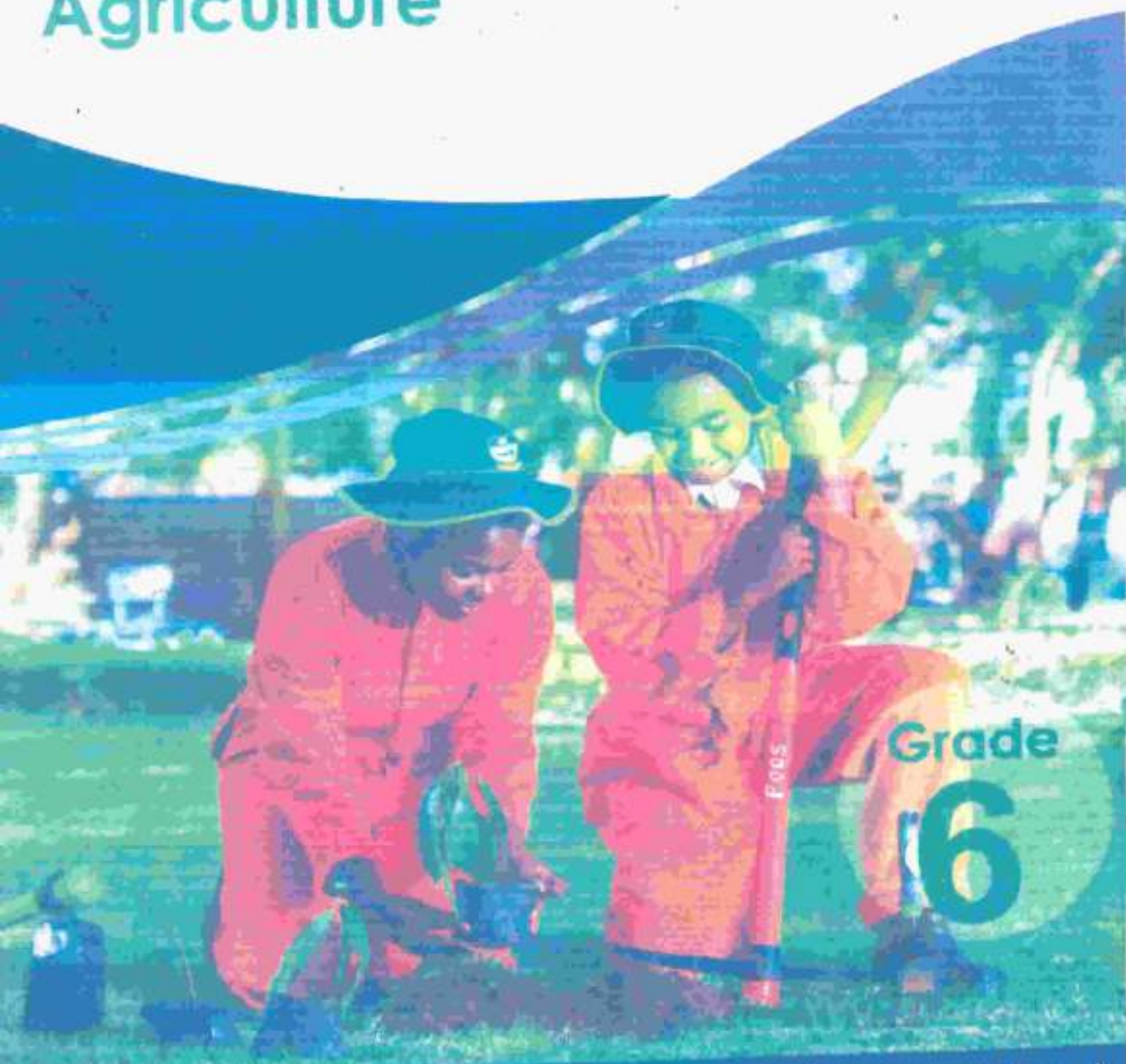


 college press

# Ventures Primary Agriculture

New Curriculum



Grade  
**6**

F. M. Sithole

Learner's Book

**Ventures Primary**  
**Agriculture**  
**Learner's Book**

Grade  
**6**

Ventures Agriculture Grade 6 Learner's Book  
Venture Primary Agriculture

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## Unit 1 Importance of agriculture

### In this unit you will:

1. name the branches of agriculture
2. describe the activities involved in each branch.

### Flashback

In grade five, you learnt about the importance of agriculture to the community and the nation. You should be able to explain the importance of agriculture at community and national level. In groups discuss the importance of agriculture.



### Key words

organic matter      economists

## Branches of agriculture

The main branches of agriculture are:

- crop production
- animal production
- soil science
- agricultural engineering
- agricultural economics
- horticulture
- forestry and wildlife

### Crop production

Crop production is a branch that focuses on the growing of crops. The aim of this branch is to have better food production. It includes the growing of annual crops like maize, beans, rice, watermelons and perennial crops like tea, sugarcane, tomatoes and potatoes. Some of these crops can also be grown for commercial value. We call these cash crops. These crops include cotton, tobacco, sunflower and sugarcane. Figure 1.1 shows examples of cash crops.





Figure 1.1 Cash crops

### Animal production

Animal production is a branch that deals with the rearing of animals. It plays an important role in food production and income generation. This branch is concerned with meat, dairy and eggs. Examples of animal products include:

cattle farming	-	beef, milk
pig farming	-	pork
goat farming	-	goat meat
poultry farming	-	eggs, chicken meat, rabbit meat...
fish farming	-	fish
sheep farming	-	mutton

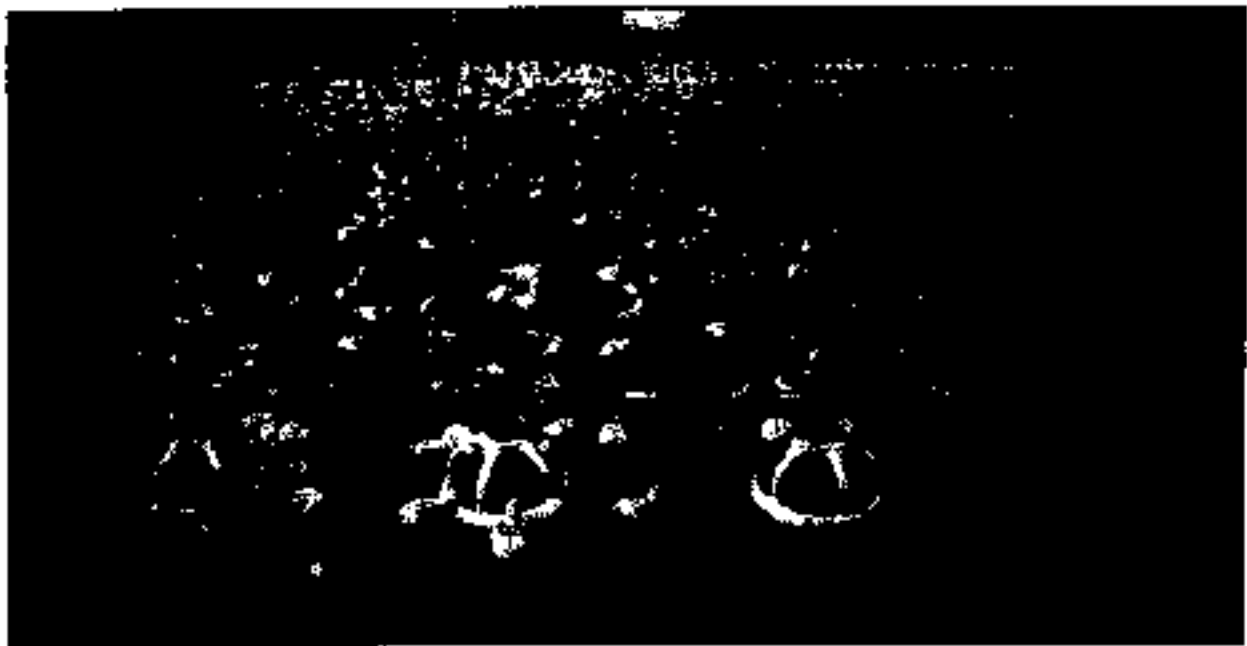


Figure 1.2 Broiler farming

## Agricultural engineering

Agricultural engineering is a branch that is involved with farm machines, tools and structures. Agricultural engineering, as shown in Figure 1.3 and 1.4, provides services on implements used for ploughing, harrowing, planting and harvesting. The aim of this branch is to improve the effectiveness and sustainability of farming practices.

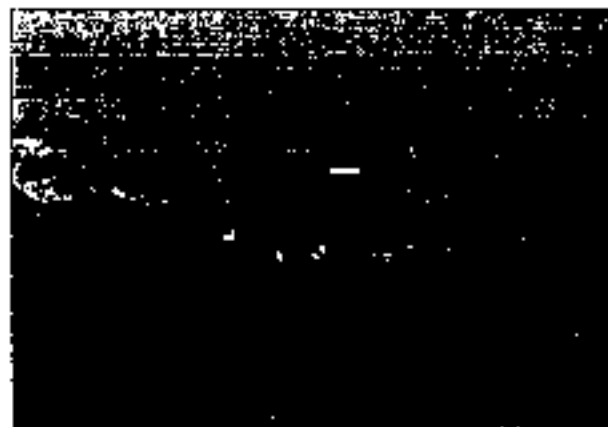


Figure 1.3 tractor drawing a disc plough

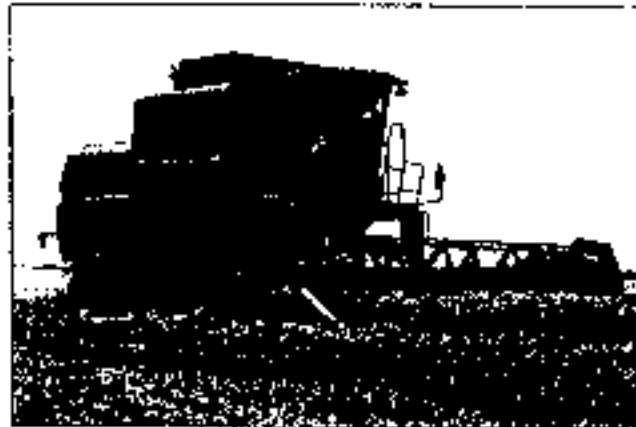


Figure 1.4 Combine harvester

### Activity 1 Individual work

1. Name other farming machinery that you have seen besides that shown in Figure 1.3 and 1.4.
2. Give the uses of the machines you named in 1.

## Soil science

Soil science is a branch that focuses majorly on the structure and components of the soil. The aim of this branch is improving soil conditions in order to increase crop production. Soil science helps farmers to select correct crops for different soils. For example, maize grows well in sandy-loam soils that are rich in organic matter, while tobacco prefers sandy soils. **Organic matter** is decaying plant and animal material. Nutrients can be added to soil through fertilisers. Soil science helps to determine nutrients suitable for different types of soil.

## Agricultural economics

Agricultural economics is a branch that is concerned with the business side of agriculture. The aim of this branch is to ensure that agricultural processes are conducted profitably. **Economists** are people who help farmers to plan their finances and keep records of income and expenditure. This branch gives farmers advice on crops to grow and how to make them profitable.

## Activity 2 Debate

**Topic:** Soil Science is more important than Agricultural Economics.

Divide yourselves into two groups. One group supports the statement while the other opposes it. Present your points for your side and have your teacher score you and determine the winning side.

### Horticulture

Horticulture is a branch that focuses on the growing of garden crops. Garden crops include vegetables, fruits, all decorative plants like flowers and plants that provide spices and medicines. The aim of this branch is to ensure sustainable and profitable production of garden crops. Examples of horticultural products include:

Fruits	-	oranges, bananas, apples and grapes
Vegetables	-	green, red and yellow peppers, tomatoes, carrots, cauliflower and broccoli
Flowers	-	roses and lilies
Herbs	-	mint, rosemary and thyme

### Forestry and wildlife

Forestry and wildlife is a branch that seeks to manage forested and wildlife resources for the benefit of human beings. The interest of this branch is in animals; how to protect them and their habitats.

## Exercise A

**Answer the questions below.**

Mr Muza grew a hectare of maize and a hectare of groundnuts last year. He sold the maize to the Grain Marketing Board (GMB) and made a profit of \$500.00. He also sold the groundnuts and made a profit of \$750.00.

1. Which crop gave Mr Muza more profit? [1]
2. How much more profit did he make from the crop in 1? [1]
3. Which crop would you advise him to grow in the next season? [1]
4. Why would you advise him to choose that crop? [1]
5. Give a disadvantage of not growing maize to the household. [1]

## Activity 3 Educational tour

1. Arrange an educational tour to a commercial farm in your area.
2. Identify the agricultural branch the farm belongs to.
3. Ask questions on how the farm is run and how they make their profit.
4. Ask questions on why the specific branch was chosen.



## Exercise B

Table 1.1 shows branches of agriculture. Fill in the activities of each branch and answer the questions that follow.

Table 1.1 Branches of agriculture

Branches of agriculture	Activities
1. Crop production	.....
2. Animal production	.....
3. Soil science	.....
4. Agricultural engineering	.....
5. Agricultural economics	.....
6. Horticulture	.....
7. Forestry and Wildlife	.....
8. Which branch of agriculture helps farmers to produce better maize yields?	[7]
9. Which branch of agriculture is responsible for tillage of land?	[1]
10. Name any two horticultural products.	[1]
11. Define the term 'cash crop'.	[2]
12. What is the role of the forestry and wildlife branch?	[1]
	[2]

## Summary

- The branches of agriculture are important because they help farmers to improve crop, livestock production and protect animals and their habitats.
- The crop production branch carries out research on crop improvement.
- The animal production branch provides services on livestock health and improvement.
- Soil science provides information on soil structure and nutrition.
- The agricultural economics branch provides financial services and advice on crop profitability.
- Horticulture focuses on garden crops such as vegetables, fruits and herbs.
- Forestry and wildlife aims to protect forestry resources, animals and their natural habitats.

## Unit 2 Basic farm tools

### In this unit you will:

1. state different ways of maintaining farm tools
2. list characteristics of good storage facilities for farm tools
3. model a farm tool rack.

### Flashback

In the last grade you learnt about how to classify tools according to their use. Think of the different farm tools and in groups classify them according to their use.



### Key words

coat

aerate

After using farm tools, we usually wash them and dry them before storage. At times we coat the tools with paint to prevent rusting. To **coat** is to cover with a layer of something. When tools are looked after properly, they usually last longer.

### Maintenance of farm tools

Farm tools help to make work easier and effective. They come in different shapes and sizes to perform various tasks. The following are reasons why it is important to maintain farm tools:






1. For them to last longer.
2. Tools that are maintained work efficiently.
3. To reduce the risk of injury to the operator.
4. Regular maintenance helps to reduce maintenance costs.

The following are ways of maintaining farm tools:

1. Wash and dry tools after use.
2. Sharpening before use reduces the amount of force you need to apply when working. Blunt tools tend to break while they are being used.
3. Greasing and oiling metal parts that rub against each other prevents friction. Also oiling the movable parts makes the tool easy to work with.
4. Ensure that wooden parts are kept dry and strong. If not, they should be replaced.
5. Keep metal parts clean and dry and paint them to avoid rusting.

6. Garden tools should always be hung because leaving them on the floor can cause injury when a person steps on them. Leaving them on the floor may also expose them to moisture which causes rust.
7. Some tools come in special packaging to keep them protected. Such tools should always be packed back to their original case.

Table 2.1 Summary of maintenance of farm tools

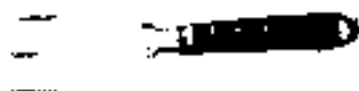
Tool	Use	Maintenance
1. ox-plough 	<ul style="list-style-type: none"> <li>ploughing large pieces of land</li> </ul>	<ul style="list-style-type: none"> <li>wash after use</li> <li>coat with oil to prevent rust</li> </ul>
2. harrow 	<ul style="list-style-type: none"> <li>breaking soil lumps</li> <li>removing weeds</li> <li>levelling the soil</li> </ul>	<ul style="list-style-type: none"> <li>wash after use</li> <li>paint to prevent rust</li> </ul>
3. hoe 	<ul style="list-style-type: none"> <li>digging</li> <li>weeding</li> </ul>	<ul style="list-style-type: none"> <li>wash after use</li> <li>sharpen edge regularly</li> </ul>
4. spade 	<ul style="list-style-type: none"> <li>digging</li> <li>loading materials</li> </ul>	<ul style="list-style-type: none"> <li>wash after use</li> <li>coat with oil to prevent rust</li> </ul>
5. sprayer 	<ul style="list-style-type: none"> <li>spraying to control diseases and pests</li> </ul>	<ul style="list-style-type: none"> <li>wash after use</li> <li>clean nozzle to prevent blockage</li> </ul>

6. hose-pipe



- watering
- roll after use
- clean sprinkler

7. hand fork



- turning soil
- aerating soil - to **aerate** is to allow air into something
- lifting grass and stover
- wash after use
- straighten prongs

8. garden line



- marking straight lines
- clean after use
- dry in the sun
- roll on pegs

9. watering can



- watering seedbeds
- wash after use
- clean rose to prevent blockage

10. rake



- breaking lumps of soil
- levelling soil
- removing weeds
- clean after use
- straighten prongs

## Exercise A

Answer the questions below.

- Which tool is used for ploughing large pieces of land?  
A. Garden fork      B. Spade      C. Ox-plough      D. Rake
- Tools are coated with paint so that they do not \_\_\_\_\_.  
A. rust      B. break      C. wear fast      D. harm workers

3. What is done to make a hoe work effectively?
  - A. Replace the hoe
  - B. Water soil
  - C. Change the soil type
  - D. Sharpen the hoe
4. Which of the following tools should be cleaned to prevent blockage?
  - A. Hedge shears
  - B. Sprayer
  - C. Sickle
  - D. Hose-pipe
5. Which is the odd one out?
  - A. Sprayer
  - B. Hose-pipe
  - C. Watering can
  - D. Bucket
6. Give two reasons for maintaining tools. [1]
7. Why should tools be hung at all times? [1]
8. What is the reason for oiling and greasing tools regularly? [1]
9. Why should wooden parts of tools be kept dry? [1]
10. How does rust affect tools? [1]

## Storage of farm tools

All tools should be sheltered to prevent wear and tear. Tools should be sheltered in a storeroom. A storeroom is a room set aside for storage of tools under lock and key. Varying storage units can be built for different tools. Storage units are built to organise tools. The following are proper storage units for farm tools.

### Tool rack

A tool rack as shown in Figure 2.1 is used to hold tools like hoes, picks, shovels, mattocks, spades, axes, rakes and garden forks. A tool rack is used to store tools in such a way that they are easy to recognise, get and return.

### Tool board

Hand tools are kept on a tool board shown in Figure 2.2. Examples of hand tools include hammers, pliers, wood saws, cutting tools, drilling tools and screwdrivers. Tool boards are used to hang hand tools so that they are safe and easy to find when needed.

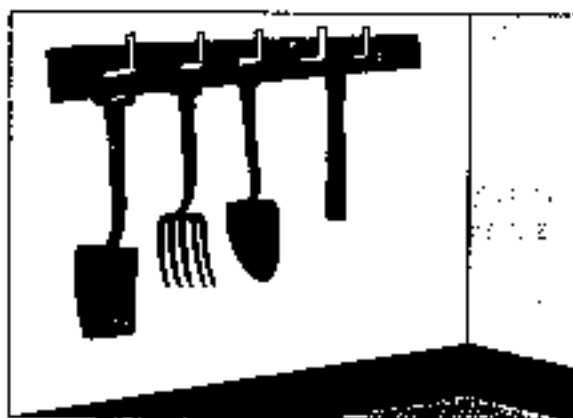


Figure 2.1 Tool rack



Figure 2.2 Tool board

## Activity 1 Modeling a tool rack

1. In groups design a model of a tool rack.
2. Identify the tools you would want to store on your tool rack.
3. Identify the materials you will need to build the tool rack.
4. With the help of your teacher build the tool rack.
5. Groups take turns to present their tool rack to the class.

### Tool shed

A tool shed, shown in Figure 2.3, is a separate structure used for storing larger farm equipment like an ox-plough, disc plough, tractors, spike harrow,awn-ower, cultivator, wheelbarrow, planter, ox yolk, sprayer, bow saw, hose-pipe and ox-cart.

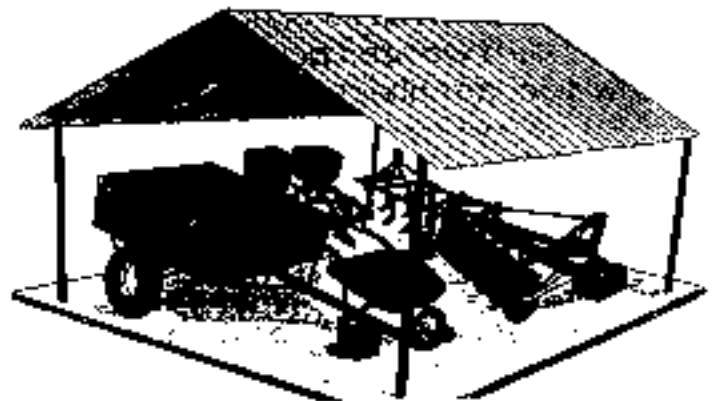


Figure 2.3 Tool shed

## Designing and keeping inventory of farm tools

Farm tools are very important. Without farm tools there would be no agriculture. Tools, however, can easily be lost or misplaced if they are not taken care of properly. There is need to keep inventory of farm tools. An inventory is a record of the available farm tools. It is a list that records the total number of tools, the tools that were issued out and the tools that were brought back and to whom. In today's world, all this information can be computerised to be manageable.

### Identifying tools

When tools are properly stored, they can be easy to maintain. Proper storage makes it easy to identify tools. The following techniques may assist a farmer in identifying the tools.

#### Numbering

Tools are marked using oil paint with numbers which are the same as numbers on the tool rack. For example, when hoe number seven has not been returned, the number seven on the rack will remain empty.

## Using colour codes on tools

Colours are used to identify storage space for a set of tools. Spades can be brown and should be placed where the brown colour is in the storage space. Other tools can have different colours to mark where they should be stored. Tools, therefore, are not mixed when in storage.

### Activity 2 Practical

Design an inventory record for your school. You can use a computer to fulfil this task. You can copy the table below or be creative and make your own.

#### Inventory record

Created by..... Date .....

Sheet number.....

Name of tool	Tool number	Description	Location	Quantity
Hoe	07/90	Black, wooden handle	Store room: 5 tool rack	

## Characteristics of good storage facilities

### Security

Tools are expensive and they should be stored in a secure storeroom. The door should be strong and kept under lock and key. Tight security is needed to ensure that farm tools are safe from theft. Replacing stolen farm tools can be very expensive.

### Roofed storeroom

To avoid damage by weather elements such as rain, tools should be kept under a roof. Tools exposed to moisture or rain develop rust. Rusty tools usually do not work properly and they break on the affected area. Rusty hoes, for example, become blunt and cannot perform tasks effectively.

### Ventilation

Ventilation is a very important factor when considering tool storage. Sometimes tools are returned into the storeroom not completely dry after being washed. If the storeroom is not properly ventilated, the moisture on the tools will cause the tools to rust. Tools with wooden handles may also rot when exposed to a lot of moisture. The handles will then weaken and break easily.

## Exercise B

Answer the questions below.

1. Tools should be sheltered to \_\_\_\_\_.  
 A. prevent wear and tear                      B. keep them warm  
 C. prevent them from working well        D. allow theft
2. Which tool is not kept on a tool rack?  
 A. Hoe                      B. Spade                      C. Pick                      D. Lawnmower
3. Where are larger farm tools like planters kept?  
 A. Tool rack                      B. Tool board                      C. Tool shed                      D. Outside
4. Select a method of identifying garden tools.  
 A. Colour codes                      B. Tool rake                      C. Tool shed                      D. Tool board
5. Which one is a characteristic of a good storage facility for farm tools?  
 A. Moisture                      B. Ventilation                      C. Darkness                      D. Colour
6. Where are hoes arranged in a storeroom? [1]
7. List any four equipment stored in the tool shed. [4]
8. What happens when tools are left in the rain? [1]
9. How is numbering used when storing farm tools? [2]
10. How is mixing of tools in the storeroom avoided? [1]
11. State any one safety precaution observed when using hoes. [1]

## Summary

- Farm tool maintenance helps to make tools last longer and work efficiently.
- Washing and drying tools after use, greasing and oiling metal parts and painting are some ways of maintaining tools.

Good storage facilities:

- Prevent rain from wetting the tools
- Prevent rusting of tools
- Ensure paint is not damaged by the sun and rain
- Ensure grease and oil are not washed away
- Ensure tools are kept safe from thieves
- Ensure that missing tools are easily identified
- Help to save time when selecting tools for use.



## Unit 3 Safety in agriculture

### In this unit you will:

1. describe safe ways of handling agrochemicals.

### Flashback

In the previous grade you learnt about the safe use of farm tools and implements. Discuss safe ways of managing a storeroom, safe ways of collecting and handling tools.



### Key words

agrochemicals      toxic

**Agrochemicals** are chemical products used in agriculture. These chemicals include pesticides, herbicides and insecticides. The use of agrochemicals has grown rapidly as farms have become big in size and the challenge of keeping crops and animals free from damage has increased. Most of the agrochemicals used by farmers are toxic and they should be handled carefully. **Toxic** means harmful. It is important to follow precautions on the labels to avoid causing harm to people and the environment. Some of the precautions are:

1. Store chemicals away from foodstuffs
2. Keep chemicals away from sources of drinking water
3. Keep chemicals away from the reach of children
4. Store chemicals in a locked storeroom
5. Wear protective clothing
6. Do not spray chemicals on windy days
7. Read and understand the instructions on the label before applying the chemical
8. Use a respirator to avoid inhaling fumes
9. Ensure safe disposal of agrochemical containers
10. Do not remove labels from containers
11. Mix chemicals correctly
12. Wash hands after handling agrochemicals.

### Colour codes of agrochemicals

There are four colour codes which are used to indicate the strength of the poison contained in agrochemicals. The colour codes commonly used are green, orange, red and purple. Table 3.1 shows colour codes and the strength of the poison they represent.

Table 3.1 Colour codes of agrochemicals

Colour code	Strength of poison
Green	Slightly toxic: harmful if swallowed
Orange/ Amber	Moderately toxic: poison
Red	Highly toxic: dangerous poison
Purple	Extremely toxic: very dangerous poison

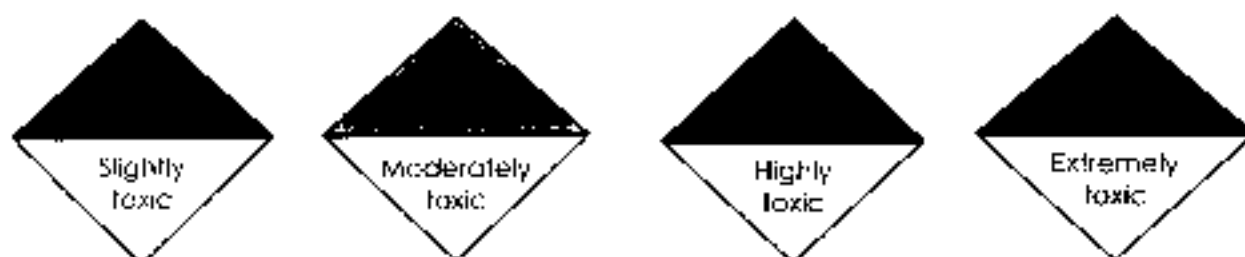


Figure 3.1 Agrochemicals colour codes

## Effects of poor handling of agrochemicals

Agrochemicals should always be handled with care. Poor handling of agrochemicals can have a dangerous effect on people's health and environment. Chemicals that are very toxic are also very dangerous even in small amounts. The poor handling of pesticides arises from excessive usage, not wearing appropriate protective clothing and poor storage.

### Health effects

There is need to wear appropriate protective clothing when handling or working with agrochemicals. The consequences of poisoning can range from mild irritations to death. The main routes of absorption of these agrochemicals are through respiration, skin and digestion. The following are some health problems associated with the poor use of agrochemicals:

- Itchy skin
- Eye irritation
- Stomach discomfort
- Headaches
- Chest pain
- Difficulties in breathing.

### Environmental effects

The poor handling of agrochemicals has negative effects on the environment. The following are the effects of agrochemicals on the environment:

- Water pollution from runoff
- Soil contamination from leaching

- Air pollution from spray drift
- Disturbances to ecosystems

Water runoff carries agrochemicals into water bodies or aquatic environments while wind can carry them to other fields, grazing areas and human settlements potentially affecting other species. The poor handling of agrochemicals has a negative effect on ecosystems as some plants and animals may die due to exposure to these chemicals.

## Summary

- Agrochemicals are chemical products used in agriculture. These chemicals include pesticides, herbicides and insecticides.
- It is important to follow instructions and precautions on the labels to avoid causing harm to people and the environment.
- The colour codes for agrochemicals are:
 

Green	-	slightly toxic
Orange/Amber	-	moderately toxic
Red	-	highly toxic
Purple	-	extremely toxic
- There is need to wear appropriate protective clothing when handling or working with agrochemicals. Poor handling of agrochemicals can lead to poisoning.

## Glossary

<b>Organic</b>	- natural without any chemicals added.
<b>Branch</b>	- is a component of something that is larger.
<b>Coat</b>	- to cover.
<b>Stamping</b>	- is marking or engraving an object using die or an ink block.
<b>Inventory</b>	- is a list of owned stock.
<b>Agrochemicals</b>	- are chemical products that are used in agriculture.
<b>Pesticides</b>	- are chemicals used to kill and control pests.
<b>Herbicides</b>	- are chemicals used to kill or prevent the growth of unwanted plants. They are also known as weed-killers.
<b>Insecticides</b>	- are chemicals used to kill and control problematic insects.
<b>Toxic</b>	- poisonous.

## End of topic assessment

### Multiple choice

Choose the correct answer.

- Agriculture is a \_\_\_\_\_.  
A. secondary activity  
B. tertiary activity  
C. primary activity  
D. simple activity
- Which one of these agricultural tools needs greasing?  
A. Sprayer  
B. Wheelbarrow  
C. Bow saw  
D. Hammer
- Select one characteristic of a good storage facility for farm tools.  
A. Colour  
B. Tool rake  
C. Ventilation  
D. Water
- The cultivation of vegetables, fruits and flowers is called \_\_\_\_\_.  
A. horticulture  
B. animal production  
C. forestry  
D. engineering
- The colour code purple indicates that the chemical is \_\_\_\_\_.  
A. poisonous  
B. harmful if swallowed  
C. safe  
D. extremely poisonous
- Which is the main activity in crop production?  
A. Growing crops  
B. Irrigation  
C. Keeping broilers  
D. Training farmers
- The branch that focuses on managing forests and wildlife resources is called \_\_\_\_\_.  
A. forestry and wildlife  
B. soil science  
C. agricultural engineering  
D. horticulture
- Choose one FALSE statement about precautionary measures taken when handling agrochemicals.  
A. Keep chemicals away from the reach of children.  
B. Store chemicals in a locked storeroom.  
C. Eat when handling agrochemicals.  
D. Wear protective clothing.
- What washes agrochemicals into water bodies causing water pollution?  
A. Wind  
B. Animals  
C. Sun light  
D. Run off water
- Where are larger farm tools like planters kept?  
A. Tool rack  
B. Tool shed  
C. Tool board  
D. Outside

### Structured questions

Answer all questions in full.

- Describe the activities of any three agricultural branches. [6]
- State any three methods of maintaining farm tools. [3]
- Describe any five effects of poor handling of agrochemicals. [5]
- Describe any three characteristics of a good farm tool storage facility. [3]
- Why is it important to have a tool inventory? [2]

## Unit 4 Climate

## In this unit you will:

1. define climate
2. distinguish between weather and climate.

## Flashback

In the last grade you learnt about weather. In groups define weather, list the different weather elements that you remember, the instruments used to measure these elements and the influences of weather on climate.



## Key words

humidity      global warming

## Weather and climate

## Weather

**Weather:** is defined as the state of the atmosphere at any given place and time. Weather is constantly changing. Weather focuses on the day to day changes in rainfall, temperature, cloud cover, wind and humidity. All these elements influence agricultural activities differently.

**Temperature:** is the measure of the hotness or coldness of the atmosphere. Temperature is measured using the maximum and minimum thermometer. This thermometer measures the highest and lowest temperatures on any given day. Temperature determines the type of crops grown per season. Crops like onions, cabbage and wheat are grown in winter because these crops prefer lower temperatures. Summer crops include maize, beans and cucumbers.

**Wind:** is moving air. The instrument used to measure wind speed is called the cup anemometer and the instrument used to determine wind direction is called a wind vane. In agriculture wind acts as an agent of pollination and cloud formation. Wind patterns differ according to area and time of year. this influences agricultural activities.

**Rainfall:** is the amount of precipitation that falls at any given area and is usually measured using a rain gauge. Rainfall is the major influence of agricultural activities. This is because crops need water to grow. Rainfall patterns differ according to areas or regions. Some areas receive more rainfall while others receive very little rainfall. The amount of rainfall determines the type of crops grown.

**Humidity:** is the amount of water vapour or moisture in the atmosphere and it is measured using a hygrometer. When the air is dry it means moisture is very low. Air moisture is needed to reduce the rate of transpiration avoiding the wilting of plants.

**Cloud cover:** is the extent at which the sky is covered by clouds. Clouds help to control temperature by storing and releasing heat energy in the atmosphere. Figure 4.1 and 4.2 show different extents of cloud cover.

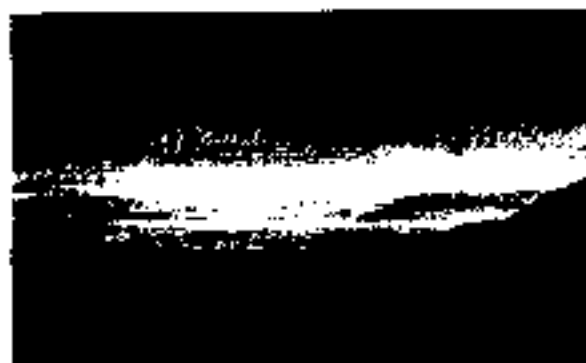


Figure 4.1 A cloudy rainy-day



Figure 4.2 Sunny day

## Climate

Climate is the average of observations and measurements of everyday weather records taken over a very long period of time of about 30 years. It is measured by analysing the weather patterns such as temperature, rainfall, cloud cover, humidity and wind of an area over a long period of time. The world is currently going through climatic change. This is a change in regional and global climate patterns. These changes are brought about by global warming. **Global warming** is a long term rise of the atmospheric temperatures. This results in changes in rainfall patterns, droughts and floods.

The climatic conditions of an area affect the classification of seasons. In Zimbabwe there are four distinct seasons namely main rain, post rain, dry and cold, and hot and dry. Table 4.1 shows the weather conditions and the agricultural activities that take place in each season.

**Table 4.1 Weather conditions and agricultural activities per season**

Season	Temperature	Rainfall	Activity
Main rain	High	High	Farmers are ploughing, planting and weeding
Post rain	Medium	Low	Crops have matured and harvesting takes place
Dry and cold	Low	Low	Marketing of harvested crops and growing winter crops under irrigation
Hot and dry	High	No rainfall	Land preparation, buying fertilisers and seeds

### Distinguishing between weather and climate

The difference between weather and climate is in the measure of time. Weather is the state of the atmosphere at any given place and time. Weather is constantly changing and is over a short period of time (it is measured daily). Climate is the average of observations and measurements of everyday weather records taken over a very long period of time of about 30 years. Table 4.2 distinguishes between weather and climate.

**Table 4.2 Differences between weather and climate**

Weather	Climate
Daily changes in temperature, cloud cover, rainfall, wind and humidity.	Arrived at after analysing weather records for 30 years.
Can change very quickly during the day.	Takes many years to change.
Weather changes affect limited areas.	Climatic changes affect larger areas.

### Activity 1 Educational tour

1. Arrange a visit to a weather station near you.
2. List the instruments to be seen.
3. Prepare questions on weather and climate.
4. Prepare questions on weather instruments.
5. Secure a field notebook for recording information.

## Exercise A

Answer the questions below.

- Which one of the following is **not** an element of weather?  
A. Temperature                      B. Humidity  
C. Rainfall                            D. Atmosphere
- The amount of water vapour in the atmosphere is known as \_\_\_\_\_.  
A. rainfall                              B. wind  
C. evaporation                      D. humidity
- List any two differences between climate and weather. [2]
- Give any two good effects of wind on agriculture. [2]
- Explain how global warming affects climate. [2]

## Summary

- Weather is defined as the state of the atmosphere at any given place and time.
- Climate is the average of observations and measurements of everyday weather records taken over a very long period of time of about 30 years.



## Unit 5 Natural farming regions of Zimbabwe

### In this unit you will:

1. identify natural farming regions of Zimbabwe
2. state climatic conditions of each farming region.

### Flashback

Which instrument is used to measure rainfall received?



### Key words

intensive specialised

Zimbabwe is divided into five agricultural farming regions. These farming regions are classified based on temperature, rainfall, soil quality and vegetation. The agricultural activities differ from region to region depending on the climatic conditions. Some areas receive a lot of rainfall while other areas receive very little rainfall. The map below shows natural farming regions in Zimbabwe from region one to five.

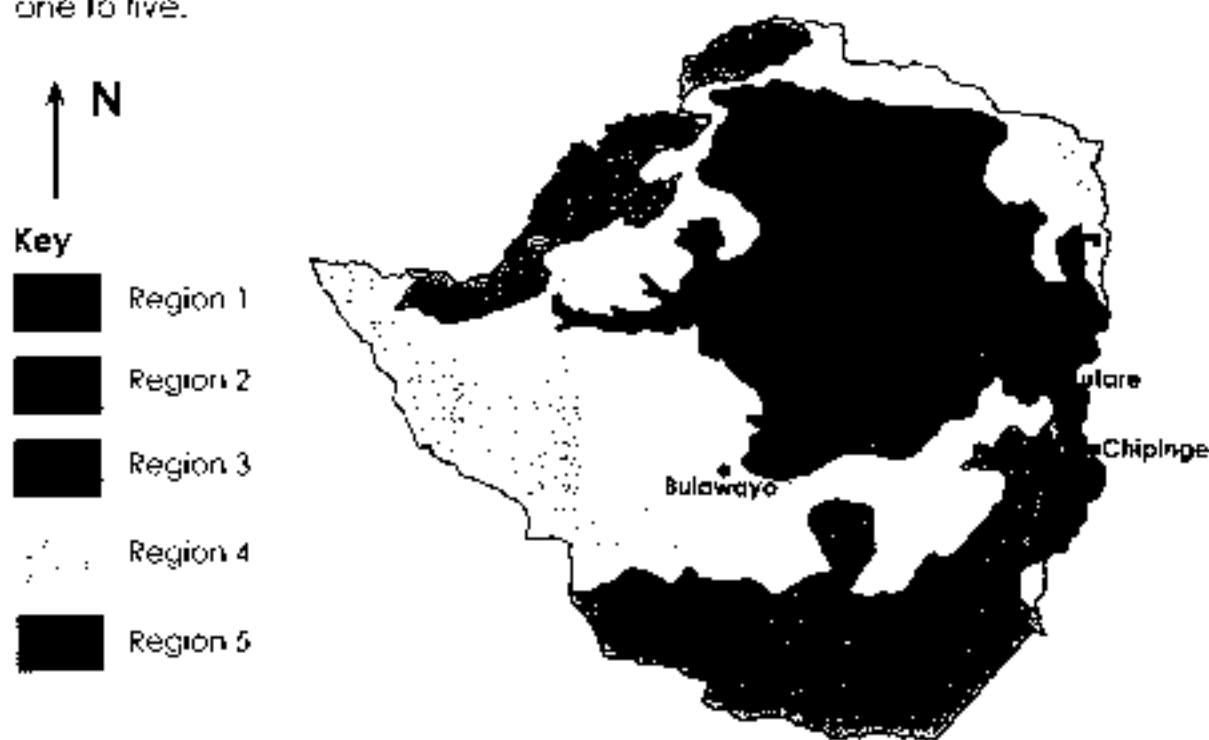


Figure 5.1 Natural farming regions in Zimbabwe

## Activity 1 Practical

1. Study the map in groups.
2. Discuss the agricultural activities that take place in each region.
3. Draw a map of Zimbabwe and colour the five natural farming regions. Use a different colour for each region.
4. Label on the map, the main farming activities carried out in each region as follows:  
 Region 1: specialised farming  
 Region 2: intensive farming  
 Region 3: semi-intensive farming  
 Region 4: semi-extensive farming  
 Region 5: extensive farming

## Activity 2 Educational tour

1. Go around your community or a nearby farm.
2. Observe the type of agriculture taking place.
3. Record your results and determine the farming region.
4. Report back to the whole class.

Table 5.1 Different characteristics of the natural farming regions in Zimbabwe

Region	Areas in the region	Average annual rainfall	Average annual temperatures	Agricultural activities
1	<b>Eastern Highlands</b> Chimanimani, Nyanga, Cashel, Chipinge	Over 1000mm High rainfall	Less than 15°C Cool temperatures	Suitable for <b>specialised</b> (one kind) and diversified farming.  Maize, beef and dairy production.  <b>Tropical crops</b> -tea and coffee.  <b>Fruits</b> -bananas and apples.  <b>Horticultural crops</b> -potatoes, peas and other vegetables.

2	<b>Northern Highlands and Middle veld</b> Guruve, Marondera, Harare, Rusape, Mvurwi, Chegutu and Norton	750mm-1000mm  Reliable rainfall	Cold winters 16°C-18°C  Warm summers 18°C-22°C	Suitable for <b>intensive</b> (requiring a lot of money and labour) farming.  <b>Crop production</b> -maize, soybeans, tobacco, sorghum, groundnuts, cotton and wheat.  <b>Livestock production</b> -beef, dairy, pig and poultry.
3	Esigodini, Gweru, Kwekwe, Shamva, Mutoko and Buhera	500mm-750mm  Average rainfall	Hot 18°C-24°C	Suitable for semi-intensive livestock farming.  <b>Drought resistant crops</b> -groundnuts, sorghum, cotton, sunflower, tobacco and soya beans. Irrigation is practiced.  <b>Livestock production</b> -beef production.
4	Bulawayo, Nkayi, Gwayi, Lupane and Gwanda	450mm-650mm Low rainfall Occasional droughts	Very high temperatures 20°C-25°C	Suitable for semi-extensive farming. Irrigation is practiced.  <b>Drought resistant crops</b> -maize, sorghum and millet.  <b>Livestock production</b> -Cattle ranching and wildlife.

5	<b>Lowveld</b>	Below 650mm	Very high temperatures over 30°C	Suitable for extensive farming.
	Beitbridge, Mwenezi, Chiredzi and Tsholotsho	Very low rainfall		<b>Limited agricultural activity</b> - drought resistant crops grown.
				Irrigation is practiced.
				Forestry, wildlife and cattle production

## Exercise A

Answer the questions below.

1. How many farming regions are there in Zimbabwe? [1]
2. Name any two of the farming regions. [2]
3. Describe the agricultural activities that take place in the regions stated in question 2. [2]
4. What is the difference between specialised and intensive farming? [2]
5. Give one example of a place located in each of the following regions:
  - a) Region 1
  - b) Region 3
  - c) Region 5
 [3]

## Summary

- Zimbabwe is divided into five agricultural farming regions which are Region 1, Region 2, Region 3, Region 4 and Region 5. The regions are classified based on temperature and rainfall received.
- Region 1 lies in the east of the country and receives more than 1000mm of rainfall, and specialised farming is commonly practised. The areas in this region are Chipinge, Nyanga, Chimanimani and Cashel.
- Region 2 is mid-north of the country and receives 750mm-1000mm of rainfall annually which is suitable for crop and animal production. The areas in this region include Harare, Gweru and Marondera.
- Region 3 lies in the middle latitude of the country and receives 500mm-750mm of rainfall annually, and intensive and specialised farming are commonly practised. The areas in this region are Esigodini, Gweru, Kwekwe, Shamva, Mutema and Buhera.
- Region 4 covers low-lying areas north and south of the country and receives 450mm-650mm of rainfall annually, and semi-extensive farming is practised. The areas in this region are Bulawayo, Nkayi, Lupane and Gwanda.
- Region 5 encompasses low-lying areas of the country and receives rainfall below 650mm per year. Cattle and wildlife production are practiced while drought resistant crops are grown under irrigation. The areas in this region are Beitbridge, Mwenezi, Chiredzi and Tsholotsho.

<b>Humidity</b>	- is the amount of moisture or water vapour present in the atmosphere.
<b>Intensive farming</b>	- is the use of high levels of input (money, labour, machinery) to get high levels of outputs (agricultural products).
<b>Specialised farming</b>	- is focusing on one type of agricultural production.
<b>Extensive farming</b>	- is the use of small input on small pieces of land.
<b>Global warming</b>	- is the long-term rise of the atmospheric temperatures.
<b>Region</b>	- is an area.

### Multiple choice

- A \_\_\_\_\_ is an instrument used to measure wind speed.  
A. cup anemometer  
B. rain gauge  
C. thermometer  
D. wind vane
- The coldest season with no rainfall in Zimbabwe is called \_\_\_\_\_.  
A. post rain  
B. main rain  
C. hot and dry  
D. dry and cold
- Why is weather and climate change important to the farmer? Farmers \_\_\_\_\_.  
A. buy the right type of clothes  
B. are able to plan their agricultural activities  
C. know when to go on holiday  
D. know when to slaughter their cattle for food
- During the hot and dry season, farmers in Zimbabwe are \_\_\_\_\_.  
A. planting and harvesting  
B. on holiday  
C. preparing for the farming activities of the next season  
D. planting winter crops
- How much rainfall is received in Region 1?  
A. More than 1000mm.  
B. Very little rainfall.  
C. Less than 750mm.  
D. Between 450mm and 650mm.
- What is the main farming activity practiced in Region 4?  
A. Crop production  
B. Forestry  
C. Livestock and wildlife  
D. Poultry production
- Which city is in Region 2?  
A. Bulawayo  
B. Gweru  
C. Harare  
D. Mutare
- Which of the following is **not** a weather element?  
A. Temperature  
B. Autumn  
C. Humidity  
D. Cloud cover

9. Humid air is — — — —  
 A. dry                      B. moist                      C. dusty                      D. cold
10. What type of farming is practiced in Region 5?  
 A. Intensive                      B. Semi-intensive                      C. Extensive                      D. Specialised

### Structured questions

**Answer all the questions in full.**

1. Explain two elements of weather and how they affect agricultural activities. [4]
2. What is the difference between weather and climate? [2]
3. Which two main weather elements are used to classify Zimbabwe in farming regions? [2]



4. Name the regions labelled A to E. [5]
5. Describe the agricultural activities of natural farming region 1. [2]

## Unit 6 Soil composition

## In this unit you will:

1. state the functions of soil components.

## Flashback

In the previous level, you learnt that soil is composed of organic and inorganic matter. In groups discuss the differences between organic and inorganic matter. State inorganic mineral matter that can be found in the soil.



## Key words

decomposition    humus    organism

## The main soil components

The main soil components are inorganic matter, organic matter, water and air. All these components encourage the growth of healthy crops. The percentages of soil components are highlighted in Figure 6.1.

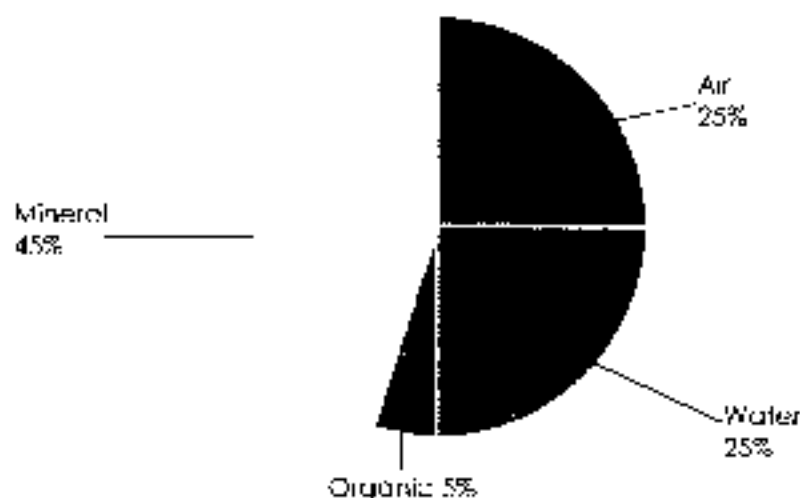


Figure 6.1 Soil composition

## Functions of soil components

### Mineral matter (45%)

Mineral matter also known as inorganic matter is the largest component. The materials that make up mineral matter are sand, silt and clay particles. These particles help to:

- anchor trees and crops so that they stand firm in the soil
- provide nutrients such as minerals to plant life
- hold water and air needed by plants for growth.

### Organic matter (5%)

The main source of soil organic matter is decayed plants and animals. Through the process of **decomposition**, organic materials are broken down and turned into useful nutrients for plants. To decompose is to decay. When organic matter decays, it forms **humus**. Humus is very important in the soil because it:

- improves soil structure
- improves soil fertility
- improves the water holding capacity of soil
- helps to raise soil temperature as warmth is needed for seed **germination**
- helps to increase the number of **organisms** that help decompose organic matter. Organisms are very small animals or plants.

### Water (25%)

Water is a very important part of soil. Plants cannot survive without water. Water affects the growth of plants and is essential for the process of photosynthesis. Water helps to dissolve and transport plant nutrients and works as a means by which minerals vital for growth, enter the plant. It is one of the elements needed for seed germination. Enough water in soil enables the growth of healthy plants.

### Air (25%)

Plants need air for respiration. The air in soil contains three main gases, namely oxygen, carbon dioxide and nitrogen. The oxygen is absorbed by plant roots and aids in the process of photosynthesis. Oxygen is also needed for seeds to germinate. When there is enough air in soil, plants grow. The air pockets allow water to pass through the soil and into the plants. Living organisms that live in the soil also need air to survive.

### Activity 1 Group work

In groups make a chart of soil components. In each component, label the percentage and function of that soil component. The best chart will be hung on the classroom wall.



## Exercise A

Answer the questions below.

1. Pick out a function of mineral matter.
  - A. Improves soil structure.
  - B. Anchors trees and crops so that they stand firm.
  - C. Aids the process of photosynthesis.
  - D. Helps seeds to germinate.
2. Which are the 3 main gases found in soil air?
  - A. Oxygen, hydrogen and nitrogen.
  - B. Hydrogen, nitrogen and carbon dioxide.
  - C. Oxygen, carbon dioxide and nitrogen.
  - D. Phosphorus, nitrogen and hydrogen.
3. What are the main soil components? [4]
4. Why is mineral matter important? [1]
5. What is the function of soil water? [2]

## Summary

- The main soil components are mineral matter 45%, organic matter 5%, water 25% and air 25%.
- Mineral matter provides plants with nutrients.
- Organic matter improves soil fertility.
- Air helps plants to respire and soil organisms to live.
- Water absorbs nutrients and transports them to all parts of the plant.

## Unit 7 Soil formation

### In this unit you will:

1. define weathering
2. state agents of weathering.

### Flashback

Where does inorganic matter come from?



### Key words

weathering   parent rock

Soil is formed from broken down rocks through the process of weathering. Rocks are broken down at different rates because some rocks are hard while others are soft. There are several agents of weathering. These include moving animals, temperature, freeze and thaw, running water, growing plants and wind.

### Weathering agents

When the parent rock is broken down through the process of weathering, soil particles are formed. **Parent rock** refers to the original rock from which other rocks are formed. **Weathering** is the breaking down of rocks to form soil.

#### Moving animals

When animals move, they tread on small and big rocks. The hooves cause gradual breaking down of rocks.

#### Temperature changes

The changes between high and low temperatures break down rocks. During the day when temperatures are high, rocks expand. At night temperatures fall and it becomes cold and rocks contract. The continuous expansion and contraction as shown in Figure 7.1 causes the rock to peel off or crack. The rock also weakens such that any form of pressure put on the rock will break it.



Figure 7.1 A rock peeling off due to temperature change

## Freeze and thaw

Freeze and thaw usually happens in very cold weather conditions. It occurs when water enters a crack in a rock. The water then freezes and expands the crack in the rock. The ice melts and goes deeper into the crack and the process repeats until the rock eventually cracks. Figure 7.2 shows the freeze and thaw process.

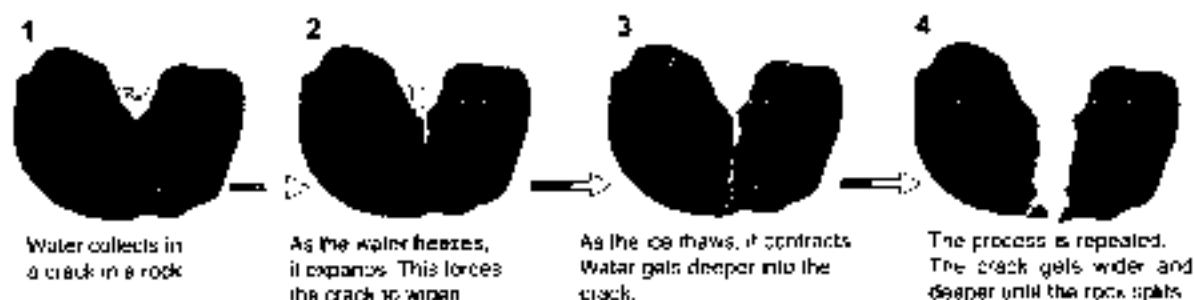


Figure 7.2 The process of freeze and thaw

## Activity 1 Experiment

**Illustrating how water freezes and expands in crack rocks.**

**Apparatus include:** 2 glass bottles with lids, water, plastic dish, deep freezer

### Method

1. Fill one glass bottle with water and close the lid tightly.
2. Half-fill the other bottle with water and close the lid tightly.
3. Place the two bottles in an empty plastic dish.
4. Place the dish with the bottles in the freezer.
5. Leave the apparatus in the deep freezer over-night.

### Observations:

1. What happened to the bottle that was full of water?
2. What happened to the level of water in the half-filled bottle?
3. What caused the bottle which was full of water to break?

Record your observations in your practical exercise book.

**Alternatively** you can look for a small cracked rock. Take a small cracked rock and place in a beaker and, using a dropping pipette, carefully drip water onto the rock. Add the water slowly, stopping when no more water appears to have been absorbed. Place the sample in a plastic bowl in the freezer. Remove the rock from the freezer every morning so that the water melts, add more water and put back in the freezer at night. Repeat the process until the rock breaks.

## Running water

As run-off water flows, it lifts up rocks and they either crush back on to the river bed or collide on to each other or other objects. Over time as the process continues the rock will become weak and break.

## Growing plants

When the roots of trees grow between rock cracks, they cause the crack to widen. These roots will eventually push with enough force to weaken the rock, causing cracks that lead to breakage.



Figure 7.3 Weathering caused by growing plants

## Wind

Wind blowing at a very high-speed carries with it soil particles and small stones that hit on rock surfaces, wearing them away. This type of weathering, shown in Figure 7.4 is most common in deserts where there is a lot of sand and wind.



Figure 7.4 Desert wind weathering

## Activity 2 Survey

Carry out a survey in your community and identify the types of weathering that are taking place. In groups, record, draw or even take pictures of what you see, then report back to the whole class. Explain how the different types of weathering occur. If you have pictures, stick them to a chart and label the type of weathering.

## Exercise A

Answer the questions below.

1. The breaking down of rocks results in \_\_\_\_\_.  
A. evaporation      B. soil formation      C. respiration      D. transpiration
2. Select a weathering agent.  
A. Water      B. Clay      C. Rock      D. Sand

- |  |                    |
|--|--------------------|
| 3. The expansion and contraction of rocks is caused by ____. |                    |
| A. wind  | B. animal movement |
| C. temperature changes                                       | D. water           |
| 4. What does the term parent rock mean?                      | [1]                |
| 5. Explain how wind causes weathering.                       | [1]                |

## Summary

- When a parent rock is broken down through the process of weathering, soil particles are formed.
- Parent rock refers to the original rock from which other rocks are formed.
- Weathering is the breaking down of rocks to form soil.
- The agents of weathering include moving animals, temperature, freeze and thaw, running water, growing plants and wind.

## Unit 8 Soil types

### In this unit you will:

1. describe the properties of clay, loam and sand soil.

### Flashback

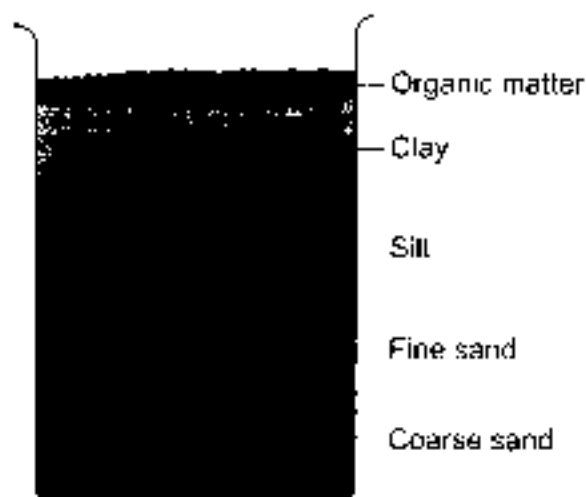


Figure 8.1 Layers of soil



### Key words

soil texture

soil structure

## Properties of sand, clay and loam

The properties of sand, clay and loam are based on the size of the soil particles, texture and structure, air space and water holding capacity. **Soil texture** is the fineness or coarseness of the soil. **Soil structure** refers to the arrangement of soil particles.

### Sand

Sandy soils have the largest soil particles. They are light in texture and have a highly loose soil structure which cause them to lose water quickly.



Figure 8.2 Sandy soil

Below are more properties of sand:

- allows air and water to move freely
- has a very low water holding capacity
- dry and lacks nutrients to support plant growth
- easy to work on.

## Clay

Clay soils are made up of extremely small and tightly packed together soil particles. Clay particles are very fine in texture, they are sticky when wet and become as hard as concrete when dry. Below are other properties of clay:

- has very tiny air spaces
- high water holding capacity
- carries a lot of nutrients and so supports plant growth
- very hard to work on.



Figure 8.3 Clay soil

## Loam

Loam is a mixture of soils and this makes it ideal for plant growth. It is usually a mixture of sand and clay. By combining these soils, loam gets the best characteristics of all the soils. This allows for the growing of almost any type of plant. Other properties of loam soils:

- allows for good movement of water and air
- high water holding capacity
- has sufficient nutrients for plant growth
- easy to work on.



Figure 8.4 Loam soil

## Activity 1 Experiment

**Experiments: Determining air content, water holding capacity and drainage of the three soils**

**Apparatus:** water glass, water, sand, clay and loam soil

### 1. Air

#### Method

1. Half fill three glasses with sand, clay and loam.
2. Add water in each glass until soil is completely covered.

### Observations

1. Check to see air bubbles coming out.
2. Which type of soil has more bubbles?

### 2. Water holding capacity

#### Method

1. Look for 3 cans of the same size.
2. Make small holes at the bottom of each can.
3. Half fill the cans with sand, clay and loam.
4. Add water into each can.

#### Observations

1. How long does it take to drain the water from the three cans?
2. Which can allows more water to drip out?

## Exercise A

### Choose the correct answer.

1. The arrangement of soil particles in soil is called \_\_\_\_\_.  
A. texture                      B. structure                      C. erosion                      D. composition
2. Texture is defined as the \_\_\_\_\_.  
A. depth of the soil  
B. fertility of the soil  
C. darkness or lightness of the soil  
D. fineness or coarseness of the soil
3. Which of the following is a fine soil?  
A. Loam                      B. Sand                      C. Clay                      D. Silt
4. \_\_\_\_\_ drains fastest.  
A. Loam                      B. Sand                      C. Silt                      D. Clay
5. Which type of soil is good for crop production?  
A. Sand                      B. Loam                      C. Clay                      D. Silt

## Summary

- The three main types of soil are sand, clay and loam.
- Sandy soils have the largest soil particles. They are light in texture and loose in structure. Their loose particles mean they cannot hold water well.
- Clay soils have very small particles. They are very fine in texture and get sticky when wet.
- Loam is the best soil for growing plants. It is a mixture of sand and clay. Its particles are average sized and it allows good water and air movement.



## Unit 7 Soil fertility

### In this unit you will:

1. identify sources of organic matter
2. prepare liquid manure.

### Flashback

The soil is made up of mineral matter, organic matter, soil, water and air. Organic matter is the component which determines the level of fertility of the soil. When soil fertility is low, artificial or inorganic fertiliser can be added to the soil. This will make crops to grow well and yields are improved.



### Key words

leguminous

nitrogen

## Sources of organic manure

Organic fertilisers are produced from decayed plants and animals. The main sources of organic fertilisers are animal manure and compost but there are other sources like fertility trench, liquid manure and green manure.

### Compost

A compost is a variety of organic matter that has been subject to decomposition before soil is added. Composts are used to increase soil fertility. Any type of organic waste can be used to make a compost.

### Activity 1 Practical

#### Making a compost.

Steps in making a compost:

1. Peg an area to make a compost (1m x 2m) in size.
2. Put the 1m pegs at every corner.
3. Put a layer of dry grass and maize stalks or any dry crop stalks.
4. Put a layer of animal manure.
5. Put a layer of dry leaves.
6. Put a layer of kitchen waste.
7. Sprinkle some fertiliser and cover with top soil.
8. Repeat the processes until the compost is about a 1m high and water the compost regularly.

NB: If heat is being produced by the compost it means decomposition is taking place.

## Fertility trench

A fertility trench is a deep trench dug underground that is filled with layers of organic matter and soil. It can be likened to a compost pile except that it is done underground. During the rainy season, rain water soaks into the soil in the trench and the organic matter in the trench holds the water for crops during the dry season. Fertility trenches are usually used in gardens. They increase soil fertility and improve the water holding capacity. Figure 9.1 shows a fertility trench.

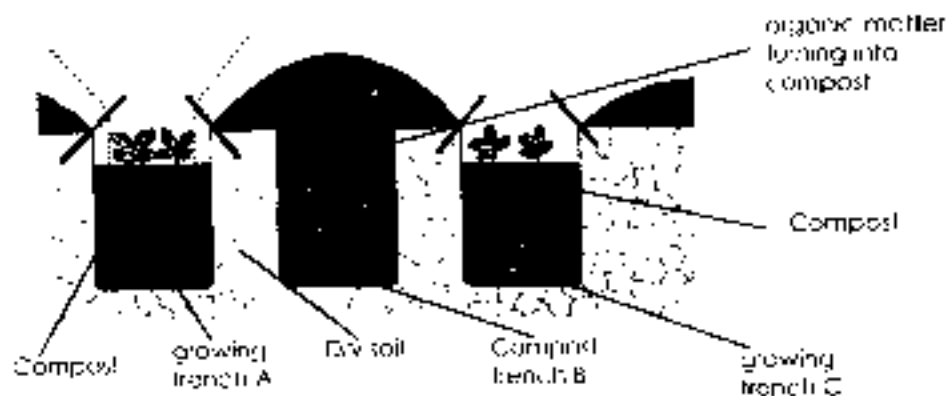


Figure 9.1 Fertility trench

## Liquid manure

Liquid manure is manure changed into liquid form. This is done by mixing manure with water. It can be made with any type of animal manure. Liquid manure is used because it allows for easier absorption of nutrients.

### Activity 2 Practical

#### Making liquid manure

Steps in making liquid manure.

1. Gather any form of animal manure (cow, pig, goat, poultry).
2. Place the manure in a container that can be closed tight.
3. Add water and mix.
4. Close the container and mix after every 3 days.
5. Leave the manure until the smell goes away.
6. When ready pour the liquid manure in a watering can and use.

## Green manure

Green manure refers to green crops that are grown and cultivated back into the soil before they mature. This improves the fertility of the soil. The plants used for green manure are usually leguminous crops like beans that produce nitrogen.

**Leguminous** plants are flowering plants that have pods. **Nitrogen** is a very important nutrient needed for plant growth. The stalks are ploughed back into the soil so that they decompose and add nitrogen to the soil. The main advantage of green manure is that it keeps nitrogen in soil while improving the water holding capacity of the soil.

## Animal manure

Animal manure shown in the diagrams below, is an organic fertiliser that comes from animal faeces. Animal manure can come from different farm animals like cattle, goats, pigs and poultry. Animal manure is important because it contributes to soil fertility by adding nutrients like nitrogen and other nutrients that help plants to grow. It also improves the quality of the soil. Farmers can save a lot of money by using animal manure as fertiliser.



Figure 9.2 Cow manure



Figure 9.3 Goat manure

## Activity 3 Educational tour

Your teacher will organise a visit to a farm that is near your school or that is within the community. Using gloves and plastic bags collect and label the different organic fertilisers that they have on the farm. Ask the farm manager about how they use the organic fertilisers. Write the information you get in your books.

## Exercise A

Answer the questions below.

1. What is organic manure? [1]
2. Give any five different sources of organic manure. [5]
3. Describe the process of making liquid manure. [3]
4. The nutrient that is very important for plant growth is, \_\_\_\_\_. [1]

## Summary

- Organic fertilisers are produced from decayed plants and animals.
- The main sources of organic fertilisers are animal manure and compost but there are other sources like fertility trench, liquid manure and green manure.

## Unit 10 Soil erosion

### In this unit you will:

1. identify eroded areas in your locality
2. describe the effects of soil erosion.

### Flashback

In the previous grade you learnt about the agents and types of soil erosion. In groups discuss the agents of soil erosion. Write them down and present them to the class.



#### Key word

siltation

Soil erosion is the washing away of top soil by wind or water. Soil erosion is mainly caused by poor management of soil. Some of the causes include:

- ploughing down slope and on steep slopes
- clearing of land leaving the ground bare
- streambank cultivation
- practicing monoculture (cultivating one crop every time on the same piece of land)
- not adding organic matter to the soil
- overstocking that leads to overgrazing.

### Effects of soil erosion

#### Loss of topsoil

Soil erosion results in the washing away of top soil. The top soil contains all the organic material needed for crop growth. Crops depend on this layer of soil because it is the most fertile. The washing away of top soil will lower soil fertility and also reduce crop yields.

#### Poor soils

Once the top layer of soil has been washed away, the remaining layer is hard and the soil particles are tightly packed. This type of soil is not suitable for crop production as it does not allow water to penetrate through and is highly infertile. Figure 10.1 displays some notable differences between land with top soil and poor soil with no top soil.

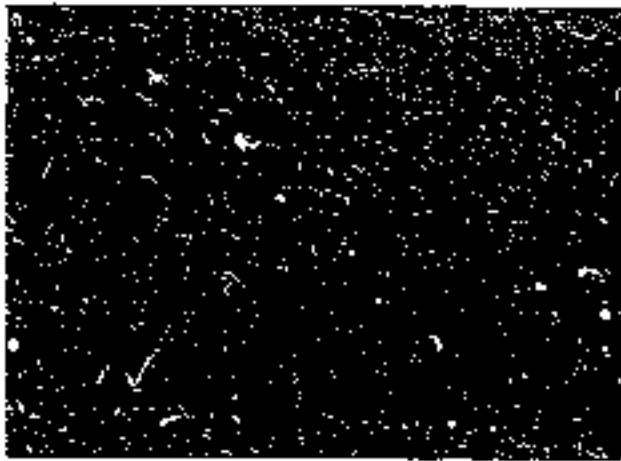


Figure 10.1 a) Land with top soil



Figure 10.1 b) Land with heavy top soil

## Siltation

The soil that is washed away by runoff water is washed into rivers and dams. This process is called **siltation**. This is the filling of rivers and dams with soil. Siltation also reduces the amount of water which dams and rivers can hold. This affects the irrigation of crops as the water levels would have been reduced. Farm animals also depend on water from dams and rivers. Figure 10.2 shows an example of a silted river.



Figure 10.2 The Save river drying at low levels due to siltation

## Formation of gullies and dongas

Soil erosion can result in the formation of gullies and dongas which can destroy roads, buildings and productive agricultural land. Farmers depend on good roads to transport their products to the market. Cattle and other livestock are also at risk of falling in these gullies and dongas and they can get injured or die. Refer to Figure 10.3.



Figure 10.3 Gully

## Water pollution

Pesticides and other agro-chemicals used by farmers during crop production can be washed into rivers and dams. This results in water pollution and can result in the death of fish and other marine life.

The addition of fertilisers into rivers and dams due to soil erosion can result in the increased growth of plants in rivers. These plants use up more oxygen in the rivers and dams. This also result in the death of fish and other marine life due to lack of oxygen.

### Activity 1 Educational tour

Tour the area within and outside your school to identify areas that have been affected by erosion. Try and identify the type of erosion that took place and the possible effects to the surrounding community. Try and find solutions to avoid erosion and ways to reclaim the eroded area.

### Exercise A

Answer the following questions.

1. What is soil erosion? [1]
2. State any four causes of soil erosion. [4]
3. Explain any five effects of soil erosion. [5]

### Summary

- Soil erosion is the washing away of top soil by different causes.
- Poor soil management practices such as overgrazing, ploughing down the slope, veld fires, bare and unprotected soil, stream bank cultivation, and monoculture cause soil erosion.
- Effects of soil erosion include loss of top soil, poor soils, siltation and formation of gullies and dongas.

## Unit 11 Soil pollution

### In this unit you will:

1. define soil pollution
2. explain the causes of soil pollution
3. explain effects of soil pollution.



### Key words

soil pollution

toxic

soil contamination

disposal

## Soil pollution

**Soil pollution** is the addition of **toxic** or harmful substances into the soil in a way that destroys the soil and also brings harm to other living things. Soil pollution leads to **soil contamination**. Soil contamination is when chemicals, nutrients or elements in the soil become more than normal. This is usually a result of human action.

## Causes of soil pollution

### Agrochemicals

The chemicals found in pesticides, herbicides and inorganic fertilisers are harmful to the soil. The excessive use of these agrochemicals contaminates the soil over time and reduces the productivity of the land.

### Industrial waste

The direct and incorrect way of wastewater disposal by industries leads to soil contamination. **Disposal** means getting rid of something. Activities like this make the soil toxic and eventually unusable.



Figure 11.1 Soil pollution by industrial waste

## 2.2.2 Agriculture and soiling

Irrigation methods like flood irrigation if not properly managed can cause soil pollution. Flood irrigation can lead to overwatering and the eventual deposition of nutrients at lower ends of the field. Eventually the soil at the lower end becomes contaminated. Other agricultural practices like lack of crop rotation and intensive farming gradually decrease the quality of soil over time.

### Waste

The disposal of cans, plastics and other solid waste as shown in Figure 11.2 can also cause soil pollution. The most harmful is the disposal of batteries because they carry harmful chemicals that leak into the soil.



Figure 11.2: Improper disposal of solid waste causes soil pollution.

The process of mining involves the removal of topsoil to get the minerals underneath. This can turn productive land into barren or unproductive land. This in itself is a form of soil pollution. The waste products from mines are also disposed of on land near the mine. When the minerals are exhausted, the mine leaves behind soil that is contaminated and cannot be used for other purposes.

### Activity 1 Survey

As a class, visit a place where soil pollution is taking place. Write down the causes of pollution in that area. Write a letter to the Environmental Management Agency (EMA) telling them about the pollution.



## Effects of soil pollution

### Lowering soil fertility

When soil is polluted by chemicals and heavy metals or degraded due to mining activities, its fertility is lower or might even be lost entirely. Pollutants also harm soil microorganism, resulting in the reduced rate of decomposition of plant and animal matter leading to soil infertility. Pollutants generally disturb the natural makeup of the soil.

### Reduces crop yield

If the soil is infertile it cannot support plant life. This results in poor yields or none at all. Soil pollution changes the nature of plants and lowers crop productivity. Some plants can even die due to the toxins in the soil.

### Lowering livestock production

When plants die, it means the animals that depend on the plants are also affected. Also, when plants take up the toxins in the soil, they pass them up the food chain endangering the health of animals and humans. This introduces diseases to animals and humans.

### Exercise A

Answer the questions below.

1. What is soil pollution? [2]
2. State any four causes of soil pollution. [4]
3. Describe any three effects of soil pollution. [6]

### Summary

- Soil pollution is the addition of toxic or harmful substances into the soil in a way that destroys the soil and also brings harm to other living things.
- The causes of soil pollution are industrial waste, agrochemicals, fertilisers, litter and mining processes.
- The effects of soil pollution are lowered soil fertility, which leads to poor crop yield, and death of crops, which also affects livestock production.

### Glossary

<b>Organism</b>	-	is any living thing, either plants or animals.
<b>Decomposition</b>	-	is the process of decaying.
<b>Humus</b>	-	is decomposed organic matter.
<b>Parent rock</b>	-	is the original rock.
<b>Weathering</b>	-	is the breaking down of rocks to form soil.

<b>Moderate</b>	-	means average.
<b>Pollutant</b>	-	is a substance that causes pollution.
<b>Pollution</b>	-	is the introduction of something harmful to the environment.
<b>Contamination</b>	-	is to make something dirty.
<b>Toxic</b>	-	means harmful or poisonous.
<b>Dispose</b>	-	means to throw away.
<b>Soil micro-organisms</b>	-	are small animals that live in the soil.

## End of topic assessment

### Multiple choice

Choose the correct answer.

- Which of the following is not a component of soil?  
A. Air                      B. Organic matter    C. Water                      D. Plastic
- Name the highest component of the soil.  
A. Mineral matter                      B. Organic matter  
C. Water                      D. Air
- The breaking down of rocks to form soil is called \_\_\_\_\_.  
A. decomposition                      B. erosion  
C. weathering                      D. pollution
- Which weathering agent forms the feature shown in the picture?  
A. Wind  
B. Temperature change  
C. Frost  
D. Plants
- The most fertile part of the soil is called \_\_\_\_\_.  
A. top soil                      B. parent rock                      C. subsoil                      D. sand
- Which soil has a very coarse texture?  
A. Clay                      B. Loam                      C. Silt                      D. Sand
- Which soil is best suited for plant growth?  
A. Clay                      B. Loam                      C. Silt                      D. Sand
- A soil which has enough nutrients to support plant growth is said to be \_\_\_\_\_.  
A. eroded                      B. polluted                      C. weathered                      D. fertile
- The washing away of top soil is called \_\_\_\_\_.  
A. weathering    B. erosion                      C. siltation                      D. decomposition
- \_\_\_\_\_ causes soil erosion.  
A. Overgrazing                      B. Adding manure  
C. Contour ridging                      D. Growing trees



### Structured questions

Answer all the questions in full.

1. State any three types of soil. [3]
2. Identify any five sources of organic manure. [5]
3. a) What is soil pollution? [1]  
b) Explain how mining causes soil pollution. [3]
4. What are the functions of the following in soil;  
a) inorganic matter  
b) air? [4]

## Unit 12 End of term one assessment

### Paper 1

Choose the correct answer.

- Which of the following is a branch of agriculture?  
A. Agriculture science    B. Horticulture    C. Dairy production    D. Grazing
- Select a correct list of perennial crops  
A. Tea, sugarcane, potato.    B. Maize, tea, tobacco.  
C. Beans, rice, watermelon.    D. Cotton, spinach, onion.
- Animal production is a branch that deals with \_\_\_\_\_.  
A. vaccination of cattle  
B. selling of livestock  
C. transportation of animals to butcheries  
D. rearing of animals
- Which product is classified under poultry farming?  
A. Rabbit meat    B. Pork    C. Beef    D. Mutton
- \_\_\_\_\_ is **not** an example of an animal product.  
A. Mutton    B. Chicken    C. An egg    D. Grass
- What is the main aim of agricultural engineering?  
A. To protect crops and animals.  
B. To teach farmers on how to make profitable farming.  
C. Improving the effectiveness and sustainability of farming practices.  
D. Increasing the number of livestock in the country.
- What is the function of a disc plough?  
A. Harvesting of wheat.    B. Slashing tall grass.  
C. Construction of tall buildings.    D. Tilling of land.
- Mr Mkhwebu grew a hectare of wheat last year. He sold the wheat to the Grain Marketing Board and made a profit of \$700,00. He also grew a hectare of lettuce and made a profit of \$935,00. How much profit did he make altogether?  
A. \$1 735,00    B. \$1 635,00    C. \$235,00    D. \$650,00
- In which soil does tobacco grow well?  
A. Loam soil    B. Sandy soil  
C. Sandy loam soil    D. Clay soil
- Economists help farmers to \_\_\_\_\_.  
A. apply for loans from banks  
B. plan their finances and keep farm records  
C. import fertilisers from other countries  
D. buy more trucks to carry farm outputs
- The growing of garden crops like flowers and vegetables is known as \_\_\_\_\_.  
A. agriculture    B. vegetable production  
C. crop husbandary    D. horticulture

2. Why do farmers use tools?
  - A. To reduce injuries to the operator.
  - B. To make work easier and effective.
  - C. To increase labour costs.
  - D. To be fancy.
13. The following are ways of maintaining farm tools except \_\_\_\_\_.
  - A. greasing metal parts to protect them from rust
  - B. oiling of pavements to reduce friction
  - C. washing and drying of tools after use
  - D. packing tools in their original case after use
14. What is the use of a harrow?
  - A. Weeding
  - B. Loading materials
  - C. Breaking soil lumps
  - D. Digging
15. Which of the following tools are stored on a tool board?
  - A. Hoes, picks, axes and pliers.
  - B. Drilling machine, rakes, forks and hammers.
  - C. Wood saws, screwdriver, hammer and pliers.
  - D. Garden forks, mattocks and rakes.
16. Records of \_\_\_\_\_ are included in an inventory of farm tools.
  - A. available farm tools
  - B. total workers in a farm
  - C. hectares of cultivated land
  - D. sold tractors
17. \_\_\_\_\_, security and a roofed storeroom are characteristics of good storage facilities.
  - A. Painting
  - B. Ventilation
  - C. Colour codes
  - D. Size
18. Choose a correct technique that a farmer can use to identify tools.
  - A. Keeping tools unwashed after use.
  - B. Leaving them in the field under the same position.
  - C. Numbering tools accordingly.
  - D. Making sure that they are not affected by rust.
19. Why is it important to follow precautions when using agrochemicals?
  - A. To avoid causing harm to the environment.
  - B. In order to apply large doses.
  - C. Because it is a must.
  - D. To wear protective clothing.
20. Select the appropriate colour code representation of agrochemicals.
  - A. Green – moderately toxic.
  - B. Red – harmful.
  - C. Purple – extremely toxic; very dangerous poison.
  - D. Orange – highly toxic; very dangerous poison.
21. Which of the following is a health problem associated with poor use of agrochemicals?
  - A. Bleeding gums.
  - B. Yellowing of teeth.
  - C. Stomach discomfort.
  - D. Swollen feet.

22. Agrochemicals include \_\_\_\_\_.
- herbicides, medicine and pesticides
  - pesticides, insecticides and herbicides
  - lotion, sprays and perfumes
  - repellents, insecticides and fertilisers
23. \_\_\_\_\_ is an environmental effect of agrochemicals.
- itchy skin
  - Wilting of plants
  - Death of pests
  - Air pollution from spray drift
24. Stamping in agriculture means \_\_\_\_\_.
- pressing manure into plastic bags
  - movement of heavy machinery in a field
  - engraving something using die or an ink block
  - sending documents to post offices for stamping
25. Identify one element of weather.
- Humidity
  - Wind vane
  - Freezing
  - Sunshine
26. Which instrument is used to measure humidity?
- Barometer
  - Thermometer
  - Humidity gauge
  - Hygrometer
27. \_\_\_\_\_ is the amount of precipitation that falls at any given area.
- Snow
  - Rainfall
  - Wind
  - Cloud cover
28. Changes in regional and global climate patterns are influenced by \_\_\_\_\_.
- weather
  - global warming
  - heat
  - ozone layer
29. Which agricultural activity occurs in natural farming region 1?
- Semi-extensive farming
  - Intensive farming
  - Extensive farming
  - Specialised farming
30. An example of an area found in natural farming region 4 is \_\_\_\_\_.
- Beit Bridge
  - Marondera
  - Cashe
  - Tsholotsho
31. What activity is carried out by farmers during the hot dry season of Zimbabwe?
- Harvesting maize.
  - Preparation for the next season.
  - Resting.
  - Growing of wheat.
32. Soil is composed of \_\_\_\_\_.
- 5% organic matter, 25% mineral matter, 25% water and 25% air
  - 25% air, 25% water, 45% mineral matter and 5% organic matter
  - 50% water, 15% organic matter and 35% air
  - 50% organic matter, 25% air and 25% water
33. Why is humus important in the soil?
- It reduces soil erosion.
  - It helps to raise soil temperature as warmth is needed for seed germination.
  - It provides water for plants.
  - It reduces soil fertility.

34. What is formed after the breaking down of the parent rock?  
 A. Stones                      B. Humus                      C. Soil particles                      D. Gullies
35. The following are agents of weathering, except \_\_\_\_\_.  
 A. moving animals                      B. temperature changes  
 C. freeze and thaw                      D. stones
36. Expansion and contraction of rocks causes them to \_\_\_\_\_.  
 A. peel off                      B. swell                      C. expand                      D. evaporate
37. What is soil texture?  
 A. Arrangement of soil particles.  
 B. Movement of soil particles.  
 C. The coarseness or fineness of soil particles.  
 D. Size of each soil particle.
38. Which soil type has a high water holding capacity?  
 A. Granite                      B. Sand                      C. Clay                      D. Loam
39. Which soil type carries large amounts of nutrients?  
 A. Loam                      B. Silt                      C. Clay                      D. Sand
40. Organic fertilisers are produced from \_\_\_\_\_.  
 A. fertilisers                      B. decayed animals and plants  
 C. decomposed plastic                      D. industries
41. Identify a good source of organic manure.  
 A. Compost                      B. Garbage bin  
 C. Compound D fertiliser                      D. Plastics
42. Where is a fertility trench mostly used?  
 A. On a large farm.                      B. Plantation.  
 C. Garden.                      D. Livestock production area.
43. Why are legume crops mostly used for green manuring?  
 A. They easily decay.  
 B. They contain nitrogen which is important for plant growth.  
 C. They make a colourful manure.  
 D. They are fancy and expensive.
44. What is the advantage of using animal manure?  
 A. It has low nutrients for plants.  
 B. It is inexpensive.  
 C. Pests are affected by its smell.  
 D. Growth of weeds is speeded up.
45. Soil erosion can be caused by \_\_\_\_\_.  
 A. improper rock weathering                      B. planting trees  
 C. heavy lightning                      D. stream bank cultivation
46. One water source in Zimbabwe that shows a sign of heavy siltation is \_\_\_\_\_.  
 A. Save river                      B. Lake Mutirikwi  
 C. Kariba dam                      D. Indian ocean
47. The washing away of fertilisers into rivers and dams results in \_\_\_\_\_.  
 A. purification of water                      B. siltation  
 C. eutrophication                      D. nutrients for aquatic animals

48. Which of the following is a human cause of soil pollution?
- A. Agrochemicals. B. Decayed animals.  
C. Irrigation. D. Soil cultivation.
49. \_\_\_\_\_ is an effect of soil pollution.
- A. Eroded land B. Decaying of dead animals  
C. Reduced crop yield D. Weathering
50. Batteries are most harmful to the soil because \_\_\_\_\_.
- A. They are heavy  
B. They leak dangerous chemicals  
C. of their colour  
D. They melt very quickly

## Paper 2

### Section A

Answer all questions in this section. Each question carries 5 marks.

1. List any five branches of agriculture. [5]  
2. a) Define the term 'farm inventory'. [1]  
b) Copy and complete the table below.

Tool	Use	Maintenance	
i. _____	Marking straight lines	Wash and dry in the sun after use	[1]
Spade	ii. _____	Wash after use	[1]
Sprayer	Spraying to control pests	iii. _____	[1]

- c) Give one characteristic of a good storage facility. [1]  
3. a) State any three health and environmental effects of poor agrochemical handling. [3]  
b) i. Define weathering. [1]  
ii. Give any one weathering agent. [1]  
4. With the aid of a pie chart, illustrate the soil components. [5]  
5. a) Distinguish between weather and climate. [2]  
b) Give any three elements of weather. [2]  
6. a) State any two major soil types. [2]  
b) State any three characteristics of loam soil. [3]

[30 marks]



## Section B

Answer any two questions. Each question carries 10 marks.

7. a) List the steps taken to test the water holding capacity of soil. [5]  
b) Describe steps taken in compost making. [5]
8. a) i. What is soil erosion? [1]  
ii. State any two agents of soil erosion. [2]  
iii. Give two effects of soil erosion. [2]  
b) What is soil pollution? [2]  
c) How do human activities contribute to soil pollution? [3]
9. a) Explain any five effects of soil pollution. [5]  
b) List any two precautions taken when using agrochemicals. [2]  
c) Give the meaning of these colour codes in agrochemicals: green, purple and red. [3]
10. a) Copy and complete the table below.

Region	Areas in the region	Average annual rainfall	Average annual temperatures	Agricultural activities	
1	i. _____	Over 1000mm	Cool Less than 15°C	ii. _____	[2]
iii. _____	Esigodini	500mm – 750mm Fairly high	Hot 18 - 24°C	Suitable for growing drought resistant crops like sorghum and wheat	[1]
5	iv. _____	v. _____	Very high temperatures over 30°C	Limited agriculture activity Forestry and wildlife	[2]

- b) What is green manure? [2]
- c) Describe how liquid manure is made. [3]

**[20 marks]**

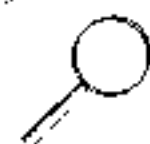
## Unit 13 Water conservation

**In this unit you will:**

1. list methods of soil moisture conservation
2. describe conservation methods
3. demonstrate soil moisture conservation techniques.

**Flashback**

In the previous grade you learnt about the methods of harvesting, storing and conserving water. In groups revise these methods and present them in class.

**Key words**

moisture    conservation    water retention    infiltration

**Soil moisture conservation methods**

There are many methods of soil moisture conservation. **Moisture** is the wetness of the soil and **conservation** is an act of keeping or preserving. Soil moisture preservation is, therefore, an act of preserving water in the soil. Most of these methods are cheap and required materials are locally available. The methods aim to provide a kind of cover for the soil to avoid evaporation and transpiration. These methods include mulching, manuring, petholing, tie ridging and crop rotation.

**Manuring**

Mulching is a process of covering the soil in order to keep moisture in the soil and to provide favourable conditions for plant growth. The materials that can be used for mulching are leaf mold, grass, manure, hay and wood shavings. The major advantage of mulching is that it prevents water from evaporating into the atmosphere but there are many other advantages like:

- helps to control weeds
- protects plant roots from the cold winter

- helps to prevent soil erosion
- allows for early germination of seeds as it enhances soil temperature.

Figure 13.1 below shows mulching.

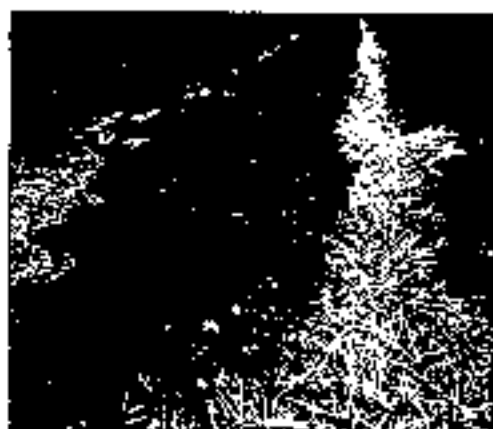


Figure 13.1 Grass mulch on strawberries

## Manuring

Adding organic matter to the soil helps improve soil quality. Improved soil quality means better **water retention** in the soil. Water retention is the amount of water the soil can hold. Manuring also helps to reduce runoff and improves water **infiltration**. Infiltration is the process of water sinking into the ground.

## Potholing

Potholing shown in Figure 13.2, is a system in agriculture where farmers till only where the crops have been planted. The farmer only waters and cultivates the area around the plant only. Potholing traps water in the hole, which will then hold the moisture and assist plants to grow. Potholing is a very cheap water conservation method and each pothole remains fertile for about three years reducing fertiliser costs.

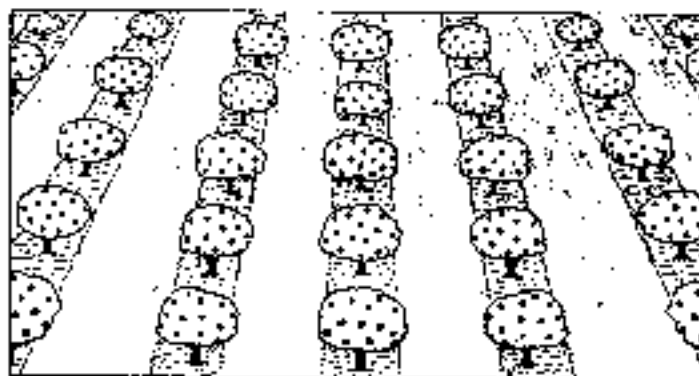


Figure 13.2 Potholing

## Activity 1 Practical

Go to the school garden and choose an area where you can make a pothole to grow a simple vegetable. It may be spinach, tomato, beans, or peas. Use any plant or seed that is easily available. Care for the plant and watch it grow.

See how the area within the pathole conserves moisture as compared to the area around. You can also mulch your hole. This activity can also be practiced at home.

### Tied ridging or contour ridging

Tied ridging involves making soil heaps. These heaps are called ridges. These ridges can be 15cm to 20cm high. The ridges are made using hoes or ploughs. Crops are then grown on top of the ridges. This is done across a steep sloping area in order to trap fast moving water. Tied ridging helps to reduce the loss of water and soil from arable land.



One of the places where tied ridging is practiced in Zimbabwe is Domboshava. **Figure 13.3 Tied ridging**

### Crop rotation

Growing different types of crops every season helps to improve soil structure and the water holding capacity of the soil. For example, in one season a farmer can grow tomatoes which are deep rooted and need to be watered less frequently and in another season, onions, that are shallow rooted and need to be watered frequently. Plants draw water from different depth levels within the soil. In this case the onions will use the unused soil moisture left from the tomatoes. Crop rotation may also improve soil fertility and help control pests and diseases.

### Activity 2 Educational tour

1. As a class visit a farm that does crop production.
2. Observe the methods they use to conserve soil moisture.
3. Ask the farm manager questions on soil moisture conservation.
4. Write a report about what you learnt at the farm.

### Exercise A

Answer the following questions.

1. The process by which water sinks into the ground is called \_\_\_\_.  
A. evaporation  
B. infiltration  
C. transpiration  
D. photosynthesis

2. Select a method of soil moisture conservation.  
A. Soiling                      B. Precipitation                      C. Watering can                      D. Potholing
3. Which of the following materials should **not** be used as a mulch?  
A. Tin    B. Maize stalks  
C. Grass    D. Wood shavings
4. With the aid of a well labelled diagram, explain tied ridging. [4]

## Summary

- Soil moisture preservation is an act of keeping water in the soil.
- Most methods of moisture conservation aim to provide a kind of cover for the soil to avoid evaporation and transpiration.
- These methods include mulching, manuring, potholing, tied ridging and crop rotation.

## Unit 14 Water pollution

### In this unit you will:

1. define water pollution
2. state causes of water pollution
3. explain the effects of water pollution.

### Flashback

Recap in groups on methods of harvesting water.



### Key words

water pollution    eutrophication    aquatic life

## Water pollution

The contamination of water sources by improper disposal of substances, is known as **water pollution**. The contaminating substances include plastics, metal objects and various chemicals. Water pollution takes place on surface water bodies like rivers, dams, lakes and also on groundwater like springs, boreholes and underground streams.

### Activity 1 Research

Watch a video on how water is polluted. You can also use the internet if available to view images and videos on water pollution. From what you have seen, what are the causes of water pollution?

## Causes of water pollution

The main cause of water pollution is human activity. These human activities include the improper disposal of industrial, mining, sewage waste, litter and agrochemicals.

### Industrial waste

Industries are a huge cause of water pollution. They dump extremely harmful substances into water bodies. They use fresh water to carry away waste from their factories into rivers, dams or lakes and oceans.

### Mining waste

Mining is a very important industry but it has negative impacts on water bodies. Mining causes water pollution on surface and groundwater through spilling harmful substances into water bodies. The water that is used to clean the minerals is dumped back into water bodies making the water unusable. In Bulawayo the

mining activities around the Umzingwane river is causing water pollution. Mining chemicals are being discharged into the river thereby polluting the river.

### Sewage waste

Sewage is waste from homes like faeces, urine and laundry waste. Sewage is usually treated in water treatment plants and the waste is often disposed into the sea. This sometimes does not happen and sewage waste is dumped in water bodies without treatment causing water pollution.

In Zimbabwe, Lake Chivero is the main source of drinking water in Harare but it is experiencing water pollution. Sewage waste from the Mukivisi and Manyame river flows into the lake.



Figure 14.1 Water pollution at Lake Chivero

### Litter

The dumping of litter such as plastic, tins, newspapers, glass and metal causes water pollution. Litter can be dumped both on land and in the water bodies. When dumped on land, these materials are carried to rivers, dams or lakes and oceans. This then causes water pollution.

### Agrochemicals and fertilisers

Pesticides, herbicides and insecticides will always find their way into water bodies. These chemicals are easily washed away by runoff water into water bodies causing pollution. When fertilisers are carried into water bodies, they cause **eutrophication**. Eutrophication is the rapid growth of plant life in water bodies, leading to the death of aquatic life deprived of oxygen which the plants use up.

## Activity 2 Survey

Identify possible sources of water pollution in your community. Think of ways to help control the sources of water pollution. Write them down and present them to the class. Collect the best ideas and if possible, present them to the community head.

## Effects of water pollution

### Death of water animals and plants (aquatic life)

The major problem caused by water pollution is that it kills **aquatic life**. Aquatic life can die from living in a toxic environment. Aquatic life means plants and animals that depend on clean water for survival.



Figure 14.2 Contamination of water bodies kills fish

### Diseases

Humans and animals are affected by water pollution. Polluted water has bacteria which causes diseases like typhoid and cholera in human beings. **Bilharzia** is also a result of bilharzia worms found in polluted water bodies.

### Disturbance of the ecosystem

An ecosystem is a chain of interdependence of animals, plants and other organisms. If harm is done to one, it affects all the organisms in the ecosystem. For example, if fish die from contaminated water, ducks, penguins and bears lose a big part of their diet.



## Reduction of water quality

Impurities in water change the taste of water and its usability, therefore, human activities like cooking, washing and irrigation are negatively affected. Large amounts of money will then be needed to purify the water and make it usable.

### Activity 3 Educational tour

1. Visit a nearby known area where water pollution is taking place.
2. Observe and write down the main components of pollution found in the water.
3. Identify effects of water pollution.

### Exercise A

Answer the questions below.

1. What is water pollution? [2]
2. Describe any two major causes of water pollution. [4]
3. Give any two examples of diseases which are caused by drinking polluted water. [2]
4. Explain any effect of water pollution on the ecosystem. [2]

## Summary

- The contamination of water sources by improper disposal of substance is known as water pollution.
- The causes of water pollution are industrial, mining and sewage waste, littering and agrochemicals.
- The effects of water pollution are death of aquatic life, diseases, disturbance of the ecosystem and reduced water quality.

## Glossary

<b>Conservation</b>	- to keep or preserve so that it lasts longer.
<b>Water retention</b>	- is the ability of soil to hold water.
<b>Infiltration</b>	- is the process of water entering the soil
<b>Arable land</b>	- is land that can be used for agricultural purposes.
<b>Contamination</b>	- is to make something impure or dirty.
<b>Eutrophication</b>	- rapid growth of plant life in water bodies which deprives aquatic life of oxygen and results in death of aquatic life.

## End of topic assessment

### Multiple choice

Choose the correct answer.

- \_\_\_\_\_ is water flowing on the ground after raining.  
A. Litter                      B. Run-off                      C. Erosion                      D. Sand
- The sinking of water into the ground is called \_\_\_\_\_.  
A. evaporation              B. transpiration              C. run-off                      D. infiltration
- What is polluted water?  
A. Water with harmful substances.              B. Safe drinking water.  
C. Processed water.                                  D. Cold water.
- Which is a correct soil moisture conservation method?  
A. Water logging              B. Soil pollution              C. Tied ridging              D. Infiltration
- Water pollution \_\_\_\_\_  
A. causes floods  
B. causes growth of vegetation  
C. makes soil fertile  
D. contaminates drinking water; killing plants and animals
- Which of the following materials should **not** be used as a mulch?  
A. Tin                                  B. Maize stalks  
C. Grass                              D. Wood shavings
- The rapid growth of plant life in water bodies, ultimately leading to death of aquatic life from lack of oxygen is called \_\_\_\_\_.  
A. fertilisation              B. eutrophication              C. pollination              D. infiltration
- Where is soil moisture preserved in potholing?  
A. Only in the pothole.                                  B. In the surrounding area.  
C. In the plant.    D. There is no moisture preserved.
- Which one of the following activities adds to water pollution?  
A. Soil conservation.                                  B. Cutting down trees.  
C. Adding manure to soil.                              D. Dumping of industrial waste.
- Soil moisture should be preserved because \_\_\_\_\_  
A. rivers carry too much water  
B. animals need to walk on moist soil  
C. moist soil is hard to work on  
D. plants depend on the moisture in the soil

### Structured questions

Answer all the questions in full.

- List any three soil moisture conservation methods. [3]
  - Describe any one method in a). [2]
- State any three causes of water pollution. [3]
  - Explain any one cause of water pollution. [2]
- Give any four effects of water pollution. [4]

## Unit 15 Plant structure

### In this unit you will:

- 1 Identify external parts of the plant.

### Flashback

In the previous grade you learnt about different types of plants and their uses. The different classes of crops are field, vegetable, cash and fodder crops, fruits, trees and flowers. You also learnt on how to classify plants according to their lifecycle.

What are annual crops? Give examples.

What are perennial crops? Give examples.

What are biennial crops? State some examples.



### Keywords

external  
stomata

photosynthesis  
plant reproduction

chlorophyll  
fertilisation

### External parts of plants

**External** parts of plants refer to the outer parts of plants. These are the visible parts that we can see at first glance, like the leaf, stem, flowers and roots as shown in Figure 15.1. Together they play a very important role in the survival of plants.

#### Leaf

Most leaves are green in colour. The green colour in leaves is called **chlorophyll**. The chlorophyll in the leaves absorbs energy from the sun and uses it to make food in a process called **photosynthesis**. Leaves also have tiny pores called **stomata** that

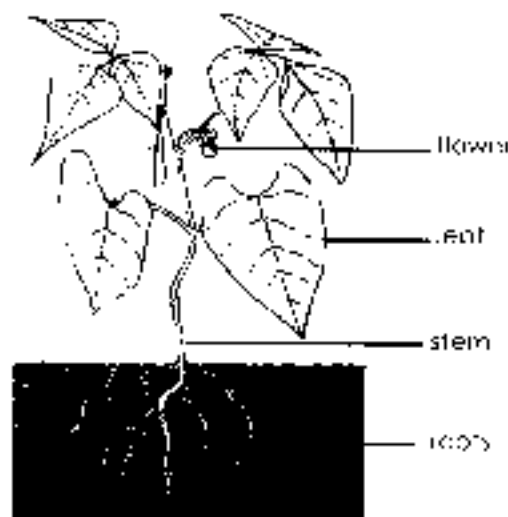


Figure 15.1 External parts of a plant

allow them to take in carbon dioxide and release oxygen produced during photosynthesis. Photosynthesis is the process where plants use sunlight, carbon dioxide and water to produce food and oxygen.

### Activity 1 Practical

Pick a green leaf. Rub it onto a white piece of paper. What colour is produced by the leaf?

### Stem

The stem gives support to the plant above the ground and has buds that develop into leaves. The stem holds the leaves in such a position that they can receive maximum sunlight. It also transports nutrients and water to places within the plant where they are needed. From the roots, water and nutrients go to the stem, then to the leaves and flowers.

### Flowers

Flowers are usually colourful and attractive. This is because they are the reproductive organs of the plant. **Plant reproduction** is the process where plants produce new offspring through the process of **fertilisation**. Fertilisation is the joining of the male and female parts in the flower. The fertilised flower develops into a fruit that contains seeds.

### Roots

The main functions of roots are to absorb water and nutrients from the soil, anchor the plant in the ground, support the stem and store food. Examples of roots that store food and are used as food are sweet potatoes and carrot.

### Activity 2 Practical

1. Collect samples of flowering plants. Identify the external parts of the plant. You can also use the internet to search for different flowering plants.
2. Draw and label the plant structure.

### Exercise A

Answer the following questions.

1. Name the part of a plant that develops into a fruit. [1]
2. What are the main functions of the plant roots? [2]
3. a) What is chlorophyll? [2]  
b) What is the function of chlorophyll? [1]
4. Define the term photosynthesis. [2]
5. What is the function of the stem? [2]
6. The tiny pores in a leaf are called \_\_\_\_\_. [1]

## Summary

- The external parts of plants are leaves, stem, flowers and roots.
- Leaves absorb sunlight and carbon dioxide to produce food in the process of photosynthesis.
- The stem supports the plant above the ground and transports water and nutrients to where they are needed.
- Flowers are the reproductive parts of the plant.
- Roots absorb water and nutrients from the soil to feed the whole plant.

## Unit 16 Plant nutrition

### In this unit you will:

1. explain the importance of major plant nutrients
2. explain the importance of minor plant nutrients.

### Flashback

Plants, like human beings, require nutrients. Nutrients make plants grow and produce food. We apply manure and fertiliser into the soil to add plant nutrients.



#### Key word

nutrients

### Major nutrients

**Nutrients** are elements that are needed for plant growth. Plants need special kinds of nutrients in large amounts for their growth. These nutrients are called major nutrients. The major nutrients are Nitrogen (N), Phosphorous (P) and Potassium (K).

#### Nitrogen (N)

Nitrogen is a very important element needed for plant growth. It is a major component of chlorophyll in leaves. 78% of the atmosphere is nitrogen but plants cannot absorb nitrogen directly from the atmosphere. Inorganic and organic fertilisers are used to increase the amount of nitrogen in the soil for plants to absorb. When plants absorb nitrogen, they use it to build protein and grow. Plants with high amounts of nitrogen experience high rates of photosynthesis. Plants that lack nitrogen have yellow leaves and stunted plant growth.

#### Phosphorous (P)

Phosphorous is another important nutrient needed by plants. In photosynthesis, phosphorous helps to transfer energy from sunlight to plants. It also encourages early root and plant growth and quickens maturity. It also increases the strength of stems and the development of flowers and seeds. Phosphorous deficient plants are seen by purple leaves, small leaves and poor shallow roots.

#### Potassium (K)

Potassium is an essential plant nutrient. It is required in large amounts for proper

growth and reproduction of plants. In photosynthesis, potassium controls the opening and the closing of the stomata, therefore, controlling the absorption of carbon dioxide. Potassium is important for flower formation, increased resistance of diseases in plants, and improving fruit quality. The shortage of potassium is seen by poor fruit formation, and leaves that are curly and dry around the edges.

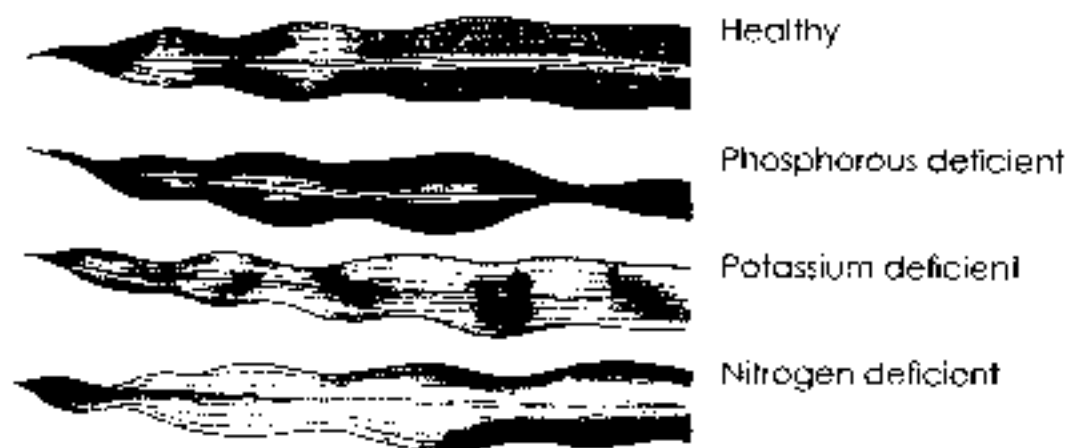


Figure 16.3 Maize leaves showing different nutrient deficiencies

### Minor nutrients

Minor nutrients are those needed by plants in small quantities. Even though these nutrients are needed in small quantities they are also important for plant growth. These nutrients include zinc, boron, copper, iron and manganese.

Table 16.1 Minor nutrients and their functions

Minor nutrient	Function
Zinc (Zn)	Improves crop quality and increases yields.
Boron (B)	It transports sugar, divides cells and aids production of protein.
Copper (Cu)	Helps in the process of photosynthesis.
Iron (Fe)	Helps in the process of photosynthesis.
Manganese (Mn)	Assists in breaking down nitrogen and photosynthesis.

### Activity 1 Group discussion

1. In groups, discuss the difference between major and minor nutrients.
2. Discuss the importance of the major nutrients in plants.
3. Draw and colour crops that lack major nutrients.

## Exercise A

Choose the correct answer.

1. Which one is a major plant nutrient?  
A. Copper      B. Potassium      C. Iron      D. Boron
2. A plant with stunted growth and yellowish leaves has a deficiency of \_\_\_\_\_.  
A. nitrogen      B. iron      C. phosphorus      D. copper
3. Which nutrient is essential for root development?  
A. Boron      B. Nitrogen      C. Manganese      D. Phosphorus
4. Which one is an example of a minor nutrient?  
A. Zinc      B. Potassium      C. Phosphorus      D. Nitrogen
5. The nutrient that controls the absorption of carbon dioxide and the formation of flowers is called \_\_\_\_\_.  
A. manganese      B. nitrogen      C. zinc      D. potassium

## Summary

- Like human beings, plants also need nutrients to grow.
- The major nutrients are Nitrogen (N), Phosphorus (P) and Potassium (K).
- The minor nutrients include iron, zinc, boron and manganese.



## Unit 17 Vegetable crops

### In this unit you will:

1. grow a fruit and a legume vegetable
2. identify vegetable pests and diseases.

### Flashback

In the previous grade you learnt about different vegetables and their nutritional value. You also learnt how to grow a root vegetable. List different types of vegetables and give their nutritional value.



### Key words

legume

transplanting

seedling

side dressing

### Growing a legume

**Legumes** are plants that produce pods with seeds. The seeds are very healthy because they are rich in protein. There is a wide variety of legumes like peas, beans, lentils and peanuts.

### Growing peas

Peas are an easy plant to grow and they do well in cool conditions so they will grow well in the dry and cold season.



Figure 17.1 Mature pea plant being harvested

## Pea varieties

There are many pea varieties that can be grown. The most common peas are garden peas, sugar snap peas and snow peas. Figure 17.2 shows these varieties.



garden peas



sugar snap peas



snow peas

Figure 17.2 Varieties of peas

## Land preparation

Peas grow well in fertile, well-drained soils that have enough organic matter and compost and in a location that gets a lot of sunlight. The following tips can be helpful in preparing land for planting peas:

- Mark the area you would want to plant your peas.
- To give the plants the best head start, turn over your pea planting beds and add compost or manure to the soil before planting.
- Add potassium and phosphorous fertiliser as peas need those two nutrients the most. Make sure the soil and the fertiliser are mixed well.

## Planting peas

- To speed up germination make sure that you soak the seeds overnight.
- Water the garden the night before planting.
- Make rows 30cm apart.
- Drop seeds 2.5cm-3cm deep and 5cm-7cm apart.
- Cover the seeds with soil then mulch the bed.
- After mulching, water the bed.
- Germination is expected 5 to 7 days.

## Caring for peas

When the crop has germinated you can care for it by:

**Watering:** make sure that the soil is always moist so that roots can easily absorb water and nutrients. Water at least once a week. Do not let the plant dry or else the pods will not be produced.

**Cultivation:** shallow cultivation should be practiced. This is done to loosen the soil so that there is free air movement. To avoid disturbing breakable roots, gently remove weeds by hand.

Continue taking care of the plant until the pods are ripe.

## Pest and disease control

The most common pests for peas are aphids. Checking the plant for pests is important so as to anticipate the problem and control it before it damages the plant. Roger can be used to control aphids.

The diseases that are common to the pea plant are damping off, downy mildew and fusarium wilt. These can be treated by using treated seeds, growing resistant varieties, planting on well-drained soil and weeding.

## Harvesting peas

Peas are usually ready for harvest 50 to 80 days after planting. Depending on the use, peas can be harvested:

- When pods of the peas appear to be swelling and form visible rounded peas. Pull firmly but gently so as to not break the plant.
- When harvesting for the seed, do it when the pods are dry.
- In the morning to avoid pod shattering when it is hot.
- When you are done harvesting, cultivate the plant into the soil to improve soil fertility.

## Marketing peas

Peas can be sold fresh or dry. Fresh peas should be packed and kept in a cool place. Fresh peas can be canned or frozen to preserve them fresh. Dry peas can be placed and kept in a dry place. Both fresh and dry peas can be sold in supermarkets.

### Activity 1 Research

Think of various ways you would grade, package, price, advertise and sell your peas. When would you start advertising your peas? Write down all the information you would need before the plant ripens. This is so that you are ready for the selling and marketing season.

## Growing tomatoes

Tomatoes are a popular garden vegetable. They are a warm season crop. They are easy to grow and produce a lot of fruit. Tomatoes are rich in vitamins A, B and C.

### Tomato varieties

There are many varieties of tomatoes. Figure 17.4 shows some popular tomato varieties which are money maker, plum and beefsteak tomatoes.



Figure 17.3 A tomato plant



money maker tomato



plum tomato



bee's neck tomato

Figure 17.4 Tomato varieties

## Land preparation for tomatoes

Tomatoes require fertile, well drained and deep loamy soil to grow.

- Choose an area that receives enough sunlight.
- Use a hoe or spade to dig deep into the soil. Tomatoes are deep rooted plants so there is need for deep ploughing.
- Add manure and compost to make the soil fertile.
- Use a fertiliser that has all the three nutrients: nitrogen, phosphorous and potassium.
- Make sure that the ground is flat before planting.

## Planting tomatoes

Tomatoes are grown from **transplants**. Transplanting is an act of moving a fully germinated **seedling** and planting it in a permanent location for growing. A seedling is a very young plant grown from a seed. Ensure that you grow the seed in a small container first. They can be transplanted after they are about 15cm tall.

- Dig a hole for each plant. The holes should be about 5cm deep and 30cm to 45cm apart.
- Make sure that you cover the roots entirely and mulch.
- Water the bed gently.

## Caring for tomatoes

**Watering:** Water regularly for the first few days. During the growing period, continue watering to ensure the plant does not dry up. Water in the morning to ensure that the plant has enough moisture to carry it through the day.

**Side dressing:** Side dressing is the application of fertilisers in a circle around individual plants. Side dress plants with fertiliser or compost every two weeks starting when the tomato fruits are about 2.5cm in diameter.

**Pruning:** Prune plants by pinching off side stems so that only a couple of branches are growing from each plant. The side stems grow between the branch and the main stem. As the plants grow, trim all the lower leaves off the bottom of the plant. This helps to keep diseases from spreading from the soil to plant leaves.

**Weeding:** Cultivate to remove weeds and to aerate the soil

## Pest and disease control

The most common pests that attack the tomato plant are aphids, flea beetles, hornworms, nematodes and whiteflies. The best way to control these pests is to use insecticide that kills the pests.

There are many diseases that affect tomatoes, these include bacterial wilt, early blight, late blight and leaf mold. The best way to control these diseases is to grow the plants in good fertile soil that is regularly watered. Healthy plants are much more likely to resist diseases and other problems. Keeping the garden free from weeds also helps to control diseases.

## Harvesting tomatoes

Tomatoes take 60 to 80 days to mature from the day of planting, depending on the variety. When tomatoes are fully matured and ready to be harvested, they will fall right off the plant without much effort. They can also be harvested earlier before they are fully ripe. The tomatoes should be washed and dried before packing them in a cool dry place.

## Marketing tomatoes

Tomatoes are easy to sell in Zimbabwe because they are a very important cooking ingredient. Tomatoes are picked and graded at the same time. They are graded into large, medium and small. Tomatoes can be neatly packed in plastic or box packaging for sale in supermarkets and vegetable markets as shown in Figure 17.5.

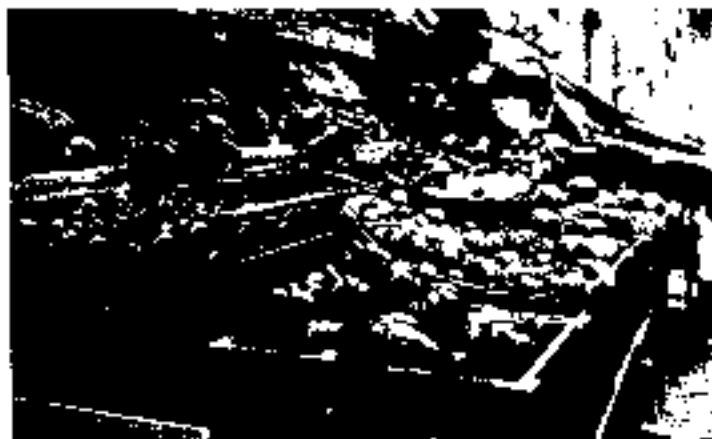


Figure 17.5 Tomatoes at a vegetable market

### Activity 2 Project

#### Growing your own tomato

##### Materials needed

An average plastic container or old pot, a stick, string, compost from garden and tomato seeds

##### Method

1. Mix compost and soil and put it in your container.
2. Make a hole in the container.
3. Put the tomato seed inside the hole and cover with compost.

4. When the seedling has germinated and grown to a height of 15cm, tie a bamboo stick to the plant to support it.
5. Remember to always water the plant well. Tomatoes grow well where there is enough moisture and sunlight.
6. After eight weeks the tomato will be ripe.

Make a tomato book etc. On the first page, write a summary record. This includes the plant name, date sown, date of germination and date of harvest. On the following pages draw a weekly picture of how the plant has developed and describe it. When the project ends compare notes and show each other interesting features.

## Exercise A

Answer the questions below.

1. Legumes are rich in \_\_\_\_\_.  
A. carbohydrates    B. minerals    C. proteins    D. vitamins
2. Which is the best weather condition to grow peas?  
A. Cool    B. Warm    C. Dry    D. Any weather
3. Which one is **not** a variety of peas?  
A. Snow    B. Cocktail    C. Garden    D. Sugar snap
4. Tomatoes are planted as \_\_\_\_\_.  
A. transplants    B. cuttings    C. leaves    D. roots
5. How long do tomatoes take to mature from planting day?  
A. 10 to 20 days    B. 100 to 150 days    C. 30 to 40 days    D. 60 to 80 days
6. Name any one pest that affects peas. [1]
7. Name any two diseases that affect tomatoes. [2]
8. How are fresh peas stored? [1]
9. Name any one variety of tomatoes. [1]

## Summary

- Soil and bed preparation must be done before planting any garden vegetable.
- Watering, weeding, pruning, cultivation, pest and disease control are some of the ways of caring for a vegetable crop.
- The last stages of growing a vegetable crop are harvesting and marketing.

## Unit 18 Field crops

### In this unit you will:

1. plant and manage a cereal crop
2. identify pests and diseases of cereal crop grown.

### Flashback

The main field crops grown in Zimbabwe are maize, wheat, sorghum, groundnuts, sunflower, field beans, and soya beans. In the previous grade you learnt about the importance of field crops. These include source of food, income, raw material and stock feed.



#### Key words

germination commodities broadcasting drilling dibbling

### Growing a cereal crop

Cereal crops are a member of the grass family. Cereal crops are grown for their edible seeds and for livestock feed. The most common cereal crops in Zimbabwe are maize, wheat and sorghum. Other cereal crops include rice, oats and barley. In this book you will learn how to grow wheat.

### Growing wheat



Figure 18.1 Wheat growing in a field

Wheat is the second most important cereal crop in Zimbabwe after maize. This is because wheat produces flour that is used for basic **commodities** like bread.

beans and cokes. Commodities are any agricultural products that can be bought or sold.

### Planting time

The wheat crop is very sensitive to temperature so it is best grown in the dry and cold season under irrigation. There are some varieties that can be grown in the main rain season but the disadvantage with this is that there is high risk of diseases and weeds. The high temperatures also result in low yields. The dry weather is ideal for wheat ripening. Winter wheat is planted from April to mid-May and harvested from mid-August to mid-September.

### Land preparation

The soil must be well drained, fertile and deep. Wheat needs a balance of all the major plant nutrients, nitrogen, phosphorous and potassium including all the other minor nutrients.

Ploughing is done using either a mechanical, or ox-drawn plough. The main reason for ploughing is to ensure a good soil structure. Ploughing also helps bury weeds and allows moisture to soak into the soil. Wheat crop needs an even and compact field for good and uniform seed germination.



Figure 18.2 Land being ploughed by a disc plough

The following steps can be followed when preparing land for wheat:

- Select a piece of land and clear it
- Plough the land, spread manure or compost and mix well
- Level the land to make sure it is even.



## Planting

Seed selection is very important. Farmers are encouraged to use high quality seed that is free from diseases to ensure high yields. The ideal plant population for wheat is 220 - 250 plants per m<sup>2</sup>. This usually depends on the seed size, rate of germination, planting conditions and planting method. There are various methods that can be used when sowing wheat. These methods include **broadcasting, drilling and dibbling**.

- Broadcasting is the scattering of seeds by hand or mechanically over a large piece of land.
- Drilling is a method that uses a seed drill to sow the seeds at proper depths and distance and then cover them with soil.
- Dibbling is a method of putting a few seeds in a hole, made at fixed spacing and depth using a dibble or planter or very often by hand.

After planting the seeds, the land should be watered and kept moist until the seeds germinate.

### Activity 1 Project

#### Growing wheat

Work together as a class to prepare land for planting wheat. Follow the given information on land preparation and planting to make your own simple wheat field.

## Caring for wheat

**Watering:** Winter is a cold-dry season in Zimbabwe. This is why wheat is grown under irrigation. Light irrigation must be done during and after **germination**. Germination is the development of seed to plant. Once the roots have completely developed, irrigation must be done to match the rate of use by the crop and water holding capacity of the soil type. Irrigation must stop when the head of the crop turns yellow. Follow the same principles when watering a small bed.

**Weeding:** Farmers must ensure that there are no weeds in the wheat field until the crop reaches maximum height and develops flowers. Weeds compete with the crop for water and nutrients.

**Fertiliser:** Fertiliser application is very important since wheat requires a constant supply of mostly nitrogen and phosphorous.

**Pest and disease control:** Aphids and stalk borers are the pests that attack wheat. Aphids tend to attack the crop soon after tillering, while borers attack after flowering. Wheat is one of the host crops for the fall armyworm so farmers need to look out for the pest. These pests can be controlled through the use of pesticides.

The diseases that affect wheat are leaf rust, stem rust, powdery mildew and fusarium head blight. The best way to control these diseases is to grow resistant varieties. The use of fungicide sprays is also recommended for disease prone areas.

## Harvesting and marketing

Harvesting is done mid-August to mid-September. Wheat is usually harvested by a combine harvester on very large fields as shown in Figure 18.3. The combine harvester cuts and threshes the crop leaving behind the stalks. The stalks can later be used as stock feed. It is also possible to hand harvest and thresh small areas of wheat. The harvested wheat is collected by the Grain Marketing Board (GMB). The GMB collects and sells almost all the cereal crops in Zimbabwe.



Figure 18.3 Combine harvester harvesting wheat

### Activity 2 Project

#### Monitoring your wheat field

After planting you have to monitor your wheat till it reaches maturity. Make sure:

- the crop has enough moisture at all times
- there are no weeds
- check for pests and diseases
- add the appropriate fertilisers.

## Exercise A

Answer the questions below.

1. Pick a cereal crop.  
A. Wheat      B. Potatoes      C. Onion      D. Groundnuts
2. Which is the best season to grow wheat in Zimbabwe?  
A. Main rain      B. Hot and dry  
C. Cold and dry      D. Post rain
3. What is the other major use of cereals besides providing food for humans?  
A. Grinding      B. Packaging  
C. Medicines      D. Livestock feed
4. State any three aspects of caring for a cereal crop. [3]
5. List any three methods of planting cereal crops. [3]
6. Name the company responsible for collecting most of the cereal crops in Zimbabwe. [1]

## Summary

- Cereal crops are a member of the grass family and are grown for their edible seeds and for livestock feed.
- The most common cereal crops in Zimbabwe are maize, wheat and sorghum.
- Cereal crop planting methods include broadcasting, drilling and dibbling.
- The aspects of taking care of a cereal crop include watering, weeding, fertiliser dress, and pest and disease control.
- Harvesting in very large fields is usually done by a combined harvester.
- The Grain Marketing Board collects most of the cereal crops in Zimbabwe.

## Unit 19 Orchard/Fruit trees

### In this unit you will:

1. identify a suitable site for an orchard
2. prepare a site for planting fruit trees
3. plant fruit trees.

### Flashback

You have learnt how to differentiate between exotic and indigenous trees. You now understand the different methods of planting trees, these include seeds, cuttings and grafting. List the different trees that are grown from each of these methods.



### Key words

sustainability

pruning

### Identifying a suitable site for an orchard

When planning to make an orchard, it is important to be mindful of the factors that will affect fruit quality and orchard **sustainability**. Sustainability is the ability to last long. Usually fruit trees produce fruit for about 15 to 30 years, this is why careful site identification is important. The site must be able to allow the production of high fruit yields and long tree life. Below is an example of an orchard.



Figure 19.1 An orchard

## Factors to consider when choosing a site for an orchard

**Climate:** Factors like temperature, rainfall, wind, light and humidity are very important for selection of fruits to be grown in an orchard.

**Soil:** It is important to have knowledge of soil type, its depth, fertility, water table and ground rock status before selecting a site for an orchard. The orchard site should have uniform soil and top soil on which the fruit trees will grow.

**Slope:** The nature of the slope can affect fruit production. Gentle slopes allow water to sink and there is less erosion.

**Water:** There should be a permanent supply of water nearby.

**Distance from school:** The orchard should be within the school or a short walking distance from the school.

## Preparing a site for planting fruit trees

After choosing a site these are the steps to follow when preparing the site for planting:

- Clear the land. Get rid of all the weeds, grass and other things that might disturb the growth of trees.
- Plough the land. Deep ploughing is needed for the growth of the roots and water drainage.
- Use a harrow to level the land and break lumps.

## Planting and caring for a fruit tree

### Laying out the orchard

The layout of the orchard is very important. This is the careful arrangement of fruit trees at a suitable distance for proper development. The layout also helps in accommodating the required number of trees per unit area. It also makes the orchard look beautiful. The types of layout include the square and triangle method.

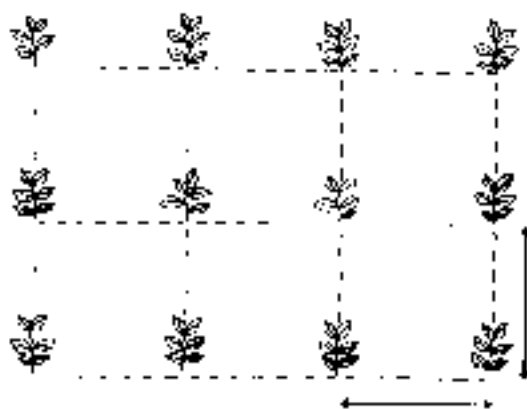


Figure 19.2 Square method

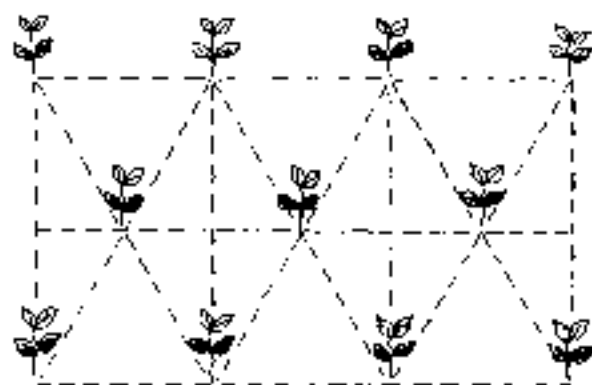


Figure 19.3 Triangle method

### Preparing a planting hole for a fruit tree

- Dig a hole 60cm deep, wide and long
- Separate the top soil and the subsoil
- Put some leaves and grass into the hole to about 30cm
- Mix top soil with 10kg decomposed manure
- Add 1kg single super phosphate fertiliser and mix
- Put the mixture into the hole up to 10cm above the ground
- Create a basin and water the hole.

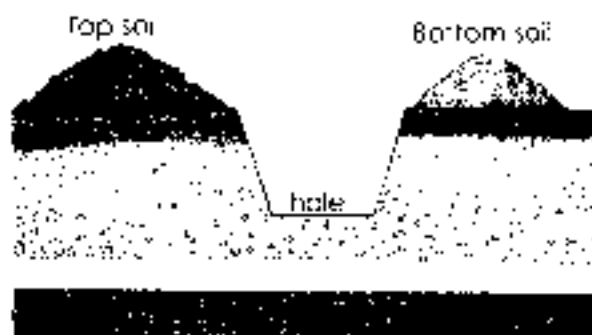


Figure 19.4 Planting hole

### Transplanting a fruit tree

- Take the seedling
- Make a hole at the centre of the basin
- Place the seedling and cover with soil
- Press the soil hard to avoid air pockets
- Make sure the plant is upright. Tie the seedling to a stick to support it
- Water the tree and mulch.



Figure 19.5 Transplanting of a fruit tree

## Caring for a fruit tree

- Make sure the tree is adequately watered. Roots grow well in moist soil.
- Keep the fruit trees free from weeds.
- Practice shallow cultivation to loosen the soil. This allows for free air movement and water infiltration.
- Check for nutrient shortages and add manure and the appropriate fertiliser.
- Prune to remove unnecessary branches from the tree. **Pruning** is cutting dead and overgrown branches from the trees. Pruning helps to improve plant health and avoid unnecessary growth.
- Spray to remove pests and control diseases.

### Activity 1 Class Project

1. Select a suitable site for an orchard.
2. Prepare a site for planting the fruit trees.
3. Plant the fruit trees.
4. Care for the fruit trees.

### Exercise A

Answer the questions below.

1. a) Identify any two factors considered when choosing a site for an orchard. [2]  
b) Describe the factors discussed in 1.a). [1]
2. Name two methods of laying out an orchard. [2]
3. What are the benefits of pruning fruit trees? [2]

## Summary

- When planning to make an orchard, it is important to be mindful of the factors that will affect fruit quality and orchard sustainability.
- The factors to consider are climate, soil, slope, water and distance from school.
- After choosing a site the land has to be prepared for planting.
- Planting an orchard involves choosing a layout for the orchard, preparing a planting hole and transplanting the fruit trees.
- The last thing is taking care of the orchard. This should be done for as long as the orchard exists.

## Unit 20 Forestry

### In this unit you will:

1. state factors considered when choosing a woodlot site
2. describe steps in site preparation
3. plant seedlings.

### Flashback

In grade 5 you looked at establishing a nursery of exotic and indigenous trees. List some exotic and indigenous trees you still remember.



### Key words

woodlot

water-logging

convenient

herbicide

## Factors considered when choosing a woodlot site

Planting and caring for forests is important for people's lives and it can also be a business. A **woodlot** is an area set aside specifically for growing trees. The trees grown in woodlots can be used to produce timber, furniture, for construction and they add more oxygen to the atmosphere. There are factors that must be kept in mind when choosing a woodlot site in order to ensure the successful growth of trees. Figure 20.1 shows a woodlot found in Zimbabwe.



Figure 20.1 A woodlot



## Climate conditions in relation to tree type

It is important to consider climate in relation to the trees one wants to grow. For instance, indigenous forests grow well in low rainfall areas while exotic ones thrive in high rainfall areas.

A suitable site should also have fertile deep soil which promotes tree growth. Soils also need adequate drainage for good growth of trees. Poor soil drainage causes water-logging and plants are not able to take up water through their roots. **Water-logging** means flooding with water.

Trees also need a site with moderate winds. Too strong winds are most likely to dry out soils and even pull up newly planted trees.

If a site does not have these conditions, extra care to improve conditions will be needed and that is an extra cost.

## Available space

Trees do not grow too well under crowded conditions. Space is therefore an important consideration when choosing a woodlot site. A site should be able to provide enough space for the intended number of trees to be planted.

## Site location

A site located near a main road is more convenient as it makes it easier to extract and transport the trees after harvesting. **Convenient** means well placed and easy to reach. For example, if the trees are to be processed into timber at a different location, a woodlot location near the road makes transportation easier.

## Pests and diseases

Pests and diseases in an area should be thought of before picking a place as a site. Some areas are more prone to pests that might affect trees than others. There are insects which feed on the leaves, stem and burrow through the bark. This negatively impacts the growth of a tree and also reduces its quality as it grows.

## Future considerations

When choosing a site, it is important to also consider if it will be usable and suitable in the long run. For example, a site might have fertile soil and receive the needed rainfall, but if it has power lines, it means that in the long run as the trees grow, they might interfere with the power lines and even require cutting down before they fully mature.

At times the soil might be fertile and the area might be receiving adequate rainfall but then climate changes might see these conditions change in the future. Years down the line, the soil might not be as fertile. It is important to keep this in mind.

## Activity 1 Educational tour

Imagine you have been tasked with starting a woodlot as an agricultural enterprise for a class project.

1. With the assistance of your teacher, go and look for a site for your woodlot.
2. Which factors did you consider in selecting the site you chose?
3. Are you going to grow indigenous or exotic trees?
4. Give a name for your woodlot.

## Exercise A

Answer the following questions.

1. What is a woodlot?  
A. Land filled with wood.  
B. Trees grown for timber.  
C. Land used for growing trees.  
D. An area for growing crops and trees.
2. Which factors are considered when choosing a woodlot?  
A. Site location, economy and the police.  
B. Climate, available space and site location.  
C. Pests and diseases, future considerations and fencing.  
D. Clearing trees, fencing and climate.
3. List any two ways in which trees are useful to people. [2]
4. Why is site location for a woodlot important? [2]
5. Give an example of a future consideration. [1]

## Steps in site preparation

Land preparation is the main task in preparing a site for woodlots. The following activities must be carried out.

### Fencing

Young trees need protection from both domestic and wild animals. A fence with barbed wire is usually used to protect woodlots.

### Clearing trees

All trees growing in the field should be removed. Stumping with mattocks and shovels should be carried out first. It is important to also spray herbicides at this point once the land is cleared, to remove competing vegetation. A **herbicide** is a chemical sprayed to kill weeds.

### Ploughing

After clearing the vegetation, the land should be ploughed. Roots and stones should be removed from the field.

## Digging holes

A planting line is used to make straight lines. Planting holes are marked 2,5m apart.

## Tree planting

Tree planting is an all-year round process as shown in Figure 20.2.

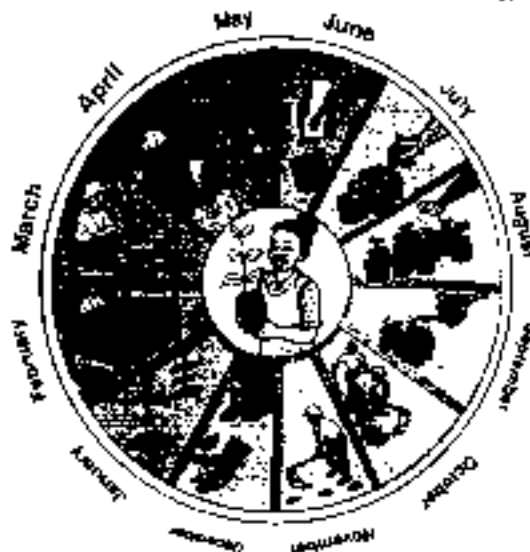


Figure 20.2 Eucalyptus planting calendar (Source: Forestry Commission)

## Planting seedlings

### Transplanting seedlings

Seedlings are raised in polythene bags. Caring and watering is important until the seedlings are ready for transplanting.

Planting out is done in December when the soil is moist. We can continue to plant until end of January. After January, the cycle begins with preparation for the coming planting season.

### Planting out

When seedlings are 25cm – 30cm high, they are ready for transplanting. Steps to follow when transplanting seedlings:

1. Dig holes with hoes.
2. Remove polythene bags.
3. Turn the seedling upside down and remove the polythene bag.
4. Plant the seedling in the hole.
5. Fill the hole with soil.
6. Press soil around the seedling with your hands or feet.
7. Make a basin around the seedling.
8. Water the seedling.
9. Record the steps you have followed in your exercise books.
10. Pack the polythene bags and keep them for use in the next season.

## Activity 2 Group work

1. Remove polythene pockets.
2. Place seedling in positions.
3. Fill holes with soil.
4. Firm the soil around the seedlings.
5. Make a basin around the seedlings.
6. Water the seedlings.

## Exercise B

Answer the questions below.

1. Which one is not a factor considered when choosing a woodlot?  
A. Climate      B. Available space      C. Site location      D. Asbestos
2. Pick out an advantage of locating a woodlot site near the main road.  
A. It is easier to see customers coming.  
B. It is easier to transport trees after harvesting.  
C. It is easier to get help.  
D. It is easier to make friends.
3. Which are the correct four steps in site preparation?  
A. Fencing, clearing trees, ploughing and digging holes  
B. Cultivating, planting, ploughing and harvesting.  
C. Fencing, cultivating, ploughing and digging holes.  
D. Cultivating, digging, clearing trees and harvesting.
4. Tree planting is done \_\_\_\_\_.  
A. once a year      B. in post rain      C. twice a year      D. all-yearround
5. At what height are seedlings ready for transplanting?  
A. 15cm      B. 25cm-30cm      C. 15cm-20cm      D. 20cm
6. Planting out is done in December because \_\_\_\_\_.  
A. there are a lot of crops  
B. the soil will be moist  
C. people will be energetic  
D. the weather will be perfect
7. What is the use of a planting line?  
A. To make straight lines.  
B. To create rows.  
C. To remove weeds.  
D. To make the land ready for cultivating.
8. A chemical sprayed to kill weeds is called a/an \_\_\_\_\_.  
A. pesticide      B. herbicide  
C. insecticide      D. acaricide

9. Young trees need fencing for \_\_\_\_\_.
  - A. protection from domestic and wild animals
  - B. decoration
  - C. protection from fires
  - D. making trees feel safe
10. \_\_\_\_\_ causes water-logging.
  - A. Too much sunlight
  - B. Poor drainage
  - C. Heavy rainfall
  - D. Little rainfall
11. Why is climate important when choosing a site for a woodlot? [2]
12. Besides climate, list any three factors considered when choosing a woodlot site. [3]
13. How are weeds removed during clearing? [1]
14. Seedlings are raised in \_\_\_\_\_. [1]
15. At what height are seedlings ready for transplanting? [1]
16. State any two steps in site preparation. [2]

## Summary

- A woodlot is an area specifically set aside for planting trees.
- Trees are important for producing timber, furniture, for construction and providing oxygen to people.
- There are factors that must be considered when choosing a woodlot site such as climate in relation to the tree type, available space, site location, pests and diseases and some future considerations.
- Steps to be followed in site preparation are fencing, clearing trees, ploughing and digging holes.
- Tree planting is an all-year round process.
- Planting out is done in December when the soil is moist.
- Seedlings are ready for transplanting when they are 25cm-30cm high.

## Unit 21 Plant protection

### In this unit you will:

1. define pests and weeds
2. explain effects of pests and weeds on crops
3. suggest appropriate methods of controlling pests and weeds.

### Flashback

In grade 5 you looked at the effects of animals, fire and drought on plants. What are some of the ways through which animals affect plants?



### Key words

pests

weeds

## Pests and weeds

The health of plants is threatened mostly by pests and weeds. **Pests** are insects which attack crops. Examples of pests include aphids, stem borers, locusts and different types of caterpillars. There are also pest birds which attack crops. **Weeds** are unwanted plants that grow and compete for nutrients with cultivated plants. Examples of weeds include black jack, couch grass, witch weed and rapoko grass.

## Effects of pests and weeds on crops

### Effects of pests

Pests can cause serious damage to crops. The major effects include:

- Damage to plant parts. Some pests feed on the leaves, burrow stems, fruit and roots of plants. This affects the quality of the plant.
- Plant infections. Some pests carry bacteria from plant to plant which infects crops, for example, aphids. This cripples the health of the plant.
- Yield losses and droughts. Sometimes pest damage is so severe that it leads to drought as yield is very low. For instance a swarm of locusts can cause such havoc.



Figure 21.1 Vegetable affected by aphids

## Effects of weeds



Figure 21.2 Maize crop affected by weeds

Weeds are also responsible for causing the following damage:

- Taking up nutrients, sunlight and moisture meant for the plant/crop. Weeds compete with plants for food. As a result, the health of a plant is in poor condition.
- Slow growth rate. Most weeds take up more water than other plants. This also causes the growth rate of plants/crops to slow down.
- Increasing cultivation costs. The presence of weeds calls for more and intense cultivation. This takes time and money.

### Exercise A

Answer the following questions.

Write True/False in answering the following questions.

- |  |     |
|--|-----|
| 1. Pests and weeds do not threaten the health of plants.                       | [1] |
| 2. Effects of pests include taking up nutrients and moisture meant for plants. | [1] |
| 3. Pest damage can be so severe leading to yield loss and drought.             | [1] |
| 4. Weeds slow down the growth of plants.                                       | [1] |
| 5. Weeds compete with plants for food.   | [1] |

## Methods of controlling pests and weeds

### Pest control

Pests can be controlled through:

- Crop rotation. Rotating crops disrupts the lifecycle of pests and ensures that they do not use crops as hosts.

- Applying pesticides. Pesticides are a chemical method which kills pests.
- Encouraging insects that attack pests. There are some insects which are natural enemies (or predators) of some pests. For example a ladybird eats aphids and it can eat more than 40 aphids a day. Refer back to Figure 21.1.
- Using scarecrows for birds. Scarecrows can be useful in chasing birds away from feeding on crops.
- Crop/Field scouting. This refers to walking through a field observing and checking the density of pests on crops. This process helps a farmer react in time before pests multiply and cause severe damage to crops.

## Weed control

Weeds can be controlled using these methods:

- Cultivation. Animal-drawn cultivators are usually used in Zimbabwe. People follow behind the cultivator using hoes to clear weeds between crops. This is a fast method of weed control.
- Hoeing. Weeding using hoes is also common in Zimbabwe. Closely spaced crops such as groundnuts are usually weeded with hoes. This is a slow method which may require many people to be effective.
- Hand pulling. Weeds are pulled by hand and gathered outside the field.
- Ploughing. The land is ploughed before crops are grown. Virgin land usually requires this method of weed control. It is fast and large fields are weeded within a few hours.
- Slashing. Slashers are used to cut soft and juicy weeds.
- Herbicides. Weeds are killed with chemicals called herbicides. This method is expensive but fast and effective. Chemicals are sprayed before the crop is planted to stop the weeds from germinating. Spraying may also be done when the crops are already growing.

### Activity 1 Practical

Finding weeds

With the guidance of your teacher, go out to the fields to look for weeds.

1. Put out one of each weed you have found.
2. Draw the weeds in your exercise book and name them.

### Activity 2 Educational tour

1. Visit a farm near you and crop scout the farm.
2. Write examples of the damage caused by the pest which you can see.
3. Which pest is responsible for the damage?
4. Ask the farm owner what measures they have in place to control the pests.



## Summary

- Pests include insects and birds which attack crops.
- Weeds are unwanted plants that grow and compete for nutrients with plants.
- Effects of pests include damage to plant parts, plant infections and yield losses and droughts.
- Effects of weeds include taking up nutrients meant for the plant, slowing down the growth rate of plants and increasing cultivation costs.
- Pests can be controlled through crop rotation, applying pesticides, using natural enemies of some pests and scarecrows to scare away birds.
- Weeds can be controlled so that crops grow healthy. Cultivation is a fast method of controlling weeds.
- Other methods of weed control are hoeing, hand pulling, ploughing, slashing and applying herbicides.

## Glossary

<b>External</b>	- means outer.
<b>Glance</b>	- to take a quick look.
<b>Photosynthesis</b>	- is a process where plants use sunlight, carbon dioxide and water to produce food and oxygen.
<b>Chlorophyll</b>	- is the green colour in leaves.
<b>Stomata</b>	- are the tiny pores in leaves.
<b>Plant reproduction</b>	- is a process where plants produce offspring.
<b>Fertilisation</b>	- is the joining of the male and female parts of plants.
<b>Nutrients</b>	- are elements that are needed for plant growth.
<b>Legumes</b>	- are plants that produce pods with seeds and are high in protein.
<b>Transplanting</b>	- is an act of moving a fully germinated seedling and planting it in a permanent location.
<b>Seedling</b>	- a very young plant grown from a seed.
<b>Side dressing</b>	- is the application of fertilisers in a circle around individual plants.
<b>Commodities</b>	- are any agricultural products that can be bought or sold.
<b>Broadcasting</b>	- is the scattering of seeds by hand or mechanically over a large piece of land.
<b>Drilling</b>	- is a method that uses a seed drill to sow the seeds at proper depths and distance and then cover them with soil.
<b>Dibbling</b>	- is a method of putting a few seeds in a hole, made at fixed spacing and depth using a dibble or planter or very often by hand.
<b>Germination</b>	- is the development of seed to plant.
<b>Pruning</b>	- is the removal of dead and overgrown branches from the trees through cutting.

**Woodlot**  
**Water-logging**  
**Convenient**  
**Herbicide**  
**Pests**

- is an area set aside specifically for growing trees.
- is the flooding of soil with water.
- means well placed and easy to reach.
- a chemical sprayed to kill weeds.
- are insects which attack crops. There are also pest birds.
- are unwanted plants that grow and compete for nutrients with cultivated plants.
- means disaster.

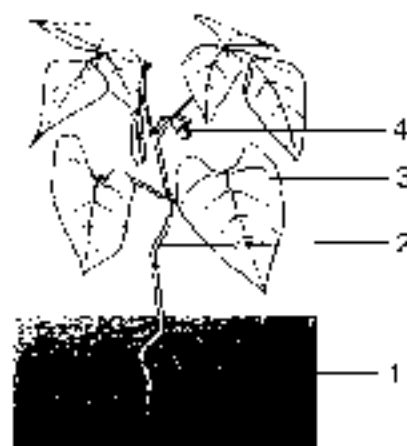
**Weeds**

**Havoc**

## End of topic assessment

### Multiple choice

Choose the correct answer.



1. What is the name of the part labelled 2?  
 A. Root                      B. Leaf                      C. Flower                      D. Stem
2. What is the function of the part labelled 4?  
 A. To hold the plant upright.  
 B. To absorb water and nutrients from the soil.  
 C. It is where fertilisation takes place.  
 D. To absorb light for photosynthesis.
3. Which part is responsible for manufacturing food?  
 A. 1                      B. 2                      C. 3                      D. 4
4. Which part develops into a fruit?  
 A. 4                      B. 3                      C. 2                      D. 1
5. Which list has major plant nutrients?  
 A. Phosphorous, zinc, nitrogen.  
 B. Potassium, nitrogen, manganese.  
 C. Zinc, iron, copper.  
 D. Nitrogen, phosphorous, potassium.

6. Which nutrient deficiency is shown by a plant leaf drying at the margin?  
A. Nitrogen                      B. Potassium                      C. Copper                      D. Phosphorous
7. Pick a legume from the vegetables below.  
A. Potatoes                      B. Tomatoes                      C. Onions                      D. Peas
8. \_\_\_\_\_ are pests that attack plants.  
A. Aphids                      B. Bacterial wilt                      C. Early blight                      D. Leaf mold
9. \_\_\_\_\_ is **not** a cereal crop.  
A. Rice                      B. Wheat                      C. Groundnuts                      D. Maize
10. Choose a list with methods of sowing wheat.  
A. Dribbling, dibbling and broadcasting  
B. Drilling, dibbling and broadcasting.  
C. Dribbling, drilling and ranching.  
D. Drilling, digging and broadcasting.
11. Which factors are considered when choosing a woodlot?  
A. Site location, economy and the police.  
B. Climate, available space and site location.  
C. Pests and diseases, future considerations and fencing.  
D. Clearing trees, fencing and climate.
12. What is the benefit of a site located near the main road?  
A. It is easier to see customers coming.  
B. It is easier to cut down and carry trees to other places after harvesting.  
C. It is easier to get help.  
D. It is easier to make friends.
13. Young trees need fencing for  
A. protection from domestic and wild animals  
B. decoration  
C. protection from fires  
D. making trees feel safe
14. Which one is a method of controlling pests?  
A. Manuring                      B. Watering                      C. Crop rotation                      D. Compost
15. \_\_\_\_\_ are unwanted plants that grow and compete with cultivated plants for nutrients.  
A. Crops                      B. Weeds                      C. Pests                      D. Algae

### Structured questions

**Answer all the questions in full.**

1. a) Give one importance of each of the following nutrients in a plant: Nitrogen, Phosphorous, Potassium. [3]  
b) Name any two minor nutrients [2]
2. a) In which season is wheat grown in Zimbabwe and why? [2]  
b) Explain how wheat is harvested. [3]
3. List any five management practices of a wheat crop. [5]
4. List any five factors considered when choosing a woodlot. [5]
5. List any two effects of pests and three effects of weeds on crops. [5]

## Unit 22 End of term two assessment

### Paper 1

Choose the correct answer.

- Which of the following branches focuses on woodlots and wild animals?  
A. Forestry and wildlife  
B. Animal production  
C. Agricultural economics  
D. Horticulture
- \_\_\_\_\_ is a branch that is concerned with the business side of agriculture.  
A. Soil science  
B. Agricultural engineering  
C. Agricultural economics  
D. Crop production
- Tools should be sheltered at all times to \_\_\_\_\_.  
A. keep them warm  
B. prevent wear and tear  
C. prevent them from working well  
D. allow theft
- Which one of these tools is kept on a tool board?  
A. Hammer  
B. Disc plough  
C. Spade  
D. Hoe
- Which one of these is a characteristic of a good storage facility for farm tools?  
A. Moisture  
B. Colour  
C. Darkness  
D. Roofed
- Which colour code shows an extremely dangerous agrochemical?  
A. Green  
B. Purple  
C. Orange  
D. Blue
- Farmers should keep agrochemicals away from the reach of children because \_\_\_\_\_.  
A. they are expensive to buy  
B. they are poisonous and harmful  
C. they can be too sweet  
D. children are dangerous to chemicals
- The \_\_\_\_\_ season is the coldest season with no rainfall in Zimbabwe.  
A. hot and dry  
B. cold and dry  
C. hot and wet  
D. cold and wet
- What do farmers do during the post rain season?  
A. They go for holidays with their families.  
B. They burn their fields.  
C. They start harvesting their crops.  
D. They slaughter their animals for food.
- In which season is wheat grown in Zimbabwe?  
A. Hot and dry season.  
B. Main rain season.  
C. Post-rain season.  
D. Cold and dry season.
- In which season is maize grown in Zimbabwe?  
A. Hot and dry season.  
B. Hot and wet season.  
C. Post-rain season.  
D. Cold and dry season.
- Name the instrument that is used to measure rainfall.  
A. Rain gauge  
B. Barometer  
C. Thermometer  
D. Wind vane
- Which instrument is used to determine wind speed?  
A. Rain gauge  
B. Barometer  
C. Thermometer  
D. Cup anemometer

14. Which two climatic factors are used to divide Zimbabwe into natural farming regions?
- A. Rainfall and temperature.                      B. Wind and humidity.  
C. Cloud cover and temperature.                  D. Soil type and wind direction.
15. Which natural region receives the lowest amount of rainfall?
- A. Region 1                      B. Region 5                      C. Region 3                      D. Region 4
16. In which region is specialised farming practised?
- A. Region 5                      B. Region 4                      C. Region 1                      D. Region 3
17. Pick a weather element from the following.
- A. Temperature                  B. Autumn                      C. Climate                      D. Summer
18. The average of observations and measurements of everyday weather records over a long period of time is called \_\_\_\_\_.
- A. weather patterns                                  B. climate  
C. global warming                                  D. temperature change
19. What causes global changes in weather?
- A. Floods    B. Droughts    C. Farming                      D. Global warming
20. Which one of the following is not a soil component?
- A. Water    B. Air    C. Plastic                      D. Organic matter
21. Name the soil component with the highest proportion.
- A. Air                                  B. Mineral matter  
C. Organic matter                                  D. Water



22. What causes the form of weathering shown in the picture?
- A. Temperature change                                  B. Freezing  
C. Plant growth    D. Animal activity
23. The breaking down of rocks leads to the formation of \_\_\_\_\_.
- A. monuments    B. soil  
C. shapes    D. organic matter
24. The least fertile type of soil is \_\_\_\_\_.
- A. loam                                  B. sand                                  C. clay                                  D. silt
25. The arrangement of soil particles is called \_\_\_\_\_.
- A. soil structure                      B. soil texture                      C. soil moisture                      D. soil erosion
26. Which of the following soils has the finest soil texture?
- A. Clay                                  B. Loam                                  C. Silt                                  D. Sand
27. Soil with enough nutrients to feed plants is called \_\_\_\_\_.
- A. polluted soil                      B. eroded soil                      C. fertile soil                      D. compost
28. Which one is **not** a source of organic matter?
- A. Compound D    B. Green manure  
C. Compost    D. Liquid manure

29. Legumes are rich in \_\_\_\_\_.  
 A. phosphorous      B. potassium      C. copper      D. nitrogen
30. The washing away of soil is called \_\_\_\_\_.  
 A. soil fertility      B. soil erosion  
 C. soil conservation      D. weathering
31. Which one is **not** an agent of soil erosion?  
 A. Running water      B. Humidity      C. Wind      D. Animals
32. Soil erosion is bad because it \_\_\_\_\_.  
 A. washes away parent rock      B. damages crops  
 C. washes away the fertile top soil      D. kills livestock
33. The addition of toxic substances to the soil is called \_\_\_\_\_.  
 A. soil erosion      B. soil pollution  
 C. soil conservation      D. soil modification
34. Which one of the following is a cause of soil pollution?  
 A. Adding manure.      B. Ploughing on dry soil.  
 C. Dumping of mining waste.      D. Use of ox-draw implements.
35. The sinking of water into the ground is called \_\_\_\_\_.  
 A. infiltration      B. run-off      C. precipitation      D. evaporation
36. \_\_\_\_\_ is **not** a method of conserving soil moisture.  
 A. Evaporation      B. Mulching      C. Patholing      D. Manuring
37. Polluted water \_\_\_\_\_.  
 A. is clean to drink  
 B. has harmful or toxic substances added to it  
 C. has been treated  
 D. has nutrients for fish to multiply
38. Which of the following is a terrible effect of water pollution?  
 A. Increases the rate of evaporation  
 B. Causes droughts and floods.  
 C. Causes dongas and gullies.  
 D. Kills livestock and makes people ill.
39. Name the part of a plant that absorbs water and nutrients.  
 A. Leaf      B. Stem      C. Flowers      D. Roots
40. The \_\_\_\_\_ supports the plant and transports nutrients to the whole plant.  
 A. leaf      B. stem      C. flowers      D. roots
41. Fruits develop from the \_\_\_\_\_.  
 A. leaf      B. stem      C. flowers      D. roots
42. The nutrient found mostly in chlorophyll is \_\_\_\_\_.  
 A. nitrogen      B. potassium      C. zinc      D. copper
43. \_\_\_\_\_ encourages early root and plant growth and quickens maturity.  
 A. Potassium      B. Nitrogen      C. Manganese      D. Phosphorous
44. Which nutrient is important for flower formation?  
 A. Copper      B. Phosphorous      C. Potassium      D. Nitrogen
45. What is the first thing done before planting a vegetable crop?  
 A. Land preparation      B. Marking  
 C. Planting      D. Taking care of the crop

46. Which season is best suited for tomato production?  
 A. Cold B. Warm C. Dry D. Wet
47. An area set aside for the care and management of forest trees is called a/an \_\_\_\_\_.  
 A. orchard B. field C. woodlot D. horticulture
48. What name is given to an area set aside for fruit production?  
 A. Field B. Woodlot C. Horticulture D. Orchard
49. The cutting of dead branches on fruit trees is called \_\_\_\_\_.  
 A. cultivation B. afforestation C. deforestation D. pruning



50. What are the effects of what you see on the picture?  
 A. Weeds compete with plants for nutrients.  
 B. The plant will grow well.  
 C. Weeds will eventually dry out leaving all the nutrients to the plant.  
 D. Curling of leaves and wilting of the plant.

## Paper 2

### Section A

Answer all the questions in this section. Each question carries 5 marks.

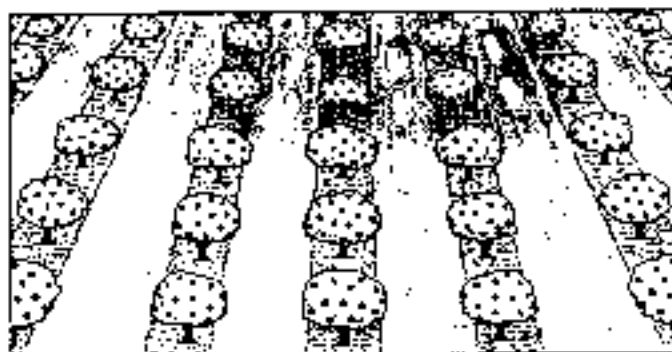
1. a) State any one value of agriculture. [1]  
 b) What are the functions of each of the following branches of agriculture:  
     i. Soil science  
     ii. Animal production? [4]
2. a) What is the difference between weather and climate? [2]  
 b) State the two major factors used to divide Zimbabwe into natural farming regions. [1]  
 c) How does rainfall affect farming? [2]
3. Explain five management practices of a wheat crop. [5]
4. Explain five factors considered when choosing a woodlot. [5]
5. a) What are the characteristics of a good storage facility for farm tools? [3]  
 b) Give two effects of mishandling of agrochemicals. [2]
6. a) Give two climatic conditions in each of the following farming regions:  
     i. Region 1  
     ii. Region 5 [4]  
 b) What is the cause of climate change throughout the world? [1]

[30 marks]

## Section B

Answer any two questions. Each question carries 10 marks.

7. a) i. List any two common agents of weathering. [2]  
ii. Describe how any one agent in 1.a) i. causes weathering. [3]  
b) Describe the process of compost making. [5]
8. a) i. What is soil erosion? [1]  
ii. Give one cause of soil erosion. [1]  
iii. State any three effects of soil erosion. [3]  
b) List any four causes of soil pollution. [2]  
c) Describe how pollution is caused by any one of the effects of 8.b). [3]



9. a) i. Name the soil moisture conservation method shown in the diagram. [1]  
ii. How does the method conserve soil moisture? [2]  
iii. Name two other soil moisture conservation methods besides the one shown in the diagram. [2]
- b) i. What are minor plant nutrients? [1]  
ii. State any two minor plant nutrients. [2]  
iii. What is the use of nitrogen in plants? [2]
10. a) i. List five important routines observed when growing tomatoes. [5]  
b) i. What is a pest? [1]  
ii. Describe two effects of pests on plants. [2]  
iii. How can pests be controlled? [2]

[20 marks]



## Unit 23 Introduction to animal study

**In this unit you will:**

1. state products and by-products of poultry or rabbits
2. construct poultry or rabbit housing.

**Flashback**

In grade 5 you learnt about the housing systems for poultry and rabbits and the nutrients needed by the different animals. In this unit you will discover the different foods we get from these animals.

**Key words**

product

by-product



chicken



eggs



feathers used on hats



rabbit pelt jacket

Figure 23.1 a) Poultry products

b) Poultry and rabbit by-products

**Products of poultry and rabbits**

Animal **products** are food derived from animals, for example, meat is a product of poultry and rabbits. Rabbit meat is a good source of protein and contains less fat compared to other meats. Poultry also produces eggs for human consumption. See Figure 23.1a).



## By-products

Poultry and rabbits also offer humans great by-products. A **by-product** is any material that people do not eat that originates from animals. Some of the by-products of poultry include feathers and poultry droppings. Feathers are used to make cushions and decorate some clothing items in the clothing industry. Rabbit fur is also a by-product which is used to make clothing items such as fur coats and hats. Both poultry and rabbits produce valuable manure rich in nitrogen. Poultry droppings can also be processed to produce cattle feed. Figure 23.1b) shows poultry and rabbit by-products.

### Activity 1 Group work

In pairs, create a table and list products in one column, and by-products of poultry and rabbits in another.

## Housing poultry

### Housing chicks

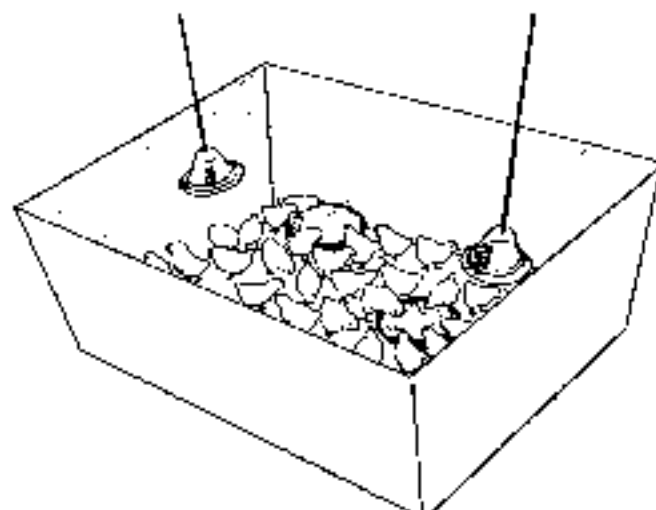


Figure 23.2 A brooder

Chicks are kept in a brooder which as you recall from the previous grade is a heated house for chicks. Broilers are a common type of bird kept for meat. Housing for broiler chicks should ensure that the chicks are warm and protected from predators so that they grow properly. See Figure 23.2 which shows a brooder.

### Constructing a brooder

Materials used to construct a brooder differ according to the resources a person has. The important thing is to ensure that the brooder provides food, water, warmth and protection from predators for the chicks.

## Activity 2 Practical

In groups, construct a small model of a brooder. Think of the importance of providing the chicks with water, food, warmth and protection. You can use any of these suggested materials:

**Enclosure:** Cardboard box, plastic bin

**Water feeder:** Tupperware tin, a cut water bottle container

**Food feeder:** Bowl, Wooden/metal/ plastic container

**Food:** Saw dust, rice grains, mealie meal

**Lighting for heating:** Torch, string

## Exercise A

Answer the following questions.

1. Poultry and rabbits produce meat as a \_\_\_\_\_.  
A. by-product    B. product    C. type    D. material
2. What is a by-product?  
A. Food from an animal.  
B. Food from plants.  
C. Materials that originate from animals but are not for human consumption.  
D. Poultry droppings.
3. A brooder should ensure that chicks have \_\_\_\_\_.  
A. water, warmth, food and protection  
B. water, music and protection  
C. food, warmth and curtains  
D. protection and water
4. Why is a light an important feature in a brooder besides providing lighting? [1]
5. State one way in which poultry droppings are used by people. [1]

## Housing broilers

Chicks will have full feathers after four weeks and they can keep themselves warm. At this stage they are transferred to the deep litter house. See Figure 23.3, a deep litter house used to keep broilers.

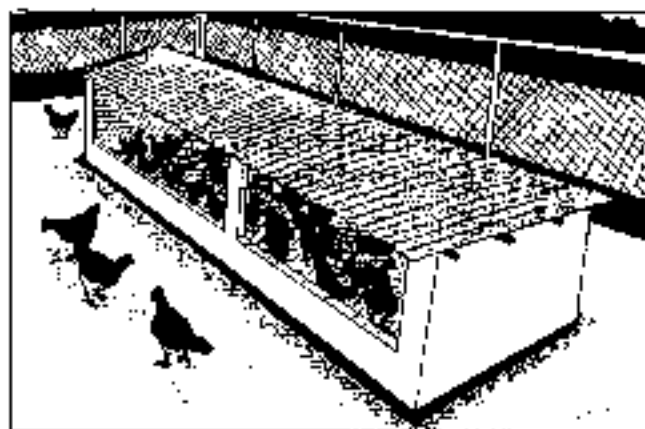


Figure 23.3 A deep litter house

A deep litter house is a closed up structure which uses concrete, wire mesh and roofing material for construction. The solid back of the wall is usually built facing the prevailing wind direction to protect the structure and the birds from strong winds.

Large scale broiler production requires more space which accommodates a large number of broilers. A structure which allows for the accommodation of several broilers should be approximately 40m x 10m. The feeders and drinkers should be arranged in rows so that broilers have access to feed and water at all times. Figure 23.4 shows a large scale broiler house while Figure 23.5 shows broilers ready for the market.



Figure 23.4 A large scale broiler house



Figure 23.5 Broilers ready for the market

### Activity 3 Educational tour

Go on a field trip to a broiler farm near you. Gallery walk with the farm guide. Look at the material used to build the deep litter houses at the farm.

1. Discuss and record your observations.
2. Interact with the farm owners and inquire on how the structures were constructed.

### Exercise B

Answer the questions below.

1. Chicks are transferred to the deep litter house after 4 weeks because they \_\_\_\_\_.  
A. can fly  
B. can keep themselves warm  
C. can make their own food  
D. are always fighting
2. Which feature is not present in a deep litter house?  
A. Wire mesh      B. Roof      C. Door      D. Carpet

3. The solid wall of a deep litter house is built facing the prevailing wind direction to \_\_\_\_.
- A. protect the birds from strong winds
  - B. block the sun
  - C. keep away thieves
  - D. protect the birds from rats
4. What is the difference between a product and a by-product? [2]
5. List any two poultry products. [2]

## Summary

- Animal products refer to food that is obtained from poultry and rabbits, for example, chicken, rabbit meat and eggs.
- By-products are materials originating from animals but are not for eating, for instance, rabbit fur.
- A brooder should ensure that chicks have warmth, water, food and protection from predators.
- A deep litter poultry house is a structure for housing large scale broilers. It is usually constructed using wire mesh, bricks and asbestos and it has an entrance.



## Unit 24 Animal nutrition

### In this unit you will:

1. define a balanced diet
2. state functions of essential nutrients which constitute a balanced diet

### Flashback

Recap the definition of the term in pairs.



### Key words

balanced diet      supplements

## Balanced diet

A **balanced diet** is food that contains all necessary nutrients in their correct amount needed for good health. Just as with humans, small animals also need a balanced diet to maintain good health. It is important for animal feed to have nutrients such as carbohydrates, proteins, fats, oils, mineral salts and vitamins. Figure 24.1 below shows pellets of poultry feed.

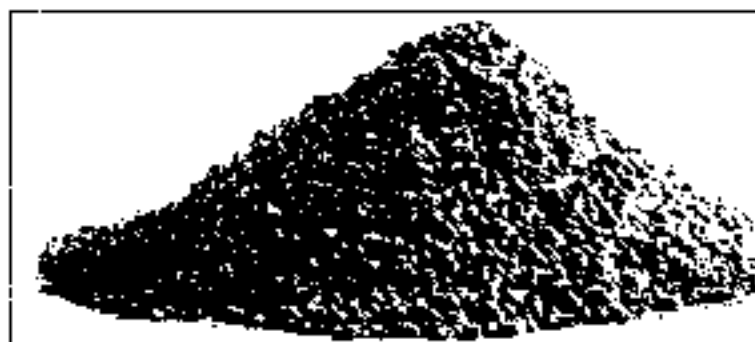


Figure 24.1 Poultry feed

## Functions of different nutrients

Nutrients in stock feed are provided in varying quantities. While carbohydrates make up the bulk of stock feed, proteins are found in smaller quantities (20%) and minerals are provided as **supplements**. Supplements are products rich in certain nutrients which otherwise lack in the available feed. Farmers should make sure that feed bought from animal feed stores adds nutritional value to the diet of the animals.

## Activity 1 Word Scramble

Unscramble the following letters to find out which nutrient they are.

- a) sinelmar
- b) tsiranpe
- c) tasf
- d) tisvnmia
- e) bcratied\*ysara

### Carbohydrates

Carbohydrates function as an energy provider that supports the breathing and movement of muscles in animals. This energy is also important for animal growth, producing eggs and chicks in chickens. Animals also get body heat for warmth from carbohydrates.

### Proteins

Proteins provide the building blocks for the body tissue; repairing old tissue and growing new tissue of animals. Without adequate proteins, the growth of animals is disturbed. Proteins also aid the building up and production of meat in poultry.

### Minerals

There are several minerals required by animals for good health and the major ones are calcium, phosphorus and sodium. Minerals are important in providing material for the growth of bones, teeth and tissue and the formation of blood cells. Minerals are provided in the form of supplements as they are low in grains.

### Fats

Fats are necessary even though they are needed in small amounts in poultry. Fats help carbohydrates in providing and storing extra energy and providing body heat.

### Vitamins

Just as with fats, vitamins are needed in small amounts. Vitamins are essential for the body to function normally. Birds actually produce some vitamins on their own, for example, Vitamin C. Some vitamins are provided for birds as supplements. Vitamins prevent and control diseases and aid food digestion in poultry.

## Activity 2 Educational tour

Visit a broiler or rabbit farm near you with your teacher.

- Acquire permission from the farm guide to take samples of the different stock feeds available.
- Discuss in groups how the different feeds contribute to a balanced diet.
- Ask for permission to feed the poultry/rabbits from the farm guide.

## Exercise A

Answer the questions.

- List the five essential nutrients that make a balanced diet for poultry. [5]
- Give one function of carbohydrates. [1]
- How does protein deficiency affect poultry? [2]
- In what way are fats similar to carbohydrates? [1]
- If a bird is suffering from several diseases, which nutrient is probably missing from its diet? [1]

## Summary

- A balanced diet for small livestock is made up of adequate amounts of carbohydrates, proteins, minerals, fats and vitamins.
- Carbohydrates supply energy needed by livestock to perform several functions such as moving, breathing and keeping the animal warm.
- Proteins are important as they provide building blocks for the body tissue for poultry.
- Minerals also form the essential nutrients with calcium, phosphorus and sodium being the major minerals. Calcium is needed for bone formation.
- Vitamins and fats are needed in small amounts and are usually provided as supplements.
- Vitamins prevent diseases while fats help in providing energy and heat.



## Unit 25 Small livestock

### In this unit you will:

1. define a parasite
2. identify parasites and diseases that affect poultry or rabbits
3. suggest appropriate methods of controlling parasites and diseases.

### Flashback

Small livestock is important because of its products such as meat and eggs. However, the health of small livestock is under threat because of parasites and diseases.



### Key words

parasite

host

deworming

quarantine

## Parasites and diseases in poultry

Poultry can fall victim to parasites in the environment. A **parasite** is an organism which lives in or on a host and uses the host for food. A **host** is an animal that a parasite lives and feeds on. Two groups of parasites commonly affect poultry. These are internal and external parasites.

### Internal parasites

Roundworms and tapeworms are the most common internal parasites which affect poultry. Roundworms and tapeworms are shown in Figure 25.1.



Figure 25.1 a) Roundworms



b) Tapeworms

### Roundworms

These worms have a round body and they live in the small intestines of poultry. If not

controlled, they can multiply very quickly. Birds with roundworms show symptoms such as reduced appetite, weight loss and in some cases diarrhoea.

## Tapeworms

Tapeworms are flat shaped and white in colour. Poultry with tapeworms also have diarrhoea and loss of appetite. Tapeworms can cause death of poultry if they are not controlled.

## External parasites

The three main external parasites of poultry are fleas, lice and leg mites.

### Fleas

Fleas feed by sucking the blood of their host. They attach themselves to the comb, wattles and eyelids of poultry. Growth is slowed down and egg production is reduced in poultry with fleas. Fleas usually increase in numbers and cause ulcers on the skin of poultry. These ulcers reduce the quality of the meat produced. Figure 25.2 shows a fowl flea.



Figure 25.2 A fowl flea

### Lice

Lice are greyish in colour and they attach themselves to the body, head and wings of birds. Birds are constantly scratching, egg production is reduced and growth also slows down. The singular form of lice is louse. Figure 25.3 shows a louse.



Figure 25.3 A louse

### Scaly leg mites

Scaly leg mites are red in colour and they attach themselves to the scales on the legs of poultry. Birds are always scratching and their legs are swollen. In laying hens, egg production is decreased because of leg mites. A scaly leg mite is shown in Figure 25.4.



Figure 25.4 A scaly leg mite

## Activity 1 Debate

Form groups and debate on which parasites cause more harm to poultry between internal and external parasites. Keep in mind the effects of each type of parasite on the quality of the poultry and its products.

## Exercise A

Answer the following questions.

1. What is a parasite?
  - A. It is an organism without a place to live
  - B. An organism which lives in or on a host.
  - C. It is a host.
  - D. It is an animal that is infected.
2. Which is an example of an internal parasite?
  - A. Louse
  - B. Mite
  - C. Roundworm
  - D. Flea
3. The 3 main external parasites of poultry are \_\_\_\_\_.
  - A. fleas, tapeworms and roundworms
  - B. fleas, lice and tapeworms
  - C. fleas, leg mites and worms
  - D. fleas, lice and leg mites
4. What are some of the symptoms of a bird affected by leg mites?
  - A. Constant running and increased appetite.
  - B. Constant scratching and swollen legs.
  - C. Ulcers on skin and swollen eyelids.
  - D. Loss of appetite and diarrhoea.
5. What is the difference between a parasite and a host? [1]

## Activity 2 Research

1. Divide into different groups: have some groups look into the rearing of poultry, and the others the rearing of rabbits.
  - a) List the stages of bringing up poultry/rabbits to maturity (rearing). Take note of the different nutritional and shelter needs at each stage.
  - b) Use ICT tools of your choice to make slides of your findings. If you do not have access to the resources needed, cut and paste pictures from magazines or newspapers on cardboard boxes.

## Control of parasites

Parasites can be controlled through treatment. This means that a farmer takes action when the parasites have already taken host and are affecting the health of the birds.

## Prevention of parasites

Preventative measures on parasites are ways of dealing with parasites before they start causing problems for the birds. Prevention ensures that parasites never take hold in the birds.

### Control and prevention of internal parasites

Control	Prevention
<b>Deworming-</b> this is giving a drug to an animal to get rid of parasites.	Practising safe hygiene. Keep the chicken house and the feeders dry and clean. This is because parasites thrive in dirty and damp environments. Avoid overcrowding. Alternate chicken houses. Isolate and inspect new birds before adding them to the others. Use apple cider vinegar. This strengthens the fighting chance of birds against bacteria and worms. Add one teaspoon per litre to water for the birds.

### Control and prevention of external parasites

Control	Prevention
Disinfecting the chicken house with poultry dip while treating the poultry with poultry dust.  Spraying equipment with chemicals such as malathion.  Dipping chickens in paraffin.  Removing and burning deep litter.  Applying engine oil to treat cracks in the chicken house.	Provide dusting areas or a dust bath for birds. Chickens naturally fight off parasites from their feathers through dust baths.

## Activity 3 Educational tour




1. Visit a broiler or rabbit farm near you with your teacher. Ask for permission from the farm guide to guide you through inspecting the animals for parasites and diseases.
  - a) Ask how often checkups should be done.
  - b) Note down some of the symptoms of a sick bird or rabbit. For example, just as with humans, a sick bird is less active.

## Exercise B

Answer the questions.

- Which of the following is not a way of controlling external parasites?
  - Splashing boiled water in the chicken house.
  - Dipping chickens in paraffin.
  - Removing and burning deep litter.
  - Disinfecting the chicken house with poultry dip.
- Deworming is \_\_\_\_\_.
  - removing worms from an animal using your hand
  - giving a drug to an animal to get rid of worms
  - cutting an animal up to remove worms
  - spraying an animal to chase away worms
- Explain the difference between controlling and preventing parasites in animals. [2]
- State any one method of controlling external parasites. [1]
- Give any one method of preventing internal parasites. [1]

## Common diseases of small livestock

Disease	Symptoms	Control
Coccidiosis 	<ul style="list-style-type: none"> <li>• Diarrhoea</li> <li>• Droppings with blood</li> <li>• Loss of appetite</li> <li>• Birds die</li> </ul>	<ul style="list-style-type: none"> <li>• Treat drinking water</li> <li>• Use feeds with coccidiostat</li> <li>• Kill infected birds</li> </ul>
Newcastle 	<ul style="list-style-type: none"> <li>• Discharge of mucus from mouth</li> <li>• Legs paralysed</li> <li>• Birds die</li> </ul>	<ul style="list-style-type: none"> <li>• Quarantine affected birds</li> <li>• Kill all infected birds</li> </ul>
Fowl pox 	<ul style="list-style-type: none"> <li>• Sneezing</li> <li>• Discharge from the eyes</li> <li>• Swollen faces</li> <li>• Lack of appetite</li> </ul>	<ul style="list-style-type: none"> <li>• Add vitamin A to feeds</li> <li>• Vaccination</li> <li>• Treat with drugs</li> </ul>

NB: To **quarantine** is to isolate infected animals from those which are not infected.

## Summary

- Poultry is vulnerable to internal and external parasites.
- Roundworms and tapeworms are examples of internal parasites while fleas, lice and leg mites are external parasites.
- Poultry with internal parasites lose appetite, suffer from diarrhoea and lose weight.
- Poultry with external parasites constantly scratch and experience a decrease in egg production.
- Parasites are controlled through treatment. Parasites can also be prevented before they take host and affect the health of birds.
- Birds can be treated for internal parasites through deworming.
- Internal parasites can be prevented through practising safe hygiene, avoiding overcrowding and isolating and inspecting new birds.
- Disinfecting the chicken house and treating poultry with poultry dust work as treatment for external parasites.
- Providing dust baths for birds helps them get rid of external parasites on their own before the parasites take host.
- Coccidiosis, Newcastle and Fowl pox are the most common diseases that affect small livestock.

## Unit 26 Apiculture

### In this unit you will:

1. Identify materials needed in constructing bee hives
2. construct bee hives

### Flashback

In grade 5 you looked at the different natural and artificial bee hives. List some of the types of artificial bee hives you still remember.





#### Key word

artificial

### Materials needed to construct a bee hive

**Artificial** bee hives are man-made hives which make use of different materials. The material used should be bee-friendly, and also make it easy to harvest the honeycombs when the time comes. A beekeeper must also keep in mind the cost when choosing the material to use.

Type of artificial bee hive	Material used
Basket hive 	Straw (type of grass for weaving baskets)
Bark hive 	A bark Rope/string

Top bar hive



Timber/Any wood (the wood must be termite-proof)  
Nails

Clay pot hive



Clay

Langstroth hive



Pine wood  
Nails

### Activity 1 Practical

1. In groups, choose a type of bee hive and list down the materials you will need to make that hive.
2. Make use of the internet to help you come up with a design for your chosen bee hive. Draw the design in your books.
3. Construct a model of your bee hive. You can use the internet to find DIY bee hive models. For example, you can refer to this site: <https://www.ghow.com/info/8368015-ideas-bee-hive-school-project.html>

You can also visit local beekeepers in your area and get ideas from them on how their bee hives are made.



## Exercise A

Answer the questions below.

1. What is an artificial bee hive? [1]
2. List the material used to build the following bee hives:  
a) top bar hive  
b) Langstroth hive  
c) bark hive [3]
3. State any two factors a beekeeper considers when selecting materials to make a beehive. [2]

## Summary

- Artificial bee hives are man-made hives which make use of different materials.
- Different bee hives make use of varying materials. Basket hives make use of straw to make the baskets, bark hives use tree barks, top bar hives use timber/any wood and nails, clay hives make use of clay and the Langstroth hive uses pine wood and nails as the main materials.
- Beekeepers should keep in mind the cost of the material and also make sure the material used makes it easy to remove the honeycombs from the hive.

## Glossary

<b>Products</b>	- food derived from animals, for example, meat is a product of poultry and rabbits.
<b>By-product</b>	- material that people do not eat that originates from animals.
<b>Balanced diet</b>	- food that contains all necessary nutrients in their correct amount needed for good health.
<b>Supplements</b>	- products rich in certain nutrients which otherwise lack in the available feed.
<b>Parasite</b>	- an organism which lives in or on a host and uses the host for food.
<b>Host</b>	- an animal that a parasite lives and feeds on.
<b>Deworming</b>	- giving a drug to an animal to get rid of parasites.
<b>Artificial</b>	- something that is man-made.

## End of topic assessment

### Multiple choice

Choose the correct answers.

1. Give the meaning of the term poultry product.  
A. Food attained from poultry.                      B. Waste of poultry.  
C. Eggs.    D. By-product.



## Unit 27 Farm machinery

### In this unit you will:

1. state uses of farm machinery
2. classify machinery as animal or engine driven.

### Flashback

In the previous grade, you looked at the uses of different farm implements. Recap in groups on what you learnt.

### Key words

aerate

efficient

complement

pesticides

### Uses of farm machinery

Farm machinery is important to a farmer because it is used to carry out many tasks. Most farm machinery varies in types and models, for example, there are a number of different types of ploughs.

#### Plough

There are types of ploughs which include the disc, rotary, mould board and chisel plough. Ploughs are important because they open up and **aerate** the soil. To aerate is to allow air to enter deep into the soil. A plough is used for preparing the soil for sowing. A plough overturns soil, bringing rich soil from underneath onto the surface. This creates a good foundation for sowing seeds. Ploughing also allows rainfall to infiltrate deep into the soil. Figure 27.1 shows a tractor drawn disc plough.



Figure 27.1 A hand-drawn disc plough

### Cultivator

A cultivator is very valuable in removing weeds in the field and deeply loosening soil. This also helps water to sink deeper into the soil. The diagrams below shows an ox-drawn cultivator and an engine-driven cultivator.



Figure 27.2 a) An ox-drawn cultivator



b) An engine-driven cultivator

### Harrow

Types of harrows include spike, line, drag and disc harrows. Harrows are used to break soil clumps. Unlike the plough and cultivator which go deep into the soil, the harrow concentrates on the surface of the soil. A harrow smoothes and levels the field. A spike harrow is shown in Figure 27.3.

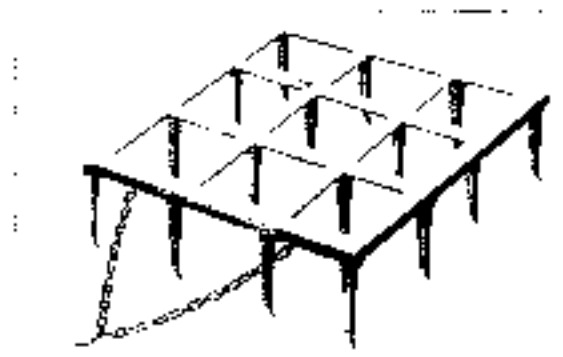


Figure 27.3 A spike harrow

## Planter

Planting is usually carried out very fast when a planter is used. A planter can do many tasks at the same time. It can open a furrow for sowing seed. It applies fertiliser, drops the seed and lastly covers the seed. All this is done in one operation. The planter shown in Figure 27.4 is ox-drawn.

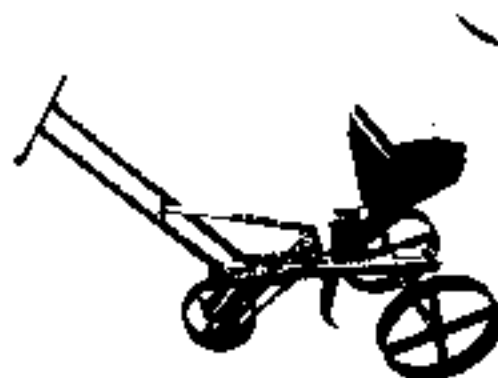


Figure 27.4 An ox-drawn planter

## Combine harvester

A combine harvester is an example of a modern specific and **efficient** tractor some farmers use. To be efficient is to produce the most using the least effort or resources. This machine can perform three tasks in one: harvesting, loosening the edible parts of a crop and cleaning grain crops. Figure 27.5 shows a combine harvester.



Figure 27.5 A combine harvester

## Pump

Pumps are used to draw water from boreholes, dams and rivers. Some large scale farms use irrigation to **complement** seasonal rains and during dry seasons. To complement means to make up for a shortage in something. Most irrigation systems have pumps at the centre of their proper functioning. See Figure 27.6.



Figure 27.6 An irrigation system uses a pump

## Sprayer

Sprayers can either be big machine operated or small equipment that can be operated by hand. A knapsack sprayer is an example of a small sprayer. Sprayers are used to apply **pesticides** on crops. Pesticides are chemicals that prevent or destroy pests. Care should be taken to ensure that the user does not get into contact with the chemicals being used. Figure 27.7 shows a knapsack sprayer and a big field sprayer.



Figure 27.6: A person using a knapsack sprayer.



Figure 27.7: A combine harvester harvesting crops.

## Mower

Just as with sprayers, mowers can be either big or small. The most common small mower you probably know is a lawn mower. Mowers cut grass or crops into rows. For example, the school grounds are kept clean by cutting grass with a lawn mower. Big lawn mowers are pulled by tractors, and they cover a large area in a short time. Heavy duty mowers cut cereal crop and arrange grass or hay in rows. Hay is cut and dried material from the field which is later used as animal feed. Figure 27.8 shows a lawn mower and a big mower.



Figure 27.8: (a) A lawn mower.



Figure 27.8: (b) A big mower.

## Activity 1: Learning about machinery

Arrange a trip to go and see the machinery not found at school.

1. Note down the machinery you see.
2. Check against the machinery you learnt on. Do they have similar machines? Are the machines advanced or old models?
3. Draw any machinery of your choice and state what it is used for.

## Exercise A

Answer the following questions.

1. Ploughs are important because they \_\_\_\_\_.  
A. open up and aerate soil  
B. cut grass  
C. infiltrate the soil  
D. level the field
2. Which of the following is an example of an efficient and modern tractor?  
A. Knapsack sprayer  
B. Mower  
C. Combine harvester  
D. Disc plough
3. Which of the following is **not** an example of farm machinery?  
A. Plough  
B. Tractor  
C. Printer  
D. Mower
4. What are pumps used for in farming? [1]
5. Why should a person avoid coming into contact with chemicals when spraying? [1]

## Classifying farm machinery

Farm machinery can be classified as animal or engine driven. Animal driven machinery is machinery which depends on animal power in order to move machines and make them functional. Engine driven machinery uses engines to move machines and make them work. Table 27.1 shows some examples of machines that use animal power and others which rely on engines to function.

Table 27.1 Classification of different farm machinery

Animal driven	Engine driven
Plough	Combine harvester
Ox-drawn cultivator	Sprayer
Planter	Mower
Harrow	Pump
	Tractor

## Activity 2 Educational tour

Visit a big farm near you. Ask for permission from the farm guide to take an inventory of the farm machinery they have.

1. Ask the farm manager(s) to show you how they keep track of all the machinery they have.
2. Use ICT tools to present your results. If you do not have access to a computer, simply write down your findings.

## Summary

- Ploughs are useful in opening up and aerating the soil.
- A cultivator removes weeds and loosens the soil.
- Harrows concentrate on making the field level.
- A combine harvester is an example of a tractor and it harvests, loosens edible parts of a crop and cleans grain crops.
- Pumps draw water from boreholes, dams and rivers. An irrigation system relies on a pump.
- Sprayers are used to apply pesticides to crops.
- Mowers cut grass and some can arrange the grass in rows.
- Farm machinery can be classified as animal or engine driven.

## Glossary

<b>Aerate</b>	-	to allow air to enter deep into the soil
<b>Efficient</b>	-	to produce the most using the least effort or resources.
<b>Model</b>	-	means type.
<b>Pesticides</b>	-	chemicals that prevent or destroy pests.
<b>Complement</b>	-	to make up for a shortage in something.

## End of topic assessment

### Multiple choice

Choose the correct answers.

1. A combine harvester .....  
A. mows grass, sprays pests and pumps water  
B. harvests, loosens edible parts of a crop, and cleans grain crops  
C. levels the field  
D. aerates the soil
2. What is the use of sprayers in agriculture?  
A. To make the air smell pleasant.      B. To keep the air moist.  
C. to apply pesticides on crops.      D. To kill pests.
3. What are some of the tasks of a planter?  
A. Opens a furrow for sowing seed, applies fertiliser and drops the seed.  
B. Harvests and loosens edible parts of a crop  
C. Removes weeds and loosens the soil.  
D. Irrigates the field.
4. Farmers use irrigation because .....  
A. it is cheap  
B. they want to be tender than other farmers  
C. they want to use up water from rivers  
D. it supplements rainfall shortages



5. Choose a machine that is **not** animal driven from the list.  
A. Pump      B. Plough      C. Planter      D. Cultivator
6. Which one out of the following is **not** an example of an engine driven farm machine?  
A. Cultivator      B. Sprayer      C. Wheelbarrow      D. Planter

### Structured questions

**Answer all the questions in full.**

1. List any four examples of farm machinery. [4]
2. What is the difference in use between a plough and a harrow? [2]
3. Which farm machine removes weeds and loosens soil in depth? [1]
4. How is a planter an efficient machine? [2]
5. List any four animal drawn machines. [4]
6. Name any one engine driven machine. [1]

### Unit 28 Agribusiness

#### In this unit you will:

1. identify national markets for agricultural products
2. prepare income and expenditure of an agricultural enterprise.

#### Flashback

What is a sales record?



#### Key words

depot      enterprise      fixed costs      direct costs      input  
cost/expenditure

### National markets

National markets buy agricultural products throughout the country. There are depots in small towns and growth points where farmers market their products. A **depot** is a storage place for large quantities of goods. National markets are a godsend for the farmer as they sell to a wider market compared to a farmer selling on his/her own. Examples of national markets are:

- Grain Marketing Board (GMB)
- Cotton Holdings Limited
- Dairyboard Zimbabwe Limited (DZL)
- Tobacco Industry Marketing Board (TIMB).

Figure 28.1 shows the Grain Marketing Board silos.



Figure 28.1 Grain Marketing Board silos

## Marketing

There are factors farmers consider when marketing their crops. Farmers research on possible markets for their crop and compare different prices offered by different buyers. This is important in making sure farmers get profit from their produce.

Farmers also use the grade of their agricultural produce as a marketing tool. The higher the grade of the crop, the more interested the buyers are in purchasing the crop, at varying price offers.

Farmers market crops to national markets such as GMB because a national market has the capacity to buy the crops in bulk. GMB has the muscle to then sell the produce to the whole country. There are also private companies in Zimbabwe which play an important role in buying and marketing agricultural produce. These include AgriFoods, National Foods and Millers.

## Sources of income in an agricultural enterprise

It is important for an agricultural enterprise to have many ways of getting income. An **enterprise** is a business or project. A helpful tip is to view every available resource on the farm as a potential source of income.

### Selling by-products

As learnt earlier on in Topic 6, there are different by-products acquired from livestock. The following can be sold depending on which livestock the farmer is rearing and crops they are growing:

- seedlings
- beeswax (to candle makers)
- manure from all livestock
- rooster feathers (they are popular with crafters)
- rabbit fur (fashion industry)
- cowhides (leather for the fashion industry)
- worms (to fishers for bait).



Figure 28.2 Some sellable by-products.

### Hiring out equipment/machinery

Hiring out some machinery during off season can bring in extra money into an enterprise. For example, tractors and mowers can be hired out to other businesses that need them. Caution should be exercised to make sure the machinery is returned in good condition.

### Utilising other skills a farmer has

People are usually good at more than one thing. For example, some farmers do not need to source out building services for their structures. Those who have architectural skills can offer construction services to other farmers or new farmers. For example, designing and constructing brooders and deep litter houses brings in extra money.

### Hosting classes or consultancy services

Even if an individual does not have teaching or consultancy experience, his/her experience in agriculture can be shared with others who wish to start an agricultural enterprise. This can be done at a price, thereby bringing a farmer extra income. Figure 28.3 shows a farmer sharing her expertise in farming with others wishing to venture into farming.



Figure 28.3 A farmer sharing her knowledge

## Expenses in an agricultural enterprise

### Fixed and direct costs

The major expenses in any business can be divided into fixed and direct costs. **Fixed costs** are expenses an enterprise has and must pay whether or not it is producing. For example electricity bills, rent and wages must be paid whether it is a farming season or not. **Direct costs** on the other hand are costs which arise as a result of the production the enterprise does. For example, if we buy birds, we need to factor in the cost of chicken feed for the birds in our expenses.

### Other expenses

A farmer can get a loan to boost the enterprise and will have to pay back the money with interest. This is called a financial cost. The farmer also takes money from the business to support himself/herself and his/her family. This is an example of a personal cost.

## Exercise A

Answer the questions below.

- Which one of the following is **not** a national market?
  - Grain Marketing Board
  - Cottco Holdings Limited
  - City Council
  - Dairibord Zimbabwe Limited
- What is the advantage of using national markets for farmers?
  - They are small.
  - National markets can reach more people.
  - National markets are close.
  - National markets sell for farmers for free.
- Where are cotton products sold? [1]
- State and explain two ways a farmer can make extra income. [2]
- What is the difference between fixed costs and direct costs? [2]



## Income and expenditure

When we plant maize, we keep records of things which we buy. We buy items such as seeds, fertilisers and chemicals for controlling pests and diseases. We also record the cost of transporting seeds and fertilisers to the school. Money spent on purchasing inputs is called **input cost** or **expenditure**. After selling the crops, we have our returns or income. Table 28.1 shows the expenditure and income account for the maize crop.

Table 28.1 Expenditure and income for maize production

Date	Expenditure (Inputs)	Amount	Date	Income (returns)	Amount
Nov 5	50 kg Lime	\$ 12.00	Feb 10	Sale of green mealies	\$ 120.00
	25 kg maize seed	\$ 25.00			
	150kg ammonium nitrate	\$105.00	Apr 12	Grain for food Grain to GMB	\$ 450.00
	100 kg Compound D	\$900.00	May 1	Grain for	\$1 000.00
	2 kg chemical	\$ 12.00	May 9	poultry feed	\$ 900.00
	Transport	\$ 60.00			
	Ploughing	\$ 30.00			
	Labour	\$120.00			
	Total return				\$ 2 470.00
	Less total costs	\$ 434.00			
	Profit or loss	\$2 036.00			

### Activity 1 Group work

Study Table 28.1 in groups and use it to draw up an input and returns account for your maize project at school. Fill in the actual amounts you used for the expenditure and your income. Compare the input {expenditure} figures and returns {income}. Did you make a profit or loss?

### Activity 2 Educational tour

Visit any national market near you and observe all activities and procedures which take place there.

## Summary

- National markets buy crops and livestock throughout Zimbabwe. They ensure that every citizen gets access to food in the market.
- Grain Marketing Board, Cotton Holdings Limited, Dairibord Zimbabwe Limited and Tobacco Industry Marketing Board are examples of national markets.
- There are several sources of income in an agricultural enterprise which include selling by-products, hiring out equipment/machinery, utilising other skills a farmer has and hosting classes or consultancy services.
- Fixed and direct costs are the two major groups of expenses in a business.
- Fixed costs are expenses an enterprise has and must pay whether or not it is producing.
- Direct costs are costs which arise as a result of the production the enterprise does.
- Other expenses include financial and personal costs.
- Money spent on agricultural inputs is called input cost/expenditure.
- The money made from selling a crop is called returns/income.

## Glossary

<b>Depot</b>	- a storage place for large quantities of goods.
<b>Enterprise</b>	- a business or project.
<b>Fixed costs</b>	- expenses an enterprise has and must pay whether or not it is producing.
<b>Consultancy</b>	- giving expert advice in a certain field.
<b>Direct costs</b>	- costs which arise as a result of the production the enterprise does.
<b>Input cost/expenditure</b>	- money spent in purchasing inputs.

## End of topic assessment

### Multiple choice

Choose the correct answer.

1. What is the function of national markets?
  - A. Raising livestock.
  - B. Providing foreign currency to farmers.
  - C. They buy agricultural products in the country.
  - D. Importing food from other countries.

2. A depot is \_\_\_\_\_.
  - A. a place for fixing cars and buses
  - B. a storage place for large quantities of goods
  - C. a business or project
  - D. an example of a national market
3. DZL is a market for \_\_\_\_\_.
 

A. maize	B. milk	C. vegetable	D. wheat
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4. Harvested crops are classified under \_\_\_\_\_.
 

A. expenditure	B. inputs	C. profit	D. outputs
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5. What is the term for money spent on purchasing inputs?
 

A. Expenditure	B. Gross profit
C. Capital	D. Fixed cost

### Structured questions

**Answer all the questions in full.**

1. List any two private companies which market agricultural products. [2]
2. Describe the relationship between income and expenditure. [2]
3. Give any one example of a fixed cost and another of a direct cost. [2]
4. State any two examples of agricultural inputs. [2]
5. What is an expenditure? [1]



## Unit 29 End of year assessment

### Paper 1

Choose the correct answer.

- What is agriculture?  
A. Agriculture is the production of fruits.  
B. Agriculture is the keeping of animals for food.  
C. Agriculture is the growing of cereal crops.  
D. Agriculture is the cultivation of soil to produce crops and rearing of animals.
- Which of the following is **not** a branch of agriculture?  
A. Soil Science  
B. Social studies  
C. Horticulture  
D. Forestry and wildlife
- \_\_\_\_\_ is a branch involved with farm machines, tools and structures.  
A. Agricultural engineering  
B. Animal production  
C. Crop production  
D. Agricultural economics
- Crops grown for sale are known as \_\_\_\_\_ crops.  
A. natural  
B. cereal  
C. cash  
D. vegetable
- \_\_\_\_\_ is not a way of maintaining farm tools.  
A. Sharpening  
B. Watering  
C. Greasing  
D. Drying
- A green triangle on an agrochemical container means \_\_\_\_\_.  
A. not poisonous  
B. extremely poisonous  
C. mildly poisonous  
D. toxic
- Which level of toxicity is shown by a white triangle in agrochemicals?  
A. Not poisonous  
B. Mildly poisonous  
C. There is no white triangle  
D. Very dangerous
- Why is weather forecasting important to farmers?  
A. It allows farmers to choose the right workers.  
B. It enables farmers to make time for holiday.  
C. It allows farmers to choose the right tools and clothes.  
D. It helps farmers plan their agricultural activities.
- The following are weather elements except \_\_\_\_\_.  
A. cold  
B. rainfall  
C. humidity  
D. cloud cover
- The weather conditions of a particular area over a long period of time is called \_\_\_\_\_.  
A. weather  
B. season  
C. climate  
D. region
- Which of the following is associated with climate change?  
A. Increasing temperature.  
B. Increased irrigation.  
C. Agricultural activity.  
D. Improved soil fertility.
- How many natural farming regions are in Zimbabwe?  
A. 8  
B. 5  
C. 10  
D. 1



13. Name the region labelled C.  
 A. Region 3                      B. Region 2                      C. Region 5                      D. Region 4
14. Which one out of the regions receives the highest amount of rainfall?  
 A. C                      B. D                      C. E                      D. B
15. Why do farmers at B grow drought resistant crops like millet and sorghum?  
 A. Because the region is very cold.  
 B. Because the region receives little rainfall.  
 C. Because it's not allowed to grow other crops.  
 D. Because the temperatures in that region can be very high.
16. Soil composition means \_\_\_\_\_.  
 A. how the soil is arranged                      B. what the soil is made of  
 C. how the soil feels                      D. where the soil comes from
17. Which soil component has the lowest percentage?  
 A. Organic matter                      B. Air  
 C. Water                      D. Inorganic matter



18. What causes this type of weathering?  
 A. Plant action                      B. Animals  
 C. Temperature change                      D. Wind
19. Which of the following soils is ideal for crop production?  
 A. Sand                      B. Loam                      C. Clay                      D. Silt

20. Soil that does not have the right nutrients and cannot support plant growth is said to be\_\_\_\_\_.

- A. polluted                      B. poor                      C. unfertile                      D. fertile

21. \_\_\_\_\_ is a bad effect of soil erosion.

- A. Siltation of water bodies                      B. Creation of fertile soil  
C. More transpiration                      D. More water in dams

22. Which of the following is **not** a cause of soil pollution?

- A. Green manuring                      B. Industrial waste  
C. Mining                      D. Littering



23. Which soil moisture conservation method is shown in the picture?

- A. Porcholing                      B. Mulching                      C. Manuring                      D. Tied ridging



24. The picture shows \_\_\_\_\_.

- A. soil erosion                      B. run-off water  
C. soil pollution                      D. water pollution

25. Which part of a plant has reproductive organs?

- A. Leaf                      B. Flower                      C. Roots                      D. Stem

26. \_\_\_\_\_ is a minor plant nutrient.

- A. Zinc                      B. Potassium                      C. Nitrogen                      D. Phosphorous

27. What name is given to an area set aside to grow fruits?

- A. Woodlot                      B. Garden                      C. Orchard                      D. Field

28. A combine harvester is used to harvest \_\_\_\_\_.  
 A. cabbage                      B. wheat                      C. tomatoes                      D. groundnuts
29. When a farmer's income is less than expenditure, the farmer has made a \_\_\_\_\_.  
 A. wage                      B. salary                      C. profit                      D. loss
30. Which is the best season to grow peas?  
 A. Hot wet season                      B. Cold wet season  
 C. Cold dry season                      D. Hot dry season
31. Trees need to be well spaced because they \_\_\_\_\_.  
 A. need air  
 B. do not grow too well under crowded conditions  
 C. need enough air to move around them  
 D. enable us to plant other things around trees
32. Which of the following statements is **true**?  
 A. Pests and weeds do not threaten the health of plants.  
 B. Effects of weeds include taking up nutrients and moisture meant for plants.  
 C. Pest damage cannot lead to yield loss and drought.  
 D. Weeds do not slow down the growth rate of plants
33. The products from a poultry farm are \_\_\_\_\_.  
 A. meat and eggs                      B. eggs and feathers  
 C. feathers and manure                      D. manure and meat
34. The by-products of a poultry farm are \_\_\_\_\_.  
 A. Meat and eggs                      B. Eggs and feathers  
 C. Feathers and manure                      D. Manure and meat
35. A balanced diet is \_\_\_\_\_.  
 A. the supply of the appropriate food nutrients to animals in their right proportions  
 B. making sure that animals drink water at the right time  
 C. providing all the nutrients to animals  
 D. providing the animals with the medication they need to live healthy
36. Which nutrient is required for bone formation?  
 A. Fats                      B. Carbohydrates                      C. Vitamins                      D. Minerals
37. \_\_\_\_\_ prevent and control diseases and aid food digestion in poultry.  
 A. Fats                      B. Carbohydrates                      C. Vitamins                      D. Minerals
38. What is a parasite?  
 A. It is an organism without a place to live.  
 B. An organism which lives in or on a host.  
 C. It is a host.  
 D. It is an animal that is infected.
39. Where are external parasites found?  
 A. In the bones of the animal.                      B. In the blood of the animal.  
 C. On the skin of the animal.                      D. In the intestines of the animal.

40. The three main external parasites of poultry are \_\_\_\_\_.  
 A. fleas, tapeworms and roundworms      B. fleas, lice and tapeworms  
 C. fleas, leg mites and worms              D. fleas, lice and leg mites
41. What is deworming?  
 A. Removing worms from an animal using your hand.  
 B. Giving a drug to an animal to get rid of worms.  
 C. Spraying an animal to chase away worms.  
 D. Cutting an animal up to remove worms.
42. Which is **not** a way of controlling external parasites?  
 A. Splashing boiled water in the chicken house.  
 B. Dipping chickens in paraffin.  
 C. Removing and burning deep litter.  
 D. Disinfecting the chicken house with poultry dip.
43. A bird with paralysed legs and discharge of mucus from the mouth suffers from \_\_\_\_\_.  
 A. Chicken pox              B. Fowl pox              C. Newcastle              D. Coccidiosis
44. Which one is not a type of a beehive?  
 A. Basket hive              B. Bark hive              C. Clay pot hive              D. Window hive
45. The following farm implements are used for digging except a \_\_\_\_\_.  
 A. harrow              B. spade              C. pick              D. hoe
46. Which one is an example of an efficient and modern tractor?  
 A. Knapsack sprayer              B. Mower  
 C. Combine harvester              D. Disc plough
47. Which record shows how much money comes in and out of an agricultural enterprise?  
 A. Budget              B. Profit record  
 C. Income and expenditure              D. Cash flow
48. A farmer buys poultry feeds to feed chickens. What kind of a cost is it?  
 A. Personal              B. Unnecessary              C. Fixed              D. Direct
49. A farmer spends \$2 000 in producing potatoes. She gets a total of \$3 500 after selling the potatoes. Calculate the profit or loss made by the farmer.  
 A. Profit \$1 500              B. Loss \$1 500              C. Profit \$5 500              D. Loss \$3 500
50. The place where tobacco is sold by farmers is called the \_\_\_\_\_.  
 A. Grain Marketing Board              B. Dairibord Zimbabwe Limited  
 C. Tobacco Auction Floor              D. Cotton Holdings Limited

### Section A

Answer all the questions in this section. Each question carries 5 marks.

1. Name the branch of agriculture that deals with the following:
  - a) study of soil fertility
  - b) farm machinery, tools and structures
  - c) production of beef and dairy cattle
  - d) animals and forests
  - e) management of money
2. a) Define the following terms:
  - i. pests
  - ii. weeds
- b) Give any one method of controlling pests.
- c) State any one way of controlling weeds.
- d) How are pests dangerous to the health of crops?
3. a) What is the difference between a product and a by-product?
- b) Why is the solid back of the wall of a deep litter house usually built facing the direction of the prevailing wind?
- c) State any two factors a brooder should provide to chicks.
4. a) Define a balanced diet.
- b) List any two functions of carbohydrates in an animal diet.
- c) Name the nutrient which provides the building blocks for body tissue.
- d) What are the benefits of vitamins to animals?
5. a) The following towns are found in which farming region?
  - i. Nyanga
  - ii. Beitbridge?
- b) What are the climatic conditions of the following agricultural regions?
  - i. Region 1
  - ii. Region 3
  - iii. Region 5?
6. a) What is weathering?
- b) Give three agents of weathering.

[30 marks]

### Section B

Answer any two questions. Each question carries 10 marks.

7. a) i. What is the best time to grow tomatoes?
- ii. Name any two ways of taking care of tomatoes.
- iii. Name any two pests that affect tomatoes.
- b) i. Give two examples of cereal crops.
- ii. When is wheat best grown in Zimbabwe?
- iii. Explain one method of harvesting wheat.

8. a) i. What is an artificial beehive? [1]  
 ii. Give any three examples of artificial bee hives. [3]  
 iii. What material is used to make a Langstroth hive? [1]  
 b) i. What are the two groups of parasites of poultry? [2]  
 ii. Give one example in each group in 8.b) i. [2]  
 iii. What is deworming? [1]
9. c) i. What is the difference between controlling and preventing parasites? [2]  
 ii. State any two methods of preventing internal parasites. [2]  
 iii. How can external parasites be prevented? [1]  
 b) i. List any three examples of farm machinery. [3]  
 ii. Which are the two groups of farm machinery? [1]  
 iii. What is the use of a cultivator in farming? [1]
10. a) i. What is a national market? [1]  
 ii. Give any two examples of national markets in Zimbabwe. [2]  
 iii. What is the advantage of a national market to farmers? [2]  
 b) Define the following:  
 i. expenditure      ii. income [2]  
 c) Outline any two ways a farmer can earn extra income. [2]  
 d) What are direct costs in an agricultural project? [1]

**[20 marks]**

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