaf vegetables and their control

Disease
Damping off
Leaf spot
Leaf blight
Black leg Black leg fum.
Black-rot
Downy mildew
Heart rot

Table 26.1 : Diseases of leaf vegetables and their control

Disease	Their signs	Control
Damping off	<ul style="list-style-type: none"> Seedlings appear water soaked at ground level and they collapse 	<ul style="list-style-type: none"> Avoid over watering and dense planting Bury the diseased plants Spray recommended chemicals
Leaf sport	<ul style="list-style-type: none"> Small yellowish or brown sports on leaves causing the older leaves to face off. 	<ul style="list-style-type: none"> Use clean seed, crop rotation, field hygiene, spray a chemical called chlorothanil or Daconil at 2g in 1 litre of water.
Leaf bright	<ul style="list-style-type: none"> Brown-black sport with a yellow margin on older leaves, stems and petioles 	<ul style="list-style-type: none"> Use clean seed, crop rotation, field hygiene, spray the recommended chemicals
Black leg fungus	<ul style="list-style-type: none"> Red-brown sports on the leaves, root decay 	<ul style="list-style-type: none"> Treat the seeds before sowing Spray with recommended chemicals Crop rotation
Black-rot	<ul style="list-style-type: none"> Blackening of the vascular tissues causing blockage of water supply, yellow -v- shaped sports with white threads of fungi on the lower surface 	<ul style="list-style-type: none"> Seed treatment Crop rotation Crop hygiene Grow crops in cool season
Downy mildew	<ul style="list-style-type: none"> Young plants develop irregular brown or white spots with white threads of fungi on the lower surface 	<ul style="list-style-type: none"> Spray with Mancozel (Dithane m45) at the rate of 2g in 1 litre of water
Heart rot	<ul style="list-style-type: none"> The whole plant rots 	<ul style="list-style-type: none"> Spray recommended chemicals Sterilize the beds before sowing Apply ash on the leaves Crop hygiene

Table 26.2 below shows some pests that attack leaf vegetables and their control

Table 26.2: Pests of leaf vegetables and their control

Pest	Type of damage	Control
Aphids	• Sucks the leaf sap causing leaves to curve inside and wilting.	• Introduce lady bird beetle • Spray actellic 50EC at 1 litre of water • Use of trap crops such milk weed which attracts aphid away from vegetables
Cutworms	• Cut the stem at ground level	• Sterilizing the soil by either burning (use of 1 metre heap of maize stalks) or use chemicals (Actellic 50EC at 1 ml per liter of water)
Caterpillars	• Feed on leaves and tender stems of leaf	• Spray carbayl 85wp, 35g in 14 litres of water.
Grasshoppers	• Feed on leaves and stem of vegetable seedlings	• Spray carbayl • Wedding
Nematodes	• Swelling on the roots	• Practive crop rotation
Mole crickets	• Cut the leaves at ground level	• Dig them out
Leaf eating beetles	Chew the leaves and feed on roots	• Pick them up • Spray malantion or carbayl or cypermethrin

Chemicals should be applied and allowed a period of 2 weeks before harvesting.
Apply chemicals when pests exist in the field beds.

Importance of Pest and disease control

- prevents transmission of diseases
- prevents destruction of the leaves
- promotes fast growth of the plants

- increased
- improved

Harvesting

- harvest
- case of c
- harvest e
- use a sha
- keep the
- harvest l

Important

- more lea
- flowerin
- tender le

Activities

Activity 1

Suggested te

You will nee

- learners'
- charts sh
- spraying

Instructions

- 1 Let the lo
- 2 Let the lo
- 3 Let the lo
- 4 Let the lo
- 5 Let the le
- 6 Summaris

Activity 2

Suggested te

You will need

- learners' e

- increases vegetable yields
- improves quality

Harvesting leaf vegetables

- harvest vegetables before they develop tough fibres or when the head is firm in case of cabbage
- harvest early in the morning when the crop still has some moisture
- use a sharp knife cutting the leaf stock at an angle
- keep the produce in fresh condition
- harvest leaf vegetables regularly

Importance of harvesting leaf vegetables at the right time

- more leaf is produced
- flowering is delayed
- tender leaves are harvested

Activities

Activity 1 Discussing field management practices for leaf vegetables (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- charts showing various types of leaf vegetables, people watering vegetables, spraying chemicals on vegetables

Instructions

- 1 Let the learners name field management practices for leaf vegetables.
- 2 Let the learners be in small groups.
- 3 Let the learners discuss how and when each of the field management practices for leaf vegetables is carried out.
- 4 Let the learners record their findings.
- 5 Let the learners report their findings to the whole class.
- 6 Summarise the field management practices.

Activity 2 Discussing the importance of field management practices (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences

8 Supervise

Activity 4

Suggested te

You will nee

- learners
- fertilizer
- hoes
- trowel
- garden f
- mulch m
- match bo

Instructions

- 1 Organise
- 2 Let the le
- 3 Take the
- 4 Let the le
- 5 Demonstrat
- 6 Let group
- 7 Let the le
- 8 Supervise

Activity 5

Suggested te

You will nee

- sprayers
- chemicals
- clear bott
- water
- pails
- graduated
- masks/ha

- charts and pictures showing some field management practices such as harvesting vegetables people applying fertilizers to the field of leafy vegetables

Instructions

- 1 Let the learners be in groups.
- 2 Let the learners study figure 26.1 on page 84 of their books.
- 3 Let the learners identify the field management practices.
- 4 Let the learners discuss the importance of the field management practice shown.
- 5 Let the learners brainstorm the importance of field management practices.
- 6 Let the learners discuss the importance of the other field management practices.
- 7 Let the learners record their findings.
- 8 Let them report their findings.
- 9 Consolidate the activity.

Activity 3 Supplying and watering leaf vegetables (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- source of water
- vegetable seedlings
- hoes
- trowel
- trays
- school garden
- resource person
- containers
- watering cans

Instructions

- 1 Organise the learners into groups.
- 2 Let the learners collect required resources.
- 3 Take the learners to school garden.
- 4 Let the learners review how and when supplying and watering are done.
- 5 Demonstrate to the learners how to supply and water leaf vegetable beds.
- 6 Let group leaders do the same.
- 7 Let the learners in their groups supply and water the leaf vegetables.

- 8 Supervise the learners supplying and watering leaf vegetables.

Activity 4 Weeding, fertilizer application and mulching (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- fertilizer
- hoes
- trowel
- garden folks
- mulch materials
- match box

Instructions

- 1 Organise the learners into groups.
- 2 Let the learners collect required resources.
- 3 Take the learners to school garden.
- 4 Let the learners review how and when to weed, apply fertilizer and mulch.
- 5 Demonstrate to learners how to weed, apply fertilizer and mulch leaf vegetable.
- 6 Let group leaders do the same.
- 7 Let the learners in their groups weed, apply fertilizer and mulch leaf vegetable.
- 8 Supervise the learners weeding, applying of fertilizer and mulching leaf vegetables.

Activity 5 Controlling pests and diseases in leaf vegetables (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- sprayers
- chemicals
- clear bottles
- water
- pails
- graduated containers
- masks/handkerchief

Instructions

- 1 Let the learners be in groups.
- 2 Let the learners visit school garden.
- 3 Let the learners identify pests and diseases attacking the leaf vegetables.
- 4 Let the learners collect samples of diseases leaf vegetables and pests.
- 5 Let the learners review how to control pests and diseases identified.
- 6 Let the learners collect the required resources. Ensure safety measures are followed by learners.
- 7 Let the learners observe the demonstration.
- 8 Let the learners control pests and diseases identified under your supervision.

Activity 6 Harvesting leaf vegetables (2 periods)**Suggested teaching, learning and assessment resources**

You will need the following resources:

- sharp knives
- basket
- water
- pails

Instructions

- 1 Let the learners be in groups.
- 2 Organise a visit to a nearby vegetable farm to observe how and when leaf vegetable are harvested.
- 3 Let the learners record their observations.
- 4 Let the learners report their findings to whole class.
- 5 Let the learners harvest leafy vegetables from school garden.

Summary

It is important to take care of leaf vegetables after transplanting in the field beds. This caring involves, mulching, watering, weeding, supplying, manure or fertilizer application, disease and pest control and harvesting. These activities help to increase the production and improve the quality of the vegetables.

Review exercise:

Let the learners do the review exercise on page 86 of their textbook.

60
35
66
63
62
62
35
8

Time allocation**Introduction**

In Standard 5, we learnt about farm animals kept in our area. Rabbits are impo-

In this unit, the learners will learn how to keep rabbits and help them to keep healthy.

Success criteria

By the end of this unit, learners will be able to:

- explain the importance of rabbits
- describe different breeds of rabbits

Developmental outcomes**Skills**

Ensure that the learners will be able to:

Knowledge and understanding

Ensure that the learners will understand the following concepts:

Value and attitudes

Ensure that the learners will develop the following attitudes:

Special needs

Ensure that the learners will be able to:

Background information**Importance of rabbits**

Rabbits are important because they:

- Provide meat which is a source of protein intake.

UNIT 27 Importance of rabbits

Time allocation: 4 periods

Introduction

In Standard 5, unit 20, the learners learnt importance of farm animals. One of the farm animals kept is a rabbit. There are different breeds of rabbits kept in Malawi. Rabbits are important in a number of ways.

In this unit, the learners will learn the importance and breeds of rabbits. This will help them to keep rabbits well.

Success criteria

By the end of this unit, the learners must be able to:

- explain the importance of rabbits
- describe different breeds of rabbits

Developmental areas

Skills

Ensure that the learners develop skills such as observing, drawing, decision making, recording and reporting.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of the importance and breeds of rabbits.

Value and attitudes

Ensure that the learners acquire values and attitudes to appreciate the importance of keeping rabbits.

Special Needs Education

Ensure that the activities are adapted for learners with special education needs.

Observe and record their performance. This will help them to access the curriculum with ease, develop their potentials and become self-reliant.

Background Information

Importance of rabbits

Rabbits are important in a number of ways, some of them are:

- Provide meat for Malawi's increasing population thereby increasing the amount of protein intake.

- They produce and grow faster than other animals such as goats, sheep or pigs. The number of young ones from a mother (doe) ranges from 4 to 12. This can happen four to five times in a year.
- They provide manure which can be used for crop production.
- They are a good source of income to farmers after selling
- They are easy to feed as they can feed on kitchen left overs which otherwise could be thrown away such as remains of cabbage and other vegetables.
- The hair is used as a raw material for making woolen clothes.
- They require small space hence they can be kept behind dwelling houses (backyard)

Breeds of rabbits

There are different breeds of Rabbits such as Angora, California, New Zealand White and Flemish giant. The recommended breeds in Malawi are New Zealand White and California. These two breeds are able to adapt different conditions and systems of keeping rabbits.

Characteristics of rabbit breeds

1. California Black

- a. It is small in size, weighs about 3.5 to 4.5kg when mature.
- b. It produces more offsprings.
- c. It is black in colour.

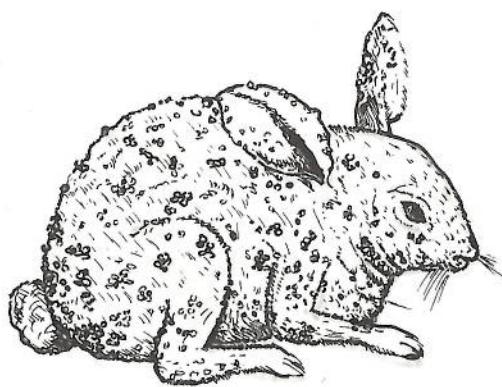


Figure 27.1 : California black rabbit

2. New Zealand

- a. It is big and strong.
- b. It produces many offsprings.
- c. It is white in colour.

3. Flemish giant

- a. It is very big.
- b. It does not produce many offsprings.
- It is grey in colour.

2. New Zealand white

- a. It is big and weighs about 4 to 5 kg when mature.
- b. It produces more offsprings.
- c. It is white in colour.



Figure 27.2 : New Zealand white rabbit

3. Flemish giant

- a. It is very big and weighs about 5 to 6kg when mature.
- b. It does not produce a lot of offsprings.
- It is grey in colour.

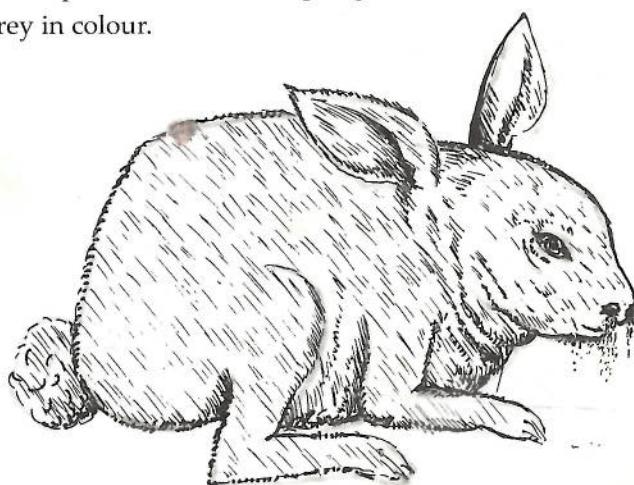


Figure 27.3 : Flemish giant rabbit

3 Let the learner...

4 Assess the dra...

Summary

Rabbits are impo...
materials. There a...
white, California l...

Review exercise

Let the learners do...

Glossary

Offspring : yo...

Activities

Activity 1 Discussing the importance of rabbits (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences

Instructions

- 1 Organise the learners into groups.
- 2 Let them brainstorm the importance of rabbits.
- 3 Let them discuss the importance of rabbits.
- 4 Let them record the responses in a notebook.
- 5 Let them report to the class.
- 6 Summarise the importance of rabbits.

Activity 2 Discussing different breeds of rabbits (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- rabbits
- charts showing different rabbit breeds
- learners' experience

Instructions

- 1 Let the learners study figure 27.1 to 27.3 or show them live rabbits.
- 2 Let the learners discuss the characteristics of the rabbit breeds shown.
- 3 Let the learners record their findings in notebooks.
- 4 Let them report their findings to the class for discussion.
- 5 Consolidate the activity.

Activity 3 Drawing different breeds of rabbits (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- rabbits
- pictures
- drawing materials
- learners' experience

Instructions

- 1 Let the learners draw different breeds of rabbits.
- 2 Let the learners display their drawings.

- 3 Let the learners go round to observe the drawings displayed.
- 4 Assess the drawings displayed and record the grades.

Summary

Rabbits are important in many ways such as source of meat, manure and raw materials. There are different breeds of rabbits. These include New Zealand white, California black, Flemish giant, angora and chinchilla.

Review exercise

Let the learners do the exercise on pages 88 - 89 of their books.

Glossary

Offspring : young ones

UNIT 28 Housing and feeding rabbits

Time allocation: 12 periods

Introduction

In standard 5, unit 22, the learners learnt about housing and feeding farm animals in general. Rabbits require a specific housing and feeding for successful production.

In this unit, the learners will learn different types of rabbit houses, construct house suitable for rabbit and feed rabbits. This will help the learners to house and feed rabbits properly.

Success criteria

By the end of this unit, the learners must be able to:

- describe housing for rabbits
- construct a house for rabbits
- explain ways of feeding rabbits

Developmental areas

Skills

Ensure that the learners develop skills such as observing, recording reporting, drawing measuring, modeling, constructing and problem solving.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of different types of rabbit houses and feeds.

Values and attitudes

Ensure that the learners acquire values for proper rabbit housing and feeding.

Special needs education

Ensure that activities are adapted for the learners with special educational needs. Observe and records their performance. This will help them to access the curriculum with ease, develop their potentials and become self-reliant.

Background information

Housing rabbits

Rabbits need to be properly housed for increased production. A good rabbit house protects the rabbits from enemies such as dogs, cats and snakes. It also protects rabbits from bad weather. There are different ways of housing rabbits such as:

Pole and the
It is made of ground for hy
Rabbits are al khola should enough for yo the floor if the cleaned.

Deep litter
Constructed u
Make sure tha
40cm) of floor
shavings to a c
dry litter to pr

Pole and thatch khola

It is made of poles and thatched with grass. The khola is raised 1m above the ground for hygienic reasons. This reduces infestation of maggots and worms. Rabbits are also unable to burrow the ground and hide. The floor or bottom of the khola should have holes big enough for droppings to fall through and small enough for young ones not to fall through. A wire mesh or flat mesh can be put on the floor if the floor has big spaces. This keeps the khola well ventilated and self cleaned.



Figure 28.1: Raised pole and thatch rabbit house

Deep litter khola

Constructed using bricks or stones. The roof is thatched with grass or iron sheets. Make sure that there is enough space for each rabbit. Space of 160cm² (40cm X 40cm) of floor space is ideal per rabbit. Provide bedding materials such as wood shavings to a depth of 7.5cm as litter. The deep litter Khola should have clean and dry litter to prevent infestation of maggots.

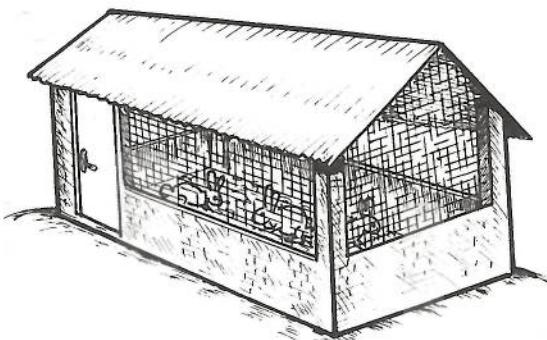


Figure 28.2: Deep litter rabbit house

Hutches

Can be constructed using wood or bamboos. Hutches can be divided into individual cages. Hutches should be easily transportable if need be. Does, bucks and weaners have different cages. A cage for a buck is slightly larger than a doe's. This is to accommodate a buck and doe when placed in a buck's cage for mating.

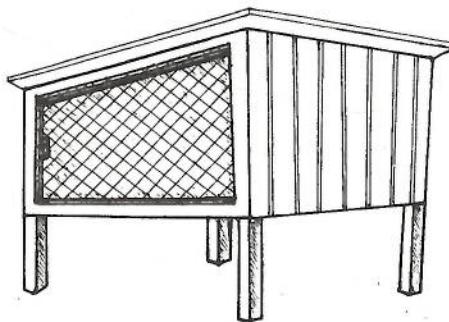


Figure 28.3a: Single hutch for a doe

Feeding rabbits

Rabbits are easier to keep than other animals. They are an example that a farmer is unwise to ignore. Feeding is a key to success. Rabbits kept in hutches should be fed on fresh feed.

Rabbits prefer fresh green feeds like groundnuts haulms (*kwakhwaniwa*), Green beans, etc. A balanced diet is essential.

The following guide will help you to feed your rabbits.

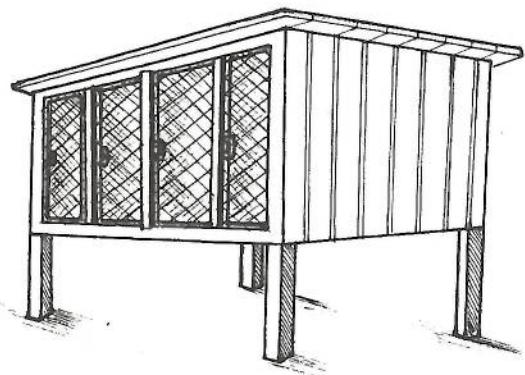


Figure 28.3b: Hutch for weaners



Figure 28.3c: Single hutch for a buck

Feeding rabbits

Rabbits are easier to feed largely because of their small body. They can be fed on food which otherwise would be thrown away by a household.

They are an example of animals that do not compete with humans for food, such that a farmer is unlikely to face problems in supplying food to rabbits. Proper feeding is a key to successful rabbit production.

Rabbits kept in hutches and kholas are totally dependant on the keeper for their feed.

Rabbits prefer fresh feed materials such as carrots, potato vines, cabbage and groundnuts haulms, elephant grass, banana leaves, *mwamna aligone*, *tridax* (*kwakhwaniwa*). Green grass should also be fed to rabbits daily in addition to other feeds. A balanced feed should be prepared or bought and fed to rabbits at all times.

The following guidelines can be used to prepare feed for rabbits:

Common concentrate feed stuffs and how to mix them

Group A	Sun flower cake or groundnut cake
Group B	Boiled and dried beans or cotton seed cake
Group C	Maize, Rice, Sorghum or millet, (meal or bran)
Group D	Dried cassava or dried sweet potatoes

How to mix

- 1 Mix 4 cups of group C with 1 cup of group A or
- 2 Mix 3 cups of group C with 2 cups of group B or
- 3 Mix 2 cups of group D with 2 cups of group B and 1 cup of group A.

NB Any suitable container can be used instead of a cup.

Grain products should be put in heavy feeding troughs which rabbits can not tip over. Plant materials such as grass can be hanged (suspended off the ground/floor) in the cage as rabbits do not eat spoiled feed. Over feeding should be avoided especially green feeds because they have plenty of water which will make the belly (stomach) of rabbits to be filled with water resulting in low growth.

One way of noticing a hungry rabbit is that it comes to meet the farmer when approaching the khola.

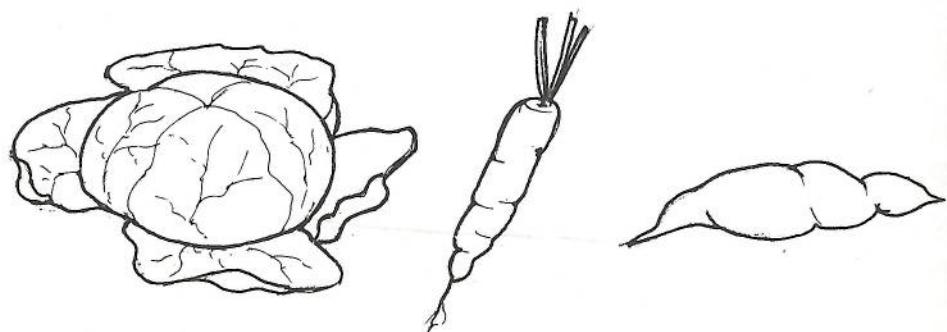


Figure 28.4: Some feeds for rabbits

Water

Provide clean water. A low supply of milk in rabbits.

Water should be available to rabbits. If possible, add water.

Activities

Activity 1

Suggested title:

You will need:

- learners
- pictures

Instruction:

- 1 Organize the learners.
- 2 Let them draw the pictures.
- 3 Let them cut the pictures.
- 4 Let the learners paste the pictures.
- 5 Let the learners draw the pictures.
- 6 Let them draw the pictures.
- 7 Let them draw the pictures.
- 8 Summarize the activities.

Activity 2

Suggested title:

You will need:

- learners
- pictures
- resources
- rabbit facts

Instruction:

- 1 Organize the learners.
- 2 Let the learners draw the pictures.
- 3 Let the learners draw the pictures.
- 4 Let the learners draw the pictures.

Water

Provide clean water to rabbits at all times.

A low supply of water will reduce affect feed intake, growth and production of milk in rabbits.

Water should be put in heavy containers so that they are not tripped over by rabbits. If rabbits are given large amounts of dry feeds increase the supply of water.

Activities

Activity 1 Discussing different types of rabbit houses (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- pictures of different rabbit houses

Instructions

- 1 Organize the learners into groups.
- 2 Let them brainstorm the different types of rabbit houses.
- 3 Let them discuss the different types of rabbit houses.
- 4 Let the learners study figure 28.1 - 28.3 of page 90 of their books.
- 5 Let the learners suggest the types of rabbit houses shown in the diagrams.
- 6 Let them record the responses in a notebook.
- 7 Let them report the findings to the class.
- 8 Summarize the different types of rabbit houses.

Activity 2 Visiting a nearby house rabbit farmer to observe rabbit houses (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- pictures
- resource person
- rabbit farm.

Instructions

- 1 Organize a visit to a rabbit farm or farmer.
- 2 Let the learners be in groups.
- 3 Let the learners observe how rabbits are housed.
- 4 Let the learners find out from the farmer how rabbits are housed.

- 5 Let the learners compare the house (s) of rabbits seen during the visit with those in figure 28.1-28.3 on page 90 of their books.
- 6 Let the learners identify the types of rabbit houses seen at the farm.
- 7 Let the learners record their findings.
- 8 Let them report their findings to the class for discussion.
- 9 Summarise the types of rabbit seen at the farm.

Activity 3 Drawing and modeling rabbit houses (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences

Instructions

- 1 Let the learners draw different rabbit houses.
- 2 Let the learners model different rabbit houses.
- 3 Let the learners display their work in class.
- 4 Let the learners observe the displayed work.
- 5 Comment on the displayed models.

Activity 4 Constructing a suitable rabbit house (4 periods)

Suggested teaching, learning and assessment resources

You will need the following resources

- local environment
- poles/ bamboos
- scrap wood
- strings
- nails
- panga knives
- thatching grass
- bricks/ stones
- water
- rabbit house models
- rubric

Instructions

- 1 Let the learners brainstorm the type of a rabbit house they prefer to construct.
- 2 Let the learners choose the type of rabbit house to construct.
- 3 Let the learners design the rabbit house to construct.

- 4 Let the learners build the house.
- 5 Let the learners choose the house chosen.
- 6 Discuss with the learners the house chosen.
- 7 Let the learners evaluate the house chosen.
- 8 Let the learners assess the house chosen.
- 9 Assess the house chosen.

Activity 5

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences

Instruction

- 1 Organise learners into groups.
- 2 Let learners choose a group leader.
- 3 Let learners choose a group member to be the reporter.
- 4 Let them record their findings.
- 5 Let them report their findings to the class.
- 6 Summarize the findings.

Activity 6

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- samples of rabbit houses
- feeders
- drinkers
- water
- checklist
- portfolio
- resource pack

Instructions

- 1 Let the learners observe the samples of rabbit houses.
- 2 Demonstrate how to construct a rabbit house.

- 4 Let the learners discuss the type of materials required to construct the rabbit house.
- 5 Let the learners collect the materials required for the construction.
- 6 Discuss with the learners the suitable materials required to construct the rabbit house chosen.
- 7 Let the learners choose suitable site for the construction of the rabbit house.
- 8 Let the learners construct the rabbit house under your supervision.
- 9 Assess the construction work using a rubric.

Activity 5 Discussing the different feeds suitable for rabbits (1 period)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences

Instruction

- 1 Organise learners into groups.
- 2 Let learners brainstorm different feeds given to rabbits in their communities.
- 3 Let learners discuss different feeds given to rabbits in their communities.
- 4 Let them record the responses in a notebook.
- 5 Let them report the findings to the class.
- 6 Summarize the types of feeds suitable for rabbits.

Activity 6 Feeding rabbits (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- samples of rabbit feeds
- feeders
- drinkers
- water
- checklist
- portfolio
- resource person

Instructions

- 1 Let the learners visit the nearby rabbit house.
- 2 Demonstrate to learners how to clean water and feed troughs.

- 3 Let the learners clean water and feed troughs.
- 4 Demonstrate how to feed rabbits.
- 5 Let the learners feed the rabbits under your supervision.

Summary

Housing and feeding are important practices for successful rabbit production. There are different types of rabbit houses which include pole and thatch, deep litter and hutches. These houses protect rabbits from bad weather and predators. Rabbits feed on a wide variety of materials. These include vegetables, cassava, maize, groundnuts, beans. Feeding make rabbits to grow and produce.

Review exercise

Let the learners do review exercise on page 92 of their book.

Glossary

Hutch	: cage or pen
Predator	: killer
Infestation	: present in large numbers
Burrow	: dig

Time allocation

Introduction

In unit 28, the learners learned about rabbit production. How can we control them?

In this unit, the learners will learn how to control them by understanding the diseases they have and how to control them.

Success criteria

By the end of this unit, the learners will:

- explain disease control

Developmental skills

Ensure that the learners will be able to:

Knowledge and understanding

Ensure that the learners understand the disease and parasites.

Values and attitudes

Ensure that the learners have positive attitudes towards controlling diseases.

Special needs

Ensure that the learners have special needs, observe and participate in the curriculum with enthusiasm.

Background information

Rabbit diseases

Rabbits are attacked by many diseases, their causes and treatments.

UNIT 29 Disease and parasite control in rabbits

Time allocation: 8 periods

Introduction

In unit 28, the learners learnt housing and feeding rabbits. These improve rabbit production. However, production can be reduced by diseases and parasites. Therefore these must be controlled.

In this unit, the learners will learn diseases and parasites in rabbits and ways of controlling them. This will help the learners to identify diseases and parasites and how to control them.

Success criteria

By the end of this unit, the learners must be able to:

- explain disease and parasite control for rabbits

Developmental areas

Skills

Ensure that the learners develop skills such as observing, drawing, recording, reporting, cleaning and de-worming.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of the various disease and parasites of rabbits, ways of controlling them.

Values and attitudes

Ensure that the learners acquire values and attitudes to appreciate the need for controlling diseases and parasites in rabbits

Special needs education

Ensure that the activities are adapted for the learners with special educational needs, observe and record their performance. This will help them to access the curriculum with ease, develop their potentials and become self-reliant.

Background information

Rabbit diseases

Rabbits are attacked by several diseases. The table below shows some of the diseases, their causes, signs, prevention and treatment.

Table 29.1: Diseases of rabbits and their treatment

Name of disease	Cause	Signs	Prevention	Treatment
Coccidiosis	• Protozoa	• Lack of appetite • Dullness of rabbits • Severe diarrhoea • Dehydration • Rapid death	• Keep khola or cage dry at all times	• Coccidiostats in feed or drinking water
Colds (snuffles disease)	• Bacterial • Virus	• Sneezing • Mucus discharge from nostrils	• Isolate sick rabbits • Avoid overcrowding of rabbits • Good ventilation • General hygiene	• Antibiotics in drinking water
Rabbit pox	• virus	• Small blisters on the skin	• Vaccinate young rabbits against rabbit pox	• Treat the sores with appropriate drugs
Sores hocks	• Bacteria	• Sores on feet	• Avoid putting rabbits in rough floors especially floors made of interwoven wire or very thin wire	• Treat the sores with antibiotic ointment

Other diseases that may attack rabbits are tuberculosis, rabies and ear cancer. Rabbits which die from unknown causes should be removed and burnt.

Parasites

Rabbits are attacked by internal and external parasites.

Internal par

Table below sh

Table 29.2 : Int

Parasites

Tape worm

Round worm

Coccidia



Figure 29.

External para

Some of the exte

These suck bloo

Internal parasites

Table below shows signs, prevention and treatment of parasites

Table 29.2 : Internal parasites of rabbits and their treatment

Parasites	Damage caused	Prevention	Treatment
Tape worm	<ul style="list-style-type: none">Suck digested feedRabbits lose weight	<ul style="list-style-type: none">Cleanliness of housesKeep feeding and drinking places clean and dry	<ul style="list-style-type: none">Use piperazine or any de wormer
Round worm	<ul style="list-style-type: none">Suck digested foodRabbit lose weight	<ul style="list-style-type: none">Clean the houseChange wet litters	<ul style="list-style-type: none">Use piperazine
Coccidia	<ul style="list-style-type: none">Attacks the lining of liver and intestineSevere diarrhoea (diarrhoea may be blood stained)	<ul style="list-style-type: none">Keep house/cage	Coccidiostats

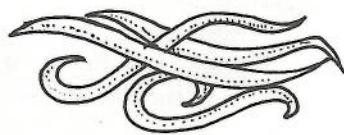


Figure 29.4: Round worms

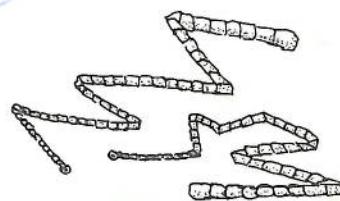


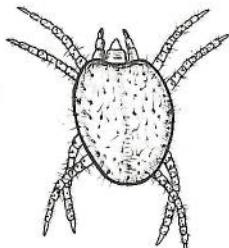
Figure 29.5: Tape worms

External parasites

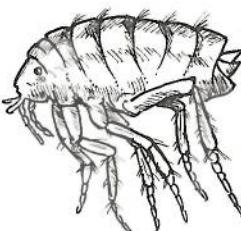
Some of the external parasites that attack rabbits include: ear mites, fleas and lice. These suck blood and the rabbit may lose hair (fur) and cause irritation to the skin.

Ear mite can cause a disease called ear cancer.

External parasites can generally be controlled by cleanliness of rabbit houses/cages.



a. Mite



b. Flea



c. Louse

- rabbit farm
- pictures of scabies
- specimens of lice

Instructions

- 1 Organize a visit to a rabbit farm.
- 2 Let the learners take photographs of rabbits.
- 3 Let the learners draw the rabbits.
- 4 Let the learners identify the diseases and parasites.
- 5 Summarize the findings.

Activity 3 Diseases and parasites of rabbits

Suggested teaching, learning and assessment resources

You will need the following resources:

Activities

Activity 1 Discussing diseases and parasites of rabbits (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- pictures of infected rabbits

Instructions

- 1 Organize the learners into groups.
- 2 Let the learners brainstorm different diseases and parasites that attack rabbits in their communities.
- 3 Let the learners discuss the different diseases and parasites that attack rabbits in their communities.
- 4 Let the learners study diagrams in figures 29.1 to 29.6 on page 94 of their books.
- 5 Let the learners discuss the signs, prevention and treatment of the diseases and parasites shown.
- 6 Let the learners record the responses in a notebook.
- 7 Let the learners report the findings to the class.
- 8 Summarize the signs, prevention, treatment of the diseases and parasites of rabbits.

Activity 2 Identifying diseases and parasites of rabbits (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences

- learners' experiences
- rabbit farm
- samples of diseased rabbits
- infected rabbits

Instructions

- 1 Let the learners identify the diseases and parasites.
- 2 Let the learners identify the diseases and parasites that are controlled by cleanliness.
- 3 Demonstrate the diseases and parasites of rabbits.

- rabbit farm
- pictures of some parasites of rabbits
- specimens of parasites

Instructions

- 1 Organize a visit to a nearby rabbit farm.
- 2 Let the learners identify diseases and parasites of rabbits.
- 3 Let the learners record their findings.
- 4 Let the learners report their findings to the class for discussion.
- 5 Summarize the diseases and parasites of rabbits identified by the learners.

Activity 3 Drawing parasites of rabbits (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources

- learners' experiences
- pictures of some parasites of rabbits
- specimen of parasites of rabbits
- resource person

Instructions

- 1 Let the learners draw parasites of rabbits.
- 2 Let the learners display their drawings.
- 3 Let the learners go round to observe the displayed drawings.
- 4 Assess the drawings displayed using a checklist or scoring rubric.

Activity 4 Controlling diseases and parasites of rabbits (2 periods)

Suggested teaching, learning and assessment resources

You will need the following resources:

- learners' experiences
- rabbit farm
- samples of drugs
- infected rabbits

Instructions

- 1 Let the learners visit a nearby rabbit farm.
- 2 Let the learners find out from the farmer how diseases and parasites of rabbits are controlled.
- 3 Demonstrate to the learners ways of controlling parasites and diseases of rabbits.

Time allocation**Introduction**

In standard 6, the different types of which can be used in agroforestry practice.

In this unit learners identify different learners to establish

Success criteria

- By the end of this unit learners will be able to:
- explain different types of agroforestry systems
 - identify suitable agroforestry systems for their area

Developmental**Skills**

Ensure that the learners are able to classify, identify and

Knowledge areas

Ensure that the learners understand the systems of agroforestry integrated with agriculture.

Values and attitudes

Ensure that the learners have positive attitudes towards agroforestry.

Special needs

Ensure that the learners have special needs. Observe and adapt the curriculum with the needs of the learners.

Handwritten list of numbers and letters:

- 1C
- 2E
- 3B
- 4A
- 5C
- 6①
- 7D
- 8C
- 9C
- 10D
- 11B
- 12D
- 13B
- 14A
- 15A
- 16D
- 17B
- 18B
- 19C
- 20C

UNIT 30 Importance and systems of agroforestry

Time allocation: 7 periods

Introduction

In standard 6, the learners established and managed a woodlot which contained different types of trees at the school. There are different types of tree species which can be used for agroforestry purposes. There are different systems of agroforestry practiced in Malawi. Agroforestry is important in a number of ways.

In this unit learners will learn the meaning, importance of agroforestry and identify different and systems of agroforestry. This knowledge will help the learners to establish suitable agroforestry system at school and home.

Success criteria

By the end of this unit the learners must be able to:

- explain different systems of agroforestry
- identify suitable trees for agroforestry

Developmental areas

Skills

Ensure that the learners develop skills such as observing, drawing, describing, classifying, identifying, recording, reporting and decision making.

Knowledge and concepts

Ensure that the learners acquire knowledge and understanding of the meaning and systems of agroforestry and characteristics of suitable tree that can favourably be integrated with arable crops of Malawi.

Values and attitudes

Ensure that the learners acquire values and attitudes to appreciate the importance of agroforestry.

Special needs education

Ensure that the activities are adapted for the learners with special educational needs. Observe and record their performance. This will help them to access the curriculum with ease, develop their potentials and become self-reliant

and information of agroforestry

"agroforestry" is formed by combining two original words of "agriculture" and "forestry". Therefore, the term "agroforestry" means the growing of sole crops together with trees on the same piece of land.

Types of agro forestry

Agroforestry is classified into three main types as follows:

Silvoarable: Mixing trees with arable or horticultural crops such as maize, sorghum, beans, cotton, groundnuts, cabbages, tomato, carrots.

Silvopasture: Mixing trees with pastures or grass for grazing livestock.

Forest farming: Cultivating high value products within forested area: medicine, botanical decoratives , handcrafts, food as well.

Systems of agroforestry

The following are some of the agroforestry systems practiced in Malawi:

- **Folder banks** - this involves planting trees used as feed for livestock intercropped with arable crops.



Figure 30.1: Folder bank

es are frequently pruned to feed livestock.