

JUNIOR
AGRICULTURAL SCIENCE

STUDYING GUIDE

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REVISION QUESTIONS WITH ANSWERS

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Preface

This pamphlet guide students to enjoy the study of agriculture. The style of writing encourages independent study. This will assist students to revise and prepare for tests and examinations. Throughout this guide, the language used to phrase the questions has been kept as simple as possible to enable the student to follow easily. Difficult, important words and concepts are emboldened. Answers to all questions are given immediately after the questions. This pamphlet is extremely useful to students of agriculture at both junior and senior secondary schools.

SAISAKA SYDNEY

Question 1

- a. Define agriculture
- b. Explain the importance of agriculture
- c. Define the following:
 - i. **Arable farming**
 - ii. **Livestock farming**
 - iii. **Mixed Farming**
 - iv. **Subsistence farming**
 - v. **Commercial farming**
- d. List the factors that limit food production in Zambia.

Answering

Question 1

- a. Agriculture is the growing of crops and keeping of livestock.
- b. Importance of agriculture:
 - Agriculture provides food
 - Agriculture provides employment
 - Agriculture provides income
 - Agriculture provides raw materials
 - Agriculture provides clothing
 - Agriculture provides a market for some agricultural tools such as sprayers, hoes, ploughs and tractors
 - Agriculture provides foreign exchange.
- c. Definitions:
 - i. Arable farming- This is the growing of crops
 - ii. Livestock farming – This is the keeping or rearing of animals
 - iii. Mixed farming – This is the production of both crops and animals.
 - iv. Subsistence farming- This is when farmers grow the crop to feed just their families and a little extra to keep as seed for the next season. They also keep a few livestock for various reasons.
 - v. Commercial farming- This is the production of crops and livestock on a large scale which is run as a business or enterprise. Commercial farms produce crops and livestock for sale in towns.
- d. Factors that limit food production in Zambia are:
 - Rainfall
 - Temperature
 - Soils
 - Pests

- Diseases
- Lack of Skills and money

Question 2

Explain the following terms:

- Drought**
- Enterprise**
- Food security**
- Inputs**
- Self- sufficiency**

Answering

Question 2

- Drought – Lack of rainfall for a long time
- Enterprise- another name for business
- Food Security – Having sufficient food for the population.
- Inputs- Things needed for production
- Self- sufficiency- Producing enough to satisfy one’s needs.

Question 3

- Define the term soil.
- Why is soil important to people?
- Give reasons why each of the following is important in soil:
 - Air
 - Humus
 - Mineral particles
 - Water
- Suggest ways in which a farmer can increase organic matter in the soil.
- How can a farmer increase the amount of air in the soil?
- Mention the three types of weathering.
- List the main agents of weathering.
- Explain the meaning of the term weathering.
- Explain how the following factors help in soil formation:
 - Climate**
 - Topography**
 - Time**
- What is a **soil Profile**?
- List the horizons of a soil profile.

1. Which horizon is the most suitable for production? Why do you think so?

Answering

Question 3

- a. Soil is a mixture of material that comes from weathered or broken- up rock and organic matter.
- b. Importance of soil:
- i. Soil support plants.
 - ii. Soil is a source of nutrients, water and air.
 - iii. Soil is a home for soil organisms.
 - iv. Soil is used in construction.
- c. Importance of the following in the soil:
- i. Air
 - Provide Oxygen for the respiration of the both plant and micro organisms
 - Air contains oxygen which can break down minerals in rocks to form soil.
 - ii. Humus
 - Improves the fertility of the soil by providing mineral salt needed for plant growth.
 - Helps the soil to form a crumb structure. This improves the drainage and aeration of the soil.
 - Makes the soil easier to work, because of the crumb structure it produces.
 - Makes the soil able to hold water.
 - Helps to prevent wind erosion by binding mineral particles together
 - Helps to raise soil temperature by absorbing radiant heat from the soil due to its dark color.
 - iii. Mineral particles
 - They release mineral salts such as calcium, iron, magnesium which support crop and animal production.
 - iv. Water
 - It cools a plant
 - It dissolves plant nutrients in the soil to be absorbed by plants
 - It transport dissolved plant nutrients from the soil to the upper parts of a plant.
 - It soaks the seed during germination
 - It is used as a raw material in photosynthesis.
 - It makes the soil easier to work
 - It helps to control the soils temperature.
- d. How a farmer can increase organic matter in the soil:
- By digging in manure
 - By Digging in compost

- By digging in weeds or other plants (Sometimes called green manure)
- e. A farmer can increase the amount of air in the soil by aerating and cultivation.
- f. Types of weathering:
 - **Physical weathering**
 - **Chemical Weathering**
 - **Biological weathering**
- g. Agents of weathering:
 - Wind
 - Temperature
 - Water
 - Air
 - Living Organisms
- h. Weathering is the breaking down of rocks into smaller particles.
- i. Explanations:
 1. **Climate**

Rainfall and temperature are the two most important aspect of climate influencing soil formation. Rainfall helps break down rocks by dissolving the soluble minerals in the rock and change their composition. Under the conditions of high rainfall the agent of chemical weathering are most active.

Change in temperature affects the rate at which the rocks are weathered. The process of physical weathering is most active when there is a large difference between day and night temperatures. High temperatures make the rock breakdown quickly.

2. **Topography**

This refers to the physical features of the land such as hills and valleys and also the slope of the land. On steep hilly land, rainwater moves faster and therefore weathering is more rapid than it is on gentle slopes.

3. **Time**

The soil takes a long time to form depending on the nature of the parent material, climate, living organisms present in the soil, and topography.

- j. The soil profile is the vertical arrangement of soil layers or horizons, as seen in a pit.
- k. Soil horizons include:
 - **Topsoil**
 - **Subsoil**
 - **Partly weathered material (Broken rocks)**
 - **Parent rock**

1. The most important horizon to a farmer is the A horizon because it has the most of the plant nutrients and organic matter needed by crops.

Question 4

Explain the following terms:

1. **Freeze- thaw action**
2. **Hard pan**
3. **Humus**
4. **Impermeable**
5. **Magma**
6. **Parent rock**
7. **Rust**
8. **Sediment**
9. **Soil aeration**
10. **Water- holding capacity**

Answering

Question 4

1. Freeze-thaw action
Cracking produced by freezing then melting of water.
2. Hard pan
Impermeable soil layer
3. Humus
The fully decomposed remains of dead plants and animals
4. Impermeable
Hard soils that reduce drainage and root penetration
5. Magma
Hot, Liquid rock inside the earth
6. Parent rock
The original rock from which the soil was broken down
7. Rust
Iron Oxide
8. Sediment
Sand or soil particles in water
9. Soil aeration
The amount of air in the soil
10. Water- holding capacity
The amount water a soil can hold.

Question 5

- a. Define **soil fertility**
- b. What are the characteristics of fertile soil?
- c. What is the difference between?
 - i. Organic and inorganic fertilizers
 - ii. Compound and straight fertilizers
- d. Give example of:
 - i. Organic fertilizers
 - ii. Compound fertilizers
 - iii. Straight fertilizer
- e. What are the advantages of using?
 - i. Organic fertilizers
 - ii. Inorganic fertilizers
- f. What are the disadvantages of using:
 - i. Organic fertilizers
 - ii. Inorganic fertilizers?
- g. State the ways of adding fertilizer to the soil
- h. Describe two ways in which fertilizer can affect plant growth.
- i. Explain at least five activities which will help farmers to maintain their soil.

Answering

Question 5

- a. **Soil fertility** is the ability of the soil to provide the nutrient elements essential for plant growth in the correct proportions.
- b. A Fertile soil should:
 - i. Have a good structure
 - ii. Be well aerated and drained
 - iii. Have a good water- holding capacity
 - iv. Not to be too cold or hot
 - v. Have many micro-organisms
 - vi. Have a good supply of organic matter and nutrients
 - vii. Be deep
 - viii. Well managed by the farmer

- c. Organic fertilizers are fertilizers from plant and animals. They are also called manures. Inorganic fertilizers are fertilizers made from chemicals. They are also called artificial fertilizers.

Compound fertilizers are inorganic fertilizers which usually supply all the three major nutrient elements and are sometimes called NPK fertilizers. They are used as basal dressing fertilizers. Straight fertilizers are inorganic fertilizers which supply only one nutrient element to the soil. They contain nitrogen, phosphorus or potassium. They are used as top dressing fertilizers.

- d. Examples of :

i. **Organic fertilizers:**

- Crop residues
- Green manure
- Farmyard manure (FYM)
- Compost manure
- Mulches

ii. **Compound fertilizers:**

- Compound C
- Compound D
- Compound R
- Compound X
- Compound V

iii. **Straight fertilizers:**

- Urea
- Ammonium nitrate
- Potassium sulphate
- Super Phosphate
- Ammonium sulphate
- Calcium ammonium nitrate(CAN)
- Potassium Chloride

- e. Advantages of using:

i. Organic fertilizers

- They are easy to obtain
- They are cheap or even free to obtain
- They improve the soil structure
- They encourage the activity of soil micro-organisms
- Most organic fertilizers contain all nutrient elements, including micro nutrients.
- They slowly release nutrients elements into the soil. This means that nutrients element is available to plant over a long period of time.

ii. Inorganic fertilizers:

- They are easy to handle or store since they are usually bought in bags.
 - Less time is needed to add and mix them into the soil.
 - The farmer can calculate the amount of nutrient elements which need to be added to the soil. This is because the amount of nutrients in the fertilizer is stated on the bag.
 - They contain large amount of nutrients elements. This means that only small amounts need to be added to the soil. All the inorganic fertilizers contain much more nitrogen than organic fertilizers.
- a. Disadvantages of using:
- i. Organic fertilizers:
 - They contain only small amounts of nutrient elements. This means that these fertilizers must be added in large quantities.
 - Much time is needed to add them and mix them into the soil.
 - A farmer cannot estimate the exact amount of nutrient elements which have to be added to the soil.
 - ii. Inorganic Fertilizers:
 - They are expensive
 - They can only be obtained in a few shops. Such shops are usually not available in rural areas where the farmers live.
 - The chemicals effect kills soil micro organisms which help in binding the soil. In this way these fertilizers destroy the soil structure.
 - Their application over a long period of time may cause pollution of the ground water used by livestock and human beings.
 - They may reduce the activity of micro organisms.
- b. Ways of adding fertilizer to the soil:
- **Broadcasting**
 - **Banding**
 - **Drilling**
 - **Side dressing**
 - **Spraying**
 - **Fertigation**
- c. Ways in which fertilizer can affect plant growth:
- If we add too much fertilizer or add it in the wrong way, several problems such as the following may result.
- Scorching, that is plants lose water, wilt and turn brown in colour, occurs when too much fertilizer is applied especially to young seedlings. It may also occur if grains of fertilizer are dropped on the leaves; fresh kraal manure may also scorch or burn plants.
 - Destruction of soil structure can occur
 - There can be a reduction in the number of micro- organisms.
 - The soil becomes more acid. This means that some elements like aluminum and iron may become toxic to plants.

- Pollution of ground water can occur
- d. Soil fertility can be maintained through:
 - The addition of fertilizers
 - Reducing leaching
 - Crop rotation
 - Ploughing back crop residues
 - Applying fertilizers at the right time
 - Mulching
 - Proper weed control
 - Controlled Irrigation and drainage
 - Control of soil erosion.

Question 6

Explain the meaning of the following:

- i. **Heavy feeders**
- ii. **Leaching**
- iii. **Light feeder**
- iv. **Macronutrients**
- v. **Micronutrients**

Answering

Question 6

- i. Heavy feeders- are crops needing lots of fertilizers
- ii. Leaching- Loss of soluble nutrients through drainage
- iii. Light feeders – are crops needing less fertilizers
- iv. Macronutrients – Are nutrients needed in large amounts
- v. Micronutrients – are nutrients needed in small amounts

Question 7

- a. Define **soil erosion**
- b. What is an agent of soil erosion?
- c. List all the agents of soil erosion
- d. Mention the main types of soil erosion
- e. Define causes of soil erosion
- f. State the causes of soil erosion
- g. What are the effects of soil erosion on crop production?
- h. What is soil conservation?

- i. State ways by which farmers can conserve soil on their farms or land
- j. What is land **reclamation**?
- k. Describe ways of reclaiming land.
- l. Define these terms:
 - i. **Conservation**
 - ii. **Deforestation**
 - iii. **Silting up**

Answering

Question 7

- a. Soil erosion is the removal of soil from one place to another by wind or water.
- b. Agents of soil erosion are those which transport soil.
- c. The main agents of soil erosion are:
 - Water (running water, ice, wave action)
 - Wind
- d. Types of soil erosion:
 - ◆ **Water erosion**
 - ◆ **Wind erosion**
- e. The causes of soil erosion are those things that expose and loosen the soil so that it can be removed.
- f. Causes of soil erosion are:
 - ◆ Deforestation
 - ◆ Uncontrolled burning
 - ◆ Ploughing along the slope
 - ◆ Types of soil
 - ◆ Over grazing
 - ◆ Poor cultivation methods
- g. The effects of soil erosion:
 - ◆ The topsoil is removed
 - ◆ The soil becomes less deep. This means that roots have less space in which to grow. Crops can easily fall over if there is not enough soil to anchor or support the crops.
 - ◆ Water flows along the ground as runoff, which may result in flooding. Flooding in turn results in the top soil being removed. The depth of the soil is also reduced.
 - ◆ Soil may be washed away into rivers. These rivers transport this soil into dams. If this continues to happen the dams fill up with soil and will hold less water.
 - ◆ Silting up is also a problem in large rivers and lakes.
 - ◆ Ploughing is more difficult especially when there are gullies in the fields.
 - ◆ The total amount of land suitable for agriculture is reduced.
- h. Soil conservation is a way of controlling soil erosion so that we do not lose the soil.

- i. Methods of conserving the soil are:
 - ◆ Addition of organic matter
 - ◆ Mulching
 - ◆ Afforestation
 - ◆ Planting wind breaks
 - ◆ Controlling Livestock numbers
 - ◆ Contour Ploughing
 - ◆ Strip cropping
 - ◆ Terracing
 - ◆ Controlled grazing, minimum tillage and controlled burning
- j. Land reclamation is making the land fit for use
- k. Ways of reclaiming land:
 - ◆ Filling gullies with rocks, stone and soil.
 - ◆ Replacing the lost top soil
 - ◆ Building stone walls across gullies.
- l. Definitions:
 - i. Deforestation – cutting down of trees
 - ii. Conservation – Avoiding loss of soil by erosion
 - iii. Silting up - Chocking the water sources such as dams, rivers and lakes with soil

Question 8

- a. List the factors that affect plant growth
- b. Outline ways in which plants adapt to water shortage
- c. Define **transpiration, photosynthesis** and **respiration**
- d. Write word equation for photosynthesis and respiration
- e. What is **dormancy** and why is it important in plants?
- f. Define the following:
 - i. **Optimum Temperature**
 - ii. **Minimum temperature**
 - iii. **Maximum temperature**
- g. What is the effect of high temperatures on crop growth?
- h. What is the effect of low temperature on crop growth
- i. State ways of controlling temperature in the field.

Answering

Question 8

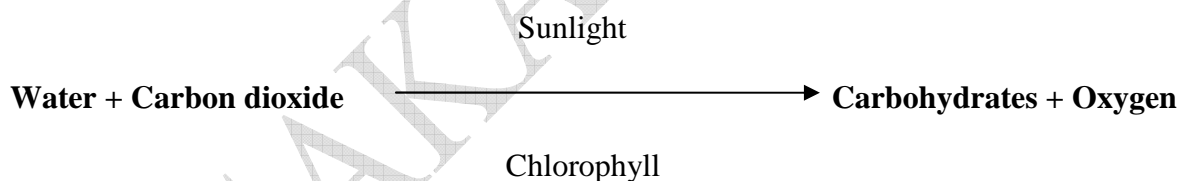
- a. Factors that affect plant growth:
 - Water
 - Sunlight

- Air
 - Nutrient elements
 - Temperature
- b. Adaptations of plant to water shortage: Some plants have developed features which allow them to survive under poor soil water conditions. These features are:
- Dormancy
 - Small leaf areas
 - Deep root system
 - Fleshy stems and leaves
 - Cuticle
 - Leaf folding
 - Closing stomata
 - Early maturity
- c. Transpiration is a process by which water is lost by plants through the stomata.

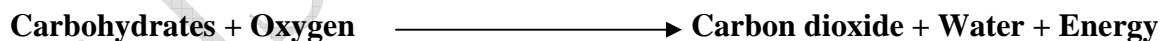
Photosynthesis is a process by which plants manufacture their food.

Respiration is the breaking down of stored carbohydrates by oxygen to release carbon dioxide, water and energy.

- d. The word equation for photosynthesis is:



The word equation for respiration is:



- e. **Dormancy** is when plants stop growing because the conditions for growth are not suitable. Dormancy is therefore important in plants because when the plant is dormant it needs less water and is able to survive on the limited water available in the soil.
- f. Temperature definitions:
- i. Optimum temperature is a temperature at which plants grow at a fast rate.
 - ii. Minimum temperature is a temperature at which plants cannot grow.
 - iii. Maximum temperature is a temperature at which plants stop growing.
- g. The effect of high temperature on crop growth:
- Reduced activity of micro-organisms
 - Wilting

- Scorching
- Reducing the rate of life processes
- h. The effect of low temperatures on crop growth:
 - Frost damage in plants
 - Reduce the activity of micro-organisms
 - Reduce the rate of life process.
- i. Ways of controlling temperature:
 - Shading
 - Irrigation
 - Mulching
 - Intercropping
 - Wind breaking
 - Covering the crops
 - Dusting plant with ash

Question 9

Define the following terms

- i. Adaptation
- ii. Carbohydrates
- iii. Chlorophyll
- iv. Cuticle
- v. Drainage
- vi. Frost
- vii. Nitrogen fixation
- viii. Optimum
- ix. Osmosis
- x. Stomata
- xi. Suction
- xii. Thermometer
- xiii. Thermometer
- xiv. Translocation
- xv. Turgid

Answering

Question 9

- i. Adaptation - Ability of a plant to survive in unsuitable condition
- ii. Carbohydrates - Plant food
- iii. Chlorophyll - In photosynthesis is a green pigment which absorbs light energy and uses it to make plant food

- iv. Cuticle - Waxy substance covering plant leaves
- v. Drainage – Loss of excess water through the soil
- vi. Frost - Frozen water on plant's surface
- vii. Nitrogen fixation - The process by which atmospheric nitrogen is changed into nitrates in the soil
- viii. Optimum - Most suitable
- ix. Osmosis – Process by which plants are absorbed by the roots
- x. Stomata – Are pores on plant leaves that allow water vapour in and out
- xi. Suction – Force created by transpiration
- xii. Thermometer - Instrument for measuring temperature
- xiii. Translocation - Process by which plants lose water through the stomata
- xiv. Turgid- Firm

Question 10

- a. What is **animal nutrition**?
- b. State reasons for feeding animals
- c. Name four constituents or components of livestock feed
- d. Explain the following:
 - 1. **Balanced ration**
 - 2. **Maintenance ration**
 - 3. **Production ration**
- e. List three feeds that are classified as concentrates.
- f. List three feed stuffs that are classified as roughage
- g. What is supplementary feeding?
- h. State two conditions under which livestock may be given supplementary feed.
- i. What is a **nutritional disease**?
- j. Give two examples of nutritional diseases.
- k. State the uses of each of the following nutrients:
 - 1. Carbohydrates
 - 2. Fats
 - 3. Proteins
 - 4. Water
- l. What do you understand by the term ration in livestock production?
- m. Why do cattle farmers feed bone meal and salt to their cattle throughout the year?
- n. Name the two types of feed.
- o. Mention the difference forms of feed.

Answering

Question 10

- a. Animal nutrition is the study of food and how it is used by the animals.
- b. Livestock are fed for maintenance and production. When they are fed only for maintenance, livestock get just enough feed to stay alive and remain in good health. The feed provides enough nutrients for the body to carry out essential life processes such as blood circulation, respiration, excretion and digestion. When there is an abundance of food, the nutrients that are not needed for maintenance are used for production. Production in livestock is seen when animal grow, produce young ones and yield products such as eggs and milk.
- c. Constituents or components of livestock feed:
 - **Proteins**
 - **Carbohydrates**
 - **Fats and oils**
 - **Vitamins**
 - **Mineral salts**
 - **Water**
- d. Explanations:
 1. A Balanced ration is one that contains all the nutrients in the correct proportion to meet the needs of an animal for a day.
 2. Maintenance ration is a ration that contains enough nutrients to keep the animal alive and good health. Animals fed on a maintenance ration will neither lose nor gain weight.
 3. Production ration is a ration that provides nutrients for production.
- e. Feeds that are classified as concentrates are:
 - Carbohydrate- Rich concentrates. Examples are **maize meal** and **Sorghum meal**.
 - Protein rich concentrates. Examples are **soya meal**, **Fish meal**, **carcass meal** and **groundnut cake**.
- f. Feedstuffs that are classified as roughage are:
 - **Succulent roughage** – These contain a lot of water. Examples are fresh green grass, green leafy vegetables, roots crops and **silage**.
 - **Dry roughage**- These contain less water or moisture. Examples are **hay**, **Straw** and **stover** (dried maize stalks).
- g. Supplementary feeds are giving extra feed to livestock to supply nutrients which are not present in their ration.
- h. Condition under which livestock may be given supplementary feed:
 - It the feed given to livestock does not contain some necessary nutrients
 - If the nutrients levels are low in the feed given to the livestock.
- i. A **nutritional disease** is dietary disease caused by the lack of (deficiency of) certain nutrients in the ration of the animal.
- j. Nutritional diseases:
 - **Milk fever**
 - **Rickets**
 - **Curled toe paralysis**

- **Nutritional anemia of piglets**
 - **Asphosphorosis**
- k. Uses of:
1. **Carbohydrates**
 - Provides energy that is needed for all life process in the body.
 2. **Fats**
 - They also provide energy. In fact they contain more energy than the carbohydrates but the energy is not readily available for use. This energy can only be used if the fats are changed to carbohydrates.
 - Fats protect animals against cold. They are stored under the skin.
 3. **Proteins**
 - Are used for the formation of new cells and repairing damaged one.
 4. **Water**
 - Dissolves food and allows chemicals reactions to take place in the body.
 - It is the main constituent of blood.
 - Transport nutrients to the different parts of the body.
- l. **Ration** is the amount of food that is eaten by livestock in one day.
- m. Cattle farmers feed **bone meal** and **salt** to their cattle throughout the year because they contain phosphorus and calcium. Salt is mixed with the bone meal to make it taste better and restrict the intake.
- n. The two types of feed are:
- ◆ **Roughage**
 - ◆ **Concentrates**
- ✓ Roughage are divided into succulent (roughages containing water) and dry roughages.
 - ✓ Concentrate are divided into carbohydrates rich concentrates and protein rich concentrates.
- o. The different forms into which feed occurs are:
- ◆ **Mash**
 - ◆ **Pellets**
 - ◆ **Crumbs**
 - ◆ **Cakes**
 - ◆ **Licks**

Question 11

Explain the following terms:

- i. Asphosphorosis
- ii. Fibre
- iii. Hay
- iv. Foetus

- v. Nutrients
- vi. Stover
- vii. Succulent

Answering

Question 11

- i. Asphosphorosis is a nutritional disease caused by phosphorus deficiency in plants caused by phosphorus deficiency in the soil.
- ii. Fibre – Roughage
- iii. Hay- Dry types of roughage
- iv. Foetus – unborn baby
- v. Nutrients – the part of the food an animal can use
- vi. Stover- dried maize stalks. A type of roughage
- vii. Succulent- describes a type of roughage containing lots of water.

Question 12

- a. What is **digestion**?
- b. State the end products of digestion of the following nutrients:
 - i. Carbohydrates
 - ii. Proteins
 - iii. Fats and Oils
- c. Give two examples of digestive juices
- d. What is an **enzyme**?
- e. Give two examples of enzymes which help in the digestion of food.
- f. Describe the differences between ruminants and non-ruminants
- g. Why are rabbits able to digest cellulose?
- h. What causes the food to move in the alimentary canal?
- i. Poultry have no teeth so how do they breakdown their food?
- j. What is a cloaca?
- k. Where are minerals, vitamins and water absorbed in the alimentary canal?
- l. Explain the following terms:
 - i. **Chyme**
 - ii. **Coprophagia**
 - iii. **Peristalsis**
 - iv. **Rumen**

Answering

Question 12

- a. Digestion is the breaking down of food in the alimentary canal.
- b. The end products of:
 - i. Carbohydrates – Fructose, glucose
 - ii. Proteins – Amino acids
 - iii. Fats and oils- Fatty acids and glycerol
- c. Examples of digestive juices:
 - **Pancreatic Juice**
 - **Intestinal juice**
- d. An **Enzyme** is a catalyst which speeds up the digestion process.
- e. Enzymes which help in the digestion of food are:

- **Amylase (Salivary enzymes)**
- **Pepsin**
- **Rennin**
- **Trysin**
- **Maltase**
- **Sucrase**
- **Lactase**
- **Lipase**

- f. Differences:

Ruminants

- Are animals like cattle, sheep, goats and game animals like kudu, antelope, impala and buffalo.
- They have a four chambered stomach (rumen, reticulum, omasum, abomasums)
- The name ruminant is derived from the latin word rumens, which means a throat.
- They contain micro- organisms in their rumens that break down cellulose
- When the ruminant rest, food is forced back in to the mouth from the rumen. This lump of food is called the **cud**. The animal then chews the food before swallowing it for the second time. This is called chewing the cud and it is common to all ruminants.
- The ruminant's abomasum is the true stomach where enzyme action begins.

Non – ruminants

- Are animals like pigs, rabbit, donkey and chickens.
 - These animals do not chew the cud.
 - All of them, except chickens, have a single stomach compartment.
 - Animals like pigs and rabbits have a large caecum in their large intestines where the breakdown of fibre (cellulose) is done with the help of micro organisms.
 - The chicken (Poultry) has two caeca where digestion of cellulose occurs.
- g. Rabbits are able to digest cellulose because they have micro-organisms in their caecum which help to break down cellulose (fibre).

- h. The contraction and relaxation of the muscles in the alimentary canal makes it possible for the food to move.
- i. Poultry breakdown their food with the help of the following:
- A stomach with three sections (crop, proventriculus (true stomach), and gizzard).
 - The poultry gizzards have thick muscular walls and small stones called grits. This grit may help to break food down into smaller particles making it easier for enzymes to digest it.
- j. A **cloaca** is a chamber where the excretory and reproductive system joins the digestive system. Poultry urine and droppings are passed out at the same time through the vent just after the cloaca.
- k. Minerals, vitamins and water are absorbed in the ileum.
- l. Explanations:
- i. **Chyme**- is food which has been digested into a semi-liquid in the stomach.
 - ii. **Coprophagia**- is a term used to mean rabbits eating their droppings.
 - iii. **Peristalsis** – is the contraction and relaxation of the muscles in the alimentary canal.
 - iv. **Rumen** – Latin word for throat, first chamber in the digestive system of a ruminant animal.

Question 13

Draw and label the following:

Fig 1.1

The alimentary canal of a rabbit

Fig 1.2

The alimentary canal of a hen

Fig. 1.3

The digestive system of a ruminant (a cow)

Fig 1.4

The four chambered stomach of a ruminant (a cow) showing the movement of food.

Answering

Question 13

Fig 1.1

The alimentary canal of a rabbit

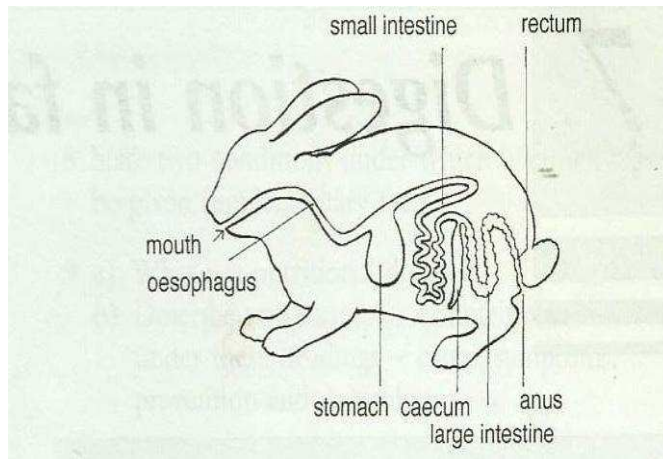


Fig 1.2

The alimentary canal of a hen

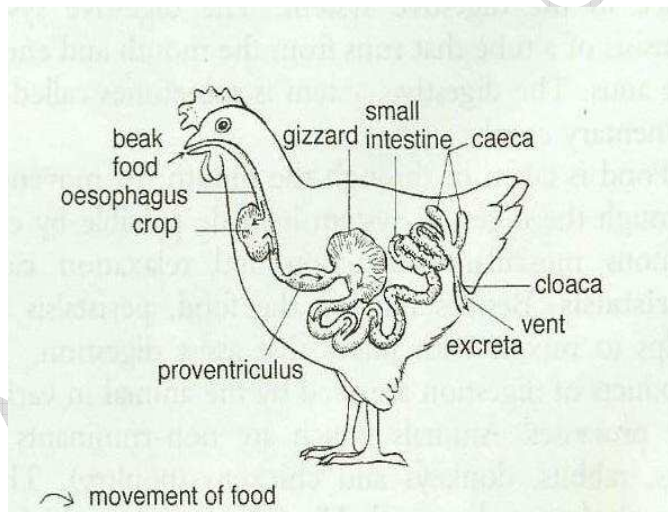


Fig 1.3

The digestive system of a ruminant (a cow)

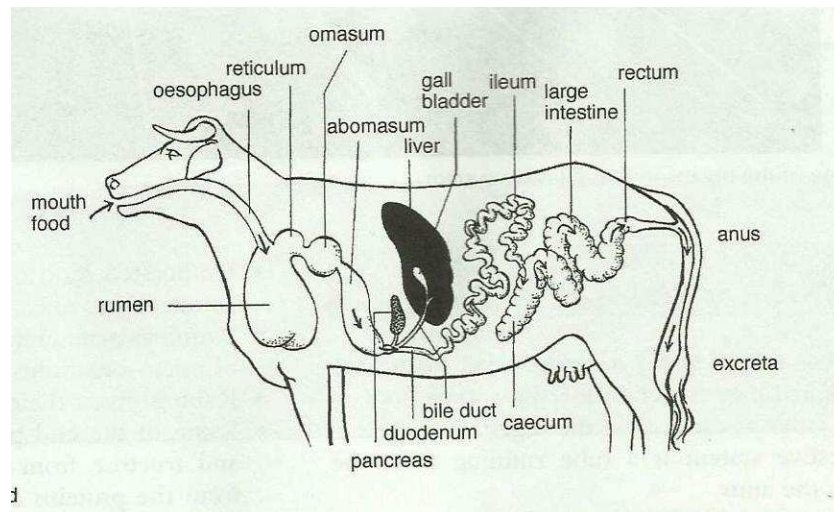
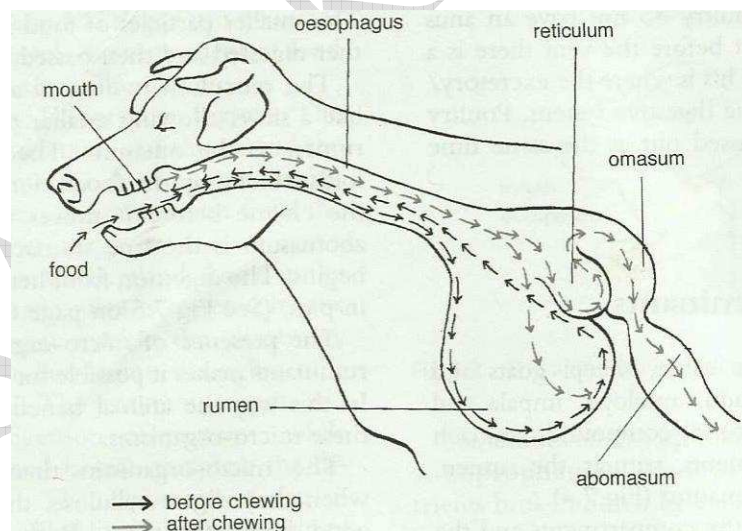


Fig 1.4

The four chambered stomach of a ruminant (a cow) showing the movement of food.



Question 14

- a. State the factors to consider when choosing a place for planting crops.
- b. Mention the two methods of sowing seeds.
- c. What are the differences between row planting and broad casting.
- d. Mention the two ways of planting crops.
- e. State the advantages and disadvantages of each of the two ways of planting crops.
- f. Discuss the types of seedbeds: sunken beds and raised beds
- g. Explain the advantages of row planting
- h. Explain the meanings of the following terms:
 1. **Folders crops**
 2. **Hybrid seeds**
 3. **Microclimate**
 4. **Perishable**
 5. **Seed Dressing**
 6. **Transplanting**
 7. **True to type**

Answering

Question 14

- a. The following factors must be considered in choosing a suitable site for crop production:
 - Slope of the land
 - Soil type
 - Source of water supply
 - Quality of water
 - Shade
 - Shelter
 - Nearness to markets
 - Sources of inputs
 - Microclimate
- b. The two methods of sowing seeds are:
 - Broadcasting
 - Row planting
- c. Row planting is a method of sowing the seeds in rows. The rows are arranged at a certain distance from each other, and within the rows the seeds are also placed at certain spacing.

Broadcasting is a traditional way of sowing seeds by scattering them on the surface. The seeds are then covered with a thin layer of light soil.

- d. The two ways of planting crops are: Direct planting and indirect planting.

e. Advantages and disadvantages:

Advantages of direct planting:

1. Less labour is needed as the plants are not moved from the place where they were sown.
2. There is no break in their growth. In other words, they grow continually from germination until they are harvested.
3. Less time is needed

Disadvantages of direct planting:

1. More seeds are used since some crops are thinned.
2. It is difficult to create a good environment for seedling on a large plot as compared to a small seed bed
3. When seedling die, it is difficult to replace them.

Advantages of indirect planting:

1. Fewer seeds are used.
2. Seedling which dies after transplanting can easily be replaced with others from the nursery.
3. It is easy to control the environmental factors for germination and seedling growth on a small plot, for example temperature, water supply, pests and diseases.

Disadvantages of indirect planting:

1. More labour is needed for transplanting.
2. Some plants may suffer from being transplanted; they need a few days to adapt to their new environment. During this time growth, there may be a check in their growth. In other words, they may stop growing. Some plants may even die when transplanted.
3. This method takes more time.

f. **Sunken beds**

In these the surface of the bed is below the level of the surrounding land. Water may runoff along the land and collects in the bed. This means that the vegetables will collect more water. These beds are only suitable if the soil is fertile or deep.

Raised beds

In these the surface of the bed is above the surrounding land surface. Ridges are built around the plot to prevent water escaping. This type of bed allows good drainage of the soil and is most common in school vegetable gardens.

g. Advantages of row planting:

- The plants do not compete for water, nutrient elements and sunlight. This is because they are correctly spaced and it means that they will be healthy and produce high yields.

- A good plant population is likely to be achieved. This is because plants are correctly spaced and seeds are sown to the correct depth.
 - Machinery can be used easily. For example, tractors, cultivators and sprayers are easy to use along the rows without causing damage to crops. Therefore, field operations like weeding, cultivation and spraying for pests can be carried out.
- h. Explanations:
1. **Folders crops**- crops used as animal feed.
 2. **Hybrid seeds** – Seeds produced by crossing two varieties.
 3. **Microclimate** – Climate pattern for a small area
 4. **Perishable crops**- Crops that spoil or damage quickly once harvested.
 5. **Seed dressing**- used to reduce pest damage
 6. **Transplanting**- moving seedling from the nursery to the main field.
 7. **True to type**- Seeds that produce the expected variety.

Question 15

- a. Explain why the following activities should be carried out:
 - i. Watering
 - ii. Mulching
 - iii. Weeding
 - iv. Thinning
- b. Name the crop management practices important for good plant growth.
- c. What is a **weed**?
- d. Explain why weeds are harmful to crops
- e. Describe three ways in which weeds can be controlled.
- f. When should mulch be removed from a vegetable plot?
- g. Describe how you would transport a seedling from a nursery into a main plot.
- h. Why is it necessary to shade the seedlings after transplanting?
- i. Describe two ways of supporting plants.
- j. Explain the meaning of the following terms:
 1. **Dry land**
 2. **Earthing up**
 3. **Herbicides**
 4. **Rainfed**
- k. What is **irrigation**?
- l. List the methods of irrigation

Answering

Question 15

- a. Explanations:

- i. **Watering:** Watering is necessary when there is not enough rainfall. Watering supplements rainfall providing water for plant growth.
 - ii. **Mulching:** Mulching reduces evaporation, prevents capping, controls weeds and soil temperature and improve the soil structure and improves the soil structure and fertility.
 - iii. **Weeding:** Weeding should be done due to the following reasons:
 - To prevent weeds from competing with crops for water and nutrients.
 - To prevents weeds from covering crops and compete with them for sunlight.
 - Weeds can harbor or hide insect pests.
 - To prevent irrigation canal from being blocked by weeds.
 - Weeds may release poisonous substance which prevents the growth of other plants. For example lemon grass.
 - Weeds can contaminate the harvest and reduce the seed quality of the crop.
 - For easy management practices
 - iv. **Thinning:** Thinning is the removal of some seedling when they are crowded. It is carried out to reduce competition for water, air, sunlight and nutrients, to make it easier to carry out certain farm operations and to help reduce pests and diseases.
- b. Crop management practices important for good plant growth are:
- **Weeding**
 - **Mulching**
 - **Watering**
 - **Thinning**
 - **Transplanting**
 - **Shading**
 - **Supporting plants**
- c. A **weed** is any plant that grows where it is not wanted.
- d. Harmful effects of weeds are:
- Compete with crops for water, sunlight and nutrients
 - Cover crops
 - Can harbor or hide insect pests
 - Can block irrigation canals and make it difficult to carry out management practices such as harvesting.
 - May release poisonous substances which prevent the growth of other plants.
 - Can contaminate the harvest and reduce the seed quality of the crop.
- e. Weed control methods:
- Mechanical control method:** This involves physically removing weeds either by hand or by using some farm implements.
- Culture control method:** This method includes good farming practices such as the following:

- Mulching
- Early planting of the crop
- Application of fertilizer to the crop
- Crop rotation

Chemical control method: This is the use of poisonous chemicals called **herbicides** to control weeds. Examples of such chemicals are Atrazine and Somazine which are used to control weeds in maize.

Biological control methods: This is the use of living organisms to control weeds. Livestock such as cattle, sheep and donkeys, may control grass weeds, while goats can control the spread of bushes.

- f. Mulch should be removed as soon as the seedlings emerge from the soil. If the mulch is left on the ground, the following problem might occur:
- **Termite damage:** Termites like to feed on dry grass or straw. They may also burrow into the soil and damage the roots of seedlings.
 - **Etiolation:** Seedlings grow thin and tall with weak stems. They may break easily during watering and die.
 - **Death of seedlings**-if mulch is left for too long, seedlings will lack sunlight and die.
- g. Preparation for transplanting: Several activities, such as hardening off of seedlings, preparation of the main plot and watering, have to be done for the successful transplanting. The following are therefore the five stages of transplanting:
- *Making the planting holes
 - *Lifting seedlings from the nursery
 - *Placing them in the planting holes
 - *Watering them
 - *Shading
- h. Shading is the provision of some kind of cover over the plants. The cover is above the ground level. The purpose of shading is to shield the plants from the heat. This should not be confused with mulching, where material is placed on the soil surface. The materials used for shading include nylon netting, grasses, leaves and branches.
- i. Two ways of supporting plants are **staking** and **trellising**. Staking is where an individual plant is supported with a stick and loosely tied to it at different heights. The sticks may be placed vertically in the soil at intervals along a row.

Another way is to arrange three or four poles in a circle so that they form a cone-shaped structure. Trellising is a more complex method of supporting plants and may be done in a number of ways. For tomatoes, two poles are placed in the ground on either side of the row at both ends, and also at interval along the row. The poles are then joined by horizontal lengths,

or strands of wire or strings at different heights. Plants then grow upwards along these strands.

- j. Explanations:
- i. **Dry land:** Another word for rain fed. These are crops depending on rainfall for water.
 - ii. **Earthing up:** Drawing up the soil around the stems of a plant.
 - iii. **Herbicides:** Are chemicals used to kill weeds.
 - iv. **Rainfed:** Are crops depending on rainfall for water.
- k. **Irrigation** is when a farmer adds water to his or her crops. It is also known as watering.
- l. Methods of irrigation are:
- **Watering using a can**
 - **Sprinkler**
 - **Farrow**
 - **Drip**
 - **Basin**

Question 16

- a. Define the following:
- i. Pest
 - ii. Disease
 - iii. Pathogen
 - iv. Baits
 - v. Broad spectrum
 - vi. Integrated pest management
 - vii. Spores
- b. Name some common pests
- c. For each pest above, name the crop it attacks and describe the damage it causes and how it can be controlled.
- d. What are pesticides?
- e. Give three types of insecticides
- f. Mention the methods used to control pests
- g. List the ways in which insecticides may be added.
- h. State the precautions that have to be taken when handling pesticides.
- i. State the common symptoms of plant diseases.
- j. What causes plant disease?
- k. How does disease spread?
- l. List some common crop diseases
- m. Discuss the methods of controlling diseases.

Answering

Question 16

a. Explanations:

- i. A pest is any organism that can feed on crop or damage crops.
- ii. A disease is a change from normal health.
- iii. Pathogens – Disease causing organism.
- iv. Baits – Substances used to attack pests and control them.
- v. Broad spectrum- describes a fungicide that control many types of fungal disease.
- vi. Integrated pest management – control of pest by a combination of methods.
- vii. Spore- Equivalent to seed but produced by fungi.

b. Some common pests are:

- Termites
- Diamond- back moth
- CMR beetle
- Cutworm
- Elegant grasshopper
- Stalker borer
- Corn Cricket
- Army worm
- Aphid
- Red spider mites
- Nematode/ eelworm
- Bugs
- Flies

c. Pest/ damage/ control:

Termites

- Pasture grasses and other crops
- Small roots, stems and leaves may be cut and removed.
- Spray with insecticides.

Diamond – back moth

- leafy vegetables like rape and cabbage
- Feeds on lower surface of leaves
- Spray with insecticides such as malathion

CRM beetle

- Beans, Okra
- Feeds on flower petals
- They may be picked off the plant by hand

Cutworm

- Many crops, for example, maize, sorghum, tomato, cabbage, beans, potatoes.
- Hides in the soil during the day. At night they cut the stems of young plants near ground level.
- Cutworms feed on weed. Destroy all weeds 3-6 weeks before planting to control cutworm.
- Use cutworm sprinkle pellets over the ground in the late afternoon.

Elegant grasshopper

- Most crops
- Feeds on leaves. Rarely a serious pest.
- They may be picked off by hands. Not easy to control with insecticides

Stalker borer

- Sorghum, maize
- Young larvae feed in the leaves
- Transparent windows and rows of holes are formed on leaves.
- Growing point of plants are killed
- Larvae burrow into the stem.
- Spray with insecticides (Endosulfan)
- Early planting
- Remove and destroy all crop remains after harvest.
- Autumn ploughing
- Crop rotation

Crop Cricket

- Maize
- May attack maize cob
- They may be picked off by hand.

Army worm

- Cereals
- Feeds on leaves whole plants may be destroyed. May occur in large numbers hence the name.
- Spray with insecticides

Aphids

- Leafy vegetables like cabbage, rape, choumoellier.
- Feeds on lower surface of leaves by sucking the sap. Leaves turn yellow or white, dry out and finally become brown.
- Spray systemic insecticides
- Crop rotation
- Destroy all crop residues after harvesting

Red spider mites

- Tomato, egg plant, tea
- Feeds on lower surface of leaves. Leaves turn yellow and finally dry out and become brown.
- Spray with Malathion or a systemic insecticide.

Nematode/ Eelworm

- Most crops including potato, tomato, peas, beans, carrot, lettuce, beetroot
- Feeds on roots. They enter roots and form root knots which look like the root nodules in legumes. They reduce water movements and nutrients from the root to other part of a plant.
- Fumigate the soil
- Plant marigolds in the vegetable plots. Their roots secrete chemicals into the soil which harm nematodes.

Bug

- Leafy vegetables like cabbage, rape, choumoellier
- Feeds in leaves which become yellow and finally dry out and become brown.
- Spray Malathion or insecticides such as metasystox

Flies

- Pumpkins, melons, butternuts, squashes
 - Fly drill hole in the soft young fruit, using its Ovipositor.
 - The eggs are laid inside the fruit and hatch into larvae which feed inside the fruit which rot and become soft. The fruit become yellow and later dry out and become brown or black.
 - Spray systemic insecticides, especially lebaycid
 - Make a bait using 15g malathion, 500g sugar, 5L water and spray over leaves
- d. Pesticides are chemicals used to kill pests.
- e. Types of insecticides include:
- **Fumigants**

- **Contact poison**
 - **Stomach poison**
 - **Systemic poison**
- f. Methods used to control pests include:
- **Mechanical control method**
 - **Cultural control method**
 - **Chemical control method**
 - **Biological control method**
 - **Quarantine control method**
- g. Insecticides may be added in several ways like:
- **By spraying**
 - **By dusting**
 - **As baits**
 - **By fumigation**
- h. Precaution when handling pesticides:
- Do not eat, drink or smoke when applying pesticides.
 - Do not face the wind when spraying.
 - Equipment for spraying should be in good working order.
 - Wash your hands after using pesticides.
 - Observe the safety period.
 - Do not allow the pesticides to come into contact with your skin
 - Do not inhale or breathe in the pesticides
 - Wear protective clothing when using pesticides such as overalls, gumboots, goggles, gloves and respirator.
 - Always mix the correct amount of water to the pesticide
 - Read and follow the instructions on the container
 - When not in use pesticides must be locked in a safe place.
- i. Symptoms of plant diseases:
- Growth is slow
 - Plant growth is stunted
 - Leaves wilt and dry out
 - Yellowing of leaves, grey, brown or black spots.
 - Fruits, roots and stems become soft and rot
 - Plant dies before reaching maturity.
- j. Disease may be caused by micro organisms like fungi, bacteria and viruses.
- k. Disease may be spread by:
- Irrigation water
 - Wind
 - Insects
 - Through seeds

- Contaminated crop residues and
- Implements

l. Some common crop diseases are:

*Fungal diseases:

- ✓ Powdery mildew
- ✓ Damping off disease
- ✓ Leafy spot
- ✓ Early blight
- ✓ Late blight
- ✓ Smut

*Bacterial and viral diseases:

- ✓ Black rot
- ✓ Maize streak
- ✓ Bacterial wilt

m. Methods of controlling diseases are:

1. Quarantine control method:

This is when certain activities are prevented by law in order to prevent disease from spreading. For example, the movement of animals from one place to another within Zambia may be restricted to control disease. By law, permits are needed to import plants and animals from other countries.

2. Culture control method

- Field sanitation like:
 - Weed control
 - Removal of crop residues, for example by burning
 - Use of clean tools
- Correct plant spacing
- Crop rotation
- Early planting
- Planting disease- resistant crop varieties
- Planting disease- free seed
- Controlled watering

3. Chemical control method

- Chemicals like insecticides and fungicides are used to control diseases
- Viral disease can also be controlled by killing the insects that transmit them.

Question 17

- a. When should we harvest crops?
- b. Name two methods of harvesting crops.

- c. State two advantages and two disadvantages of one of the named methods of harvesting crops.
- d. Explain the meaning of the following:
 - ✓ **Stooking**
 - ✓ **Threshing**
 - ✓ **Winnowing**
- e. Mention the ways of storing vegetables.
- f. Name some pests which attack stored grain.
- g. What measures can be taken to prevent damage to grain during storage?
- h. Mention the traditional and modern methods of storing grains.

Answering

Question 17

- a. The Best time for harvesting crops is usually when they ripen or reach maturity. The time of harvesting may also depend on the type of crop, the nearness of markets, the use of the crop and its selling price.
- b. Methods of harvesting crops are:
 - Hand harvesting
 - Mechanical harvesting
- c. *Advantages of hand harvesting are:
 - It is cheap, No expensive equipment is needed
 - It does not require a lot of skill
 - It is good for small vegetables plots
 - It allows the farmers to select only those crops they require.

*Disadvantages of hand harvesting are:

- It is tiring
 - It is slow and takes a long time
 - It needs careful planning.
- d. Explanations:
 - ✓ **Stooking** – This is when harvested plants are stacked upright in the field on tripods or they may be hung down from a rack for future drying. It is often used to dry maize, sorghum and groundnuts.
 - ✓ **Threshing** – This is the removal of the seed from the fruits. It is known as shelling.
 - ✓ **Winnowing** – The seed of some grain crops, such as sorghum, have a dry outer covering called a husk or hull. This is also known as chaff. The chaff is very light and is removed from the sorghum grains by winnowing. In this process the grain is

put on a flat basket. It is then tossed into the air and as it falls the wind separates the chaff away.

e. Ways of storing vegetables are:

- **Fresh**
- **Frozen**
- **Dried**

f. Pests which attack stored grains are:

- **Rodents**
- **Insect pests**

g. Measures to prevent damage to stored grains are:

- **Sanitation**

- ✓ The storage house should be kept clean
- ✓ The storage house should be well ventilated.
- ✓ Sacks and metal tanks should be cleaned.
- ✓ The grain stored must be clean and dry
- ✓ Old and new grains should never be mixed and stored together.
- ✓ Grain should be regularly inspected for pest attack.

- **Physical control**

Barriers may be used to control and kill pest. For example,

- ✓ Rat guards: These are constructed on platforms legs to prevent mice and rats from climbing on to the platform where bags are stored.
- ✓ Rat traps: Various traps may be used but mice and rats become aware of them quickly and avoid them.
- ✓ Burning: Burning of old infected grain also helps to control pests
- ✓ Controlling humidity
- ✓ Controlling temperature

- **Chemical control**

Pesticides may be used on stored grain. For example malathion (Kopthion) and Phostoxin.

- **Biological Control**

Cats are kept in storage areas to kill and scare rats and mice.

h. *The tradition methods of storing grains:

- ✓ Gourds
- ✓ Traditional silos

*The modern methods of storing grains:

- ✓ The use of bags
- ✓ The metal tank
- ✓ Grain silo