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MSCE AGRICULTURE

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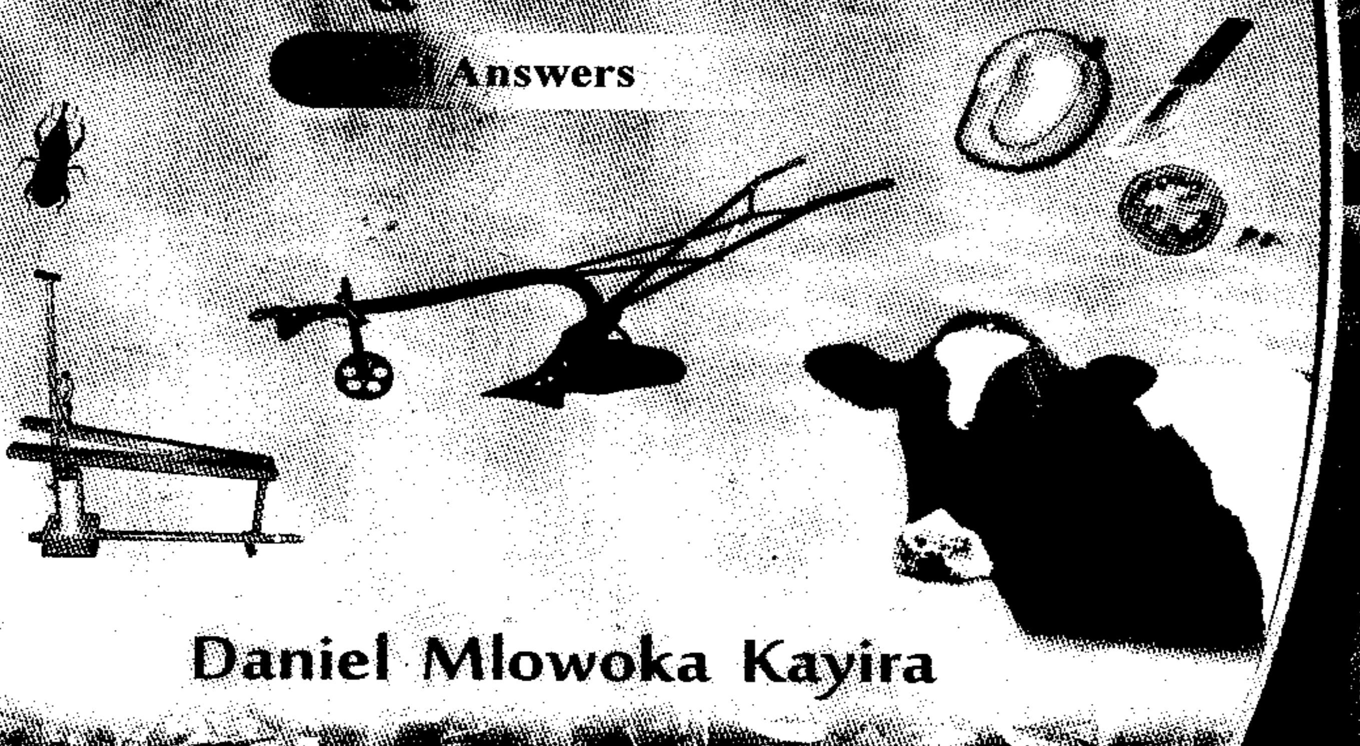

Daniel Mlowoka Kayira

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Teach yourself series

MSCE AGRICULTURE

TOPICS AND OBJECTIVES; EXAMINATION TIPS; QUESTIONS AND MODEL ANSWERS

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Design and Layout : Gervasio Manyungwa
Illustrations : Kingsley Jika

ISBN: 978-99960-23-12-5

Printed in Malawi by Design Printers P. O. Box 330, Lilongwe.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

First of all, I would like to thank Mr Kingsley Jika, Publishing Coordinator for Chancellor College Publications for his effort to have this work published and eventually reach the target audience. I had lost hope that this work would ever reach the Malawian student some day.

I also wish to thank Mr NT Kaperemera (former Principal of the Malawi Institute of Education), Mr G Thole (Likangala Secondary School) and Mr T Kanyamuka (Likuni Boys Secondary School) for checking and reviewing the material. My gratitude should also be extended to Mrs J Mmanga (Head Teacher – Likangala Secondary School) and Brother Murakho (Head Teacher – Likuni Boys Secondary School) for releasing Mr G Thole and Mr T Kanyamuka, respectively, to help Chancellor College Publications in the noble task of editing and proof-reading the work.

Teachers and Students of Nkhamenya Girls Secondary School (Kasungu) and St Patricks Secondary School (Mzedi, Limbe, Blantyre) offered me all their support during the compilation of this work. I salute them all in a very special way.

The Malawi National Examinations Board – MANEB – deserves a great mention. The Board trained me as Assistant Examiner for Agriculture – MSCE level. The experience and confidence from that have helped me quite a lot during my time as a School Teacher of Agriculture and during the compilation of this work.

Most importantly, I should like to thank GOD for my wife (Lilian) and my son (Daniel Jr). From the word go, Lilian and Daniel were always by my side.

Daniel Mlowoka Kayira (Msc., Bsc., Dip.)

INTRODUCTION

The topics in ***MSCE Agriculture: Topics and Objectives; Examination Tips; Questions and Model Answers*** cover the entire new MSCE Agriculture Syllabus. Emerging or topical issues in agriculture between the time the Syllabus was developed and now have been incorporated to make the content as wide-encampassing and current as possible. The topics and objectives have been listed for both teachers and students to refer to so as to acquaint themselves with what is expected of them in each topic.

Comprehensive examination tips have also been provided so that candidates will know exactly what is expected of them during the national examinations. The new syllabus summaries for both JCE and MSCE courseworks have been provided for you to check when you need them. The rationale for inclusion of summaries for JCE coursework is that MSCE work is a four-year coursework, something candidates should always bear in mind. In Agriculture, it is not uncommon to meet a question (especially in Practicals) one would deem specific to a JCE coursework. Furthermore, application of knowledge from JCE Agriculture could help in some contexts at MSCE level when answering some questions in Agriculture. We thought we should not deprive our candidates of this opportunity to know and shine.

The questions in ***MSCE Agriculture: Topics and Objectives; Examination Tips; Questions and Model Answers*** are divided into two broad sets: Theory (Test) Part and Practical Part. Theory (Test) Part has thirty tests, each test made up of twelve questions. Put simply, Theory (Test) Part alone has a total of **360 questions (each question with numerous branches)**.

Similarly, the Practical Part alone has thirty practicals, each practical having six questions, giving a total of **180 questions (each with numerous branches).**

These questions have corresponding model answers, carefully scrutinised and verified by a number of experienced teachers of Agriculture in the country. These model answers are not the only ones there are; so, students should not just limit themselves to these answers. Besides, we implore you to reason and understand the answers provided rather than just memorise them because questions do change. Try to always imagine a setting in which a similar question could be asked in a slightly different way (and what the answers could be in that context).

It is our hope that you will utilise this great resource and derive maximum benefit from it.

Kingsley Jika - Chanco Teach Yourself Series Editor

TOPICS AND OBJECTIVES IN AGRICULTURE

(A) JUNIOR CERTIFICATE OF EDUCATION LEVEL

TOPIC 1: AGRICULTURE AND THE ENVIRONMENT	OBJECTIVES
(a) Natural resources, deforestation, land degradation and their conservation (b) Soils and their properties	♦ Describe the natural resources that influence agricultural production ♦ Explain, how these natural resources influence agricultural production ♦ Identify ways in which natural resources that influence agricultural production can be exhausted/depleted ♦ Appreciate that natural resources that influence agricultural production can be depleted/exhausted ♦ Explain the effects of population increase on natural resources and the environment ♦ Define the term 'conservation' ♦ Explain methods of conserving soil and water ♦ Explain the methods of conserving forests ♦ Conserve soil, water and forests/vegetation

TOPIC 2: CROP PRODUCTION	OBJECTIVES
(a) Vegetable production (b) Maize and groundnuts (c) Weeds and their control (d) Soil fertility and fertilisers (e) Major crop diseases and pests (f) Cultural/agronomic/husbandry practices (g) Plant requirements	♦ Describe factors for crop growth and development ♦ Explain the importance of vegetables ♦ Classify vegetables into indigenous and exotic ♦ Recognise the importance of indigenous vegetables ♦ Select a suitable site for vegetable growing ♦ Construct a vegetable garden fence ♦ Prepare seed beds ♦ Sow indigenous and exotic vegetables ♦ Care for seedlings ♦ Transplant indigenous and exotic vegetables ♦ Care for the transplants ♦ Control pests and diseases ♦ Harvest vegetables

TOPIC 3: ANIMAL PRODUCTION	OBJECTIVES
(a) Classes of livestock (b) Egg production (c) Broiler production (d) Rabbit production	♦ Classify farm animals into ruminants and non-ruminants (monogastrics) ♦ Distinguish the digestive systems of ruminants and non-ruminants

(e) Pig production (f) General livestock management	♦ Explain the functions of different parts of digestive systems of ruminants and non-ruminants ♦ Describe four main activities in livestock management ♦ Explain the housing requirements of broilers ♦ Contruct a broiler house ♦ Explain how to feed broiler ♦ Feed broiler ♦ Explain how broilers can be protected from diseases and parasites ♦ Explain the housing requirements for layers ♦ Construct a house for layers ♦ Explain how to feed layers ♦ Feed layers ♦ Explain how layers can be protected from diseases and parasites ♦ Identify any three breeds of rabbits ♦ Explain the basic requirements for a rabbit house ♦ Describe types of rabbit houses ♦ Construct a deep litter house for rabbits ♦ Feed rabbits ♦ Protect rabbits from diseases and parasites ♦ Describe the breeds of pigs ♦ Describe the systems of pig production ♦ Explain the basic requirements for a pig house ♦ Describe the breeding practices in pigs ♦ Feed pigs ♦ Protect pigs from diseases and parasites

TOPIC 4: AGRICULTURAL MARKETING	OBJECTIVES
(a) Demand and supply (marketing forces) (b) Marketing (c) Problems of agricultural marketing (d) Marketing functions	♦ Define the term 'marketing' ♦ Explain the importance of agricultural marketing ♦ Review the principles of demand and supply ♦ Describe the relationship between demand and price ♦ Describe the relationship between supply and price ♦ Describe how market forces determine price ♦ Describe marketing functions ♦ Describe problems in agricultural marketing ♦ Suggest solutions to problems in agricultural marketing

TOPIC 5: FARM BUSINESS MANAGEMENT	OBJECTIVES
(a) Factors of production (b) Farm business management concepts (c) Farm finance and farm budgeting	♦ Identify basic business management concepts ♦ Identify the main factors of production ♦ Explain how each of the factors influence agricultural production

- Recognise the presence of other factors of production
- Identify sources of finance for farm business
- Recognise the cost of borrowing
- Explain what is meant by 'budgeting'
- Budget for an agricultural enterprise

TOPIC 6: AGRICULTURAL TECHNOLOGY	OBJECTIVES
(a) Farm power, farm structures and farm safety (b) Irrigation and drainage	♦ Describe types of farm structures ♦ Construct a granary ♦ Maintain the constructed granary ♦ Observe farm safety rules when utilising farm structures ♦ Explain the meaning of the term 'irrigation' ♦ Explain the importance of irrigation ♦ Describe systems of irrigation ♦ Irrigate vegetables in a school garden ♦ Review different types of irrigation systems ♦ Describe types of surface irrigation ♦ Explain the advantages and limitations of surface irrigation ♦ Irrigate a selected crop in the garden ♦ Identify sources of power on the farm ♦ Describe the commonly used sources of farm power in Malawi Observe safety measures when using farm power

TOPIC 7: AGRICULTURAL EXPERIMENTATION	OBJECTIVES
(a) Theory and agricultural experimentation (b) Practical and agricultural experimentation (c) Report writing for agricultural experiments	♦ Define the term 'agricultural experimentation' ♦ Explain the importance of agricultural experimentation

TOPIC 8: CHALLENGES IN AGRICULTURAL DEVELOPMENT	OBJECTIVES
(a) Population (b) Improving agricultural production (c) Food supply by smallholders (d) Gender roles in Food production (e) Gender and Agricultural Development (f) Food security (g) Land utilisation	♦ Explain the meaning of the term 'food Supply' ♦ Relate population growth to food supply ♦ Recognise the need to balance population growth and food supply ♦ Determine gender roles in food production ♦ Assess the impact of gender roles in food production ♦ Recognise the need for both genders to participate fully in food production

- Explain the meaning of the term 'food security'
- Describe how changing food habits can ensure food security

(B) MALAWI SCHOOL CERTIFICATE OF EDUCATION

TOPIC 1: AGRICULTURE AND THE ENVIRONMENT	OBJECTIVES
(a) Soil properties and management (b) Environmental degradation	♦ List physical properties of soil ♦ Describe soil texture ♦ Determine soil texture ♦ Identify textural classes of soil ♦ Explain effects of soil texture on crop production ♦ Describe soil structure ♦ Identify types of soil structure ♦ Explain the effects of soil structure on crop production ♦ List methods of maintaining and improving soil structure ♦ Explain how each of the methods maintain and improve structure ♦ List chemical properties of soil ♦ Define the term 'soil pH' ♦ Explain the factors affecting soil pH ♦ Set up an experiment to test soil pH ♦ Relate soil pH to plant growth ♦ Modify soil pH ♦ Outline the factors affecting nutrient status of soil ♦ Explain how much each factor affects nutrient status of the soil ♦ Define the term 'Cation Exchange Capacity' ♦ Appreciate the importance of CEC on plant growth ♦ Describe forms of soil degradation ♦ Explain causes of soil degradation ♦ Describe effects of soil degradation ♦ Control soil degradation

TOPIC 2: CROP PRODUCTION	OBJECTIVES
(a) Fruit production: mangoes (b) Cropping systems (c) Seeds, planting materials, plant parts and their uses (d) Pasture types, establishment, management and utilisation (e) Food self-sufficiency	♦ Label parts of a plant ♦ State functions of parts of the plant ♦ Identify and label parts of a legume and cereal seed ♦ Describe the functions of different parts of the seeds ♦ List examples of vegetative planting materials ♦ Label parts of vegetative planting materials ♦ Distinguish the terms 'sexual' and 'asexual propagation'

(f) Crop processing, storage, improvement and estate
(g) Drought resistant varieties
(h) Weeds and weeding
(i) Essential plant nutrients
(j) Crop improvement, aims and methods
(k) Crop protection
(l) Cropping systems

- Enumerate the advantages and disadvantages of sexual and asexual propagation in crop production
- List the essential plant nutrients
- classify the essential plant nutrients into macro-nutrients and micro-nutrients
- Explain the role of the essential plant nutrients in plant growth and crop production
- Explain how the essential plant nutrients are depleted from soil
- Describe the deficiency signs of essential plant nutrients
- List sources of the essential plant nutrients
- Apply appropriate chemical fertiliser and organic manures
- Define the term 'weed'
- Identify common weeds of Malawi
- Explain the importance of weeds in 'crop production'
- List the methods of weed control
- Explain the advantages and disadvantages of the methods of weed control
- Control weeds in a field of a selected crop
- Explain the meaning of the term crop protection
- Differentiate between a pest and a disease
- Identify common pests and diseases of field crops
- Explain the economic importance of pests and diseases of field crops
- Describe the methods of pests and disease control
- Control pests and diseases in a selected field crop
- Explain the meaning of the term 'cropping systems'
- List types of cropping systems
- Analyse the activities in each cropping system.
- Select cropping systems which can promote higher crop yields
- Discuss the importance of fruits
- Select suitable site for mango production
- Identify a suitable mango variety
- Prepare the site
- Planting mango seeds
- Mulch around the planting station
- Weed the mango field
- Identify pest and diseases of mangoes
- Control pests and diseases in mangoes
- Explain the meaning of the term 'crop improvement'
- State the aims and objectives of crop improvement
- Explain the methods of crop improvement
- Describe the processing of various crops for storage
- Explain the meaning of the term 'pasture'
- Explain the importance of pasture production
- List the types of pasture
- Describe methods of pasture establishment

- Establish pasture
- Manage the pasture
- Conserve the pasture
- Describe the factors that affect the quality of pasture

TOPIC 3: ANIMAL PRODUCTION	OBJECTIVES
(a) Feeds and feeding (b) Ruminants and non-ruminants (c) Goat and sheep production (d) Cattle, beef and dairy production (e) Poultry production (f) General livestock improvement	♦ Distinguish classes of livestock feeds ♦ List feed nutrients ♦ Explain the functions of feed nutrients ♦ Identify sources of feed nutrients ♦ Explain the importance of feeding the animals ♦ Outline factors to consider when feeding animals ♦ List breeds of sheep and goats ♦ Select an appropriate breed of sheep/goats for the area ♦ Identify a suitable sheep/goat house ♦ Construct appropriate house for sheep/goats ♦ Explain feeding behaviour of sheep/goats ♦ Identify suitable sheep/goats feeds ♦ Identify the diseases and parasites of sheep and goats ♦ Explain how to control diseases and parasites of sheep and goats ♦ List the breeds of cattle for beef production ♦ Select the breed for beef production ♦ Describe management practices in beef production ♦ List the breeds of cattle for dairy production ♦ Select the breed for dairy production ♦ Describe management practices in dairy production ♦ Draw reproductive systems of cattle and poultry ♦ Label the parts of the reproductive systems of cattle and chicken ♦ Explain the functions of each part of the reproductive systems of cattle and chicken ♦ State the age at puberty for cattle sheep, goats and rabbits ♦ Trace the Oestrus cycle of a selected animal ♦ Explain the meaning of the term 'heat' in animals ♦ State the signs of heat ♦ State the gestation period of cattle, sheep, goats and rabbits ♦ Describe the processes of reproduction in cattle ♦ Explain the meaning of the term 'livestock improvement' ♦ State the aims of livestork improvement ♦ Describe the methods of livestock improvement ♦ Identify characteristics of livestock to be selected for bleeding ♦ Describe livestock breeding systems

TOPIC 4: AGRICULTURAL MARKETING	OBJECTIVES
(a) Demand and supply (marketing forces) (b) Marketing – channels, agencies, costs and margins (c) Markets (d) Marketing and population distribution (e) Management (f) Trade at national level (g) Trade at internal level	◆ Define and differentiate the terms 'price elasticity of demand' and 'price elesticity of supply' ◆ Choose an appropriate enterprise combination ◆ Calculate the price elasticity of demand and supply for tomatoes ◆ Explain the degrees of price elasticity of demand and supply ◆ Describe the significance of the different degrees of price elasticity of supply and demand ◆ Explain the meaning of the terms 'Marketing channels' and 'marketing agencies' ◆ List marketing channels and marketing agencies ◆ Explain the roles of channels and agencies in marketing of agricultural commodities ◆ Explain the meaning of marketing costs and marketing margin ◆ Relate marketing costs and marketing margins ◆ Describe the population distribution in Malawi ◆ Describe the effects of population distribution on marketing ◆ Distinguish between marketing and trading ◆ Explain the importance of trading of agricultural commodities ◆ Outline ways of improving trading agricultural commodities

TOPIC 5: FARM BUSINESS MANAGEMENT	OBJECTIVES
(a) Farm records and importance (b) Cooperatives and importance (c) Decision making in Agriculture (d) Farm budgets (e) Enterprise combination (f) Risks and uncertainties	◆ State the reasons for keeping records ◆ Describe the types of farm records ◆ Keep records ◆ Identify factors to be considered when selecting enterprise/enterprise combination ◆ Name types of farm budgets ◆ Differentiate between partial and complete budgets ◆ Prepare complete and partial budgets ◆ Explain the meaning of the term 'agricultural cooperatives' ◆ Explain the importance of agricultural cooperatives ◆ Identify principles for cooperative formation

TOPIC 6: AGRICULTURAL TECHNOLOGY	OBJECTIVES
(a) Farm energy and farm safety (b) Irrigation and drainage (c) Farm mechanisation (d) Food technology	♦ Give the meaning of the term 'Farm energy' ♦ Explain the forms of farm energy ♦ Outline sources of farm energy ♦ Observe safety measures when using farm energy ♦ Select an irrigation system ♦ Establish an irrigation unit ♦ Manage an irrigation unit ♦ Explain the meaning of the term 'land drainage' ♦ Explain the importance of land drainage ♦ Describe methods of land drainage ♦ Give the meaning of the term 'farm mechanisation' ♦ State advantages and limitations of farm mechanisation ♦ List the types of implements and farm machinery ♦ Describe the mainteinance of various farm machinery ♦ Maintain various types of farm machinery ♦ Identify safety measures when using farm machinery ♦ observe the safety measures when using farm machinery ♦ Explain the factors to consider when mechanising a farm

TOPIC 7: AGRICULTURAL EXPERIMENTATION	OBJECTIVES
(a) Theory and agricultural experimentation (b) Practical and agricultural experimentation (c) Report writing for agricultural experiments	♦ Use scientific approach to experimentation ♦ Identify problem for conducting an experiment or investigation ♦ Design an agricultural experiment ♦ Conduct an agricultural experiment ♦ Outline the format for a report ♦ Write a report

TOPIC 8: CHALLENGES IN AGRICULTURAL DEVELOPMENT	OBJECTIVES
(a) Increased population and food self-sufficiency (b) Physical environment and population (c) Agro-based industries (d) Agricultural development services and agencies (e) Gender and Agriculture development (f) Innovations in food security (g) Land degradation	♦ Explain the meaning of the term 'soil erosion' ♦ Explain how rapid population growth accelerates soil erosion ♦ Describe how soil erosion may cause silting and flooding ♦ Recognise the effects of soil erosion on the physical environment ♦ Explain how rapid population growth may contribute to the occurrence of droughts

(h) Population and land policy

(i) HIV and AIDS and agricultural development

- Explain how rapid population growth contributes to the depletion of water resources
- Describe ways of conserving water
- Develop an appreciation for the need to conserve water
- Explain how fish farming may be used to meet the demand for fish by the growing population
- Explain the meaning of the terms 'food security' and 'food for self-sufficiency'
- Explain how the growing population can achieve self sufficiency in food
- Determine the role of estates in food production for the growing population
- Develop an appreciation of the importance of estates in food production
- Explain how proper food storage ensures food security for the growing population
- Identify ways of ensuring food security through proper storage
- Examine how mixed cropping and mixed farming (diversification) may support population growing
- Identify agricultural development agencies and services
- Describe the services offered by the agricultural development agencies
- Relate the importance of the agricultural development services to the growing population
- Explain the meaning of the term gender 'gender bias'
- Analyse some of the gender biases on agricultural technology
- Examine the implications of some gender biased application of agricultural technology
- Explain the effects of land degradation on the economy
- Develop an appreciation for land degradation on the economy
- Explain the meaning of the term 'land tenure'
- Describe land tenure systems in Malawi
- Evaluate the existing land tenure systems in relation to the growing population
- Describe land distribution policy in Malawi
- Develop an appreciation for the need for equitable land distribution for the growing population
- Asses the role of agro-based industries in supporting the growing population
- Rate the involvement of women in decision making in agricultural development
- Develop an appreciation for the need for growing drought resistant crops for food security
- Describe the impact of HIV and AIDS on agricultural development

EXAMINATION TIPS AND INSTRUCTIONS

There are many reasons why candidates fail to meet the expectations of the examination setters and therefore the markers in Agriculture. The following are the major reasons (with tips on how to overcome them).

1. **NOT FOLLOWING INSTRUCTIONS**

   Many candidates have failed examinations because of failure to follow instructions. Consider a setting in which a candidate was responding to questions from Paper I Agriculture that had Sections A and B. The instructions said a candidate was supposed to answer **all** the questions in Section A and **only three** questions in Section B. Section B had four questions (9, 10, 11 and 12) and this candidate responded to all the four questions in this section. When marking, the examiners only marked the first three attempted questions (9, 10 and 11) and left question 12 untouched.

   Note that in some examinations, a candidate can be penalised (through deduction of marks) for not following the instructions. It is better to read the instructions carefully before start responding to the questions.

   At the end, once you are through with the writing, it is advisable that, if there is still time, you should check whether you have provided (written) the correct answers in correct spellings and even whether you have followed the given instructions at all.

2. **COPYING THE QUESTION**

   Avoid copying the question asked, and instead, go straight to supplying the answers. This is especially true for Paper I Agriculture where a candidate fills in the answers. Candidates complain of being provided with a small space for Paper I yet they waste paper by copying the question that is already there. A candidate can copy part of the question for Paper II Agriculture, for it is written on a separate answer sheet for ease of identification of the question number by the marker. Copying of the whole question wastes both paper and time for answering questions during the examination.

   How would you respond to a question: What are the two types of natural resources? (2 marks)

   Would you have responded as brilliantly as presented below?

   (a) The two types of natural resources are:
   – Renewable natural resources
   – Non-renewable natural resources
   (This is best for Paper II)

   Or simply write
   – Renewable natural resources
   – Non-renewable natural resources
   (This is best for Paper I)

3. **PROVIDING INCOMPLETE ANSWERS**

   When answering, make sure you first understand the question. Avoid rushing into answering with the aim to finish quickly because this can lead into writing a lot of wrong answers. Any examination asks about how much a candidate knows and how fast he or she can provide or write the correct answers.

   Marks indicated against the question serves an important purpose: it guides the candidate on how much he or she is expected to write or provide as answer.

Consider the following question and its corresponding answers: Explain one way in which high rainfall affects crop growth. (2)

A – Through leaching.
B – Through leaching of nutrients in the soil.
C – Through leaching of nutrients in the soil beyond the root zone of crops, thereby making nutrients not being used by crops for their growth.

The answers written above may all be marked correct but may not be awarded equal marks. For example, 'A' and 'B' may be awarded 1 mark each while 'C' full 2 marks because 'C' has clearly answered what the question asked (demanded).

If you were answering the above question, you first of all had to check for the **key words**, and at the same time, look at the **marks** allocated against it. In this question the key words are **high rainfall** and **effect on growth**. Now when answering, first find one cause or result of high rainfall (1 mark) and how this cause or result of high rainfall can affect the growth of a crop (another 1 mark). Be neither too short nor too long in your answer; be brief (and to the point) but sensible. In other words, answer what the question has asked you considering the marks allocated to it.

4. ANSWERING OR GIVING MORE THAN THE REQUIRED NUMBER OF ANSWERS

Most examiners, as already stated, require a candidate to follow instructions, otherwise a candidate can be penalised for not doing so. Consider this question: Name the natural resource that can be replaced. (1 mark)

(a) Non-renewable and renewable natural resources
(b) Non-renewable or renewable natural resources
(c) Renewable and non-renewable natural resources
(d) Renewable natural resource

The best and correct answer is (d) but at times (c) can be marked if the examiner or setter states that the first correct answer be awarded a mark. At times if the first written answer is correct it can be marked but as much as possible never write more than the required number of answers hoping that the marker should choose the correct one for you. 'Or' can be used only if the candidate is talking of the same thing although it is not necessary, e.g. **Weeds can be controlled by using herbicides or chemicals**.

(In this book, the many answers that have been provided for some questions in Paper I and Paper II later are just for your references, but do not write more than the required number of answers during the examinations.)

5. WRITING A GENERAL ANSWER FIRST THEN SUB-ANSWERS LATER

There are some questions that require a candidate to come up with several points and it is important for a candidate to first think of whether she may get all points from the main (general) topics or else she has to go for the sub-topics. It is not proper to combine answers from the main topics with those of the sub-topics. You will get clear of what is being said here in the example below:

Name three main ways or methods of weeding in a crop field. (3 marks)

(a) – By physical or mechanical weeding
– By using a hoe
– By using a slasher

(b) – By using a hoe
– By physical weeding
– By using chemicals
– By biological means

(c) – By physical weeding
– By using chemicals
– By biological means

The best answer is (c). The problem with (a) is that main topic (physical weeding) has been combined with sub-topics (hoeing and slashing). Hoeing and slashing are both physical weeding methods. Another good example would be: Give four examples of natural resources. (4 marks)

– Renewable natural resources
– Vegetation
– Soil
– Sunlight

In the above example 'renewable natural resources' has been wrongly placed because it is not an example but a main type of a natural resource. A candidate can put **wildlife** as another example instead of **renewable natural resources**.

6. POOR NUMBERING

Poor numbering of answers of a particular question can lead to a candidate failing badly. Owing to rushing and carelessness, many candidates have ended up putting correct answers against wrong question numbers. No matter how best or correct the answers can be presented or how many marks they are worth, the point is numbering must be correct, otherwise, they cannot be awarded any mark at all. This is why it is very important that candidates check their answers once they are through with the writing. It is also prudent to present answers following the question numbers; e.g. 1, 2, 3, 4, etc and not 1, 9, 3, 5, etc., for this can lead to the marker's failure to see distinguish clearly some of the answers. The candidate may also end up putting a correct answer against a wrong question number or completely forgetting to answer some of the questions.

7. BEATING ABOUT THE BUSH WHEN ANSWERING

Some answers require a candidate not to beat about the bush but rather to hit the nail on the head. For example: Explain three ways of controlling grasshoppers. (6 marks)

(a) Using chemicals to kill the nymph and grasshoppers
Using living things (biological) to eat the nymphs and grasshoppers
By physically killing the grasshoppers

(b) – Use of chemicals such as carbaryl to kill the grasshoppers
– Use of biological control through letting birds eat the nymphs and grasshoppers
– Physically by handpicking the grasshoppers

The best answers for a candidate to be awarded full 6 marks are found in (b) where the actual chemical, physical and the biological methods have been mentioned. In this instance, it is important for a candidate to name the actual chemical and the stage or type of living things that are controlled by the mentioned chemical.

8. MISSING KEY WORDS OR OPENING SENTENCE IN A QUESTION

Before start responding to any question, the candidate should look for the key words in that given question so that he or she answers exactly what is required of him or her. Understanding the key words will make questions very easy to answer. Key words in Agriculture include **contribution,**

effects, features, characteristics, types, methods, reasons, factors, results, and **importance.** In the question: What are the effects or importance of wind?, the candidate should understand the meaning of the word **effects** or **importance** before answering the question.

Some questions will have an opening sentence to guide a candidate on the topic from which the question has been picked before actually looking at individual questions; and this is very common for questions in Paper II of Agriculture and questions in section B of Agriculture Paper I. For example:

Weed control is an important component of crop production.
(a) Explain five reasons why weeding is important in agriculture. (10 marks)
(b) Discuss five ways of controlling weeds. (10 marks)

In the above example, the opening sentence is **Weed is an important component of crop production**. This opening sentence can also help the candidate not to waste time because he or she concentrates his or her knowledge in that specific area (in this case **weed control**). In this way, he or she can produce or recall as many facts on the topic.

9. DEFINING TERMS USING SAME WORDING OR VOCABULARY

When defining agricultural terms, the candidate should use different main words or vocabulary to the one asked to be defined. For example, in What is terracing? (1 mark), a candidate should not write: Terracing is the construction of **terraces**. Find a different word to stand in place of **terraces**; for example, you could use other words and replace terraces with say, **flat physical structures that are constructed in the field to ....**

10. WRONG SPELLINGS

Any wrong spelling will result in wrong answer. Spellings whether for English words or scientific (botanical) names should be written correctly. However, in Agriculture examinations some vernacular words may be marked as correct, e.g. *khola*, *mwamunaaligone*, *denje*, *nkhokwe*, *bonongwe*, *madeya*, etc. but it is good to write their English or scientific names if a candidate knows them. Instead of writing a Chichewa word *nkhokwe*, simply use the word **granary**.

In the same light, scientific names should always be underlined or when in print, in *italics*. Besides, the first word in the scientific name always starts with a capital letter, e.g. *Zea mays* (scientific name for maize).

As for spellings, always use British English, e.g. 'labour'not 'labor'; 'behaviour'not 'behavior'; 'organise' not 'organize'; 'sulphur'not 'sulfur', etc.

11. POOR LAYOUT OF ANSWERS

A candidate should learn before the final examinations how answers for each subject are supposed to be written or supplied. The way a candidate can respond to questions in History may not be the same way he or she can in Agriculture. Through looking at and revising past papers you should get familiar with how responses for each subject are supposed to be provided. Candidates should ask teachers how responses are made in specific subject areas. For example, a candidate can find the word **narrate** in Bible Knowledge and not in Agriculture and should know before the examinations how to answer a **narration** question.

Teachers are also supposed to let their students know how responses in particular subject areas are supplied during the examinations. For example, the way a candidate can answer a discussion question in Agriculture may not be the same way he or she can answer a discussion question in English or Biology.

Most of the Agriculture questions are asked in a guiding manner so that answering is not difficult, e.g. **explain, describe** or **discuss five** or **two factors that may affect, say, soil formation**. It is best to answer your questions using dashes, numbers, etc, and make sure that each factor or point to be explained has started with a dash or a number. It is not good to write too many answers in one line or in one paragraph. Look at a good example of laying out answers below: Discuss any two effects of high rainfall intensity on crop production. (4 marks)

– Leaching: Leaching makes nutrients go beyond the root zone of crops and hence cannot be used by crops. This leads to low yields.
– Defoliation: Leaves are destroyed, thereby reducing the photosynthesising area of the leaf of crops. A candidate can also create his or her number as below:

(i) Leaching: Leaching makes nutrients go beyond the root zone of crops and hence cannot be used by crops. This leads to low yields.
(ii) Defoliation: Leaves are lost, thereby reducing the photosynthesising area of the leaf of crops. Letters such as (a), (b), etc. can be written by the candidate depending upon wish. In some papers, a candidate may find such dashes or numbers already written for him or her. A candidate should also be laying his or her answers neatly for ease of marking by the examiner. If numbers used in question paper are 1, 2, 3, etc, use a similar numbering system or use dashes.

Another concern is whether to put a fullstop at the end of the answer or not. Usually a fullstop appears at the end of an answer that has appeared in form of a full sentence. Phrases or those answers in bits do not carry a fullstop at the end. However, because Agriculture is not strictly for observance of mechanics, most books do not put fullstops at all at the end of short sentences unless it is an essay. In other words, whether you put a fullstop at the end or not is no issue except in essays where you use a number of sentences.

12. POOR IDENTIFICATION OF SAMPLES THAT ARE DISPLAYED USING LETTERS

Agriculture is a science and practical subject and therefore a candidate should expect questions involving samples, diagrams, experiments, graphs, tables, etc. **Samples can come from anything that has been covered in JC and MSCE syllabuses**, e.g. soils, fertilisers, weeds, pasture, seeds, fruits, flowers, roots, stems, leaves, food tests, parts of living and non-living things, etc. It is best to name a sample by attaching it to the letters that are given to the samples.

Look at the following ways of answering questions involving samples: Imagine three samples of soil are provided during an examination. Sand is placed on letter A, clay near letter B, and silt near letter C. What would be your response if you were asked to identify samples A, B and C provided. In other words, which of these three responses is correct?

(i)	Sand	(ii)	A is sand	(iii)	sand
	Clay		B is clay		silt
	Silt		C is silt		clay

The best answers are in (ii) because they have attached the letters to the samples provided. Writing a letter or sample alone is not enough; make sure both sample and its letter are written.

13. POOR DRAWING OF DIAGRAMS OF SAMPLES

A candidate is supposed to draw diagrams of samples that he or she is provided with or according to the instructions given. Candidates are supposed to draw what they see during the examinations and not from drawings they memorised unless they are exactly the same. Many candidates are fond of drawing diagrams that they have memorised and not the ones provided to them. Teachers preparing for samples should also make sure that they have provided to their students the correct and well-prepared samples. A wrong sample will lead to a candidate drawing a wrong thing and this may affect the grade.

Diagrams appearing on question papers act as samples or specimens in one way or another because it is not possible to bring some materials or agricultural items to the examination room. For example, you cannot bring the whole physical furrow irrigation to a practical examination; however, you can provide a diagram of furrow irrigation.

14. FAILURE TO GIVE EXAMPLES FOR CLARITY

Examples are essential in the sense that they make weak points or answers strong. An example can tell a marker that the candidate really knows what he or she is writing about. Examples make what a candidate has written very clear. Examples can be added even if the question does not require you to give them. However, not all answers can have examples but a candidate can do so where possible.

Put simpy, sometimes what a candidate has written may not be clear enough to attract awarding of a mark but with an added example, follows the spine of the answer and therefore awards the mark. Consider the following example which sounds clear when an example is added at the end: Ruminants are animals with four-chambered stomach, **e.g. cattle and goats.**

15. LACK OF KNOWLEDGE OF EXAMINATION FORMAT

Fully understanding of the examination format helps a candidate know what, where and when a certain question can be asked and how it can be answered during an examination. Below are some points for teachers which can make a candidate know, familiarise and understand the examination format before the actual examination date.

When setting an Agriculture examination or test, it is important to always to set it following formats taken or followed by major examining boards. The number of questions and the way of presenting them should be exactly as the final examinations from the examining board. It does not help much to write an end-of-term test with only 2 questions when the actual examining board asks 12 and 5 questions for Paper I and Paper II, respectively. Start writing the examination format right from first term of form three. This assists the candidate to know the exact looks of the final examinations format and questions and how best he or she can answer the questions.

Some students experience the examining board format tests only during the mock examinations. Funds or resources permitting, ensure that the candidates are familiar with the real setting, and practise as much as possible in order to know the number of questions for each paper, vocabulary used during the examinations, number of questions for each paper, number of marks for each question and section, number of marks for each paper, how to choose questions in section B of Paper I, number of papers for each subject, how much time is allocated for each paper, the difference between the papers, etc.

In other words, try to follow the Agriculture final examination format even if what has been taught is very little. MSCE covers work from form one; there is no harm asking JC questions during first term of form 3 in case the material covered is not much.

Candidates should remember that practice makes perfect and they should not meet the real examination format during the final examinations only. One way of getting familiar with the real final examinations format is by studying and revising past papers. This also helps them to get familiar with what is asked during the final examinations.

16. BREAKING OF RULES ON PROBLEMS INVOLVING MATHEMATICS

Mathematics is one of the easiest subjects when coupled with constant practice , unfortunately most students shun the practice part and get it rough. Agriculture is a science subject. As such expect it to contain mathematical problems to be solved during the examinations. Most candidates are fond of leaving out a mathematical problem during the examination even if it is worth as many marks as 20. One of the contributing factors is that some candidates think that Agriculture is only about crops and livestock. A good Agriculture test will contain mathematical problems. Students should learn to practise all mathematical problems that are in the syllabus.

Teachers also should not skip mathematical topics, for students cannot learn them on their own. There are very few Agriculture topics that contain mathematical problems such as demand and supply, production function (diminishing marginal returns), labour profiles, plant populations and seed rates, fertiliser calculations, gross margin analysis, marketing costs and margins, partial and complete budgets, depreciation, marketing channels and agencies.

17. FAILURE TO RESPOND APPROPRIATELY TO ADVICE QUESTIONS

There are some questions that may require a candidate to give a piece of advice, e.g.: A farmer had all his chickens attacked by a virus disease of chickens called Newcastle. What two pieces of advice can be given to this farmer?

- The farmer can be advised to see the field assistant or veterinary assistant on how he can cure the birds.
- The farmer can be advised to see the agricultural experts at Bunda College of Agriculture so that they tell him what medication to give the chickens.

The two answers supplied look very funny, but that is what some candidates would think are their best two. Strictly speaking, both answers are wrong. Such answers show that a candidate has never come across such type of questions until his or her final examination. This type of question is simply asking the candidate to advise this farmer on what control measures the farmer can take to cure his chickens of Newcastle disease. The examiner or setter expects the candidate to know everything about Newcastle. He or she therefore expects such a candidate to help this farmer without referring him to a third party, e.g. to a veterinary assistant.

In a question such as: Discuss five problems that lead to low livestock production in your area or village. (10 marks), the candidate is not supposed to answer specifically about his or her actual home area, e.g. Namikango Area, but should rather look at Malawi as a nation, the whole of it. In other words, despite the question talking about **your** area, village or home, you, as a candidate, should not base your answer specifically on your area but rather on Agriculture as a subject in Malawi. Do not start by saying, **In my home area, the five problems are ....** You should just say, **The five problems are: ....**

18. MISUNDERSTANDING OF AGRICULTURAL TERMS

Agricultural terms should be used the way they are supposed to be used without changing their meanings. The terms or words that apply to human beings should not be used for livestock except where the terms are the same. For instance, Name one sign of **heat period** in cattle. (1)

- The sign of heat period in cattle is that cattle sweat and this is very common in October and November when it is hot.

The answer above clearly reveals the fact that this candidate does not know the agricultural word or term **heat period.** It is possible that a candidate writing the above answer has never learnt or read about **heat period** and was just guessing the answer and thought it has to do with weather or temperature. One of the best answers would be 'swollen vulva'. It is important that the students cover the whole syllabus before writing the examination, for no examination will come outside the syllabus.

Some candidates are fond of writing parts of humans for livestock, pests and parasites or vice versa. For instance, '**Nipples** are found on **breast** of cows' instead of, '**teats** are found on **udders** of cows'. Similarly, when talking of giving birth, we talk of **calving in cattle** and **farrowing in pigs**; we **do not use** the term **labour**, as some cadidates do, when referring to giving birth in cattle or pigs.

19. POOR DIAGRAMS

Some questions may demand a candidate to draw something or a sample, e.g: Draw and label any **three** internal parts of the groundnut you see. (5)

In such cases a candidate is supposed to draw the diagram neatly and in pencil, not in ink. Diagrams in pencil can be easily rubbed out if there is any mistake. Make sure the pencil is sharp enough to be able to draw diagrams with thin lines. Practise drawing diagrams during learning time for it is only practice that makes perfect. Label your diagrams clearly and correctly so that the marker should not have problems in identifying the actual part labelled.

Some questions, e.g. those on practicals, may require a candidate to **draw a conclusion** from the experiment or from the question. Sometimes students who lack practice end up drawing a diagram of some kind. In such type of question, a candidate is not supposed to draw a literal diagram but rather a concluding sentence. Do not draw anything if you have been told to draw a conclusion unless what you draw is supposed to assist in making what you have written or concluded clearer than otherwise.

20. LACK OF KNOWLEDGE ON COMPARING AND CONTRASTING QUESTIONS

When comparing, you look for either similarities or differences while contrasting looks for differences only between or among what you have been given. And in questions of this type, it is important to base your argument on two sides of the **same** factor rather than on two completely different factors or points. To clarify this point look at the example below: What is the difference between fixed costs and variable costs? (2)

(a) Variable costs are expenses that change according to the size of an enterprise while fixed costs are expenses that are not specific to one enterprise.
(b) Variable costs are expenses that change according to the size of an enterprise while fixed costs are expenses that do not change according to the size of an enterprise.
(c) Variable costs are expenses that are specific to one enterprise while fixed costs are expenses that are not specific to one enterprise.
(d) Variable costs are expenses that change according to the size of an enterprise.

The best answers are (b) and (c), for they are comparing one or same factor at a time. The problem with (a) is that if the candidate was asked to mention several other differences, answer (a) would affect him or her in coming up with as many answers, for it has combined two different factors that would have been marked differently, i.e. **size of enterprise** and **not specific to one enterprise**.

21. FAILURE TO SHOW CALCULATIONS, METHODS AND FORMULAE

Mathematics will always form part of Agriculture and there are no two ways about it. Any kind of calculation should show steps or methods clearly and to the point. Steps in calculations should not mean repeating already written steps but should show ways a candidate has followed to arrive at the answer. No important step should be skipped with the aim of finding the answer quickly. Method is very important in mathematical calculations. Most mathematical problems get more marks in method than in the actual final answer. It is sheer lack of wisdom to rush to the final answer.

If a candidate has to use formulae to find a certain answer, it is extremely important that he or she start by writing the formulae first before plunging into the figures. Leaving out the formulae means leaving out some marks.

Most calculations have figures that have units: %, kg, m, hours, litres, etc. It is recommended to write the correct units at each step till the final answer is reached. Do not write units at the final answer only. Many times candidates end up guessing the unit for the final answer because they skipped some steps. Units cancel out themselves through steps so that the ones remaining in the final step are the ones that are supposed to be put at the final answer. If, for example, the final answer is **2 kg**, do not expect marks from **2%**, **2**, **2 hours**, **K2**, etc., for units are specific to particular measurements. A candidate should not think that writing **2** only without **kg** could be marked correct.

It is also important not to combine many steps in one because this can rob you of marks.

In some questions involving figures (calculation) the examiner may deliberately bring similar figures to see if the candidate is paying attention to note the differences in figures on the question; for example the question can have figures with similar numbers like 300, 1 300, 3 000 or 500, 1 500, 500 on the same problem to confuse the candidate. If not careful, candidates may end up swapping (mixing) the figures, writing them in wrong places, e.g. putting 1,500 where he or she should have put 500, ending up getting the answers all-wrong.

22. SCANTY KNOWLEDGE OF DATA PRESENTATION (GRAPHS, TABLES, ETC)

Scientific data is recorded and presented in many ways: line graphs, circle graphs or pie charts, bar graphs or bar charts, tables, etc. Candidates should expect a lot of graphs (graphs are one way of presenting and interpreting data) and tables in Agriculture examinations. This means that as much as possible candidates should try to get familiar with graphs and tables before the final examinations.

Candidates are supposed to use the tables or graphs plotted to answer questions. A candidate is not supposed to answer from sheer guessing when the question requires him or her to use either a graph or a table or both.

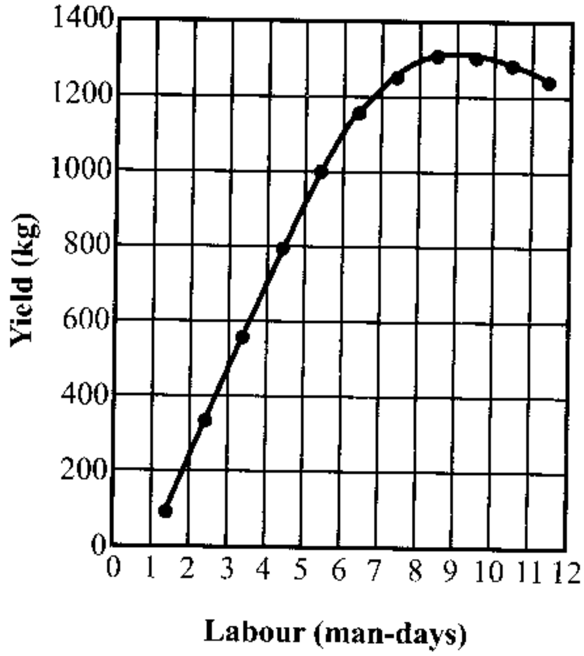
When plotting a graph, the dependent variables (to be on vertical or Y-axis) should be plotted against the independent variables (to be on horizontal or X-axis). The dependent variable is the one that changes during an investigation. The dependent variable depends on independent variable, i.e. you find the dependent variable by knowing the independent variable first. When you have been asked to plot a graph of yield against labour, it means that the first variable (yield) is a dependent variable and should be put on the Y-axis while the second variable (labour) is an independent variable and should be put on the X-axis. Consider the example below:

Plot a graph of yield in kg versus (or against) man-days of labour used.

Labour (Man-days) X-axis	1	2	3	4	5	6	7	9	10	11
Yield (kg) Y-axis	100	328	570	800	1,000	1,152	1,260	1,312	1,312	1,250

Sometimes a candidate can just be given data in a table and be asked to plot a graph. In such cases a candidate should master which data is in the first column or in the first row and which data is in the second column or second row. According to the alphabet X comes before Y. Therefore the data in the first column or row should be put on the X-axis and the data in the second column or row should be put on the Y-axis.

Labour in man-days	Yield in kg
1	100
2	328
3	570
4	800
5	1,000
6	1,152
7	1,260
8	1,312
9	1,312
10	1,300
11	1,250



Important points to remember when plotting any graphs:

– Write the title of the graph you want to plot.

– Label the X-axis and the Y-axis, giving units for each.

– Choose a scale that gives a graph large enough space for accurate plotting of points. The scale for the X-axis and Y-axis can be the same or not depending upon the size or range of figures that you will use.

– If points do not line in a straight line or smooth curve, even out the imperfections by drawing a line of best fit.

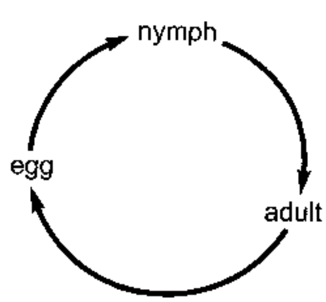
– Use a sharp pencil when drawing graph lines.

23. POOR PRESENTATION OF LIFE CYCLES

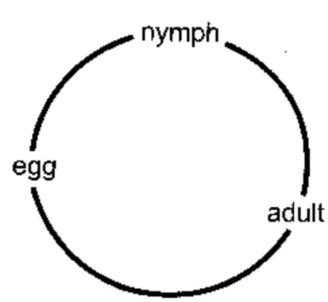
There are two types of cycles: **complete life cycle** and **incomplete life cycle**. There are a lot of cycles that a candidate can meet in his or her everyday life but the special thing about these cycles is that they have life, i.e. they are cycles of living things. Complete life cycle has mainly four life stages involving eggs, larvae, pupae and adult while incomplete life cycle has mainly three stages involving eggs, nymphs and adult. However, incomplete life cycle can have many nymph stages between eggs and adult. Note that the life cycle of a cattle tick has the following stages: eggs, larvae, nymphs and adult so it has a complete life cycle. There is no pupae stage in a tick.

Draw the life cycle of a grasshopper. (5)

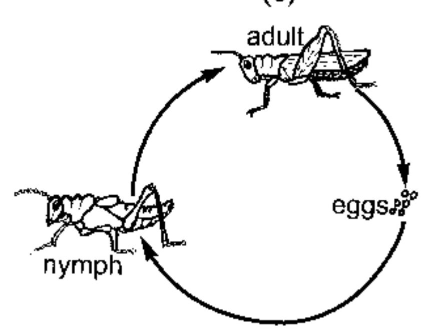
(a)



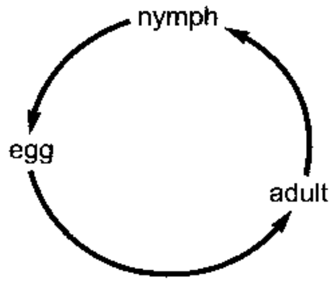
(b)



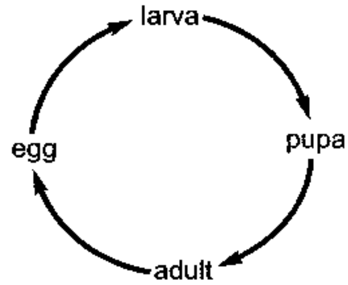
(c)



(d)



(e)



(f)

egg ⟶ nymph ⟶ adult

The best and correct answers are (a) and (c) because they have arrows pointing in the right direction, they start from one point and end at the same point (circle) have not interchanged the stages and have written the correct type of life cycle. In drawing a life cycle, a candidate can either give the names of the stages or give names of the stages and their actual drawings.

24. LACK OF KNOWLEDGE OF SOME COMMON QUESTION PHRASES

In Agriculture examinations there are some common words which are used for phrasing questions during the examinations. Common words in Agriculture include **contribute, results**, **influence**, **effects, factors, causes**, **importance**, **use, types, ways**, and **methods.** Through revisions and exercises, students will get familiar with such words and will know how to answer a question involving any one of them. Many students do not know the meanings of such words so that they end up *confusing them during the examinations. For instance, some students confuse* **effects** *with* **harmful factors**. **Effects** is similar to **importance**. And if you have been asked to find the effects of something, it means you are supposed to write on negative side or positive side of the factors. It means you are free to write on the positive, negative or both sides at the same time depending upon which points have come in your mind first. Consider this question: What are the two effects or importance of rainfall? (2 marks)

– Causes floods which wash away crops.
– Brings water which is used for crop growth.

The two answers have been taken from both positive (good) and negative (bad) side of factors. **Harmful effects** are just the same as **harmful factors**, and **good effects** are similar to **beneficial effects**. The word **effect** does not necessarily mean harmful but harmful and beneficial factors together.

Many times questions which require a candidate to **list, name**, **outline**, **mention**, etc carry one mark each point and questions requiring a candidate to **discuss, explain**, **describe**, **give a reason**, etc. carry two marks for each well-explained point. In questions of the second category, it is important that a candidate write the point first (1 mark) and then explain the same point (another mark) for 2 marks. You can do the same for questions of the first category if you are not sure of the points that you have written. There is no harm in explaining a 1-mark question, for such answers are made even clearer though they will still be worth same (1) mark. There are some special questions where the examiner may require a candidate to write one point for 2 marks and not just one point for 1 mark. This can be known by looking at the marks allocated to the question.

What is expected of the candidate when given such words.

(a) **Describe** requires a candidate to give an outline of something asked about. To write what something or somebody is like.
(b) **Discuss** requires a candidate to outline the points concerning a particular issue for and against from his or her point of view. Write about something or somebody in detail, showing different ideas and opinions about it.

(c) **Explain** requires a candidate to give details about how and why a specific thing happened or took place where it does. To tell someone about something in a way that makes it easy to understand.
(d) **Compare** requires a candidate to show the similarities only or differences between or among things.
(e) **Contrast** requires a candidate to show differences between or among things.
(f) **Why** requires a candidate to give reasons from his or her point of view.
(g) **State** requires a candidate to name or list points.

25. WRONG CHOICE OF QUESTIONS DURING EXAMINATIONS

It is very important to learn how to choose examination questions before the time of final examinations come. For example, if an Agriculture examination has 2 papers, make sure you know how questions are asked in each paper. You may have Paper II where you are supposed to write all the questions and Paper I where you are supposed to choose any three questions in section B. Know again that at present a candidate is supposed to write all five questions in paper II, each carrying 20 marks. Questions 1 and 2 of Paper II are sample or specimen questions. Questions 3 and 4 of Paper II may be containing diagrams or tables and question 4 or 5 of Paper II may be a mathematical problem depending upon the examiner's choice. Do not worry about question 4 that is the way it behaves.

Paper I has 12 questions, 8 in section A and 4 in section B where a candidate is supposed to choose only three out of these four. A candidate should note that questions in section B carry 20 marks each and therefore should be handled with care. Questions 9 and 10 have 5 parts each (a, b, c, d, and e) each carrying 4 marks, giving a total of 20 marks. Questions 11 and 12 have 2 parts each (a and b) carrying 10 marks each, giving a total of 20 marks. Questions 9 and 10 can be chosen by both intelligent and average candidates. It is easy to get some marks from the parts that can be well-answered and lose marks on parts that are not properly answered. In questions 9 and 10, it is not easy for a candidate to completely get zero. Choosing questions 11 and 12 requires a candidate to be very sure that what he or she is going to write are correct answers. Most questions belonging to numbers 11 and 12 will use words such as **describe five, explain five**, and **discuss five** so that it is very easy for a candidate to either get a zero or get all answers correct. Questions 11 and 12 are best to choose if a candidate is very sure with the answers he or she is going to write. One goodness with questions 11 and 12 is that all five points will be talking about the similar points or factors (like discuss five) so once a candidate knows all the factors or points well then he or she will have an easy 10 marks. Is that not good?

(Note: Examinations format do change. It is therefore important to carefully follow news from the Malawi National Examinations Board, and to follow important circulars, from Ministry of Education, to do with schools and examinations in the country.)

26. USING SHORTCUTS, ABBREVIATIONS IN OR FOR ANSWERS

Candidates are not supposed to write shortcuts or abbreviated forms of answers during examinations. Shortcuts and note taking are regarded as wrong answers during the examinations unless otherwise stated. Candidates are not supposed to create their own abbreviations. There are abbreviations that are accepted but if a candidate is not sure of the abbreviations it is better to write all words in full. Candidates should avoid writing **coz, bcause** for 'because'; **U** for 'you'; **C** for 'see'; $\overline{\mathbf{C}}$ for 'which', **BT** for 'Blantyre'; **LL** for 'Lilongwe'; **btween** for 'between'; **B4** for 'before'; **Bcareful** for 'be careful', etc.

27. LACK OF KNOWLEDGE ON SILENT COMPARING QUESTIONS

A candidate should know that there are some questions that require him or her to know or have something at the back of his or her mind to compare with in order to answer such questions properly. Questions of such type are also very common in Agriculture examinations. The following two (questions) are of this nature: What are the two advantages of vegetative propagation? (2 marks); What are the two advantages of surface irrigation? (2 marks)

If you look critically at the two questions, you will discover that the first one mentions the type of propagation and the second one mentions the method or system of irrigation. When answering the first question, you should be answering it by comparing (in mind) with another type of propagation and that is by seed though the question has not mentioned about seed at all. The same way with the second question, when mentioning the advantages of surface irrigation, do it by comparing (in mind) with another system of irrigation and that is overhead (sprinkler) irrigation or drip irrigation. It is not always a must to do so but it only helps a candidate to get the answers with ease. However, in answering the question given in the example above, do not add words such as **while by seed** or **while overhead** does this and that. Keep them silent as well because the question did not mention them. For example, one advantage of vegetative propagation is that the offspring resembles the parent. Do not say, one advantage of vegetative propagation is that the offspring resembles the parent while in a seed it does not resemble the parent. A candidate could only do so if the question was: What is the difference between vegetative (asexual) propagation and seed (sexual) propagation? (2 marks). The marks will again be 2 instead of 1 (mark).

28. WRONG/CONFUSING MATERIALS FOR SAMPLE QUESTIONS (PAPER II Q1 & Q2)
Some materials for preparing practical samples are not easily found such that teachers look for substitutes, which end up confusing some candidates during the examinations. It is better that the candidate be provided with samples that are easily found and are also easy to prepare. Teachers should make sure that they prepare the correct samples for their candidates. If a teacher prepares a wrong sample or fails to prepare a sample, it means all the candidates will be writing wrong answers according to the examiner but correct answers according to the sample that has been provided by their teacher at the examination centre. Such candidates will automatically fair badly even if they are very bright. For instance, it is very easy for candidates to confuse poorly prepared samples of humus and organic matter in a practical examination where sample X is humus and sample Y is organic matter.

A fully decomposed organic matter forms humus. If the two samples are not prepared well, they will look the same to the candidates except for the letters X and Y close to them. Well-prepared humus depends on the material used, the method of preparation and time of decomposition. Another confusing sample these days is fertiliser. You will find the same type of fertiliser looking different depending upon the manufacturers.

29. REFORMULATING OF QUESTIONS
Reformulating of questions is not necessary in papers where a candidate put the answers on the space below the question, e.g. in Paper 1 Agriculture. Many candidates complain that the space provided for the answer is not enough forgetting that they waste a lot of space with copying of the question or part of the question that is already there. Some candidates add a lot of unnecessary points to their answers, making the space seem small. When answering questions that you are supposed to fill in the blank spaces, you are supposed to go straight into answering the questions. Do not even waste space with words like 'These are:' Just write correct answers in brief.

30. BELIEF IN CHEAT SHEETS (*LIKASA*) AND CHEATING IN GENERAL
Cheating methods used by most candidates at either cluster centre or lone centre can be grouped into:

I Methods that use the eye (sight) and
II Methods that use the ear (hearing).

(I) Methods that use the eye (sight)
This is the common methods that candidates use when they want to cheat during the examinations. Candidates will enter the examinations room with cheat sheets which are already written materials containing answers, or somebody will provide them with written answers and they will see the

answers and copy them. This is very easy to discover especially in questions involving calculations. A whole class can copy wrong same method of calculating certain problems or can copy wrong same answers. Some candidates would place correct answers against wrong question numbers just because they were rushing when copying the answers. For example, a candidate can place correct answers for 7(a) at 11(a), because of being in a hurry or nervous with the invigilator.

(II) Methods that use the ear (hearing)

In this type of cheating a candidate will speak or whisper the answer to a friend so that the friend hears it and writes it. With modern technology, candidates have resolved to using even cell phones to hear answers from people who are outside or within the examination room. Candidates who are fond of being whispered to for answers during the examinations tend to write wrong spellings of the thing or a completely different thing is written as an answer. For instance, an answer to a question can be **aphids**, and very few candidates will hear a whispered answer as aphids but will hear it wrongly and write it as **afisi, aphase, afetsa, faeces, a feeds, a fees, kadzidzi, fizesi, aphunzitsi, a police**, etc.

Markers are expert at discovering cheating cases whenever they skip the invigilator's eye. It does not take time for a marker to know which centres were cheating or which candidates were cheating. Change of ink during the examination and change of handwriting are other signs of cheating. Over-scoring in one or selected subjects can be another sign of cheating. Another good source of information can be fellow candidates who will report that candidate X, Y and Z were cheating during the examinations. Invigilators, security officers and examination centre supervisors also report such cases (of cheating). Remember that any cheating case will result in disqualification.

Cheating is usually a sign of desperation due to lack of proper preparation. A candidate who prepared thoroughly for the examinations can never cheat.

As a candidate, you simply have to learn all the material that is on the syllabus, do a lot of exercises, revise past papers to know how questions come and study hard in general. University, nice colleges and nice jobs are waiting for hard working and well-disciplined candidates.

The following areas should be of great help when preparing for examinations:

(a) **Planning:** A candidate should plan his or her daily activities well. Study in the morning or late in the evening when it is quiet.

(b) **Knowledge of the syllabus:** Know the material that is covered on the syllabus so that you do not study outside the syllabus.

(c) **Identifying of important topics:** Through past papers you can identify important topics that are often asked by the examining boards. Some topics are seldomly asked.

(d) **Determination and hardwork:** A candidate is not given a certificate from only one subject. It is required that a candidate works hard in all subjects including Agriculture. Work hard from the beginning.

(e) **Taking notes:** A candidate should be taking down notes during lessons and studies.

(f) **Knowing relevant textbooks:** Identify approved core (principle) textbooks and recommended supplementary (reference) books. However, when studying, concentrate on approved core textbooks.

(g) **Revision:** Revise at all the time but intensify your revision two to three months before the examinations because by this time you will have covered a lot in your subjects. It is also close to the period of the examinations so whatever has been revised can be easily remembered during the examinations.

(h) **Concentration during examinations:** During the examinations read carefully and understand each question. Start with simple ones (first) then 'difficult' ones (later) to serve time for the 'difficult' ones. However, all hard working and intelligent candidates will answer question one through to the last with ease and neatly at that.

AGRICULTURE QUESTIONS

(*Theory Paper I*)

TEST 1

1. (a) Briefly explain the difference between volatilisation and immobilisation.
   (b) Describe any **two** types of soil structure.

2. What is an experiment?

3. (a) Explain **one** way in which use of large seeds as planting material can increase production of crops in Malawi.
   (b) A small holder farmer wants to plant 5 hectares of land with genetically modified maize whose germination percentage is 80. How much seeds will be required if the seed rate is 28 kg/ha? Assume purity percentage of this maize is 100.

4. (a) What are gender roles?
   (b) List **two** factors that influence gender roles.

5. (a) Formulate a 15% digestible protein feed using pigeon peas containing 40% protein, and maize 10% protein.
   (b) Calculate the mass of pigeon peas and of maize that would be mixed to give a 1,000 kg mixture feed with 15% protein.

6. (a) List any **two** reasons why it is important to promote trade between Malawi and other nations.
   (b) Mention **five** ways that the government can use to attract foreign buyers for commodities of Malawi.

7. Briefly state how the following may improve agriculture production in Malawi:
   (a) Mulching
   (b) Deworming
   (c) Castration
   (d) Cross-breeding
   (e) Agricultural credit

8. List **six** methods of calculating depreciation.

9. Crops can be propagated by specialised vegetative part of plants or by seed.
   (a) List any **two** advantages and **two** disadvantages of propagation by seed.
   (b) Mention **four** characteristics that you may use to identify a seed as belonging to a certain variety.
   (c) Explain **two** methods of propagating plants vegetatively.
   (d) Mention **four** disadvantages of using poor quality materials for planting.
   (e) List **four** qualities of good planting materials.

10. Agriculture cannot develop without a good marketing system.
    (a) Mention any **four** marketing functions done by ADMARC.
    (b) State any **four** problems of agricultural marketing in Malawi.
    (c) Discuss any **two** ways how the government of Malawi controls the prices of agricultural products.
    (d) Describe any **two** factors that affect supply of an agricultural product at any market.
    (e) Explain any **two** ways in which marketing promotes agricultural development in Malawi.

11. Soil is a very important natural resource for crop production in Malawi.
    (a) Discuss any **five** physical properties that influence soil.
    (b) Describe any **five** ways by which soil structure can be destroyed.

12. (a) Explain any **five** reasons why increased crop production is important to a nation.
    (b) Explain any **five** ways the government can take to increase food crops to ensure food security at household level.

TEST 2

1. (a) Define 'essential plant nutrients'.
   (b) What are micro-nutrients or trace elements or minor elements?
   (c) What is the difference between yellowing (chlorosis) of maize leaves caused by potassium deficiency and that caused by nitrogen deficiency?

2. (a) What is the difference between partial budgeting and complete budgeting as used in agriculture?
   (b) Under what **three** conditions can a complete budget be used?

3. (a) Discuss **four** ways of controlling weeds and give **two** examples for each.

4. Mouth parts of insect pests are usually specialised to carry out a particular type of feeding. According to the mode of feeding, can you classify the insect pests into **three** major groups and describe them?

5. The **table** below shows a rotation sequence for crops. Year 1 has been completed already.

	Year 1	Year 2	Year 3	Year 4
Plot I	Rape			
Plot II	Peas			
Plot III	Maize			
Plot IV	Paprika			

   (a) Complete the sequence for years 2, 3 and 4.
   (b) Name any **one** importance of following the rotation sequence in (a) above.

6. (a) Explain any **five** advantages of sexual propagation.
   (b) With the aid of a diagram, explain how crops can be propagated by budding.

7. (a) State **four** functions of a plant stem.
   (b) You are provided with the following information:
   - Family A has 10 members
   - Family B has 3 members
   - Both families produce food enough for only 3 members every year.

   i. Which family is food insecure?
   ii. Explain any **two** ways in which the family identified in (a) could be food secure.

   (c) Explain any **one** way by which increase in population density can slow down the socio-economic development of an area.

8. Explain the difference between the following terms as used in agriculture.
   (a) Absorption and adsorption
   (b) Gestation and parturition
   (c) Hay and silage
   (d) Roughages and concentrates

9. Limited amounts of plant nutrients in the soil greatly limit crop production on any farm.
   (a) Explain any **two** methods that can be used to determine the types of nutrients that are deficient in a particular soil.
   (b) i. Describe any **one** effect of rainfall on availability of plant nutrients.
   ii. Describe any **one** effect of soil acidity on the availability of plant nutrients.
   (c) Explain any **two** differences between organic and inorganic sources of plant nutrients.
   (d) Describe **two** processes that take place to urea in terms of how it is absorbed and used by the maize crop.
   (e) State any **two** deficiency symptoms of any **one** major and any **one** minor element required by crops.

10. Low living standards and low nutritional status in Malawi, among other factors, are caused by high population growth.
   (a) Mention any **four** things or indicators that can show that there is low living standard in Malawi.
   (b) Explain any **two** ways of improving the living standards of poor Malawians.
   (c) Explain any **two** reasons that lead to population growth increase in Malawi.

(d) Explain **two** reasons why high population growth can lead to poor nutrition and health in your area.

(e) Give **four** reasons why adequate nutrition is important for the increasing population of Malawi.

11. (a) Describe any **five** methods of sowing or establishing pasture.

(b) Explain any **five** correct procedures that smallholder farmers should follow in order to establish pasture successfully in Malawi.

12. (a) Discuss **five** factors that affect soil pH.

(b) Explain **five** factors that affect the nutrient status of the soil.

TEST 3

1. (a) What is cation exchange capacity (CEC)?

(b) Discuss any **two** losses of nitrogen from the soil that can come as a result of microbial (microorganism) activity.

2. (a) State any **five** factors which should be considered when mechanising a farm.

(b) Describe any **two** ways through which subsistence farmers can improve the productivity of their enterprises.

3. Mention **two** types of farm machinery that can be used by farmers in Malawi.

4. List any **four** goat diseases.

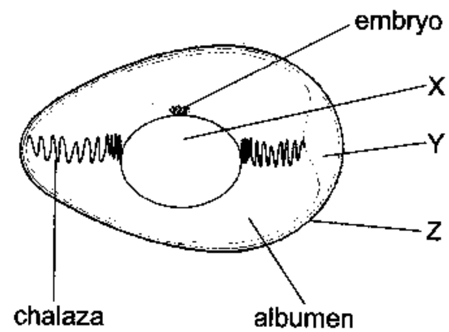
5. List any **three** factors that affect the rate of crop maturation.

6. A field of maize has a vertical interval of 8 metres and a horizontal distance of 50 metres.

(a) Calculate the percentage slope of this maize field.

(b) Give **two** reasons why the percentage slope in (a) above is not good for maize growing.

7. The **diagram** below is a chicken egg.



(a) Name the parts labelled **X**, **Y** and **Z**.

(b) Give **one** important function of the parts labelled **Y** and **Z**.

8. Explain how the following may affect soil pH.

(a) Microbial acidity

(b) Nutrient uptake by plants

(c) Leaching

(d) Poor drainage

(e) Vegetation

9. Livestock in Malawi can be sold live (on hoof) or slaughtered (carcass or on hook or cold dressed).

(a) Mention any **four** grades of cattle that can be sold live at the various cattle markets in the country.

(b) Mention any **four** grades of cattle that can be sold as carcass at the various cattle abattoirs or markets in the country.

(c) i. Mention disadvantages of keeping local breed of sheep.

ii. Explain the criteria to select a breed of sheep.

(d) Explain the importance of the following practices in sheep production.

i. Docking

ii. Trimming

(e) Explain the difference between sheep and goats in terms of their feeding habits.

10. Weed control is an important component of crop production.

(a) List any **four** advantages of physical weed control.

(b) Mention **four** disadvantages of physical weed control.

(c) i. Mention **four** advantages of cultural weed control in agriculture.

(d) State any **four** disadvantages of mechanical weed control.

(e) Mention any **four** disadvantages of legislative weed control method.

11. Fertilisers are necessary for crop development.

(a) Discuss **five** factors that affect the effectiveness of fertiliser application.

(b) Discuss **five** ways of maintaining and improving soil fertility in Malawi.

12. Plant breeders worldwide work hard to improve the genotype of crops in order to develop superior varieties of crops that meet the requirements of processors, consumers, farmers and buyers.

(a) Explain how any **five** objectives of improving crops can lead to increasing yield quantity of any crop.

(b) Explain any **five** objectives of improving crops that relate to improving the quality of the produce.

TEST 4

1. What is salinity?

2. (a) List any **three** pests of mangoes.

(b) What are any **two** diseases of mangoes?

3. (a) Define the following terms as used in Agriculture:

i. Porosity

ii. Bulk density (BD)

iii. Particle density

(b) A certain arable surface soil after analysis in the laboratory produced the following results:

Total volume of soil = 200 cm^3

Mass of oven-dry soil = 260 g

Volume of soil solids = 100 cm^3

i. Find the bulk density (BD) of the soil.

ii. Calculate the particle density.

iii. Calculate the percentage of the solid space.

iv. Find the percent pore space.

4. Mention any **three** causes of depreciation.

5. (a) What are the **three** functions of replication in experiments?

(b) Give **two** reasons why randomisation is important.

6. (a) What is the main purpose of randomisation in field experiment?

(b) Explain any **three** situations where randomisation may be useful in field experiments.

7. Describe any **four** ways of randomising the experimental treatments.

8. Define the following words as used in agriculture:

(a) Gender

(b) Power

(c) Cation exchange capacity (CEC)

(d) Agricultural marketing

(e) Farm structures

9. Soil structure and fertility influence crop production.

(a) Discuss any **two** ways in which good soil structure can be maintained.

(b) Apart from application of inorganic fertilisers, explain any **two** ways of maintaining soil fertility.

(c) Mention any **four** advantages of organic fertilisers over inorganic fertilisers.

(d) State any **four** functions of phosphorus in crops.

(e) Explain any **two** deficiency symptoms of boron in a maize crop.

10. (a) With any **two** examples, describe an inventory record that can be kept by a pig farmer.

(b) Explain **two** ways in which an inventory record may improve the pig keeping enterprise.

(c) State any **three** types of commercial feeds that can be given to pigs.

(d) Describe any **two** ways in which production records may assist in increasing the production of pigs.

(e) Apart from keeping pigs, a farmer can also grow vegetables; explain any **two** ways in which vegetable seedlings can be hardened off.

11. (a) Describe **five** extents or effects of land degradation in Malawi.

(b) Explain any **five** effects of land degradation on the economy of Malawi.

12. (a) Explain how herbicides are classified basing on:

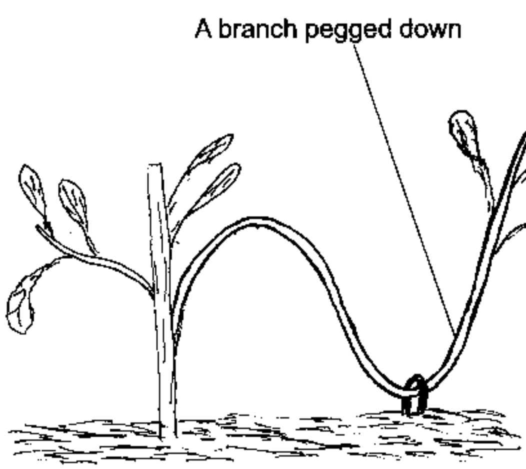
i. Mode of action

ii. Use

(b) Explain **five** disadvantages of using herbicides of a farm.

TEST 5

1. The **figure** below is a diagram showing one of the methods of propagating crops vegetatively. Study it carefully and answer the questions that follow.



(a) Identify the method shown in the diagram.

(b) State any **two** advantages of using this method to propagate crops.

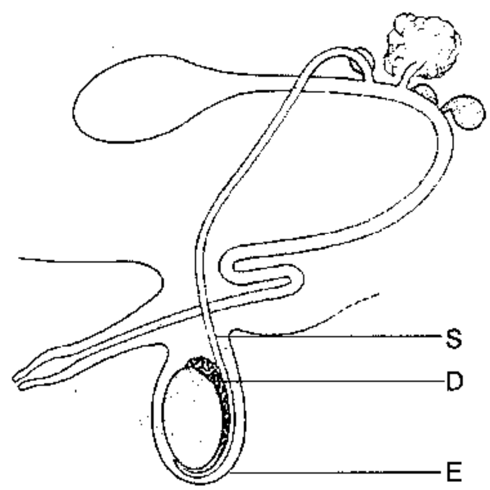
(c) Apart from the method shown in the diagram, describe any **two** methods that are used to propagate crops.

2. (a) Mention any **two** main types of pasture that are found in Malawi.

(b) Describe any **three** differences between the two pastures mentioned in (a) above.

(c) To what main pasture type do permanent and temporary pastures belong?

(d) The **figure** below is a diagram of a reproductive system of a Malawi Zebu bull.



i. Name parts labelled **S**, **D**, and **E**.

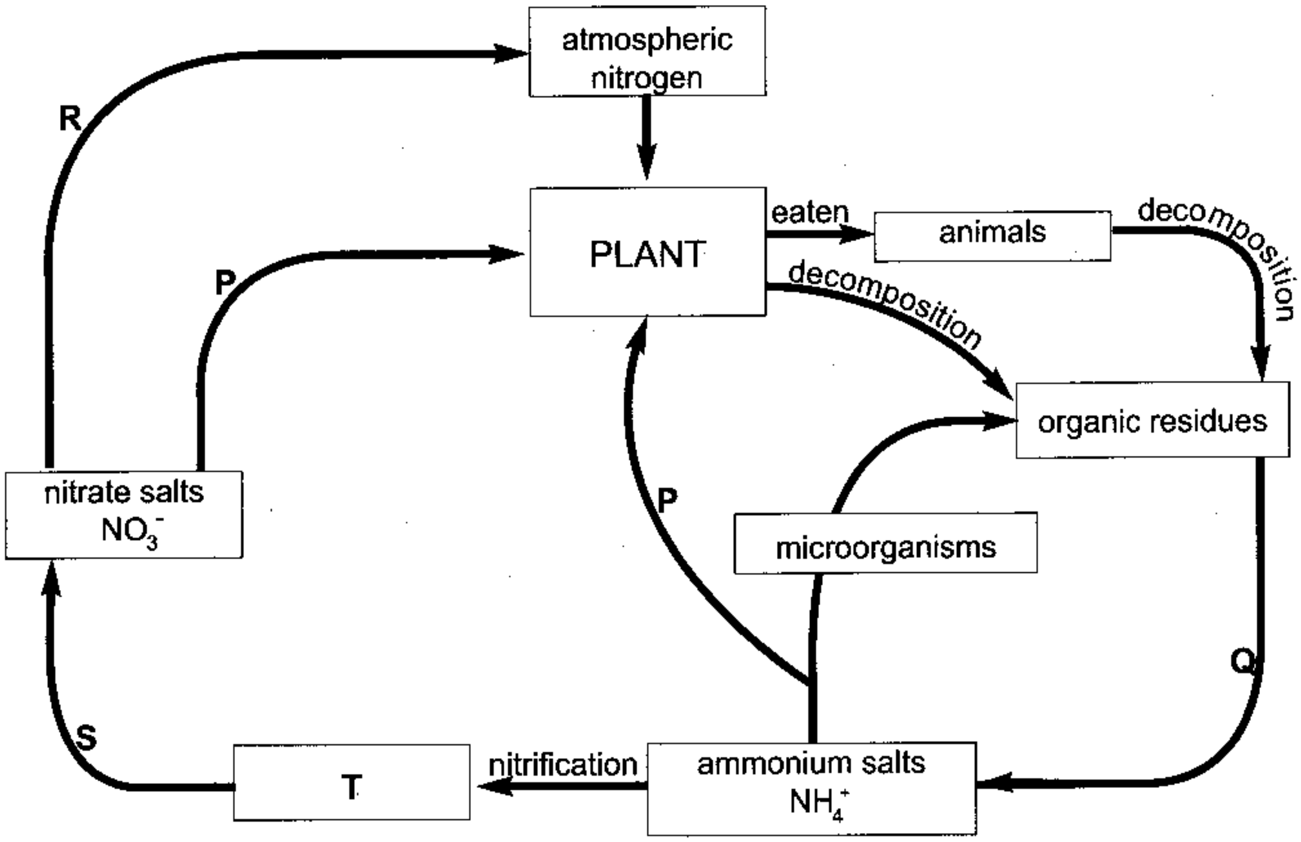
ii. What is the function of S and **D**?

3. Mention any **five** factors that should be considered when applying fertiliser (amount and type) to your crops.

4. (a) Formulate a 13.93% digestible protein (DP) concentrate feed using groundnut meal 41% DP and maize meal 7% DP.

(b) If 100 kg grain mixture as dry matter (DM) is needed, what will be the amounts of groundnut meal and maize meal?

5. The **figure** below is a diagram of the nitrogen cycle.



Complete **P**, **Q**, **R**, **S** and **T**

6. What are **four** ways of improving the involvement of women in decision making for agricultural development in Malawi?

7. Mention any **four** advantages of agricultural cooperatives.

8. Explain briefly what is meant by the following terms in agriculture:
   (a) Drainage
   (b) Rouging
   (c) Seed inoculation
   (d) Colostrum
   (e) Variable costs

9. Discuss **two** ways in which the following factors contribute to agricultural development:
   (a) Growing crops by using irrigation
   (b) Practising the principle of comparative advantage
   (c) Club for farmers
   (d) Registered land ownership
   (e) Agro industry

10. (a) Mention any **four** advantages of chemical weed control.
    (b) Mention any **four** disadvantages of chemical weed control.
    (c) List **four** conditions that need to be considered for maximum effectiveness of herbicides in controlling the weeds.
    (d) i. Mention **four** other main ways of controlling weeds in a field of crops.
        ii. Give **one** example of chemical that is used to kill weeds.
    (e) Mention any **four** companies or organisations in Malawi that sell or manufacture herbicides.

11. Different cropping systems have developed over the years to help farmers avoid or solve an existing farming problem.

(a) Discuss any **five** cropping systems practised in growing crops.

(b) One of the existing problems to solve in farming is how to make fields weed free. Explain any **five** reasons why weeds despite being controlled every year or growing season, their species never finish completely or weeds never finish completely.

12. (a) Explain any **five** causes of soil degradation resulting from bad farming practices.

(b) Explain any **five** effects of soil degradation in agriculture.

TEST 6

1. (a) What are marketing costs?

(b) Describe **two** ways through which international trade may improve through community participation.

2. (a) Explain the difference between farm gate price and marketing margin.

(b) Explain **one** advantage of the direct marketing channel to:

i. The producer (farmer).

ii. The final consumer.

3. List **four** groups of common pests that attack field crops and crop produce in Malawi.

4. (a) Mention any **three** chemical properties of the soil.

(b) i. Explain the difference between soil texture and soil structure.

ii. State **one** similarity between soil texture and soil structure.

5. (a) Give **four** reasons why fruits are important.

(b) List any **four** varieties of mangoes (*Mangifera indica*).

6. Explain any **five** ways in which water as a natural resource influences agricultural production.

7. Concentrates for feeding animals are usually compounded from a number of feed ingredients since a single feedstuff may not contain a balanced supply of nutrients.

(a) Formulate a 20% protein feed using maize containing 10% protein and groundnut meal containing 45% protein. Use Pearson's square method.

(b) If 100 kg grain mixture is needed, what will be the amounts of maize and groundnut meal?

8. Name the term that is commonly given to each of the following groups of words in agriculture:

(a) The giving of animal liquid medicine or drugs through the mouth.

(b) An area from which rainwater flows into rivers or lakes or any body of water.

(c) The maximum limit a farmer is allowed to produce and sell.

(d) A chemical applied to control weeds in crop fields.

(e) The decomposition of rocks to form soil.

9. Productivity of the soil can also be improved and maintained through the application of fertilisers.

(a) Explain any **two** advantages of organic fertilisers to the soil.

(b) Explain any **two** nitrogen deficiency symptoms that can be seen in maize crop.

(c) Explain **two** ways in which nitrogen may be depleted through the activities of bacteria.

(d) Explain any **two** effects of high soil acidity on nutrient availability to crops.

(e) State any **two** ways in which a farmer can raise soil pH in a maize garden.

10. Soil and water are necessary for agricultural production.

(a) Describe any **two** ways in which soil depth affects crop growth and development.

(b) Explain any **one** effect of each of the following on the presence of crop nutrients:

i. Low soil pH
ii. Rainfall

(c) Explain any **two** ways through which infiltrated water returns to the natural hydrological cycle.
(d) Briefly explain **two** ways that can lead to reduced rate of evaporation in the field of crops.
(e) Discuss any **two** factors that can contribute to low water table in the soil.

11. Land preparation is done in order to make a seed bed ready for planting.
(a) Discuss **five** reasons why farmers in Malawi are engaged in land preparation before planting their seeds and crops.
(b) Describe any **five** land preparation activities that farmers do in your area before planting seeds.

12. (a) Discuss any **five** factors that must be considered when choosing a method of irrigating crops.
(b) Explain any **two** advantages and any **three** disadvantages of overhead or sprinkler irrigation.

TEST 7

1. (a) What is the difference between roughages and concentrates?
(b) List **two** types of concentrates.

2. List **four** functions of marketing agencies (individuals, companies or organisations).

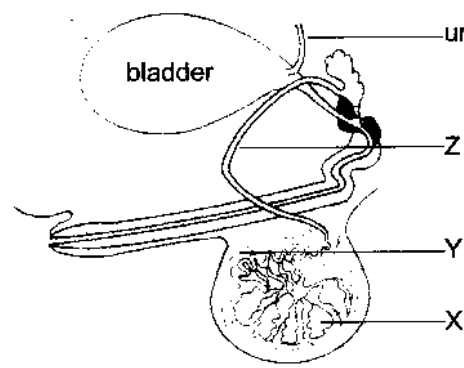
3. (a) Between partial budget and complete budget which one is more useful to the smallholder farmers in Malawi?
(b) Give a reason for your answer in (a) above.

4. (a) Name **two** types of marketing channels.
(b) Explain **one** way in which HIV and AIDS has reduced agricultural production through:
i. Money or capital obtained from farming
ii. Labour force

5 (a) Define the following terms:
i. Depreciation
ii. Randomisation

6. Explain any **two** ways in which late planting contributes to low crop yields.

7. The **diagram** below shows the reproductive system of a boar (male pig).



(a) Name the parts labelled **X, Y** and **Z.**
(b) Give **one** important function of the parts labelled **X, Y** and **Z.**
(c) Describe a bloodless method of castrating bull calves in livestock production.
(d) Explain any **three** methods of castrating young males in livestock production.

8. Give **one** word for each of the following sentences used in agriculture:
(a) The work done by people.
(b) Yellowish, thick creamy milk produced by cattle soon after parturition.
(c) The removal of forests through careless cutting down of trees.
(d) Turning into desert of a particular piece of land.
(e) A natural home for plants and animals.

9. The soil and water are some of the important factors that influence crop production in Malawi.
(a) Explain **two** ways in which lack of water in the soil reduces crop development and yield.

(b) Explain **two** ways in which too much rainfall can retard the growth of some crops.

(c) Explain **two** ways how the parent rock material influences the soil characteristics.

(d) Explain **two** ways how improved soil structure promotes crop growth.

(e) Discuss **two** ways in which infiltrating water and ground water can become part of water cycle.

10. Soil is the basis for crop growth and development in any environment.

    (a) Describe any **two** biological processes important in the breaking down of rocks to form soil particles.

    (b) Explain any **two** factors that influence the physical properties of the soil.

    (c) Explain any **two** reasons why soil is important in crop production.

    (d) State any **four** physical properties of clay soil.

    (e) Explain any **two** factors that influence chemical properties of soil.

11. In Malawi more than 70% of farm work is done by female farmers yet there are biases which limit females from obtaining and making use of agricultural technology.

    (a) Discuss **five** factors that cause gender biases towards males in using agricultural technology in Malawi.

    (b) Explain any **five** ways of describing the population distribution in Malawi.

12. (a) Describe any **five** agricultural services that can be available to subsistence farmers from different agricultural agencies.

    (b) Explain any **five** agricultural agencies that can provide agricultural services to farmers in Malawi.

TEST 8

1. What is a cropping system?

2. (a) What is a balance ration?

   (b) What are the **two** types of rations?

   (c) Explain **one** reason why each of the following processes is important in pasture:

   i. Pelleting

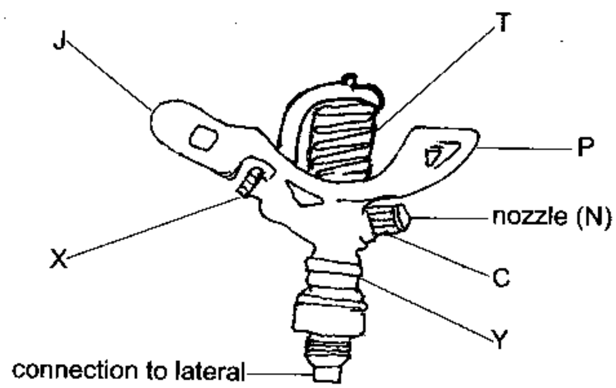
   ii. Inoculation

3. Mention any **four** diseases of sheep.

4. A machine was bought for K10,000 with an estimated life span of 10 years and scrape value of K1,000.00. Calculate the depreciation in the 10th year using sum of digits method.

5. (a) Give **four** examples of an overhead irrigation system.

   (b) The **figure** below shows a rotating sprinkler head that can be used in an



   overhead irrigation method.

   i. Name the parts labelled **P, X** and **Y**.

   ii. What happens at each of the following labelled parts: **T, P, N, J** and **X**?

6. (a) Mention any **five** causes of soil degradation in Malawi.

   (b) Mention any **two** main ways of controlling soil degradation in Malawi.

(c) Explain any **three** forms of soil degradation.

7. (a) What is meant by the word 'catchment area'?
   (b) Describe any **two** effects of deforestation of a catchment area.

8. Define the following terms:
   (a) Overgrazing
   (b) Strip cropping
   (c) Rill erosion
   (d) Scarification
   (e) Drenching

9. There are a lot of limitations to animal production in Malawi.
   (a) Explain briefly **one** way by which each of the following may lead to low cattle production in Malawi:
      i. Seasonal variation of cattle feed
      ii. Communal cattle grazing
   (b) With **one** example for each, state any **two** ways through which subsistence farmers would reduce shortage of cattle feed during the dry season
   (c) Discuss **two** advantages of stall feeding in cattle.
   (d) Explain briefly **two** symptoms of pneumonia in goats.
   (e) Explain any **one** advantage of inbreeding and any **one** disadvantage of inbreeding of livestock.

10. Smallholder farming in Malawi is mainly based on fragmented (small and scattered) gardens. Explain **two** ways in which
   (a) this affects the efficient use of heavy machines.
   (b) this may limit the use of heavy machinery.
   (c) this may cause problems in conservation of soil and water.
   (d) this may affect the transportation of harvest produce.
   (e) The fragmented (small and scattered) gardens can be consolidated.

11. (a) Describe **five** factors which should be considered when irrigating crops in the field.
   (b) Discuss any **two** advantages and any **three** disadvantages of overhead irrigation.

12. Different crops and cropping systems are practised in different areas of Malawi.
   (a) Describe any **five** factors that determine the type of crops to be grown in a particular area.
   (b) Explain any **five** advantages of mixed cropping to subsistence farmers.

TEST 9

1. What are sodic soils?
2. (a) Mention **two** examples of indigenous breeds of goats.
   (b) Give **five** examples of exotic goat breeds.
3. Given that in a family there are four adults, five children and one labourer. An adult will require an average of 300 kg of maize per year. A young person (under 18 years) will require 150 kg of maize per year.
   (a) Calculate the maize requirement for this family.
   (b) Calculate the amount of land to be used for the production of maize for this family. (Use figures for hybrid maize.)
4. (a) Define 'puberty' as used in livestock production.
   (b) Describe **four** factors that may affect the rate at which animals reach puberty.
   (c) State any **four** phases of oestrous cycle in cattle.

5. Mention **three** types of farm records.

6. With **two** examples, describe any **two** ways in which agricultural production can be increased at farm level using the following ways:
   (a) Proper combination of farm enterprises.
   (b) Applying the principle of comparative advantage.
   (c) Explain **one** way in which food security is affected by each of the following:
      i. Food processing technology.
      ii. Storage facility of food products.
      iii. Planting early maturing varieties for food.

7. (a) Explain any **three** factors that are required for seed germination.
   (b) List any **four** requirements for crop growth and development.

8. What do the following words mean in agriculture:
   (a) Staking
   (b) Evapotranspiration
   (c) Sheet erosion
   (d) Terracing
   (e) Gully erosion

9. To ensure a successful dairy business, a farmer should feed and breed dairy cattle at an appropriate time and place.
   (a) State **four** signs of heat in a cow.
   (b) Give **two** reasons why dry off period is important in dairy cattle.
   (c) Mention **four** signs that can indicate that a cow is about to give birth (parturition).
   (d) i. Define 'colostrum'.
      ii. Give **three** reasons why it is good that colostrum should be given to newly born calf.
   (e) Explain **two** reasons why feeding may affect reproduction in cattle.

10. Population in Malawi is growing very fast and human population has an influence on the socio-economic development.
   (a) Mention any **four** ways in which Malawi government strives to achieve self-sufficiency in food or food security for the growing population.
   (b) Explain any **two** ways in which expanding international trade can assist in raising the living standards of the Malawian population.
   (c) List any **four** factors that influence population density in Malawi.
   (d) Discuss any **two** effects of population increase on socio-economic development of Malawi as a country.
   (e) Explain **two** ways in which the urban population depends on the rural population.

11. There are a lot of problems in livestock production in Malawi.
   (a) Explain any **five** factors that have led to uneven distribution of livestock in the national herd.
   (b) Describe any **five** limitations of local chickens as compared to exotic breed of chickens.

12. Subsistence farmers require capital to carry out their farming activities and these smallholder farmers can obtain capital through credit.
   (a) Discuss any **five** ways of using capital in order to increase agricultural production.

      Note that capital can be cash or items (dead stock).
   (b) Explain any **five** sources of credit for subsistence farmers.

TEST 10

1. (a) Name **two** hosts for *Striga asiatica.*
   (b) Explain briefly how weeds may
      i. reduce the crop yield quality;
      ii. increase the cost of production of a plant.

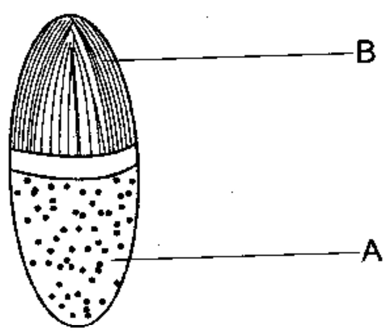
2. List **one** indigenous example of sheep and **three** exotic examples of sheep.

3. Explain how the following husbandry practices may help to control weeds:
   (a) Crop rotation
   (b) Mulching
   (c) Correct fertiliser placement

4. State **three** types of surface irrigation methods or systems.

5. Mention **four** advantages of mulching.

6. The **figure** below is a diagram of a vascular bundle of maize plant. Use it to answer questions that follow.



   (a) Name the parts labelled **A** and **B**.
   (b) Explain **one** function of the part labelled **B**.
   (c) Explain how substances are translocated by parts labelled **A** and **B**.

7. The **table** below shows daily rainfall record in mm of two different areas, namely, Nthalire and Salire.

Day	Time	Nthalire	Salire
1	8 Hours	750	520
	14 Hours	450	250
2	8 Hours	760	500
	14 Hours	440	245
3	8 Hours	780	490
	14 Hours	447	247
4	8 Hours	720	400
	14 Hours	380	230
5	8 Hours	650	350
	14 Hours	410	200

   (a) Calculate the average daily rainfall for Nthalire and Salire.
   (b) Mention any **three** advantages of keeping daily rainfall records.

8. Give **one** word for each of the group of words used in agriculture:
   (a) The type of erosion where soil particles are scattered due to the force of the rain drops.
   (b) Financial assistance given to farmers by government in the form of grants for co-operatives or pegging of the prices of agricultural inputs such as pesticides, fertilisers and improved varieties of planting materials.
   (c) A course of action which is formulated, adopted and pursued by a government of a country to enable it to achieve certain prescribed agricultural goals.
   (d) The ability or capacity of a soil to resist any appreciable change in pH.
   (e) The mass of a given dry soil per unit bulk volume usually expressed in gcm^3.

9. To increase subsistence agricultural development, there is a need to study the modern farming systems of the smallholders.
   (a) i. Define the word 'farming system'.
       ii. State any **three** farming systems practised in Malawi.
   (b) State any **four** ways in which Agricultural Development Division (ADD) helps to raise agricultural production in Malawi, the Warm Heart of Africa.
   (c) List **four** factors that can be used to describe an area as suitable for agricultural production.
   (d) Mention **four** ways of improving the profitability of any farming system.
   (e) Mention any **four** ways in which the productivity of a farming system in a given village would be improved by the group action of the villagers.

10. (a) You are provided with the following information.
    - Mr Kanyamuka had only enough money to buy either CAN or layers marsh.
    - Mr Esau had enough land to grow either pasture or guavas.
    - Mr Kanyamuka decided to buy layers marsh while Mr Esau decided to grow pasture.
        i. State the opportunity cost of Mr Kanyamuka if CAN would have given him the highest profit.
        ii. State the opportunity cost for Mr Esau if pasture had the lowest value.

    (b) State any **two** characteristics of land that would influence choice of crop enterprise.

11. (a) Discuss any **five** ways in which self-sufficiency in food production can be achieved in Malawi.
    (b) Describe any **five** uses of livestock in Malawi apart from being used as food.

12. Stall feeding projects are done in many parts of our country, Malawi.
    (a) Explain any **five** ways in which a stall-feeding project can help to raise the living standard of Malawians.
    (b) Describe any **five** processes or stages that would be involved in a stall feeding project of cattle in Malawi.

TEST 11

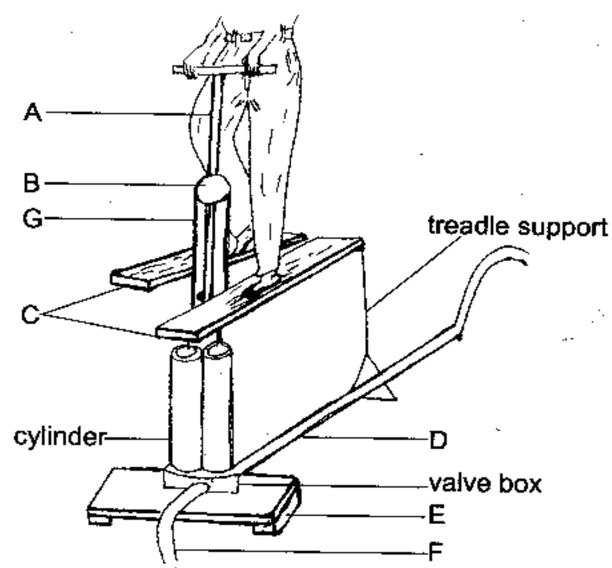
1. (a) What is food security?
   (b) Mention any **four** scientific and technological innovations which could ensure food security in Malawi.

2. (a) Mention any **three** ways in which drought resistant crops can ensure food security for the growing population of Malawi.
   (b) Name any **four** examples of drought resistant varieties of crops found in Malawi.

3. (a) What is statistical design of an experiment?
   (b) Define the following terms:
       i. Replication
       ii. Randomisation
       iii. Local control or control error
   (c) Into what **four** grades can live cattle be sold at a cattle market in Malawi?
   (d) Explain any **two** benefits of dehorning in livestock production in Malawi.

4. (a) Mention any **five** qualities of a good seed for planting.
   (b) Give **five** reasons why pasture is important.

5. The **figure** below is a diagram of a pump that is used in irrigating crops in Malawi by most subsistence farmers.



   (a) Give the name of the pump shown in the figure.
   (b) Name the parts labelled **A, B, C, D, E, F** and **G.**
   (c) List **two** parts that get easily worn out in this type of manual irrigation pump.

6. (a) Name any **three** types of budgets in agriculture.
   (b) Mention **four** sources of finance for a farm business.

(c) Describe **three** conditions that enable farmers to borrow money from banks.

7. (a) Mention **one** main function of nitrogen to crops.
   (b) State **one** main deficiency symptoms of calcium in groundnuts.

8. What is meant by the following terms in agriculture?
   (a) Opportunity cost
   (b) Cation exchange capacity
   (c) Back-cross
   (d) Culling in birds
   (e) Price elasticity of supply

9. The policy of Malawi emphasises the intensification of the production of food crops and the achievement of food security at household level and increase in the production of cash crops for foreign exchange.
   (a) Mention any **three** functions of a named marketing agency that exports and imports agricultural products.
   (b) State any **four** ways that would improve chances of exporting agricultural products in Malawi.
   (c) Explain what is meant by:
      i. Intensification of production;
      ii. Food security at household level.
   (d) Explain **two** ways in which this policy assists the growing urban population.
   (e) Discuss any **two** different patterns or farming systems that have developed due to this policy.

10. Soil status, climate and crop husbandry or agronomic or cultural practices are some of the factors that affect crop production.
   (a) State **four** important ways in which manure helps to increase crop production.
   (b) Give any **four** reasons why high rainfall intensity reduces crop yield.
   (c) Discuss any **two** ways in which soil depth affects crop production.
   (d) Mention **four** harmful effects of insect pests on crop production.
   (e) List any **four** ways in which temperature affects growth and development of crops.

11. (a) Below is a list of crops, choose **one** crop and discuss any **five** ways in which it contributes to improving the living standards of the Malawian population.

    The crops are **tomatoes, beans, groundnuts, maize** and **mangoes.**
   (b) Explain any **five** pieces of advice that would be given to the fruit farmer who wants to produce high yield of mangoes (*Mangifera indica*) from her orchard.

12. (a) Explain any **five** effects of drought in an environment or habitat.
   (b) Discuss **five** recommended cultural or husbandry practices of groundnuts.

TEST 12

1. (a) State 'hybridisation'.
   (b) Explain the importance of the following steps during hybridisation.
      i. Choosing parents
      ii. Self-pollinating the parental lines
      iii. Cross-pollinating the pure lines.

2. State **five** factors to be considered when selecting the method or system of irrigation.

3. State any **four** advantages of mulching in vegetable crops.

4. (a) Mention any **three** qualities (characteristics) of a good experiment.
   (b) What do the following terms mean in agriculture?
      i. Branding
      ii. Disbudding
      iii. Castration
      iv. Dehorning
      v. Debeaking

(c) What are the **three** groups of ticks that attack cattle?

(d) Mention any **four** species of ticks that attack animals in livestock production and for each, name **one** disease it transmits.

5. (a) Describe the **three** types of agricultural credits common in Malawi.

   (b) Give **two** examples that can be bought or obtained through the types of credits described in (a) above.

6. Margaret Magwedeza grows 4 ha of groundnuts with an average yield of 900 kg/ha. Price for groundnuts is K50.00 per kg for entire nuts but only K20.00 per kg for damaged nuts.

   She usually spends K7,000.00 on casual labour to shell her nut by hand and is considering buying for K9,000.00 a mechanical sheller that should last for five years. This farmer could get a loan for this purchase over three years at 5% interest a year and average interest rate is 10%.

   The Sheller would produce 35% damaged nuts instead of none that she now gets with hand labour (from hand shelling).

   Should she buy a sheller?

7. List **five** types of experimental designs.

8. What do the following words mean in agriculture?

   (a) Cation exchange

   (b) Photoperiod

   (c) Closed season

   (d) Companion crop or nurse crop

   (e) Double cross

9. The genetic make up, age and the environment affect the productivity of local breeds of pigs.

   (a) State any **four** characteristics of an ideal meat-type pig.

   (b) Explain any **two** disadvantages of local breeds of pigs.

   (c) Explain any **two** ways in which the local breeds of pigs can be improved through breeding.

   (d) Explain any **two** management principles that a subsistence farmer would consider apart from breeding in order to increase the production from the local breeds of pigs.

   (e) State any **four** agricultural services done by the Ministry of Agriculture and other organisations and firms that aim at improving livestock production in Malawi.

10. (a) Name **four** main factors of production in farming business.

    (b) Mention any **four** other limiting factors of production in farming business apart from the main four named in (a) above.

    (c) In what **four** ways do labour affect agricultural production?

    (d) i. What is the difference between factor market and product market?

    ii. Mention any **two** units in which labour can be expressed or measured.

    (e) Mention **four** main ways of allocating and paying labour.

11. (a) Explain how rapid population growth contributes to drought and to the depletion of water resources.

    (b) Explain the **five** ways in which water conserved on the farm may be used.

12. Proper feeding is one of the major requirements in livestock management in agriculture.

    (a) Explain any **five** factors that can make livestock requirements for feed to be greater than their normal feed intake.

    (b) With the aid of a well-labelled diagram, describe **five** processes involved in the digestion of roughages in a ruminant between mouth and the small intestines.

TEST 13

1. (a) What is irrigation?
   (b) Describe the **two** main types of irrigation.
   (c) Explain any **four** main water application methods or systems of irrigation.

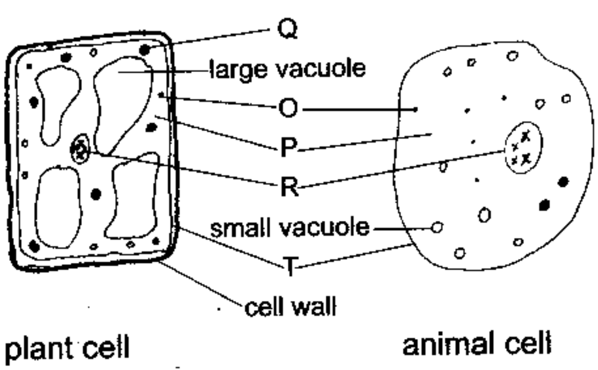
2. What are **four** functions of population and agricultural policies in the development of a country?

3. (a) What is an agro-based industry?
   (b) Mention any **four** roles of agro-based industries in supporting the growing population of Malawi.

4. (a) What is soil erosion?
   (b) Mention **four** types of soil erosion.
   (c) List **four** causes of soil erosion in agriculture.
   (d) What are the **two** agents of soil erosion?
   (e) What is conservation?
   (f) Name **two** main methods of soil conservation and give **two** examples for each method.
   (g) Mention **four** ways of conserving forests in Malawi.

(5) Crop growth and development can be affected by both abiotic (physical or non-living) and biotic (living things) factors.
   (a) What are the **two** abiotic factors that affect crop growth and development and give **four** examples for each?
   (b) In what **two** ways do biotic factors affect crop growth and development?

6.



   (a) Name the parts labelled **O**, **P**, **Q**, **R** and **T**.
   (b) State any **two** structural differences that you can see from the two cells above.
   (c) Mention one function of the parts labelled **Q** and **O**.

7 (a) Mention any **four** water lifting devices that can be used in irrigation.
   (b) What is the meaning of intensity of irrigation?
   (c) Give **two** examples of pumps that smallholder farmers can use as sources of energy in their irrigation operations.

8. What do the following words mean in agriculture?
   (a) Mass selection
   (b) Forage crop
   (c) Pure line
   (d) Selfing
   (e) Variety

9. (a) State any **four** advantages of chemical control on pest of crops and animals.
   (b) State any **four** disadvantages of using chemical control on the pest of crops and animals.
   (c) Mention any **four** effects (implications) of low cation exchange capacity of the soil.
   (d) Explain how pesticides kill pests through the following mode of action:
      i. Contact poison
      ii. Respiratory poison
      iii. Systemic poison
   (e) Mention any **four** common herbicide formulations.

10. Describe any **two** differences between goats and pigs in terms of:
   (a) Their digestive systems.
   (b) Utilisation of feed high in fibre content.
   (c) Competition with human beings for food.
   (d) Management requirements.
   (e) Economic returns to the farmer.

11. (a) Discuss **five** reasons why vegetables are important.
    (b) Vegetables have been grown under irrigation for several years. Describe any **five** advantages or uses of irrigation apart from providing moisture for the crops.

12. Recommendations regarding farming techniques are obtained using findings from agricultural experiments.
    (a) Discuss any **five** ways in which agricultural experimentation are important in improving crop farming techniques.
    (b) Describe any **five** ways in which agricultural experimentation are important in improving livestock production techniques.

TEST 14

1. (a) What is farm business management?
   (b) List **five** main concepts of farm business management.
   (c) Define the following terms as used in agriculture:
      i. Farm budgeting
      ii. Financing
      iii. Production

2. Mention any **four** examples of agricultural experiments that can be performed in schools or research stations.

3. (a) A farmer observed the following signs of disease attack in cattle.
   - Swollen feet
   - Difficult in walking
      i. Name the diseases the cattle were suffering from.
      ii. State any **one** way of controlling the disease.

4. Name **three** factors that should be considered when designing an experiment.

5. Decision making should be done by both men and women in society for agriculture to improve in Malawi. Give **four** reasons why this is important.

6. List **four** factors that prevent women's contribution to agriculture development in Malawi.

7. Mention any **three** methods of crop improvement in agriculture.

8 What do the following words mean in agriculture?
   (a) Cultural control
   (b) Nitrification
   (c) Herbicide
   (d) Clone
   (e) Dormancy

9. (a) State any **two** ways in which agricultural experimentation can help to improve agricultural production.
   (b) Explain any **one** role of each of the following principles in agricultural experimentation:
      i. Replication of experiments
      ii. Use of a control
   (a) Why would you consider each of the following when writing a report on an experiment?
      i. Adopting a scientific attitude
      ii. Expressing facts accurately
      iii. Using graphic aids

10. Crop production and distribution is also influenced by climatic factors such as temperature and rainfall.
    (a) Describe **two** ways in which high rainfall intensity can affect soil pH.
    (b) Explain any **two** characteristics of rainfall that influence the crop to be grown in a particular area.
    (c) Explain how the following contribute to salinity:
       i. Low rainfall and evaporation
       ii. Poor drainage
    (d) Explain **two** signs of wilting in crops
    (e) Discuss any **two** functions of water to crops.

11. (a) Explain any **five** reasons why it is necessary to have enough farm buildings and storage facilities at a farm or an estate.
    (b) Discus **five** ways in which a commercial farmer can keep farm buildings and storage facilities (farm structures) in order to serve their intended purpose.

12. Discuss the **three** advantages and **two** disadvantages of each of the following methods of controlling pests and diseases in crop and livestock production:
    (a) Chemical control
    (b) Biological control

TEST 15

1. (a) What do you understand by 'the scientific approach to experimentation'?
   (b) What does evaluation of results in a 'fertiliser trial' on maize involve?
   (c) Explain any **one** way in which a 'fertiliser trial' on maize would contribute to food security.

2. Explain **one** way in which each of the following management practices can improve goat production.
   (a) Keeping goats in a warm house.
   (b) Providing protein concentrates to goats.
   (c) Selecting appropriate breed of goat

3. Explain any **one** way in which each of the following technologies would ensure high food production.
   (a) Crop diversification
   (b) Use of herbicides
   (c) Application of fertiliser

4. Mrs Chirwa planted maize on one hectare of land. Ridges were made 80 cm apart and planted 3 seeds per planting station spaced 75 cm apart. The number of seeds (seed size) were 9 000 seeds per kg, purity was 40% and germination percentage was 60.
   (a) Calculate the plant population of this maize variety.
   (b) Calculate the seed rate of this maize variety.

5. (a) What are **three** disadvantages of biological control of weeds?
   (b) Herbicides can be classified in many ways or groups. Describe any **three** categories into which herbicides can be classified.
      i. Based on use
      ii. Based on mode of action
      iii. Based on time of application.

6. (a) Mention **two** main types of fertilisers.
   (b) Discuss **two** main groups of inorganic fertilisers applied to crops in Malawi.
   (c) Give **two** examples of high analysis fertilisers.
   (d) List **four** examples of low analysis fertilisers commonly found in Malawi.
   (e) With **one** example, give the difference between straight fertilisers and compound fertilisers.
   (f) Name the elements found on 23:21:0+4S+Zn
   (g) What does 0 mean on 23:21:0 +4S +Zn?
   (h) Name one minor element found in 23:21:0+4S+Zn

7. Explain **one** way in which the productivity of a farm would be improved by applying the principle of comparative advantage.

8. What do the following terms mean in agriculture:
   (a) Mixed farming
   (b) Grading up
   (c) Oestrus cycle
   (d) Capital
   (e) Leaching

9. Agricultural experiments are absolutely necessary because they assist us to find better ways of growing crops in order to obtain high yields.

(a) Describe any **two** methods that can be used to collect data or information in field experiments.

(b) Mention **four** characteristics of a Latin Square Design (LSD) in experiments .

(c) Mention any **four** characteristics of Randomised Complete Block Design (RCBD).

(d) i. State **three** factors should be considered when designing an agricultural experiment.

ii. What is another name for Latin Square Design?

(e) List **four** points that should be included in any good written report on an agricultural experiment.

10. In spite of soil being important resource for agricultural production, a lot of it is lost through water or wind erosion.

(a) List any **four** poor farming methods that can lead to soil erosion.

(b) Mention any **four** ways in which wind erosion can be controlled.

(c) Explain any **two** effects of splash erosion.

(d) List **four** factors that should be considered when designing and making a water way.

(e) Describe any **two** effects of gully erosion in Malawi.

11. (a) Describe any **five** ways in which agriculture influences industrial development in Malawi as a nation.

(b) Explain any **five** facilities which can provided by the Ministry of Agriculture, to help reduce the movement of people from rural to urban areas.

12. The Zebu cattle found in Malawi has its potential and limitations.

(a) Explain any **five** characteristics that make the Malawian Zebu best suited to Malawian conditions.

(b) Describe any **five** characteristics that a farmer would look for when selecting the Zebu cow and bull for breeding purposes.

TEST 16

1. (a) Name any **two** textural classes of soil.

(b) Classify molybdenum, sulphur, boron and iron into 'macro' and 'micro' plant nutrients.

(c) Explain any **three** conditions which must be satisfied for a plant nutrient to be essential.

2. (a) Explain any **two** problems faced by local breeds of cattle when allowed to mate with improved breeds of cattle.

(b) Name **two** diseases which attack female animals only.

3. (a) A farmer observed the following deficiency signs in maize:

- Chlorosis (starts at the leaf tips of cover leaves and spread along midrib).
- Stunted growth.

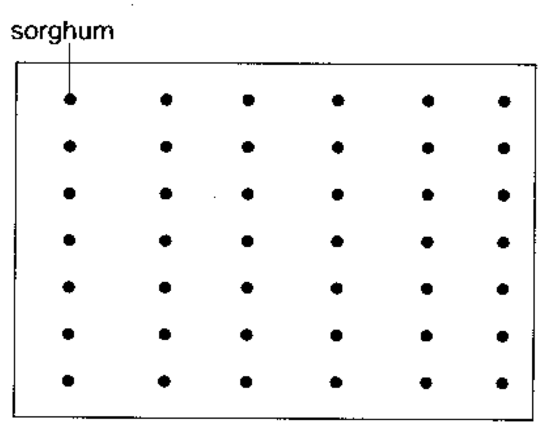
i. Name the nutrient which is lacking in the soil.

ii. Name the chemical fertiliser that can be applied to the maize plant in order to correct this problem.

iii. State the percentage of nitrogen in the fertiliser mentioned in (ii).

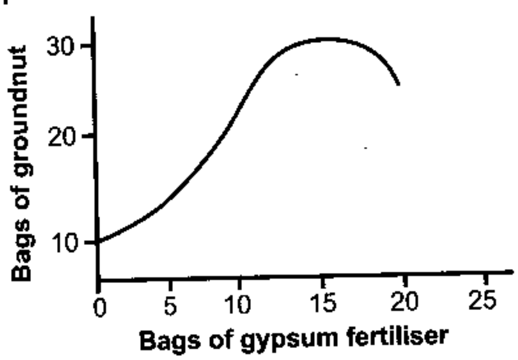
4. Too much water in the soil may be dangerous to some crops. State **two** ways in which this will affect the soil physically and **two** ways in which it will affect the soil chemically.

5. **Figure** below shows one of the experimental plots to find out the effect of irrigation on the yield of sorghum. Use it to answer the questions that follow.



i. Indicate on the figure by ticking all sorghum plants that would be recommended for observation.
ii. Give **one** reason for the recommendation in (i).
iii. Explain the need of identifying a sample of sorghum plants for observation from the recommendation made in (i).
iv. Assuming the experiment was successful, explain **one** way in which such an experiment would ensure sufficient food production.

6. Study the **figure** below and answer the questions that follow.



(a) What was the response of groundnut when no gypsum was applied?
(b) How many bags of gypsum fertiliser should be applied to get maximum yield of groundnut?
(c) What name is given to the law illustrated in the figure above?
(d) Explain briefly how this law can be used to increase groundnut yield per hectare.

7. (a) Define energy.
(b) Give reasons why solar energy is the main sorce of energy on the farm.
(c) List down any **two** safety measures to be observed when using farm energy.

8. What do the following words mean in agriculture?
(a) Complementary enterprises
(b) Conformation
(c) Maintenance ration
(d) Steaming up
(e) Transhumance

9. Agricultural experiments both in theory and practical are important because they help us find better ways of growing crops in order to get high yields.
(a) Write any **four** steps that should be followed when carrying a scientific investigation.
(b) Mention any **four** ways of randomising treatments in a field.
(c) Name **four** types of experiments or trials that can be done in maize.
(d) List **four** points that should be included in a report for an agricultural experiment.
(e) Write any **four** guidelines for writing a report on agriculture experiments.

10. Explain **five** steps to be followed when preparing sweet potatoes for storage.

11. Farmers in a cèrtain village have the following resources at their disposal:
- Small farm holdings with clay soil
- Abig river with lots of water
- Poultry
- Vegetables

Explain how the farmers can use the available resources to maximise production.

12. (a) Discuss **five** methods of controlling pests in agriculture.
(b) Explain **five** advantages of slow-release fertilisers in agriculture, e.g. Urea.

TEST 17

1. (a) What is a parasite?
(b) Mention **one** internal (endoparasite) and external (exoparasite) parasite of pig.
(c) State any **two** methods of controlling/preventing either the internal or the external mentioned in (b) above.

2. **Table** below shows results of an agricultural experiment in four varieties of tomatoes each grown on a 20 square metre plot. Use it to answer questions that follow:

Variety	Yield (kg/20m^2)
W	32
X	26
Y	40
Z	38

   (a) Which variety produced the highest yield?
   (b) What is the range of the yield?
   (c) Calculate the yield in kilogrammes per hectare for variety **Z**.

3. Mention **four** methods of livestock identification in animal production.

4. A plough costs K30,000.00 and the depreciation provision is 15% per annum.

   Using the reducing balance method, calculate the depreciation value of the plough for the first 4 years.

5. (a) Agricultural marketing problems can be categorised into three different types. What are these **three** categories?
   (b) Explain any **three** marketing problems that follow under the problems from characteristics of agricultural products.
   (c) What are **five** marketing problems under problems from characteristics of production?
   (d) What are **five** marketing problems under problems from farm marketing process?

6. Mention **three** factors that limit women farmers from producing a lot of food in Malawi.

7. What any **four** improvement measures should be put in place so that women farmers should assist in increasing agricultural production in Malawi and at family level?

8. Give **one** word for each of the following group of words used in agriculture:
   (a) The period when a female animal is ready to mate.
   (b) Genetic constitution of an inherited trait of an organism.
   (c) The appearance of the inherited trait of an organism.
   (d) A disease that is transmissible between animals and people.
   (e) A useful product of which the consumer would rather have more than less.

9. A maize plant shows scorched margins on the leaf.
   (a) State the nutrient lacking.
   (b) Explain **one** way of correcting the defficiency sign.
   (c) One of the diseases of maize is headmunt caused by fungus (*Ustilago maydis* or *Ustiligo zea*).
      i. Describe the main sign of this disease.
      ii. Explain how 'the planting of clean seed' can help to control the disease.

10. Smallholder farmers in Malawi are advised to include legumes in grass pastures, and correctly managing the pasture in order to increase livestock production.
   (a) Describe any **two** effects of overgrazing on pasture and animal production.
   (b) Mention any **four** methods that are used to conserve cattle feed for the dry season.
   (c) Mention **four** reasons why high animal production is obtained from a pasture that is composed of grass and legume species to make a mixed sward.
   (d) Give any **two** reasons why farmers sometimes use controlled burning in the management of pasture.
   (e) State any **four** grazing methods used in pasture management.

11. (a) Discuss any **five** factors that affect soil formation.

(b) Explain any **five** advantages of mixed cropping in agriculture.

12. (a) For any cereal crop or maize crop, explain any **five** environmental requirements that would lead to high cereal crop or maize crop yield.

(b) Explain any **five** cultural or husbandry or agronomic practices that would contribute to high production of the maize crop.

TEST 18

1 (a) What is livestock management?

(b) State **four** main livestock activities.

2 (a) Explain the difference between maintenance and production ration.

3. Marketing function follow under the function approach. Name the **three** groups of marketing functions and **two** examples for each.

4. (a) State **one** way in which resources are used in each of the following agricultural activities:

i. Marketing

ii. Trading

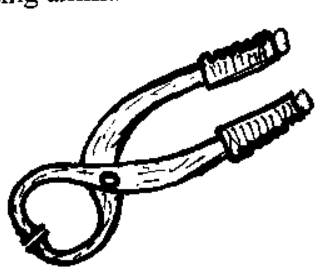
(b) Explain the relationship between the marketing margin and the markets costs.

5. State any **three** ways in which mulching helps crop growth.

6. (a) Define the term 'clone'.

(b) Which among the following crops are propagated using clones: sugarcane, rice, paprika, cassava and mangoes?

7. The **figure** below is a tool which is used for castrating animals.



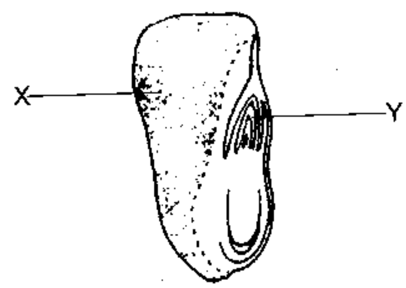
(a) Name the tool shown in the diagram.

(b) Explain how the tool is used when castrating animals.

(c) Apart from using this, describe **two** other ways in which animals can be castrated.

8. (a) Define 'a seed'.

(b) **Figure** below is a diagram of a **longitudinal** section of a maize grain.



i. Name the parts lebelled **X** and **Y**.

ii. State **one** function of each part mention in (i) above:

(c) Explain each of the following advantages of vegetative propagation.

i. Ensuring genetic uniformity.

ii. Ensuring early mating of plants.

9. Mr Kanyamuka had the following assets at the begining of September, 2010.

- 10 hectares of land valued at K50,000.00
- 100 bags of maize valued at K500,000.00
- 200 broilers valued at K100,000.00
- 20 goats valued at K60,000.00
- 20 bags of feed at K60,000

Prepare an inventory record for the farmer.

10. (a) Explain any **two** ways in which pastures help to prevent soil erosion.

(b) Explain any **two** advantages of 'improved pasture' over 'natural pasture'.

(c) Explain any **two** advantages of broadcasting as a method of sowing pasture.

(d) Describe the following criteria when selecting improved grasses and regumes:

i. Compatibility with desired species
ii. Proposed method of utilisation of pasture.

(e) Explain any **two** ways in which hay can be useful on a farm.

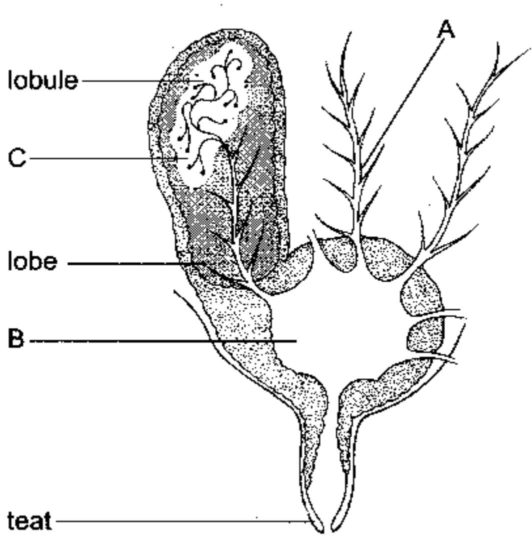
11. (a) Explain any **five** things that the government can do in order that the food is distributed equally to all parts of the country to ensure food security.
(b) Explain **five** ways in which proper food distribution can ensure food security for the growing population.

12. (a) Explain any **five** ways in which HIV and AIDS affects agricultural development in Malawi.
(b) Discuss any **five** ways in which self-sufficiency in food production can be achieved in Malawi.

TEST 19

1. (a) Define 'cooperatives'.
(b) List down any **two** principles for the function of cooperatives.
(c) Explain any **two** factors that make cooperatives succeed.

2. The **figure** below is a diagram of a mammary gland of a cow.



(a) Name the parts labelled **A, B** and **C**.
(b) List **two** functions of the part labelled **C**.
(c) Name **two** hormones that control milk let-down.
(d) What is the function of the following reproductive hormones?
i. Relaxin
ii. Oestrogen

3. (a) Explain the meaning of the term 'heat'.
(b) State the signs of heat in cow.

4. (a) Mention **two** ways by which unreliable rainfall may affect crop growth in the field.
(b) Discuss any **two** ways in which a subsistence farmer can reduce the effects of unreliable rainfall on crop growth and development.

5. (a) Name the land tenure system that can promote farming in your area.
(b) Mention any **two** reasons why the land tenure system given in (a) above can promote farming in Malawi.
(c) Describe any **one** advantage of the system mentioned in (a) above.

6. (a) List down any **three** characteristics of beef cattle.
(b) Explain the advantages of the intensive system of managing beef animals.

7. An equipment or machinery bought today may cost a lot of money if bought in future and when estimating the present value of a commodity it is important to consider depreciation.

Calculate depreciation value per annum using a straight-line method of a ridger costing K40,000.00. It has an expected life of 10 years and has an estimated salvage or scrape value of K5,000.00.

8. Give **one** word for each of the following group of words as used in agriculture:
(a) Substitutes
(b) Appropriate technology
(c) Depreciation

(d) Dioecious
(e) Germination

9. Farm business management is essential for any kind of farm business. Records, cooperatives, farm budgets and enterprise combination should all be considered when studying farm business management.
   (a) Mention any **four** reasons for keeping farm records.
   (b) i. What are **three** main types of farm records?
       ii. Into what **two** broad types can the three main types of records mentioned above be grouped?
   (c) What **four** types of records can follow under physical records?
   (d) Mention **four** factors that should be considered when selecting enterprises or deciding on enterprise combinations.
   (e) State **four** factors that can affect the success of agricultural cooperatives.

10. The genetic make up, age and the environment affect the productivity of local breeds of sheep.
   (a) State any **four** ways of preventing/controlling mastitis disease in sheep.
   (b) Mention any **four** disadvantages of local breeds of sheep.
   (c) Describe any **two** ways in which the local breeds of sheep can be improved through breeding.
   (d) Discuss any **two** management principles that a subsistence farmer would consider apart from proper feeding in order to increase the production from the local breeds of sheep.
   (e) Mention any **four** characteristics of a good mutton sheep.

11. (a) Discuss any **five** harmful effects of weed in agriculture.
   (b) Explain any **five** methods of controlling weeds in agriculture.

12. (a) Agricultural marketing makes it possible for farmers to sell their produce. Explain any **five** reasons why agricultural marketing is important in agriculture.
   (b) Agriculture is a very risky business, for the farmer is uncertain about the outcome of his or her produce.
   Discuss any **five** ways in which the farmer can adjust the uncertainty of the outcome of the produce from his or her enterprises.

TEST 20

1. (a) State **one** advantage of colostrum to calves.
   (b) Explain **one** way in which each of the following factors would affect milk yield:
       i. Age of the animal
       ii. Milking technique

2. Describe any **three** effects of population distribution to the marketing of agricultural products.

3. (a) State any **two** ways in which population policies in Malawi promote agricultural development.
   (b) Explain **two** ways in wich equitable land distribution is important in Malawi.

4. (a) Explain any **one** effect of stalk borer (*Baseola fusca*) on maize crop.
   (b) Describe **one** way in which closed season would be used to control pests of crops in Malawi.

5. Mention any **four** sources of power that can be used in farming.

6. What do the following words mean in agriculture?
   (i) Dystokia
   (ii) Breeding

7. Explain any **three** differences between marketing and trading.

8. What do the following words mean in agriculture?
   (a) Hay

(b) Heterosis
(c) Land fragmentation
(d) Overstocking
(e) Pure line

9. Explain how the following agricultural technologies ensure food security.
   (a) Plant and Livestock breeding
   (b) Irrigation technology
   (c) Crop practising and packaging
   (d) Soil conservation and drainage
   (e) Mechanisation

10. Trading in agricultural commodities is very important at community level, national level as well as at international level.
    (a) Mention any **four** ways of improving trading of agricultural goods at community level.
    (b) State any **four** reasons why trading of agricultural commodities at national level is important.
    (c) Mention **four** reasons why trading in agricultural commodities at international level is important.
    (d) State any **four** ways of improving availability of agricultural commodities at national level.
    (e) Mention any **four** ways by which trading at international level can be improved.

11. Soil fertility can be defined as the ability of the soil to produce and sustain high crop yields continuously, and this can be achieved if the soil can meet the nutritional requirements of the crop plants being grown.
    (a) Discuss **five** factors that can make the soil meet the nutritional requirement of a particular crop.
    (b) Discuss **five** ways by which fertility may be lost in the soil.

12. (a) Describe any **five** types of soil structure.
    (b) Explain any **five** characteristics of soil that make it suitable for crop production.

TEST 21

1 (a) What is a farming system?
  (b) What are the **two** main farming systems?

2. (a) Explain the difference between:
      i. Crop rotation and land rotation
      ii. Relay cropping and inter-row mixed cropping
   (b) Owing to scarcity of land for farming, a farmer decided to plant maize and groundnuts on the same piece of land in the same row.
      i. What type of cropping system was this farmer practising?
      ii. State any **two** advantages of this cropping system.

3. Below is an example of type of animal breeding method.

   Father X Daughter
   ↓
   Progeny

   (a) What name is given to this type of breeding in animal production?
   (b) Describe any **one** advantage and **one** disadvantage of the type of breeding using father and daughter.
   (c) What would you call the type of breeding where the second cousins mate to produce the offspring?

4. The **table** below shows the methods of controlling pests and diseases represented by letters A, B and C with the example of activities which are done under each method. Study it and answer questions that follow.

Method of control	Activity
A	Quarantine
B	Removing the volunteer plants
C	Chilling and heating

(a) Name the method of controlling pests and diseases represented by A and C.

(b) Explain how the activity under method B helps to control pests and diseases.

(c) Write **one** advantage and **one** disadvantage of method A.

5. Explain any **one** way in which each of the following affects agricultural production:
   (a) Balanced ration
   (b) Thinning of crops

6. Desribe the following processes of the oestrus cycle in a cow.
   (a) Proestrus
   (b) Metoestrus

7. Define the following terms as used in agriculture:
   (a) Forage (fodder)
   (b) An additive
   (c) Soil degradation
   (d) Pasture
   (e) Technology

8. Mention **four** factors that can lead to formation of deserts and loss of value of land in farming areas.

9. Natural resources are all things that are provided by nature and water is one of the basic natural resources in any given environment.
   (a) Discuss **two** main methods of irrigating crops in Malawi.
   (b) State any **four** ways in which plants depend on water.
   (c) Mention **four** ways in which excessive water affects the growth and development of crops.
   (d) Mention the stage of growth when cereal crops require the greatest amount of water and why.
   (e) Explain **two** ways of draining excess water from a farm.

10. The genetic make-up, age and the environment affect the productivity of local breeds of cattle.
    (a) Describe any **two** disadvantages of extensive system of keeping cattle.
    (b) Mention any **four** exotic dairy breeds of cattle.
    (c) Describe any **two** ways in which the local breeds of cattle can be improved through breeding.
    (d) Mention **four** ways of controlling/preventing a protozoan disease called Red water.
    (e) Mention any **four** factors that affect the rate at which animals attain puberty stage.

11. Students at Nkhamenya Girls Secondary School visited a poorly cultivated farm on a moderately steep slope. The farm had a poor cereal crop. After coming from this farm they went into their classroom to discuss what they had observed.

    The girls without problems described symptoms of nitrogen deficiency, stalk borer attack and smut but it took the teacher of agriculture's explanation for the students to differentiate a pest from a disease, and to understand that diseases of crops could be grouped into deficiency, physiological and parasitic.
    (a) Explain any **five** factors that were covered in this discussion.
    (b) Explain **two** ways in which soil erosion could have been reduced and **one** way in which any two of three groups of diseases and the pest attack in this farm could have been reduced.

12. Select an improved grass pasture crop recommended for grazing livestock that can be established in Malawi and describe:
    (a) any **five** ways in which you would establish it to produce the highest yield.

(b) any **five** points about a grazing system you would use to avoid the deterioration of the grass land.

TEST 22

1. What is culling?
2. Describe any **two** problems that can arise as a result of land fragmentation in farming business.
3. A form four class intends to carry out an experiment to find the appropriate rate of Muriate of Potash on tomato production. The class teacher advised them to use the following information.

A.

Treatment	**Rate of Muriate of Potash**
1	0 kg
2	40 kg
3	50 kg
4	120 kg
5	160 kg

B. Random number table

3	1	8	5	9	4	2	6	7

(a) Using the random number table, design the experiment in three blocks.

(b) Explain any **two** ways in which the results from this experiment could have been analysed.

4. (a) Mention any **three** types of vegetative propagation.

(b) Define grafting and budding as used in citrus fruit production.

5. (a) Explain **one** major feature of labour that is not found in other three major factors of production in agriculture.

(b) Many subsistence farmers in Malawi have problems in allocating the limited agricultural resources. List any **four** ways that farmers can use to reduce these problems.

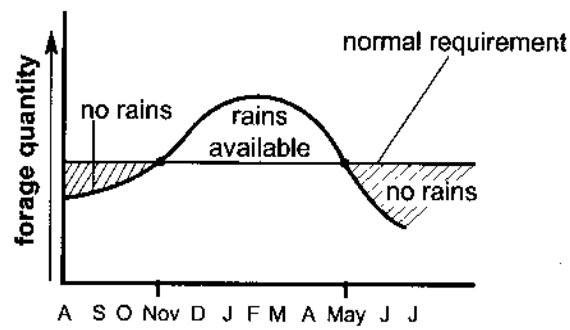
6 (a) What are the causes of coccidiosis and pneumonia in rabbits?

(b) Explain the difference between crop processing and storage.

(c) State **one** way of processing each of the following crops and fruits:

i. Cassava
ii. Mangoes
iii. Sweet potatoes
iv. Maize
v. groundnuts

7. Below is a **figure** that shows the productivity of grass for feeding animals over several months in a year. Study it and answer the questions that follow:



(a) Explain **one** way of utilising grass between November and May.

(b) Explain **one** way of utilising grass between May and November.

(c) What is the difference between exotic pastures and local or indigenous pastures?

8. Malawi has a wide range of climatic conditions and soil types which enable a variety of fruits to be grown.

(a) Explain any **three** socio-economic importance of fruit production.

(b) Explain any **three** qualities you would look for in mango varieties for production.

(c) Mention **two** diseases of mangoes and for each one, describe **one** symptom.

(d) Briefly explain **five** husbandry practices that are carried out in an orchard.

9. For successful farming, the right knowledge of crops and livestock production practice is essential.
   (a) Mention **four** methods of maintaining soil fertility (improving soil fertility).
   (b) Explain how soil colour may affect crop production.
   (c) Discuss **two** important characteristics of soil as a medium for crop production.
   (d) Explain **two** factors that determine the planting depth of seeds.
   (e) State any **four** factors that determine the spacing and plant population of crops.

10. The basis for all agriculture in Malawi is soil.
    (a) Explain **one** physical process and **one** chemical process of soil genesis (formation).
    (b) Explain with examples how topography and parent material would influence type of soil formed.
    (c) Describe any **two** methods that you would use to determine the amount of humus and sand in a particular soil.
    (d) State any **four** factors that affect the rate of soil erosion.
    (e) Distinguish between physical and biological soil conservation measures and give examples for each.

11. (a) Explain any **five** cultural or agronomic practices that are needed in mango growing.
    (b) Discuss **five** environmental requirements of mangoes.

12. (a) Explain **five** ways how soil structure can be improved.
    (b) Describe any **five** characteristics that can make land suitable for the production of crops.

TEST 23

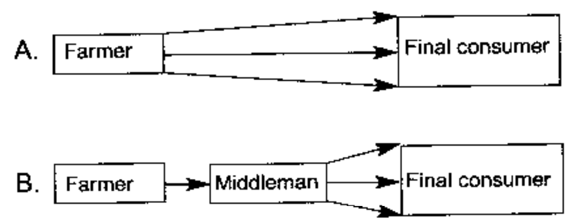
1. Define the term 'gender' as used in agriculture.

2. (a) Mention any **three** factors that influence soil pH.
   (b) Describe **one** way in which soil acidity reduces crop yield.

3. What **three** things happen in most households during shortage of food in the months of January and February in Malawi?

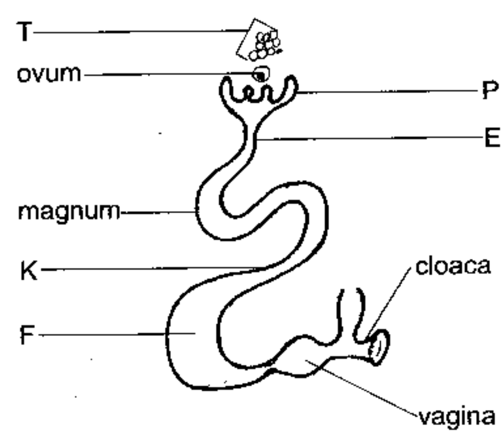
4. (a) List any **four** factors that have to be considered when deciding to mechanise a farm.
   (b) State any **two** disadvantages of mechanising a farm.

5. The **diagrams** below show types of marketing channels. Study them and answer questions that follow.



   (a) Name the type of a marketing channel represented by **B**.
   (b) Explain **one** advantage and **one** disadvantage of **A** to
      i. the farmer
      ii. the final consumer

6. The **figure** below shows a diagram of the oviduct of female chicken.



(a) Name the parts labelled **T**, **F** and **P**.

(b) What is the function of each of the parts labelled **E** and **K**?

7. (a) What does each of the following soil column indicate in terms of composition of the parent material?
    i. Grayish colour
    ii. Reddish colour

   (b) Explain how soil colour affects soil temperature.

8. What do you understand by the following agricultural words?
   (a) Hybridisation
   (b) Land degradation
   (c) Marginal land
   (d) Out breeding
   (e) Out crossing

9. Form four students conducted an agricultural experiment to find out the effect of different rates of fertilisers on maize yield.
   (a) What was the variable in this experiment?
   (b) What was the control of this experiment?
   (c) Explain any **one** observation that could have been recorded during this experiment.

10. (a) List **four** factors that can lead to deforestation in Malawi.
    (b) Mention **four** effects of deforestation.
    (c) What are **four** harmful effects of overgrazing and overstocking on the environment?
    (d) Give **four** reasons why it is important to avoid overgrazing and overstocking in Malawi.
    (e) State any **four** signs of soil erosion.

11. (a) Explain **five** crop cultural (husbandry or agronomic) practices that can be used to control pests and diseases on Malawian farms.
    (b) Explain any **five** reasons why crop production is important in Malawi.

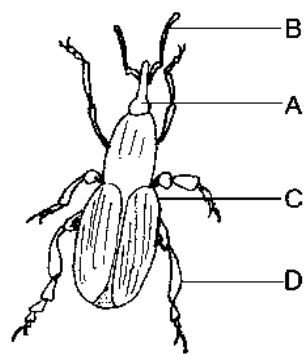
12. Mrs Thole has the following resources at her disposal
    - Large arable land
    - Crop: maize, millet, groundnuts and beans

    If the farm has a lot of *Striga asiatica* (witch weed) and the amount of nitrogen in the soil is low, describe how a suitable cropping system can be established to sorve these problems.

TEST 24

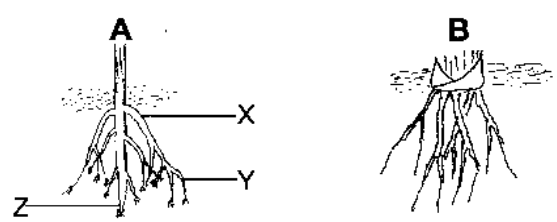
1. (a) What is deforestation?
   (b) What is overstocking?
   (c) What is overgrazing?

2. The **figure** below is a diagram of a maize weevil (stophillus zeamais).



   (a) Name the parts labelled **A**, **B**, **C** and **D**.
   (b) Explain any **one** type of damage that results from this storage pest on the maize seed.
   (c) Mention any **two** cultural ways of controlling maize weevil.
   (d) Name any **one** chemical method of controlling maize weevil.

3.



   (a) Identify these root systems

(b) Name the parts labelled **X, Y,** and **Z.**

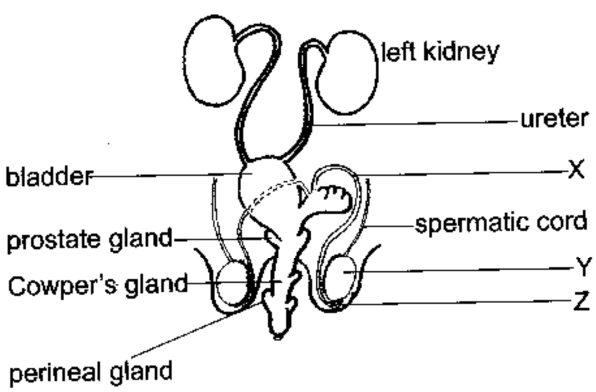
(c) Which root system would you prefer if you wanted to do the following? (Remember to give a reason for your answer.)

i. Conserve soil.
ii. Recover leached soil nutrients.
iii. Make full use of nutrients in the top soil.
iv. Raise seedlings for transplanting.

(d) Which root system would require:

i. light, but frequent irrigation?
ii. heavy, but periodic irrigation?

4. The **diagram** below shows the reproductive system of a male rabbit.



(a) Name the parts labelled **X, Y** and **Z.**

(b) Give **one** important function of the parts labelled **Y** and **Z.**

5. (a) State any **two** examples of gender biases on agricultural technology.

(b) Describe any **two** implications of gender biased application of agricultural technology.

6. List any **four** ways of maintaining a ridger.

7. State **three** advantages and **one** disadvantage of zero grazing in animal production.

8. What do the following words mean in agriculture?

(a) Haploid
(b) Diploid
(c) By product
(d) Let down of milk
(e) Inbreeding

9. Hybrid varieties of maize are bred for high yield, and if well managed, they can be the most profitable of the maize varieties grown in Africa.

(a) Mention **four** processes involved in breeding hybrid maize.

(b) Describe **two** ways in which hybrid maize could be planted and managed to give the highest possible yield.

(c) Mention any **two** potential losses that could occur while the hybrid maize is in storage and how these two losses could be reduced.

(d) State **two** handling and **two** marketing procedures for hybrid maize that take place from producers to the final users.

(e) Mention **four** signs of maturity in hybrid maize.

10. Below is a **table** that indicates Tobacco calendar sourced from 'Guide to agricultural production' by MOA and Food Security, 1994. Use it to answer questions that follow:

Operation	**Southern Region**	**Central Region**	**Northern Region**
Earliest date allowed for sowing	1st July	22nd July	7th August
Earliest date allowed for transplanting	1st October	1st October	21st October
Date for uprooting or destroying remaining seedlings from nursery	31st December	31st December	31st December
Date by which all tobacco stalks or regrowths shouldbe uprooted and destroyed	1st May	15th May	30th May

(a) What is the closed season for
  i. tobacco nurseries in the Northern Region?
  ii. field tobacco in the Central Region?
(b) Explain why farmers should practise closed season.
(c) Explain why closed season differs from one Region to another.
(d) Apart from tobacco, which crop may also require a closed season in order to control pests?
(e) Explain how closed season helps to control pests in the field.

11. Discuss **five** ways in which each of the following affects the distribution and production of crops in Malawi.
    (a) Soil
    (b) Rainfall

12. (a) Discuss any **five** reasons why improving agricultural production at farm level and national level is important.
    (b) Describe **three** reasons why trading of agricultural commodities at village level is important and **two** reasons why trading of agricultural commodities at national level is important.

TEST 25

1. (a) What does the word 'food supply' mean?
   (b) Mention **four** factors that affect food supply in your area.
   (c) Describe **four** ways of increasing food production in Malawi?

2. Mention any **five** causes of low productivity in smallholder agriculture in Malawi.

3. (a) List down any **two** signs of parturition in a cow.
   (b) Explain any **two** causes of difficulties experienced by a cow during parturition.

4. (a) Name any **two** tillage implements which are human power.
   (b) State any **two** uses of fuel energy.

5. (a) Differentiate between progeny testing and sib selection as used in animal selection.
   (b) State **two** advantages of cross breading as a method of improving livestock.

6. Explain any **one** way in which each of the following activities carried out on a farm can reduce market margins and increase profit.
   (a) A famer performing some of the marketing function.
   (b) A famer selling farm produce through agricultural cooperatives.
   (c) Eliminating some of the marketing functions.

7. (a) Mention any **four** reasons for importance of farm mechanisation.
   (b) Name any **three** types of capital.

8. (a) Name any **two** agro-based industries that use maize as a raw material.
   (b) Name the product which is produced by the agro-based industries named in (a).
   (c) State any **two** ways in which processing mangoes is important.

9. Explain briefly **two** ways in which each of the following affects agricultural production:
   (a) Microorganisms
   (b) Conservation of natural resources
   (c) Marketing
   (d) Selection of crops and livestock
   (e) Good timing of farming operations

10. There are many challenges in agriculture development that need to be overcome for agriculture to develop in Malawi.
    (a) State **four** ways in which population growth can cause deforestation.
    (b) Mention any **four** reasons for conserving water in Malawi.
    (c) State any **four** ways of achieving crop diversification.
    (d) What are **four** aims of farm settlements in Malawi?

(e) In what **four** ways does HIV and AIDS reduce agricultural development in Malawi?

11. Explain any **five** causes of land degradation in Malawi.
    (b) Describe **five** ways of reducing desertification (a place becoming a desert).

12. A farmer was provided with four inbreds of maize with following characteristics.
    - Inbred W: Early maturing.
    - Inbred X: High resistance against maize streak virus.
    - Inbred Y: Short height that resists plant lodging.
    - Inbred Z: High yielding per unit area.

    With the aid of a well labelled diagram, describe how the farmer would develop a new variety that would retain all the characteristics from the four inbreds.

TEST 26

1. (a) Define 'land tenure'.
   (b) State any **two** differences between freehold and leasehold land.
   (c) Which system of land tenure is most useful in promoting national development?

2. (a) State **two** advantages of customary land.
   (b) Explain the **three** provisions in Malawi land distribution policy.

3. State any **four** importance of trading of agricultural commodities at a community level.

4. Describe **four** main ways in which agricultural production can be improved.

5. (a) State any **two** disadvantages of private land.
   (b) Explain **two** roles of population and agricultural policies in national development.

6. (a) Define 'quota' in agriculture.
   (b) Name **two** advantages of quota system of producing agricultural commodities.

7. (a) Describe any **four** ways in which agricultural production can be increased at community level using group action.
   (b) Describe **two** characteristics of concentrates as livestock feeds.
   (c) Explain the problems of natural mating in cattle.

8. What do the following words mean in agriculture?
   (a) Lambing
   (b) Labour
   (c) Itinerant trader
   (d) Lodging
   (e) Culling.

9. Mention **four** ways in which the following factors affect crop growth and development.
   (a) Relative humidity
   (b) Wind
   (c) Photoperiod
   (d) Soil water
   (e) Microbes

10. Agricultural technology in farm energy, farm mechanisation, irrigation and drainage can lead to plenty of food throughout the year.
    (a) Mention **four** main processes that are involved in processing of sweet potatoes (*Ipomea batatas*) before putting them in storage.
    (b) State any **four** disadvantages of farm mechanisation.
    (c) State any **four** forms of energy that can be on the farm.
    (d) Mention **four** characteristics of Drip or Trickle irrigation system.
    (e) List **four** natural ways through which water is drained in our agricultural lands.

11. With the aid of a diagram, describe a cause-effect problem tree for soil erosion.

12. Low income farmers live in an area with the following characteristics:
    - Moderate sloping land with clay soils
    - A dam with plenty of water situated on the upper part of the farms.
    - Plenty of unskilled labour

    If the area experiences a long dry spell every year, describe how a suitable irrigation system for maize production would be established and managed.

TEST 27

1. (a) What is land tenure?
   (b) Describe the following **three** land tenure systems:
   i. Public land
   ii. Customary land
   iii. Private land

2. List any **five** factors to consider when feeding animals.

3. Mention any **four** decisions that smallholder farmers have to make to hasten agricultural development in Malawi.

4. (a) List any **three** functions of ADMARC as an agricultural service agency.
   (b) Name **two** other agencies or organisations doing the functions similar to those performed by ADMARC.

5. (a) State any **four** characteristics of natural pasture.
   (b) Mention **five** legume pastures found in Malawi.

6. Write any **two** factors that limit the involvement of female farmers in decision-making in agriculture in Malawi.

7. (a) i. What is the difference between pasture management and pasture conservation in agriculture?
   ii Mention any **three** ways of conserving pasture.
   (b) i. State any **three** ways of achieving grazing management in order to have high levels of livestock production per unit area.
   ii. List down any **six** grazing systems of livestock in agriculture.
   (c) Out of the **six** grazing systems given in (b) above, which ones offer rest periods for pasture?

8. What do the following words mean in agriculture?
   (a) Ad lib feeding (freely and feeding at will)
   (b) Bargaining power
   (c) Labour profile
   (d) Kidding
   (e) Hybrid

9. Plant yield is affected by several factors, which include soil reaction (pH) and soil nutrients.
   (a) Mention any **four** ways of increasing soil nitrogen.
   (b) Give any **two** reasons why nitrogen is important for crop production.
   (c) List any **four** factors that lower the nitrogen content of soil.
   (d) Explain any **two** ways of increasing soil pH.
   (e) Mention any **four** important effects of low soil pH on crop production.

10. There are a lot of challenges in agricultural development that need to be dealt with for Malawi population to have sustainable food supply.
    (a) Mention **four** ways of increasing food production in Malawi.
    (b) State any **four** reasons that contribute to food insecurity in Malawi.
    (c) Despite 70% of farming activities in Malawi being done by women (about 52% of population), their contribution to agriculture is very low. State any **four** reasons for this.
    (d) Write **four** limitations of subsistence farming in Malawi.
    (e) Mention **four** ways of improving agricultural production without degrading land.

11. (a) Explain any **five** factors that should be considered when a farmer is feeding her cattle.
    (b) Discuss any **five** reasons why farmers have problems in obtaining high production levels from Malawian Zebu.

12. Appropriate agronomic or cultural practices should be followed in any crop production.
    (a) Explain any **five** reasons why early land preparation is important in agriculture.
    (b) Discuss **five** reasons why weeding is an important component in crop production.

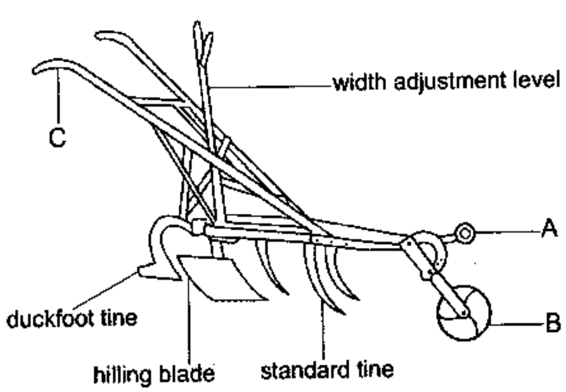
TEST 28

1. (a) Explain **one** way in which each of the following enterprises can benefit from fish farming:
       i. Crop production
       ii. Beef production
   (b) Explain **one** way in which HIV and AIDS can limit contribution of women to agricultural production.

2. (a) In what **one** way does each of the following characteristics of parent material affect the pH of the soil?
       i. Physical nature of the parent rock.
       ii. Chemical nature of the parent rock.
   (b) Discuss any **two** ways that farmers can use to increase soil pH in acidic soils.

3. (a) What are any **four** important cooperative principles?
   (b) What are **two** types of cooperatives?

4. **Figure** below shows an adjustable cultivator.



   (a) Name the functions and parts labelled **A**, **B** and **C**.
   (b) What is the other type of a cultivator apart from an adjustable cultivator?
   (c) How can you maintain the following parts of a cultivator?
       i. Wheel and axle
       ii. Sweep
       iii. Hillers and Tines

5. Explain any **one** way in which each of the following agricultural services ensures food security for the growing population.
   (a) Seed technology.
   (b) Provision of farm inputs.

6. (a) State **three** functions of boron in crops.
   (b) Describe any **two** deficiency signs of sulphur in crops.
   (c) Name any **one** inorganic fertiliser that can be applied to soil to correct boron deficiency in crops.

7. Define the following terms as used in agriculture:
   (a) A feed
   (b) Farm mechanisation
   (c) A ration
   (d) A supplement in animal feeding
   (e) Chlorosis

8. (a) i. Explain the meaning of the word equation written below as used in crop improvement.

       Phenotype = Genotype + Environment

       ii. What is meant by 'crop improvement'?
   (b) What are the **two** main aims and objectives of crop improvement?

9. The genetic make up, age and the environment affect the productivity of local breeds of goats.
   (a) State the function of the following breeds of goats.

i. Anglo-Nubian
ii. Toggenburg
iii. Boer goat
iv. Angora goat

(b) Mention any **four** disadvantages of local breeds of goats.

(c) Describe any **two** ways in which the local breeds of goats can be improved through breeding.

(d) Discuss any **two** management principles that a subsistence farmer would consider apart from parasite and disease control in order to increase the production from the local breeds of goats.

(e) Mention any **three** characteristics of meat goats and **one** characteristic of milk goats.

10. In crop production, fruits, cropping systems, pasture, food-sufficiency can be studied.

(a) Mention any **four** reasons why fruits are important in Malawi.

(b) What are any **four** cropping systems practised in Malawi?

(c) Give **four** reasons why pasture is important.

(d) Give **four** steps that should be followed in processing of maize for storage.

(e) Identify **four** scientific and technological innovations that can ensure food security in Malawi.

11. With the aid of a diagram describe the cycle of activities involved in shifting cultivation.

12. With the aid of well-labelled diagrams describe the procedure of

(a) grafting

(b) budding

(c) layering

TEST 29

1. (a) What does the word 'desertification' mean in agriculture?

(b) List **four** ways of conserving forests in Malawi.

2. Explain any **five** causes of food insecurity in Malawi.

3. A laggard farmer plants beans, groundnuts, maize and paprika late every growing season and always gets low yields. Explain any **four** reasons why this farmer gets low yields.

4. The **table** below shows the effects of water stress on the yield of cereal crop X.

Crop X Development Stages	% Yield Loss
Initial stage	30
Crop development stage	30
Mid-season stage	60
Late-season stage	25

(a) During what stage is water requirement most critical in the production of crop X?

(b) Explain any **two** ways how water shortage affects crop X yield during the most critical stage of water requirement.

(c) Mention any **one** way in which a farmer can supply water to crop under water shortage.

5. Explain briefly how each of the following practices are important in agriculture:

(a) Giving newly born calf colostrum for the first four days after birth.

(b) Having ducks close to fish ponds.

(c) Applying Calcium Ammonium Nitrate (CAN) and not Urea in areas of low rainfall.

6. (a) Explain any **one** reason for practising seed dressing in agriculture.

(b) Explain any **two** factors that affect seed rate.

7. Define the following terms as used in agriculture:

(a) Afforestation

(b) A balanced ration

(c) A long-term credit

(d) A co-operative

(e) Antibiotics

8. Describe any **two** ways through which soil structure can be destroyed on an estate.

9. Describe **one** way in which each of the following legislative measures can help to control pests and diseases:
   (a) Prohibition.
   (b) Notification order.

10. Agricultural marketing is one of the essential factors to be considered in any profitable agricultural business.
    (a) State **four** reasons why agricultural marketing is important.
    (b) Mention **four** factors that affect demand of a commodity in a market.
    (c) Mention any **four** factors that affect supply of a commodity in a market.
    (d) List any **four** common risks that can be met when marketing agricultural commodities in Malawi.
    (e) What are **four** causes of problems that farmers in Malawi face when marketing their commodities.

11. Malawi's population is increasing mainly because of high birth rate and low death rate.
    (a) Discuss any **five** socio-economic problems that have arisen due to rapid population growth in Malawi as a nation.
    (b) Explain **five** causes of high birth rate and low death rate in Malawi.

12. (a) Describe with the aid of a well labelled diagram of reproductive system of a hen any **five** processes of egg formation.
    (b) Explain any **five** ways in which aphids can affect vegetable production.

TEST 30

1. (a) What is drainage?
   (b) Name **five** sources of excess water that may need draining.

2. (a) Define 'seed dormancy'.
   (b) Give any **three** reasons why seed dormancy is important in pasture growing.
   (c) Mention any **one** method of scarification that can be used to break seed dormancy in pasture.

3. (a) State any **three** symptoms of Mastitis disease in goats.
   (b) List any **two** symptoms of Anthracnose in beans.

4. Give a reason why the following are done when controlling weeds physically:
   (a) Weeds are uprooted before flowering.
   (b) Weeds are uprooted when the weather is sunny.

5. What are **five** advantages of crop rotation?

6. (a) Explain the importance of weeds.
   (b) Explain the importance of pasture.
   (c) Explain the importance of soil.

7. (a) What is the difference between soil structure and soil texture?
   (b) Mention any **three** mechanical methods of analysing soil samples in agriculture.

8. Define the following terms as used in agriculture:
   (a) A subsistence farmer
   (b) Land degradation
   (c) Food security
   (d) Agroforestry
   (e) Capital

9. Labour is very important in planning of any farming operation.
   (a) What is the difference between labour and planning in agriculture?
   (b) Apart from labour, mention other **three** factors of production, and state what each contributes to agriculture.
   (c) What **four** types of information should be included in labour records?
   (d) List any **four** factors that should be considered when replacing labour with machinery on the farm.

(e) Mention **four** types of labour commonly used in Malawi.

10. Agricultural marketing is very important in any farming business.
    (a) Mention any **four** factors that lead to farmers lowering or increasing prices (changing prices) of their commodities.
    (b) State any **four** marketing channels that can be involved in marketing of maize.
    (c) What are **four** ways of reducing marketing margins so that the farmer's share of the value of the produce can increase?
    (d) Mention **four** factors influencing demand of a particular product.
    (e) State **four** factors affecting supply of a particular product.

11. (a) Explain any **five** problems that have reduced agricultural production and development in Malawi.
    (b) Describe any **one** way of reducing the effects of each of the problems explained in (a) above.

12. (a) Discuss any **five** methods of conserving feeds to be fed to animals during dry season.
    (b) Explain any **five** problems associated with uncontrolled grazing.

AGRICULTURE QUESTIONS

(*Practical Paper II*)

PRACTICAL 1

1. You are provided with **weed K** (Bidens pilosa, i.e. black jack), **L** (Cynodon, dactylon i.e. star grass or couch grass), **V** (*Cypress distans*) and **W** (*Oryza longistaminata*, i.e. *Mpungadziwe*).
   (a) Identify **K, L, V** and **W.**
   (b) i. What letter stands for an annual weed?
   ii. Mention **four** methods of weed dispersal.
   (c) Mention any **four** uses of weeds?
   (d) Describe **three** true aquatic weeds that you know.
   (e) Classify the **four** weeds into broad or narrow leaved.

2. You are provided with **samples** of fertiliser **C** (CAN), **U** (Urea) **K** (Triple Super Phosphate) and **D** (farm yard manure).
   (a) Identify samples **C, U, K** and **D.**
   (b) Mention any **four** factors that affect the quality of farmyard manure.
   (c) i. What is the difference between straight or single fertilisers and compound or mixed fertilisers?
   ii. What is the difference between high analysis or concentrated fertilisers and low analysis or conventional fertilisers?
   iii. What are complete fertilisers?
   (d) Study the **table** of chemical fertilisers below and answer the questions that follow:

Fertiliser	% N	% P	% K	% S
Sulphate of Ammonia	21	-	-	24
Nitrate of Soda	16	-	-	-
Ammonium Nitrate	34.5	-	-	-
Urea (Carbamide)	46	-	-	-
Calcium Ammonium Nitrate (CAN)	26-28	-	-	-
Diammonium Phosphate (DAP)	18	46	0	-
Single Super Phosphate	-	19 P_2O_5	-	-
Double Super Phosphate	-	38 P_2O_5	-	-
Triple Super Phosphate	-	46 P_2O_5	-	-
Calcium Sulphate (gypsum)	-	-	-	17.5
Muriate of Potash	-	-	60 K_2O	-
Mono Ammonium Phosphate (MAP)	11	50	0	-
Sulphate of Potash	-	-	40	-
Potassium Sulphate	-	-	52 K_2O	-
Potassium Nitrate	13	-	37-44	0-2
23:21:0+4S	23	21	0	4
20:20:0	20	20	0	-
Compound A	2	18	15	-
Compound B	4	18	15	-
Compound C	6	18	15	-
Compound D	8	15	15	-
Compound L	18	15	10	-
Compound S	6	18	6	-
Super B Mixture	5.33	24	20	-
Super C Mixture	8	24	20	-
Super D Mixture	10.7	24	20	-

(i) Write any **two** straight fertilisers from the table above.

(ii) List any **two** compound fertilisers from the table above.

(iii) List any **two** conventional fertilisers from the above table.

(iv) List **two** high analysis fertilisers from the table above.

(v) List **two** complete fertilisers from the table.

3. (a) **Table** below shows quantity and quality of two grass pastures. Each grass pasture was grown on three hectares of land. Use it to answer questions that follow.

Grass pasture	Dry matter (kg/ha)	Crude protein (%)
L	100	4.0
K	120	3.6

i. Calculate the crude protein of each of the grass pastures
Grass pasture **L**
Grass pasture **K**

ii. Explain **two** ways in which calculation of crude protein yield of these two grass pastures is important to the livestock farmers.

(b) Mr Mthutha planted 1000 seeds of grass pasture **L**. Out of these 200 seeds did not germinate.

i. Calculte the germination percentage of the grass pasture **L**.

ii. Calculate the expected plant population given that:
Seed rate = 12.5 kg
Seed size = 300,000 seeds/kg
Purity % = 30

(c) How can you calculate the seed rate of grass pasture **L**? Write the formula which can assist you to calculate the seed rate.

4. The **table** below shows a health record on cattle production for the 2010/2011 farming season. Use it to answer questions that follow.

Date	Symptoms of disease	Drugs used	Cost of treatment
7/05/10	High fever Excessive Salivation Lameness		
16/06/10	Nasal discharge Difficult breathing Coughing Loss of appetite	antibiotics	K500.00
20/08/10	Clots in milk Swollen udder	tetracycline	K700.00

(a) i. Name the disease that attacked the cattle on 07/05/10.

ii. What is the cause of the disease named in (i)?

(b) Give **one** reason for not administrating drugs to the diseased cattle on 07/05/10

(c) i. Calculate the cost of treatment during the 2010/2011 farming year.

ii. Give **three** ways of preventing the disease shown by the signs on 20/08/10.

iii. Name any other farm animal that can be attacked by the disease shown by symptoms on 07/05/10.

5. **Table** below shows transactions that were recorded on a farm. Use it to answer questions that follow.

06/09/2009	Opening valuation	K8,500.00
02/03/2010	Closing valuation	K10,000.00
04/03/2010	Depreciation	K1,000.00
05/04/2010	Fertiliser application	K7,000.00
06/04/2010	Casual labour	K2,000.00
16/05/2010	Tobacco sales	K24,000.00

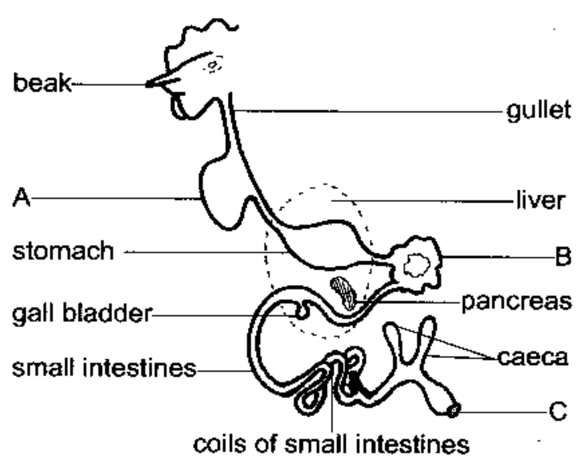
(a) Prepare a profit and loss account.

(b) Calculate the farmers profit or loss.

(c) Describe any **three** uses of this type of record on a farm.

(d) Explain the benefit of calculating depreciation on a farm.

6.



(a) Name the parts labelled **A, B** and **C**.

(b) Explain **one** function of parts labelled **A** and **C**.

(c) What is the best class of feed to be given to poultry?

(d) i. A pure bred white chicken was mated with a grey chicken of unknown genotype. The offspring were all white. Show by diagrams and symbols the genotypes of the parents and the offspring.

ii. One of the offspring above was later mated with a grey chicken, and half the offspring were white and half were grey. Show by diagrams and symbols the genotypes of these parents and of the offspring.

iii. What are sex-linked characteristics?

iv. If feather colour in chickens is a sex-linked characteristic, then what would be the phenotypes and genotypes from crosses between a white male and a grey female? Show all your working and give reasons for your conclusions.

v. If feather colour in chickens is a sex-linked characteristic, then what would be the phenotypes and genotypes from crosses between a pure bred white female and a grey male? Show all your working and give reasons for your conclusions.

PRACTICAL 2

1. You are provided with **W** (witch weed), **T** (*Tridax procumbens*), **P** (pig weed) and **H** (water hyacinth)

(a) i. Identify weeds **W**, **T**, **P** and **H**.

ii. Which weed is parasitic?

(b) Name **two** other parasitic weeds.

(c) Mention any **three** host crops of weed **W**.

(d) State any **two** ways of controlling weed **W**.

(e) Mention **four** main ways of controlling weeds in crop fields.

(f) Give any **four** reasons why clean mechanical weeding through cultivation (tillage) may be undesirable in certain circumstances.

(g) What are **four** advantages of chemical weed control?

2. You are provided with **five different planting materials P** (cassava stem), **Q** (bean seed), **R** (Irish potatoes) and **S** (pawpaw fruit).

(a) Identify the samples **P**, **Q**, **R**, and **S**.

(b) Which of the **four** planting materials are propagated by asexual means and which ones are propagated by sexual means?

(c) Give any **four** advantages of propagation by vegetative means.

(d) State any **one** characteristic of a good planting material.

(e) What are any **four** advantages of propagation by seed?

(f) Draw and label any **two** parts of the sample **P**.

(g) Calculate the plant population per hectare of specimen **Q** which is planted on a 1 ha land, with ridges spaced 90 cm apart, planting two seeds per station and planting at 15 cm apart.

3. **Table** below shows a wrong randomised block design of an experiment on maize variety trial conducted by students at a certain secondary school. Use it to answer questions that follow.

	Block I	**Block II**	**Block III**
Plot 1	NSCM 41	MH 16	NSCM 41
Plot 2	Local Maize	MH 12	Local Maize
Plot 3	MH 16	Local Maize	MH 12
Plot 4	MH 12	MH 16	MH 16

(a) i. Mention **four** mistakes in the experimental design.

ii. Using the information in the table, lay out the correct field plan for Randomised Block Design.

(b) Apart from randomisation, explain **two** other ways which student could have made the results of the experiment more reliable.

(c) Explain **two** main methods which the students could have used to correct data in the experiment.

(d) Explain any **two** ways in which the results in the experiment could be analysed.

4. **Table** below shows live weight gained for two exotic breeds of cattle that were stall-fed using same amount of silage for 40 days. Weighing was done at 5 days interval. Use it to answer questions that follow.

Days	Breed A (Live weight gained in kg)	Breed B (Live weight gained in kg)
5	1	4
10	3	7
15	4	10
20	6	13
25	8	16
30	10	19
35	12	22
40	14	25

(a) Draw **two** line graphs on the same axes to show the live weight gained in the cattle breeds.

(b) What is the difference in the live weight gained between two cattle on day 33?

(c) If you were a beef cattle farmer, explain any **two** advantages you could set by raising the breed B.

(d) Given the following additional information on breed B:

Total cost of feeds	K10,000.00
Veterinary costs	K1,500.00
Cost of "khola"	K5,000.00
Income obtained	K40,000.00

Calculate the gross margin for breed B. Show your working.

5. **Table** below shows information on feeding of layers. Use it to answer questions that follow.

Available feeds	Protein content
Maize meal	7%
Soya bean meal	40%

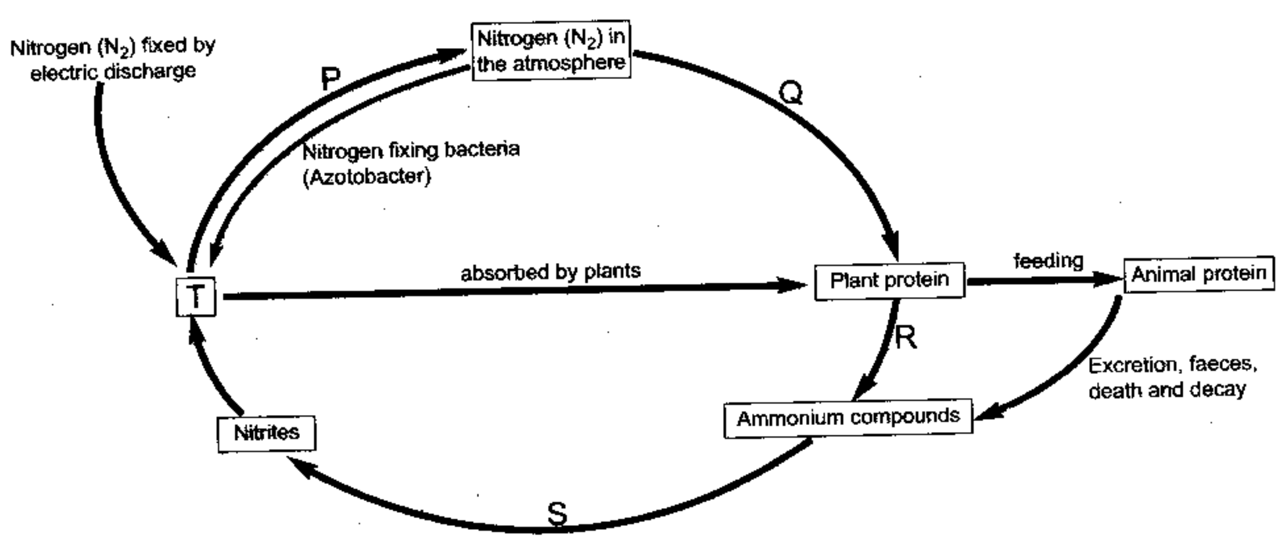
(a) Using a Peason's Square Method, formulate a 900 kg ratio for layer containing 21% protein. Show your calculation.

(b) Explain any **three** factors which should be considered when balancing a ration.

(c) Describe any **two** fanctions of soya bean meal to layers.

(d) Suggest **two** types of nutrients which could be added to the feeds in (a).

6. The **figure** below is a diagram of the nitrogen cycle.



(a) Complete **P**, **Q**, **R**, **S** and **T**.

(b) Name other **three** types of cycles that you know in nature.

(c) In what forms are the following nutrients taken by plants?

i. Nitrogen
ii. Calcium
ii. Potassium
iv. Phosphorus
v. Sulphur

PRACTICAL 3

1. You are provided with **four pests S** (stalk borer), **C** (aphid), **G** (grasshopper) and **A** (army worm).

(a) Identify pests **S**, **C**, **G** and **A**.

(b) Describe any **four** factors that have led to an increase in pest occurrence to crops.

(c) Draw and clearly label the life cycle of a stalk borer.

(d) Describe the **three** main groups or categories of damage caused by insect pests.

2. You are provided with an **animal product** labelled **M** (milk).

(a) Identify the product.

(b) Mention any **three** by-products which can be produced from product M.

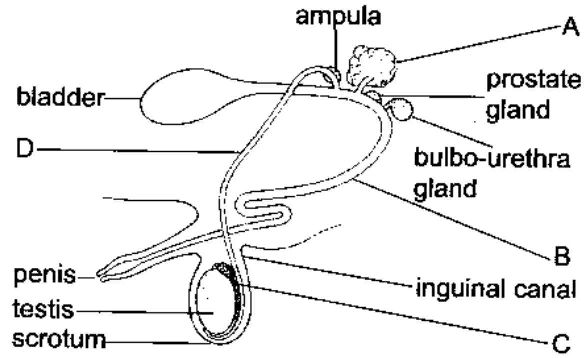
(c) Name any **three** farm animals which supply product M.

(d) Explain any **two** nutritional values of specimen **M** in the human body.

(e) Explain any **three** ways in which the quality of product **M** may be improved.

(e) Describe any **three** ways in which a farmer may stimulate the product **M**.

3. **Below** is a diagram of a reproductive system of a bull.



(a) Name the parts labelled **A**, **B**, **C** and **D**.

(b) What is the function of each of the parts labelled **A**, **B**, **C** and **D**?

4. **Table** below shows the supply and demand for fresh chambo fish at different prices in the market. Study it carefully and answer the questions that follow:

Average price for each fish in Kwacha	Quantity demanded (kg)	Quantity supplied (kg)
80	10	88
70	21	79
60	30	70
50	40	61
40	50	50
30	63	37
20	77	23
10	92	10

(a) Draw a graph to show the relationship between price and quantity of fish demanded and supplied on the market.

(b) How much chambo fish would be demanded when the price for each is K55.00?

(c) i.What is the equilibrium price of fresh chambo fish at the market?

ii. Explain any **one** way in which the equilibrium is important to a fish farmer.

(d) i. What happens to the quantity demanded when the price of fish increases from K40.00 to K50.00?

ii. Calculate the price elasticity of demand.

iii. What does the answer in (i) tell you about the price elasticity of demand for fish at the market?

(e) Describe any **three** effects of changing the price of the fish at the market.

5. (a) A farmer kept the following **record**. Use it to answer questions that follow.
- Harvested 52 bags of maize
- Sold 40 bags of maize at K2,500/bag
- The farmily consumed 12 bags of maize
- Bought 6 bags of fertiliser at K 5,500/bag
- Sold maize stalks for K4,000
- Paid casual labour for K36,000
- Bought 20 kg maize seed at K150/kg

Calculate the farmer's profit or loss.

(b) A farmer bought an ox-cart at K25,000.00. The ox-cart had an expected life span of eight years and an estimated salvage value of K6,500.00

i. Explain **two** factors that would make the ox-cart reach the salvage value earlier than the expected life span.

ii. Using straight line method, calculate annual depreciation for the ox-cart.

6. You are provided with the **three types of rocks**, **O** (igneous rock), **K** (metamorphic rock) and **Z** (sedimentary rock).

(a) Identify the **three** types of rocks **O, K** and **Z.**

(b) With **one** example state how each one type of the rocks is formed.

(c) Draw a diagram and clearly label any **two** structures of rock **O.**

(d) Draw and label any **three** structures of rock **K.**

(e) Name any **two** main processes of weathering of rocks.

PRACTICAL 4

1. You are provided with **A** (sand soil), **B** (clay soil) and **C** (loam soil).

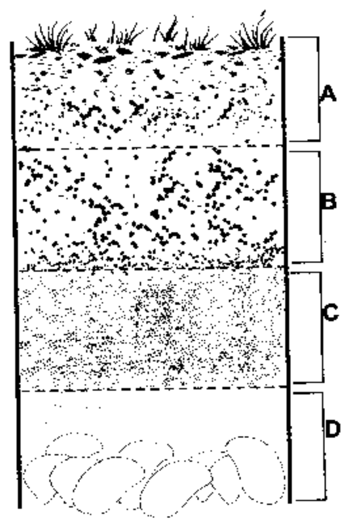
(a) Identify the **three** soil samples.

(b) Which of the three soil samples is good for the maize growth and development?

(c) Mention **one** method of improving the productivity of **A** and **B.**

(d) What are the **five** characteristics of sample C?

(e) Draw and label any **four** parts of a soil profile.



(f) The elements present in the soil are derived from five sources. Name the **five** sources.

2. You are provided with **specimen G,** (which is a groundnut seed).

(a) Draw and label any **two** external parts of the specimen **G.**

(b) Remove the testa (seed coat) and divide the specimen **G** into two parts. Draw clearly the divided **G** and label any **three** internal parts.

(c) Explain one function of the **two** external parts labelled in (a).

(d) Mention **one** function of the three internal parts labelled in (b).

(e) Explain **one** importance of legumes to human health.

(f) Describe **one** importance of putting leguminous plants in rotation of crops.

3. A farmer kept a **record** of four dairy cows called Likuni, Ntchentche, Bola and Kamphuno. The record shows the quantity of feeds eaten by each animal per day, milk obtained from each cow per day and calving interval for each animal. All these are shown in the **table** below.

Name of cow	Quantity of feeds (kg/day)	Milking yield (day)	Calving interval (day)
Likuni	1.0	4.5	360
Ntchentche	1.0	3.9	400
Bola	1.0	4.6	340
Kamphuno	1.5	5.0	380

(a) From the table select the best yielding cow for further breeding.

(b) Explain **two** reasons for the answer in (a) above.

(c) i. State the meaning of the term 'calving interval'.

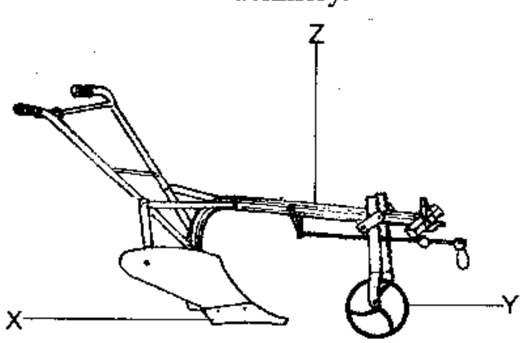
ii. Explain how a farmer may reduce the calving interval in his dairy animals.

(d) Mention any **four** signs of calving in a cow.

(e) Explain any **two** reasons for the two months dry period the cow requires before parturition.

4. The **figure** below is a diagram of farm machinery.

(a) Name the farm machinery.



(b) Name the parts labelled **X**, **Y** and **Z**.

(c) Explain **one** function of the parts labelled **X, Y** and **Z**.

(d) Mention any **four** ways of making use of the machinery on the farm.

(e) Describe any **two** ways in which the machinery can be maintained to last long.

(f) State any **two** factors that would lead to reduced use of the farm machinery on the farm.

5. A twelve month old steer of mass 250 kg was stall-fed from 10/02/04 to 10/06/04 and had a mass of 350 kg during the time of selling.

(a) Calculate the average mass gain per day for this steer.

(b) Calculate the farmer's total revenue or total income or gross income if she was paid K200.00 for one kilogramme gained by the steer.

(c) Find the farmer's net income if she spent K15.00 per day on medication and labour.

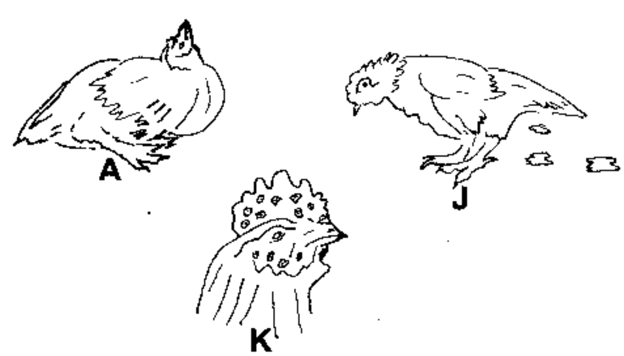
(d) List any **two** advantages of stall feeding animals.

(e) Name any **two** factors that would limit stall feeding by smallholder farmers in Malawi.

(f) What grade would be given to this steer at the time it was sold?

6. The **figure** below is a diagram of diseases of poultry.

(a) Identify the diseases **A**, **J** and **K**.



(b) Describe any **two** ways in which **A** affects poultry production in Malawi.

(c) Explain any **two** ways of controlling or preventing a poultry disease **J**.

(d) Name **one** internal parasite and **one** external parasite of chickens.

(e) Name the organism that causes the disease labelled **K**.

(f) Explain any **two** ways of controlling or preventing the disease **K**.

PRACTICAL 5

1. You are provided with **specimen** labelled **L** (nsenjere or star grass).
   (a) Identify the specimen labelled L.
   (b) To which group of livestock feeds does this specimen belong?
   (c) State any **two** characteristics of feeds which belong to the group mentioned above.
   (d) Explain **two** advantages of growing specimen L together with Leucaena.
   (e) Give **two** examples of pastures which can be used in a tobacco rotation to control cell worms.

2. You are provided with **T** (termite), **B** (bean weevil) and **G** (grasshopper).
   (a) i. Identify the samples **T, B** and **G**.
   ii. To which group of insect pest do **T, B** and **G** belong?
   (b) Mention any **two** effects caused by each of the **three** main groups of insect pests:
   i. Biting and chewing insect pest.
   ii. Piercing and sucking insects.
   iii. Boring insects.
   (c) Mention any **four** factors that a farmer need to consider when making a decision to control pests.
   (d) What are **four** advantages of chemical pest control?
   (e) What are **five** disadvantages of chemical pest control?

3. A farmer has 10 hectares and has a choice of growing either more maize or groundnuts. The following information is available for use in decision making.

	Maize	**Groundnuts**	**Beans**
Yield (kg/ha)	6,000	2000	2,500
Price(Kwacha/kg)	30	50	40
Cost of seed/ha	K500	K1200	K1,000
Cost of fertiliser/ha	K2,400		K2,000
Depreciation of *nkhokwe*/year	K500	K500	K500

   (a) Calculate variable costs per hectare for maize, groundnuts and beans.
   (b) Which crop between maize and groundnuts would a farmer be encouraged to increase hectares? Show your calculations.
   (c) If the farmer wanted to substitute beans for groundnuts, what advice would you provide? Show your working.
   (d) Explain **one** reason for considering depreciation when calculating profit
   (e) What **two** important variable costs may have been forgotten in the data?

4. The **table** below shows the record of quantity of feed, milk produced and calving interval four five cows.

Cow	**Amount of Feed (g/day)**	**Milk produced (g/day)**	**Calving interval (years)**
A	900	4,000	0.9
Z	1,000	3,000	0.95
E	900	4,100	0.8
B	1,500	5,000	1.2
U	900	3,000	1.4

   (a) i. Using the table, choose the cow that is the best for breeding purposes.
   ii. Using the table, choose the cow that is the worst for breeding purposes.
   (b) Explain **two** reasons for your answer in a (i) above.

(c) Explain any **two** factors affecting quality of milk in dairy production in Malawi.

(d) Explain any **two** reasons why dry period is important before animals give birth.

(e) Explain any **two** ways through which a smallholder farmer can reduce the calving interval of her livestock on her farm.

(f) State any **four** signs of heat in goats.

5. The **table** below shows a record of milk production in a goat.

Time in months	Milk per day in dm^3
Jan	3
Feb	3.5
Mar	4
Apr	3.5
May	3
Jun	2.7
Jul	2.5
Aug	2.2
Sep	2
Oct	1.7
Nov	1.5
Dec	1.2

(a) Draw a graph of time against milk produced.

(b) When is milk production at its peak?

(c) What name is given to the extra feed supplied to animals above maintenance ration?

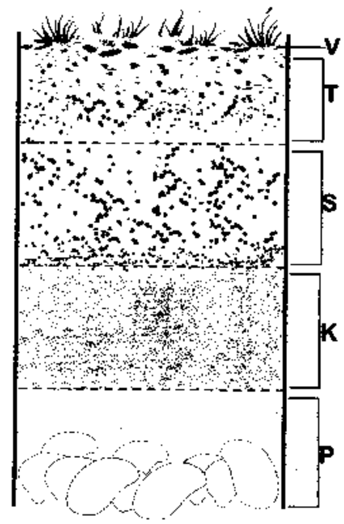
(d) Name any **two** milk breeds of goats?

(e) Explain **two** other types of records that a dairy farmer may keep to improve milk production at her farm.

(f) Describe **two** ways how the graph you have plotted can assist a smallholder farmer managing her animals.

(g) What is the difference between maintenance ration and production ration?

6. The **figure** below is a diagram of soil profile.



(a) Define soil profile.

(b) Name the parts labelled **V**, **T**, **S**, **K** and **P**.

(c) Name the part known as a layer of accumulation and give a reason why it is called a layer of accumulation.

(d) Mention any **four** characteristics of part labelled **T**.

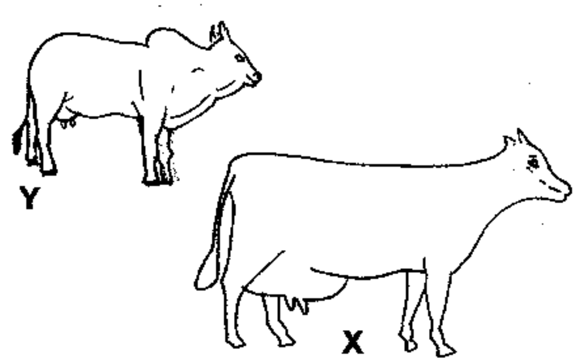
(e) State **three** uses of organic matter found in the soil.

(f) Explain **two** functions played by plants on the rock weathering during soil genesis.

(g) Explain any **two** reasons why it is important that the soil should contain pore space.

PRACTICAL 6

1. You have been provided with two diagrams of animals labelled **X** and **Y**.



(a) Classify the breeds into indigenous and exotic breeds of cattle.

(b) Which **one** of these breeds is well adapted to local conditions?

(c) Name **two** features in the diagram which support your answer in (b) above.

(d) Identify the breed that is good for dairying.

(e) State any **two** characteristics which make this breed good for dairying.

(f) Mention **four** characteristics of exotic breeds of cattle.

2. You are provided with **five samples G** (grass pasture), **L** (legume pasture), **F** (crushed fish or fish meal), **S** (common salt or Na*Cl* /sodium chloride) and **M** (*mgaiwa* or maize meal), which can be used as feed for animals.

(a) Identify the samples of pastures **G**, **L**, **F**, **S** and **M**.

(b) Which of the **five** samples would be most suitable for grazing?

(c) Give a reason for your answer in (b) above.

(d) In what **one** way would maturity of sample **G** affect the quality of the feed?

(e) Explain **one** best way of conserving sample **L**.

(f) Mention **three** importance of drying crops.

(g) Give **four** reasons why crop storage aeration is necessary.

(h) i. Mention any **four** reasons for giving **S** to layers.

ii. State **two** reasons for giving a small amount of sample **F** to layers.

iii. State any **three** reasons for feeding layers green vegetables apart from providing sample **S**.

(i) i. Explain **one** problem that layers feeding only on **M** would develop.

ii. How can the problem in (i) above be corrected?

iii. Imagine you were told to prepare a simple ration for layers from deya, beans and maize, explain how you could go about it.

iv. Mention **seven** major or macro elements needed by livestock.

v. List **seven** trace or minor or micro elements needed by livestock.

vi. With **one** example for each, mention any **four** additives used in livestock.

3. The **table** below shows a record of milk production in a cow.

Time (months)	Average amount of milk per day (litres)
1	6
2	7
3	8
4	7
5	6
6	5.5
7	5
8	4.5
9	4
10	3.5
11	3
12	2.5

(a) Draw a graph using the data in the table.

(b) When is milk production at its peak?

(c) i. If this cow calves every year, when should it be allowed a dry period?

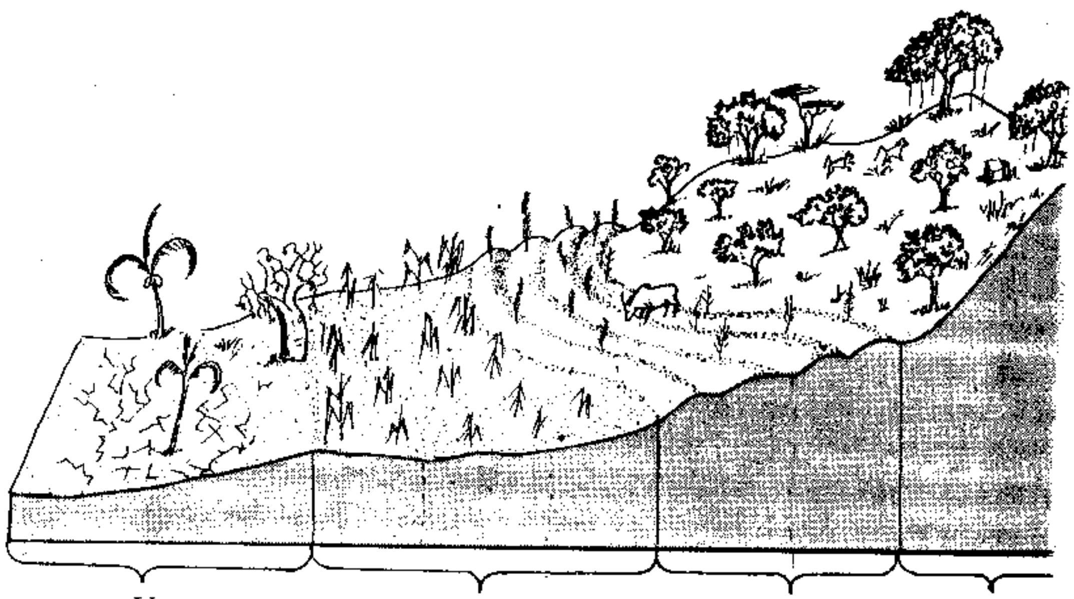
ii. Explain any **one** reason for allowing a cow to have to have a dry period?

(d) What term is commonly given to the additional amount of feed given to an animal on top of its maintenance requirements?

(e) Explain any **two** ways in which record given in the table assist a farmer in a livestock management.

(f) Describe **two** other types of records that a dairy farmer may keep besides the record given in the table.

4. Below is an **illustration** of land capability classes:



(a) Suggest **three** conservation measures which should be constructed in Class IV to grow maize successfully.

(b) List **two** important characteristics of each of the **four** classes shown in illustration above.

(c) Name the most suitable agriculture activity for Class. VI.

(d) Mention **six** factors that can determine the characteristics of a particular class of land.

5. Given 35 hectares of maize on a deep sandy loam soil with slopes less than 1% (i.e. flat land). The maximum water application rate for the soil is 13 mm/hour and available water holding capacity is 150 mm/m. The depth of the root zone is 90 cm and the peak use rate of the crop is 8mm/day.

Management allowable depletion of moisture is 55% (i.e. irrigate after 55% moisture is depleted). Assume an irrigation efficiency (i.e. application efficiency) of 70%.

Determine the following:

(a) Net depth of water per application

(b) Depth (gross) of water pumped per irrigation

(c) Irrigation interval

(d) The number of hectares to be irrigated per day.

6. The students at a certain school carried out three experiments on soils as follows:

Experiment I procedure

(1) They dried 30 g of soil (original mass) in a crucible to constant mass in oven.

(2) After cooling the soil its mass was found to be 20 g. (Dry mass)

(3) The crucible containing the cooled 20 g soil was strongly heated to red hot with a Bunsen burner flame for about 20 minutes.

(4) The soil was then cooled again and its mass recorded.

(5) Steps (3) and (4) were repeated until its mass was constant. And the constant mass was found to be 19 g. (Final mass)

(a) i. What was the aim of this experiment?

ii. Why was 20 g of soil strongly heated in a Bunsen burner flame?

iii. Calculate the percentage by mass of humus or organic matter.

iv. Find the percentage of water in the soil

Experiment II procedure

(1) Students put some 30 g of soil (original mass) in a crucible.

(2) The 30 g soil was put into an oven at 100°C for about 30 minutes to drive off water. After cooling, the mass was obtained.

(3) Heating and cooling was repeated until the mass was constant at 20 g, i.e. dry mass of soil.

(b) i. Calculate the amount of water in this soil sample.

ii. Calculate the percentage by mass of water in the soil.

iii. Mention **four** forces that make water be held in the soil.

Experiment III procedure

(1) They put 50 cm^3 of soil into 100 cm^3 measuring cylinder.

(2) They used another measuring cylinder to measure 50 cm^3 of water.

(3) Water was added to the soil, stirring continuously to allow air bubbles to escape.

(4) If no air were present the combined volume would have been 100 cm^3 (50 cm^3 of soil + 50 cm^3 of water). However, the final combined volume was found to be 90 cm^3.

(c) Calculate the percentage by volume of air in the soil.

PRACTICAL 7

1. You are provided with **two potted plants** after four days of receiving water. Plants W are grown on loam soil and Plants X are grown on sand soil. Both received same amount of water.

(a) Mention **two** distinct differences between the two potted plants.

(b) Briefly describe **one** way how the state of the soil in pot affected the growth of the plant.

(c) If water was poured to the plant in pot **W**, explain any **two** processes by which water would move up to the leaves from the roots.

(d) Under field conditions, explain **one** way how you would improve the soil condition in pot **X** for it to be ideal for plant growth.

(e) What type of soil is suitable for arable cropping?

(f) What is the difference between land and soil?

(g) What is the difference between land degradation and soil degradation?

(h) Mention **five** causes of land degradation.

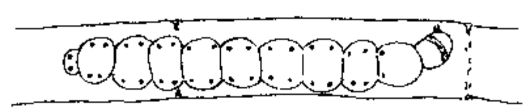
(i) Mention any **five** causes of soil degradation.

(j) State any **five** effects of soil degradation.

(k) What are any **four** ways of controlling soil degradation?

(l) What are any **four** ways of conserving forests in order to control land degradation?

2. You are provided with a crop pest, **P** (maize stalk borer).



(a) Draw and label the pest showing structures used in movement.

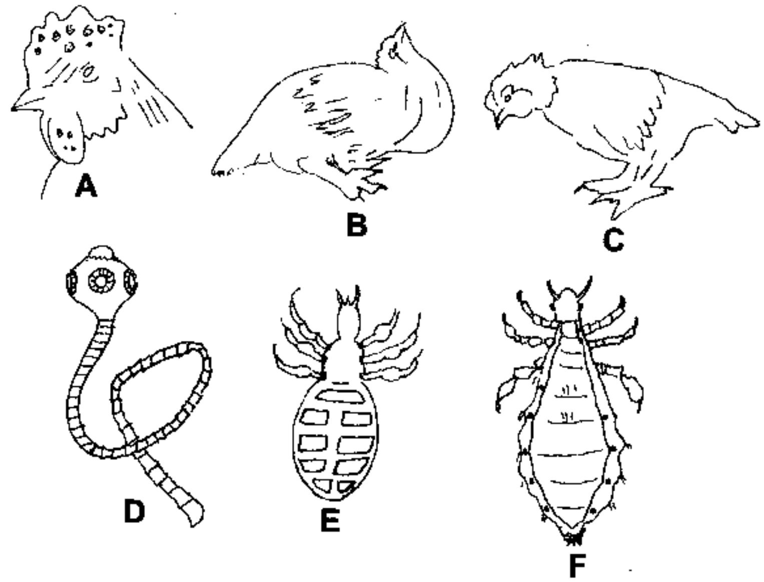
(b) Mention **two** ways through which this pest can reduce the yield of crops.

(c) What are the **three** ways of controlling the pest without using chemicals?

(d) Name **three** plants that are alternative hosts of stalk borer.

(e) Mention **four** other storage pests of maize.

3. Examine the **diagrams** of chicken diseases and parasites provided.



(a) Identify diseases whose signs are shown in **A**, **B** and **C**.

(b) Identify the poultry parasites shown in the diagrams.

(c) Name **two** signs on chickens suffering from **A** and **C**.

(d) Name the organisms that cause the diseases **A**, **B** and **C**.

(e) Give **two** ways of controlling/preventing the diseases you have identified in (a) above.

(f) Name **two** ways of controlling/ preventing parasite **F**.

4. The **table** below shows the demand and supply (market forces) of maize at different prices in the market. Study it and answer the questions that follow:

Price /kg of maize	Quantity demanded (kg)	Quantity supplied (kg)
K9.00	100	20
K20.00	90	30
K31.00	80	40
K42.00	70	50
K50.00	60	60
K60.00	50	70
K70.00	40	80

(a) Draw a graph to show the relationship between price and quantity demanded and supplied (combined demand and supply schedule).

(b) How much maize is demanded when the price of maize is K64.00 per kg?

(c) What is the equilibrium or market price of maize at this market?

(d) Explain any **one** reason why the market price is important to a farmer.

(e) What happens to the quantity supplied when the price of maize rises from K20.00 to K50.00?

(f) Find the price elasticity of supply.

(g) What does the answer in (f) above tell you about the price elasticity of supply for maize at this market?

(h) Describe any **three** things that will happen if the price of maize changed.

5. Mr Mayeso has one hectare of land (fixed factor) planted to rice. He applies different quantities of NPK fertiliser (variable factor) and each weighs 50 kg. The results are shown below.

Inputs (bags of fertiliser)	0	1	2	3	4	5	6	7	8	9	10
Output (yield of rice in kg)	0	2	5	10	16	20	23	25	26	26	25

(a) Plot the graph of TPP (total physical product), MPP (marginal physical product) and APP (average physical product).

Input (x) bags	**Output (y) yield in kg**	**TPP**	**APP=y/x**	**Δy**	**Δx**	**MPP=Δy/Δx**	**EP= MPP/APP**
0	0	0	-	-	-	-	0
1	2	2	2	2	1	2	1
2	5	5	2.5	3	1	3	1.2
3	10	10	3.3	5	1	5	1.5
4	16	16	4	6	1	6	1.5
5	20	20	4	4	1	4	1
6	23	23	3.8	3	1	3	0.8
7	25	25	3.6	2	1	2	0.6
8	26	26	3.3	1	1	1	0.3
9	26	26	2.9	0	1	0	0
10	25	25	2.5	-1	1	-1	-0.04

Input of variable factor (x) bags	**TPP (kg of maize)**	**MPP=Δy/Δx**	**APP=y/x**
0	0	-	-
1	2	2	2
2	5	3	2.5
3	10	5	3.3
4	16	6	4
5	20	4	4
6	23	3	3.8
7	25	2	3.6
8	26	1	3.3
9	26	0	2.9
10	25	-1	2.5

(b) What do the following terms mean in production function:
   i. Point of technical efficiency
   ii. Point of inflection.

(c) What is the value of input that would produce maximum profit?

(d) Why is it good to produce in stage II?

(e) What is the value of MPP and APP where the value of Elasticity of Production is equal to 1?

(f) What is the value of TPP where the value of MPP is equal to zero?

(g) What is the maximum output produced?

(h) i. If the value of each unit of input or each bag of fertiliser is K400.00, what is the cost of inputs that would produce maximum profit (from output)?
   ii. If the price of each kg of rice or each unit of output is K100.00, what is the total money obtained after selling the output that would give the maximum profit?

(j) i. What is the value of total output at the point where MPP and APP are equal?
   ii. Using your graph, where would you advise this farmer to produce his yield?
   iii. What are the values of output and input at the point of technical efficiency?

(k) Define the following:
   i. Total physical product (TPP)
   ii. Marginal physical product (MPP)
   iii. Average physical product (APP)

6. (a) What is a seed rate?
   (b) Calculate the seed rate for a pasture species using the following information:
      i. Seed size = 200,000 seeds /kg
      ii. Purity = 70%
      iii. Germination = 50%
      iv. Expected plant population = 900,000 plants per hectare
   (c) Mention any **five** qualities of a good seed for planting.
   (d) State any **five** factors that affect the seed rate of pasture.

PRACTICAL 8

1. You are provided with **G** (green manure), **P** (DAP), **A** (Sulphate of Ammonia) and **K** (Muriate of Potash).
   (a) Identify samples **G**, **P**, **K** and **A**.
   (b) Mention any **four** factors that affect the quality of farmyard manure.
   (c) State any **four** advantages of organic fertilisers.
   (d) Mention any **four** advantages of inorganic or chemical fertilisers.
   (e) Which fertilisers from the samples stand for straight chemical fertilisers?
   (f) Which fertiliser from the samples is a high analysis fertiliser?

2. You are provided with **part of maize tassel** labelled **D** and **part of a female maize flower** labelled **E**, and a razor blade or calpel for cutting.
   (a) Describe the flowers of **D**.
   (b) i. Draw and label any **two** parts of specimen **D** you can see.
      ii. Write **one** function of each of the parts of the flower that you have mentioned in (i) above.
      iii. Draw and label any **two** parts of specimen **E**.
   (c) Give any **five** characteristics, which show that specimen **D** is pollinated mainly by wind.
   (d) Mention **four** cereal crops apart from maize.
   (e) List any **four** leguminous plants.
   (f) Mention any **five** maize diseases.

3. The **figure** below is a diagram of an internal livestock parasite.

   (a) Name the internal livestock parasite.
   (b) Mention any **two** symptoms of the parasite attack in livestock.
   (c) Draw and label a life cycle of the internal livestock parasite.
   (d) State any **five** ways of controlling/preventing this internal parasite.
   (e) Describe **two** ways this internal parasite can affect livestock production in Malawi.
   (f) Mention any **three** livestock that can be attacked by this internal parasite.

4. The **table** below shows the results of an experiment done at Chaminade School of Champions on maize crop. Study it and answer the questions that follow:

Plots	1	2	3	4	5	6
Plot size (m^2)	100	100	100	100	100	100
Rate of 23:21:0+4S (kg/ha)	-	100	200	300	400	500
Rate of CAN (kg/ha)	-	200	300	400	500	600
Yield of maize (kg)	5	90	50	25	15	10

   (a) What do you think was the aim of the experiment?
   (b) i. What does the word 'replication' mean in experiments?
   ii. Define a 'fair test' in experiments.
   iii. Define the word 'experiment'.
   (c) i. Which plot is a control treatment?
   ii. Why is it necessary to have a control treatment in an investigation?
   (d) i. Which fertiliser rate produced the highest yield of maize?
   ii. Explain **one** reason for your answer in d (i) above.
   (e) Convert the yield of maize in plot 6 to yield in kg/hectare.
   (f) Explain any **one** reason why 5 kg of maize was produced despite no fertiliser being applied to plot 1.
   (g) i. Describe any **two** ways in which the soil nutrient status in the plots should be analysed before fertilisers were applied.
   ii. Explain any **one** reason why it is important to analyse soil in the plots before applying any kind of fertiliser.

5. The students at St. Patrick's Secondary School, Box 5450, Limbe carried out experiments and found the following results:

Experiment I results

i. Mass of fresh garden soil before air drying = 30 g
ii. Mass of fresh garden soil after air drying (If an oven is not available, the soil sample can be left outside in the sun for three hours, turning over periodically with a glass rod so that water can evaporate) = 20 g
iii. Mass of water = (30 g – 20 g) = 10 g

(a) Calculate the percentage of water in the soil.

Experiment II results

i. Mass of soil before drying = 30 g
ii. Mass of soil after first heating = 20 g
iii. Mass of soil after being burnt = 19 g
iv. Mass of organic or humus = (20 g – 19 g) = 1 g

(b) Calculate the percentage of humus or organic matter in the soil sample.

Experiment III results

i. Volume of soil used = 50 cm^3
ii. Volume of soil + water in a 100 cm^3 measuring cylinder = 90 cm^3
iii. Volume of air alone = (100 cm^3 – 90 cm^3) = 10 cm^3

(c) Calculate the percentage of air by volume in this soil sample.

(d) What do the following words mean?
   i. Hygroscopic water
   ii. Surface tension
   iii. Capillary water
   iv. Gravitational water

(e) Which of the **two** types of water described above can be available to plants for their use.

(f) State any **three** reasons why not all soil water is available for plant use.

(g) i. What does heating the soil to constant mass mean?
   ii. What does air-dried soil mean?

6. **Table** below shows information on land distribution among smallholder farmers. Use it to answer questions that follow:

Land holding category (in hectares)	Percentage of smallholders
Below 0.5	26
0.5-1	30
1.1-1.5	22
1.6-2	11
2.1-2.5	5
2.6-3	3
Over 3	4

(a) Draw a bar graph of land holding category of 0.5 to 2 hectares.

(b) If the area has a total of 300 smallholder farmers, calculate the number of smallholder farmers who own land between 1.6 to 2 hectares.

(c) Explain **one** effect of holding less than 1 hectare of land on each of the following
   i. Food production
   ii. Economic development of the country

(d) State any **two** roles estate can play in increasing food production.

(e) i. What type of land tenure is normally associated with smallholder farmers?
   ii. State **one** way in which smallholder farmers acquire the type of land mentioned in e (i).
   iii. Give any **one** disadvantage of the land tenure system mentioned in e (i).

PRACTICAL 9

1. You are provided with **specimen S** (Bean seed).

(a) i. Identify the specimen **S.**
   ii. Draw the specimen as you see it.

(b) On your diagram label **four** important parts for its growth.

(c) State **two** functions of any one part you have labelled.

(d) What is germination?

(e) Mention **four** conditions necessary for germination to take place.

(f) Describe the **two** main types germination that you know.

(g) Describe the **six** stages of seed germination.

2. Study specimens **R** (maize seed) and **T** (groundnut seed) carefully and answer the following questions.

(a) Identify each of the specimens provided.

(b) Name **three** varieties of specimen **T.**

(c) i. Which of the specimen provided would be more suitable for improving the productivity of sandy soils?
   ii. Give **two** reasons for your answer in c (i) above.

(d) With **five** examples each, mention **two** groups of improved maize varieties found in Malawi.

3. A small holder farmer planted genetically modified maize (GMO) at 3 seeds per planting station, 100 cm between planting stations on ridges spaced 60 cm apart. This farmer applied 2 bags of urea per hectare when the plants were knee high (60 cm).

(a) Suppose all the seeds planted emerged, calculate the plant population per hectare.

(b) Calculate the seed rate given that the seed size was 10,000 seeds per kg, germination percentage was 60 and the purity percentage was 60.

(c) If one bag of urea weighed 50 kg, how many kg of nitrogen did he apply per hectare?

(d) What fertiliser would supply 19% less nitrogen than urea?

(e) Mention the best method of applying urea in a maize field.

(f) Explain **two** advantages of applying urea in maize using the method mentioned in (e) above.

(g) Mention **one** inorganic fertiliser that contains 23% nitrogen.

(h) i. State any **two** inorganic fertilisers that can be applied in maize as basal dressing.

ii. Mention any **two** deficiency symptoms of nitrogen in maize.

4. **Table** below shows yields obtained on an experimental plot for different varieties of maize and quantity of manure applied. Use it to answer questions that follow.

Farm yard Manure (kg)	Hybrid Maize (kg)	Local Maize (kg)
0	900	700
100	1,000	800
200	1,100	900
300	1,250	1,000
400	1,400	1,200
500	1,500	1,300
600	1,600	1,400
700	1,700	1,400
800	1,900	1,400

(a) Draw a line graph on the two varieties of maize against farm yard manure.

(b) i. What was the aim of the experiment?

ii. What was the control of the experiment?

(c) From the graph, what yield was obtained from each variety for an application rate of 650kg of farm yard manure?

(d) From the graph, what advice should be given to a farmer on application of farm yard manure above 600 kg to:

i. Hybrid maize?

ii. Local maize?

(e) Explain why hybrid maize performed better than local maize at the same farm yard manure application rates.

5. Gross margin can be a quick way for farmers to make decisions on the kind of enterprise to choose. The farmer is provided with the **information** below to help her choose the best enterprise.

(a) i. Calculate the variable costs per hectare for sorghum, cassava and rice.

ii. Calculate the Total Revenue for each of the three crops.

(b) Between sorghum and rice, which crop would the farmer be advised to increase its area?

(c) What advice would be given to a farmer who would wish to substitute sorghum for cassava? Show your calculations.

(d) Explain how a complete budget is computed.

(e) Explain any **one** reason why it is important to consider depreciation when calculating net profit.

(f) Mention any **two** methods of calculating depreciation.

6. Study the **tables** below and answer the questions that follow.

Fertiliser	% N	% P_2O_5	% K_2O
Sulphate of Ammonia	21	-	-
Nitrate of Soda	16	-	-
Ammonium Nitrate	34.5	-	-

Urea (carbamide)	46	-	-
Calcium Ammonium Nitrate (CAN)	26-28	-	-
Diammonium Phosphate (DAP)	18	46	0
Single Super Phosphate	-	19 P_2O_5	-
Muriate of Potash	-	-	60 K_2O
Potassium Sulphate	-	-	52 K_2O
Potassium Nitrate	13	-	37-44
Mono Ammonium Phosphate (MAP)	11	50	0

Element	**Relative Atomic Mass**
Nitrogen (N)	14.0
Hydrogen (H)	1.0
Oxygen (O)	16.0
Potassium (K)	39.1
Calcium (Ca)	40.1
Phosphorus (P)	31.0

(a) i. Mention any **three** straight chemical fertilisers.

ii. List any **two** compound fertilisers.

iii. Name any **two** conventional or low analysis fertilisers.

iv. Mention **two** high analysis fertilisers from the table above.

v. List **three** complete fertilisers from the above table.

(b) i. A farmer has a plot of size 8 m long and 6 m wide. How much Single Super phosphate (SSP) does he need to apply 40 kg /ha of P to a plot 48 m^2 (8 m x 6 m) using broadcast method. Single Super phosphate contains 19% P_2O_5.

ii How much SSP is needed per plot of 48 m^2?

(c) The same farmer has a plot of size 4 ridges, 5 m long, 0.91 m apart and requires to apply 20 kg per ha of Potassium (K), using Muriate of Potash (MOP) which contains 60% K_2O.

i. How much Muriate of Potash should he apply to meet a 20 kg per ha supply of K?

ii. How much MOP is needed per plot (4 x 5 m x 0.91 m) of 18.2 m^2

PRACTICAL 10

1. You are provided, with **three soil samples** labelled **A** (clay), **B** (sand) and **C** (loam). Add a little water to each sample to just moisten it. Rub each wet soil sample between your fingers.

(a) Identify the soil sample labelled **A, B** and **C**.

(b) Mention the method used to identify the three soil samples labelled **A, B** and **C**.

(c) Identify the soil sample that has got a lot of air space in it.

(d) i. Explain any **one** reason why the soil mentioned in (c) above has got a lot of air space in it.

ii. What **two** other methods can be used to determine soil texture?

(e) i. Which of the **three** soil samples has the largest amount of nutrient in it?

ii. Explain any **one** reason for the largest nutrient content in the soil sample you have mentioned in e (i) above.

iii. Which soil sample has the least nutrient content?

iv. Which soil sample has good chemical properties but bad physical properties?

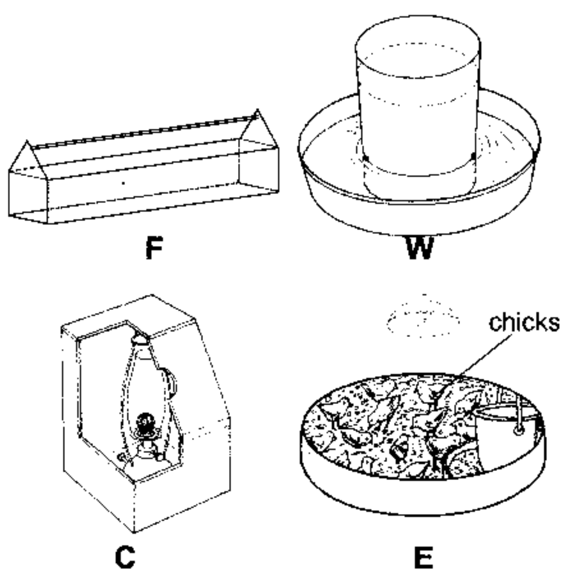
(f) Discuss **one** way how soil structure of sample **A** affects plant nutrient uptake.

(g) Explain any **one** reason why sample **B** easily loses bases especially during heavy down pours.

(h) List **two** ways of increasing the pH of soil **B**.

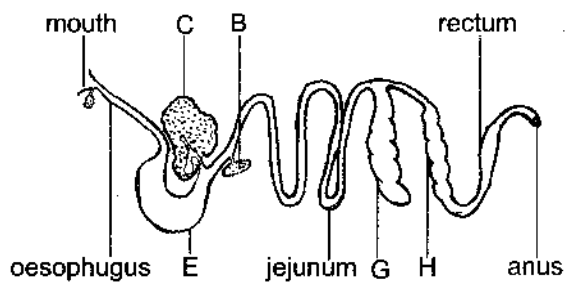
2. You are provided with three **specimens** labelled **R** (rape), **P** (tomato) and **Q** (cassava cutting).
   (a) Identify the specimens **R**, **P** and **Q**.
   (b) Cut specimen **P** longitudinally. Draw and label any **three** internal parts.
   (c) State **one** function of each of the **three** parts labelled in (b) above.
   (d) Draw and label any **three** parts of specimen **Q**.
   (e) Explain **one** problem of marketing specimens **R** and **P**.
   (f) Explain **one** reason why it is important to include legumes in rotation with **R** and **P**.

3. The **figures** below are diagrams of farm equipment. Study them and answer the questions that follow.



   (a) Name the equipment labelled **W**, **F**, **C** and **E**.
   (b) Name the type of animals that can use this farm equipment listed above.
   (c) What is the use of part labelled **X**?
   (d) List any **four** types of commercially balanced rations that can be provided to the animals using this farm equipment.
   (e) What is the function of the equipment **C**?
   (f) How are fertile eggs identified using one of the equipment listed above?
   (g) What is brooding?

4. The **figure** below shows the digestive system of a certain group of livestock.



   (a) Name the parts labelled **H**, **G**, **B**, **C** and **E**.
   (b) Mention any **two** types of livestock.
   (c) List any **three** reasons why this type of digestive system cannot digest cellulose.
   (d) Name any **three** types of enzymes that are produced by the part labelled **B**.
   (e) Explain **two** functions of the part labelled **E**.
   (f) State the digestive fluid that is produced by the structure labelled **C**.
   (g) Discuss **one** function of the digestive fluid produced by the structure labelled **C**.

5. Two steers named Chamie and Bunda were stall fed at Natural Resources College under the same conditions.

   The following data was collected:
   Date when both steers were put in stall: 03/06/04

Initial live mass:	Chamie 220 kg
	Bunda 310 kg
Initial value of the steers:	Chamie K8000.00
	Bunda K10000.00
Date of selling of both steers:	31/08/2004
Selling price: Choice grade	K250.00/kg
Standard grade:	K200.00/kg

Live mass during selling time: Chamie 480 kg
Bunda 380 kg

Grades: Chamie: Choice
: Bunda: Standard

Variable costs are K1,000.00 for each steer.

(a) Calculate the live mass gain per day for each steer.

(b) Calculate the gross margin for Chamie and for Bunda.

(c) Calculate the difference in mass gained per day between Chamie and Bunda.

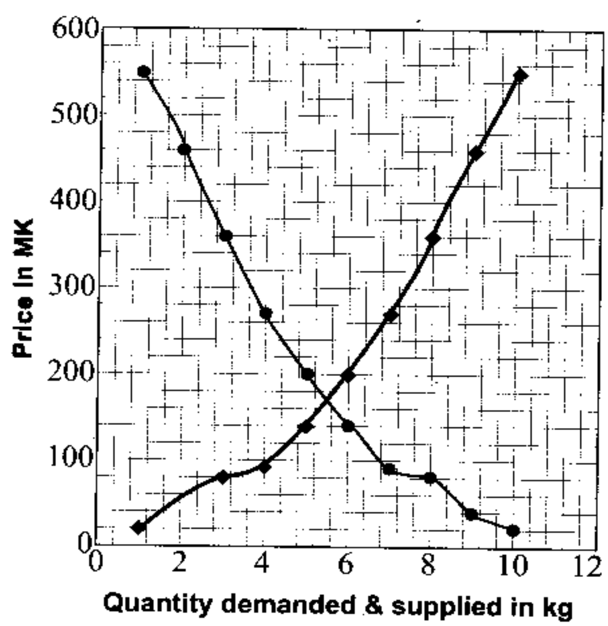
(d) Mention any **three** reasons why the mass gained per day by the two animals is different.

(e) Describe any **three** functions of gross margin in farming businesses.

(f) Explain any **two** advantages of stall feeding livestock between the months of June and August.

(g) If one of the costs that have contributed to the variable costs is cost of feeding, what would be **three** other sources of variable costs for the two steers?

6. Study the **figure** of the market price and demand at Nkhamenya below and answer the questions that follow:



(a) What is the market price of maize at Nkhamenya?

(b) Explain any **one** reason for the importance of market price or equilibrium price to both sellers and buyers.

(c) Discuss what happens to the price of beans when the quantity of beans available in the market decreases.

(d) When should sellers sell their beans in order to get high price.

(e) The students at Nkhamenya Girls Secondary School would like to find out the effect of four different crop spacing (50 cm, 70 cm, 90 cm and 110 cm) on the yield of maize in their school experimental garden.

i. Design an experiment in three blocks using randomised block design (RBD).

ii. Describe how the experiment would be carried out using the following information:
- Carrying out the investigation or experiment
- Collecting data
- Recording data
- Analysis of data collected

iii. With the information given above about the four different crop spacing (50 cm, 70 cm, 90 cm and 110 cm) on the yield of maize, design a 4 X 4 Latin square design.

iv. From your understanding of Agriculture, which of the above spacing would be considered a control? Give a reason for your answer.

v. Mention one importance of repeating an experiment.

PRACTICAL 11

1. You are provided with three types of **pastures** namely **A** (Bahia grass), **B** (cytodon grass) and **C** (elephant grass).

(a) Identify the **three** types of pastures provided.

(b) Which **one** of three named above pastures is the best for cattle livestock?

(c) Explain briefly **two** reasons for your answer in (b).

(d) Describe **one** method of sowing/ establishing type **C** pasture.

(e) Mention any **five** advantages of cultivated (Exotic and improved pasture).

(f) What are any **four** disadvantages of cultivated pasture (Exotic and improved pasture)?

2. You are provided with two plant **samples** labelled **X** and **Y**. **X** is a maize plant affected by head smut disease and **Y** is a maize plant affected by stalk borer (*Baseola fusca*) pest.

(a) Identify the samples and state the abnormality and/or damage associated with them.

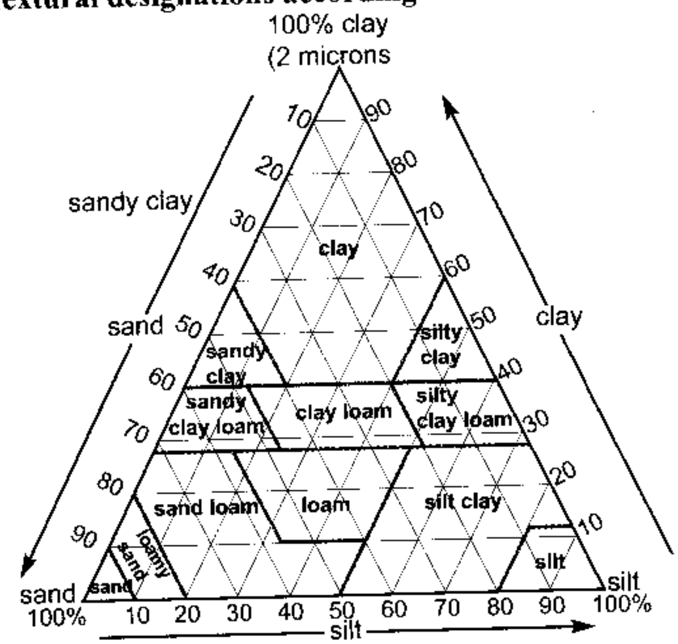
(b) Give the organism that caused the abnormality and/or damage in plants **X** and **Y**.

(c) Name **one** way in which each of the two above abnormality and/or damage can be controlled/prevented.

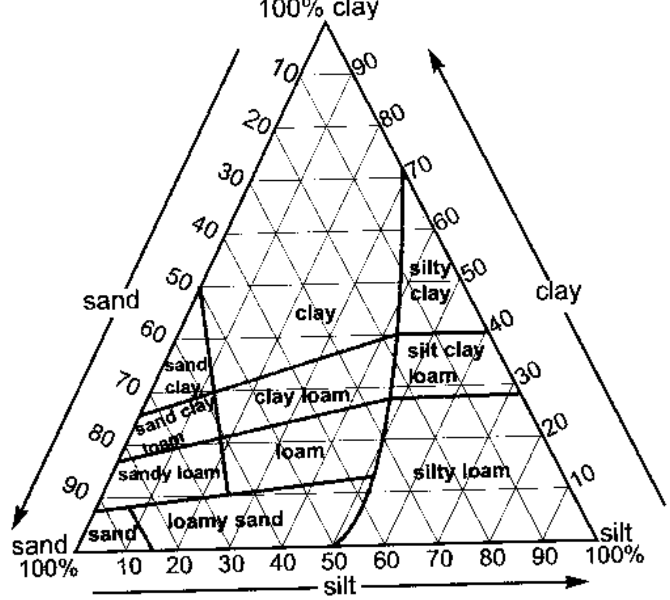
(d) Mention **two** other pests of maize and **one** chemical way of controlling each of them.

3. Study the **two** soil triangles (Triangulation) below and answer the questions that follow:

(A) Textural designations according to Mechanical Analysis



(B) Textural designations as modified by Marshall



(a) i. Why is it important to study the texture of the soil?

ii. What was the aim of modifying texture class **A** into **B**?

(b) Mention **three** types of soil based on texture.

(c) Using soil triangle (Triangulation) **A** classify the soil texture represented by the following percentages:

i. 20% clay, 35% silt and 45% sand

ii. 65% clay, 5% silt and 30% sand

iii. 30% clay, 20% silt and 50% sand

(d) Using the soil triangle (triangulation) **B** modified by Marshall, classify the soil texture represented by the following percentages:

i. 5% clay, 30% silt and 70% sand

ii. 35% clay, 5% silt and 60% sand

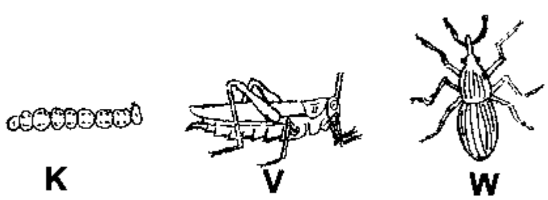
(e) Mention any **two** ways of improving and maintaining soil texture in Malawi.

(f) Classify the soil into **five** types depending upon the particle size.

(g) State any other physical properties of the soil you know.

(h) Mention any **three** factors that make one horizon (layer) of the soil profile to differ from another.

4. Below is a **figure** of crop pests that lower crop production in Malawi. Study it and answer the questions that follow:



(a) Identify **K**, **V** and **W**.

(b) Which of these pests is both a field and storage pest?

(c) State any **two** cultural ways of controlling the pest mentioned in (b) above.

(d) Draw a well labelled diagram of life cycle of pest **V**.

(e) Explain any **two** ways that can be used to break the life cycle of pest **V**.

(f) Explain any **two** ways in which pest **K** contributes to reduced crop production in Malawi.

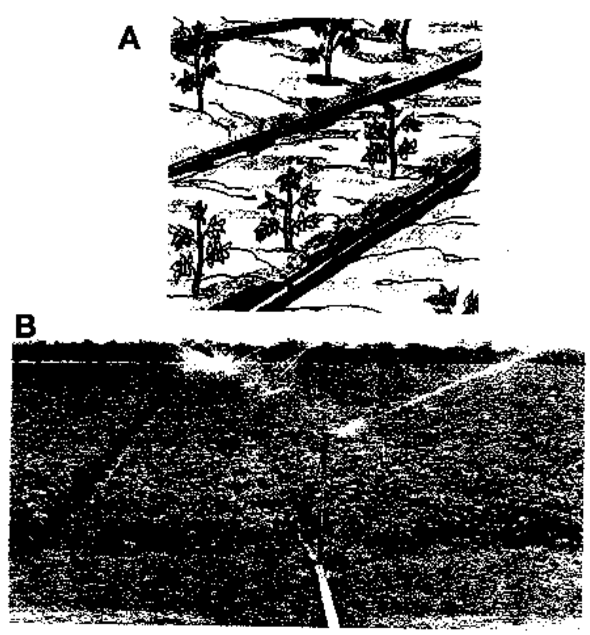
(g) Describe any **one** method of controlling pest **K**.

(h) i. A pure bred yellow maize was crossed with a pink maize of unknown genotype. The seeds were all yellow. Show by genetic diagrams and symbols the genotypes of the parents and the offspring.

ii. One of the offspring above was later crossed with another maize variety of unknown genotype, which was also yellow. Of the 80 seeds collected from the cob, 20 were pink. Show by diagrams and symbols the genotypes of these parents and of all types of offspring produced.

iii. If you were given yellow maize plants of unknown genotypes how could you find out which ones were homozygous and which were heterozygous?

5. **Figure** below shows diagrams of irrigation systems labelled **A** and **B**. Use it to answer questions that follow.



(a) Identify the types of irrigation system labelled **A** and **B**.

(b) State any **two** disadvantages of the irrigation system shown in **B**.

(c) Explain **one** advantage of planting trees in the windward side of a garden irrigated by the system in **B**.

(d) i. What is the name of the structures filled with water in **A**?

ii. Explain any **two** problems caused by the structure named in (i).

(e) Briefly state how irrigation alters farming calendar.

(f) List **two** factors to consider when stabling irrigation system **A**.

6. Mr Chakanika planted maize seeds on a hectare land. Three seeds were planted on ridges spaced 60 cm apart and planting stations were 80 cm apart.

(a) Calculate the plant population for this maize species.

(b) Calculate the seed rate for this maize species, which had the following characteristics:

i. Seed size = 10,000 seeds per kg

ii. Purity = 50%

iii. Germination = 50%

PRACTICAL 12

1. Specimen **B** (*Bidens pilosa* or *chisoso*) or *Tridax procumbens* depending upon which was given during the Examinations.

(a) Identify the weed.

(b) In what **two** ways does this weed compete with growing crops?

(c) Discuss how any **two** structures on the leaves of this weed can assist in absorption and retention of the herbicides.

(d) Explain **three** reasons why chemical weeding is not widely used by subsistence farmers in Malawi.

(e) Mention **four** importance of weeding.

(f) Mention **four** herbicides that can be used to control the weed labelled **B**.

(g) i. What type of a flower is found in weed **B**?

ii. Describe a weed **B**.

(h) i. Mention **two** other functions of the hairs found on the specimen **B**.

ii. Draw and label any **two** parts of specimen **B**.

iii. What type of seed dispersal is done by weed **B**?

iv. What type of pollination does flowers of weed **B** undergo?

2. You are provided with **G** (farmyard manure), **P** (Diammonium Phosphate DAP), **A** (Ammonium Nitrate) and **K** (Muriate of Potash).

(a) Identify samples **G, P, K** and **A**.

(b) Mention any **four** factors that affect the quality of farmyard manure.

(c) State any **four** disadvantages of organic fertilisers.

(d) Mention any **four** disadvantages of inorganic or chemical fertilisers.

(e) Which fertilisers from the samples stand for straight chemical fertilisers?

(f) Which fertiliser from the samples is a high analysis fertiliser?

3. Pesticides can be grouped in many groups. Would you classify and describe the pesticides based on:

i. Mode of entry

ii. Mode of action

iii. Chemical grouping with at least one example for each

4. (a) Cross homozygous (**RR**) (pure breeding) red bull with homozygous (**WW**) white cow for two generations to see the offspring that would result. **RR** represents red offspring; **RW** represents roan offspring; **WW** represents white offspring and alleles **R** and **W** are both dominant, i.e. incomplete dominance or co-dominance. What will be the

genotypes and phenotypes of offspring at the second generation?

(b) What do the following terms mean in animal and crop improvements?
   i. Genetics
   ii. Heredity
   iii. Character or trait
   iv. Variation
   v. Mutation

(c) Mention any **four** advantages of Artificial Insemination (AI).

(d) i. What is hybridisation (cross-breeding)?
   ii. Mention the **three** steps involved in hybridisation.

5. **Table** below shows demand and supply of rice. Use it to answer questions that follow:

Price per kg (MK)	Quantity demanded (kg)	Quantity of rice supplied (kg)
70	154	300
60	170	290
56	195	195
48	250	170
40	292	150
35	292	130

(a) What is the relationship between the price and quantity supplied?

(b) i. What is the equilibrium price from the table.
   ii. Give a reason for your answer in b (i).
   iii. Explain **one** importance of equilibrium price.

(c) Calculate the income farmers received when the price was K60 per kilogramme

(d) Describe the market situation in each of the following conditions of demand for an agricultural commodity.
   i. Elastic demand
   ii. Unitary demand

6. Mr Kanyamuka has 2 hectares of land on which he grows NSCM 41. He however wants to make the following changes:

- To apply 4 bags of urea instead of 6 bags per hectare at K1,300.00 per bag.
- To sell 40 bags of maize at K1,000.00 per bag to Chibuku Products instead of K850.00 per bag to ADMARC.
- To store maize in 50 sacks at K30.00 each instead of storing it in the nkhokwe.
- To spend K500.00 instead of K300.00 on Actellic.
- To spend K600.00/hectare instead of K300.00/hectare on casual labour.

(a) Prepare a partial budget for Mr Kanyamuka.

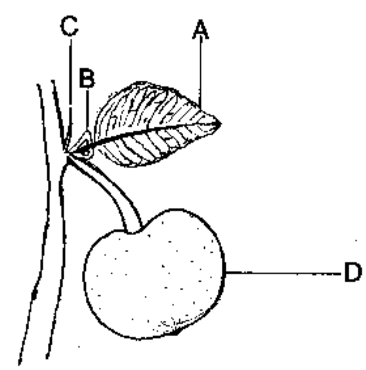
(b) Should Mr Kanyamuka go ahead with his plan? Explain your answer.

(c) Explain any **two** uses of the partial budget prepared in question 4 (a) to Mr Kanyamuka.

(d) Explain the major weakness of the partial budget prepared in question 4 (a).

PRACTICAL 13

1. (a) You are provided with an **orange** as shown below:



   i. Name the parts labelled **A**, **B**, **C** and **D**.
   ii. Draw and label a cross section of an orange fruit (citrus fruit) and label any **four** parts.

(b) Give **two** examples of each of the following recommended citrus varieties and only one example for the sour orange.
   i. Sweet orange (*Citrus sinensis*)
   ii. Tangerine (*Citrus recticulata*)
   iii. Grape fruit (*Citrus grandis*)

iv. Lemon (*Citrus limonum*)
v. Lime (*Citrus aurantifolia*)
iv. Sour orange (*Citrus aurantium*)

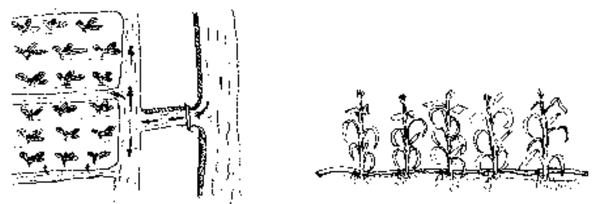
(c) Name any **three** diseases of citrus fruits common in Malawi.

2. You are provided with **samples X** and **Y** [two tomatoes (*Lycopersicon esculentum*)].
   (a) Name any **four** varieties of tomatoes.
   (b) Mention any **two** diseases of tomatoes and their causes.
   (c) Draw and label any **two** external parts of sample **X** (tomato) provided.
   (d) Cut the tomato with a razor blade transversely. Draw and label any **four** parts of the cut sample **X** (tomato).
   (e) Cut sample **Y** (another tomato) provided with a razor blade longitudinally. Draw and label any **four** parts of the tomato that you have cut.

3. You are provided with the specimens **M** and **N** (**M** = Maize and **N** = Cassava).Use them to answer questions that follow.
   (a) Identify the specimen **M** and **N**.
   (b) State any **two** processing activities through which specimens **M** and **N** undergo in readiness for storage
   (c) Explain any **two** conditions which are required in the storage of specimen **M**.
   (d) Explain any **two** ways in which specimen **N** is important in terms of food security.
   (e) i. State the nutritive value of specimen **N**.
   ii. Give any **two** products obtained from processing specimen **N**.

4. You are provided with an **ectoparasite** (tick).
   (a) Identify the ectoparasite provided.
   (b) Draw the top view of the parasite and label any **two** parts.
   (c) Explain briefly **two** ways in which this parasite affects its host animals.
   (d) Give a reason why chemical control fail to completely control the parasite on Malawian farms.
   (e) Mention **three** ways of controlling/preventing the ectoparasite.
   (f) Name **two** types of livestock that can be attacked by such groups of ectoparasite.
   (g) The Pox diseases are caused by viruses, which produce pocks or skin lesions in the affected animal. Mention **five** Pox diseases and the livestock they attack.

5. The **figure** below shows two diagrams of irrigation systems labelled **T** and **P**. Study them and answer the questions that follow:



T **P**

   (a) Define the word 'irrigation'.
   (b) Name **two** main types of irrigation.
   (c) Identify the types of irrigation systems labelled T and **P**.
   (d) State any **three** advantages of the irrigation system labelled **P**.
   (e) Mention any **two** advantages of irrigating crops using system **T**.
   (f) Explain any **two** problems of furrows in diagram labelled **P**.
   (g) Explain briefly **one** way in which irrigation can change the farming plan.
   (h) Mention any **four** factors that a farmer should consider when starting an irrigation system of any type.

6. The change that a farmer plans to effect is to store groundnuts in sacks and sale later when the groundnuts are scarce. The groundnut yield he got from his 1 ha of land is 70 bags, each weighing 100 kg. The main extra costs are:
   - Cost of sacks at K30.00 each
   - Cost of casual labour to pack groundnuts is K300.00

4. **Table** below shows reproductive cycle of four types of farm animals belonging to Mrs Chinsapochanyau. Use it to answer questions that follow.

Type of animal	Length of oestrus cycle (days)	Duration of oestrus cycle (hours)	Legth of gestation (days)	Time of ovulation (hours)
Cow	21	18	283	10 after end oestrus
Ewe	17	36	150	36 after beginning of oestrus
Sow	21	48	115	36 after beginning of oestrus
Nanny	20	36	150	Not known

(a) Which animal (5) has the longest heat period?

(b) Explain **one** advantage of having a longer heat period.

(c) A nanny was on heat on 27th June 2010 but was not served.

i. State any **three** ways Mrs Chinsapochanyau would have known the nanny was on heat.

ii. What was the heat appropriate date serving the nanny? Show your working.

(d) Mrs Chinsapochanyau plans to have her ewe give birth on 31st December, 2010.

i. When should she allow the ewe to mate? Show your working.

ii. Explain **one** advantage of planning to have the ewes lamb on 31st December, 2010.

5. (a) Two black pigs are mated together on several occasions and their offspring are black. However, when their black offspring are mated with white pigs, half of the mating result in all black litter and the other half produce litters containing equal number of black and white babies. From these results figure out the (i) genotype of the parents and (ii) the F1 offspring (First Filial Generation).

(b) In cattle, the presence or absence of horns is controlled by a single gene, which has two forms, one for the presence of horns and the other for the absence of the horns. Pure breeding cattle with horns were crossed with pure breeding cattle without horns. All F1 cattle were hornless.
Use **H** for dominant form and **h** for the recessive form in answering the questions below.

i. Give the genotype of the **two** parents and the F1 (first filial generation) cattle.

ii. F1 cattle were mated amongst themselves. Write down the results of such a cross showing the genotypes and phenotypes of the offspring.

iii. The F1 cattle were crossed with pure breeding cattle with horns. What proportions of the offspring were hornless? Show your working.

6. A farmer has 2.5 ha of maize and 0.8 ha of groundnuts.
He is considering applying for a loan of K70,000.00 to obtain plough at K25,000.00 and a ridger at K45,000.00 respectively. He already has two trained oxen and an ox-cart.
Assume the following:

- Both the plough and the ridger will last for five years.
- They will both incur annual repair costs of K1,000.00 each.
- There will be no saving in labour costs.
- The K70,000.00 loan is for three years and is to be repaid in annual installments at 8% on the reducing balance. However, the annual interest rate is 10% and annual depreciation is 20%.

- The ridger will save one hand-weeding of maize that is now done by casual labour at a cost of K4,000.00 per hectare.
- Both maize and groundnuts will be planted two weeks earlier than usual. This would raise the yield by 450 kg/ha and 130 kg/ha respectively.
- Maize is worth K2,000.00 for a 90 kg bag and groundnuts K50.00 per kg.
- Extra feed for the oxen would cost K3,000.00
- Since the oxen would be kept busy ploughing, this farmer would get K6,000.00 less each year for contract carting (using ox-cart) with them.

(a) Should this farmer apply for the loan? Show your calculations.

(b) Will any extra profit cover his annual loan payments?

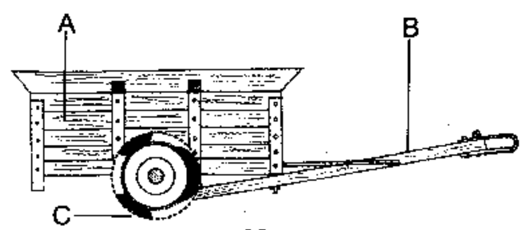
PRACTICAL 15

1. You are provided with **soil samples** labelled **A** (Top soil) and **B** (Sub soil), which were taken from the same soil profile of a certain farm at Bunda College of Agriculture.
   (a) Identify the samples **A** and **B** provided.
   (b) State any **one** physical and chemical property that makes the samples **A** and **B** differ.
   (c) Discuss any **two** ways through which **A** would lose its mineral elements easily.
   (d) Explain briefly **three** reasons why it is important in agriculture to have a well-developed soil profile.
   (e) Explain any **three** methods of maintaining soil fertility in our Malawian soils.
   (f) Mention **two** types of soil structure.
   (g) Mention any **four** similarities between sedimentary and metamorphic rocks to distinguish them from igneous rocks.

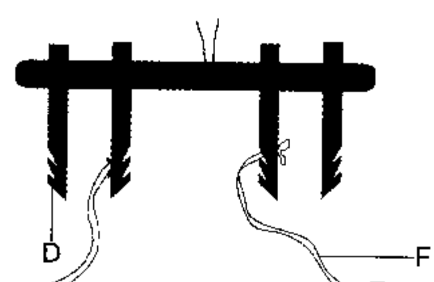
2. (a) You are provided with a **pawpaw** fruit (berry). Cut the pawpaw with a razor blade. Draw and label any **four** parts.
   (b) With **one** example, define each of the following types of true fruits grown in Malawi:
   i. Legume
   ii. Capsule
   iii. Achene
   iv. Caryopsis
   v. Berry
   iv. Drupe
   (c) What is the difference between true dry fruits and true fleshy fruits?

3. (a) i. Name any **two** types of sprayers that can be used to apply chemicals on crop fields.
   ii. Give **two** types of knapsack sprayers.
   iii. Define these words as used in chemical pest and weed control in crop fields
   - Wetting agent
   - Adjuvant
   - Concentration
   - Active ingredient (a.i.)
   - Diluent

   (b) Describe **three** main kinds of spray applications that depend on the quantity of spray liquid used.
   (c) **Figures** below are diagrams of the equipment used by smallholder farmers in Malawi to improve and increase farm production.



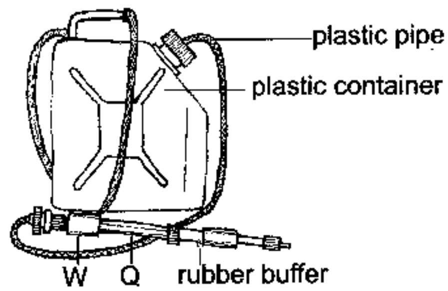
K



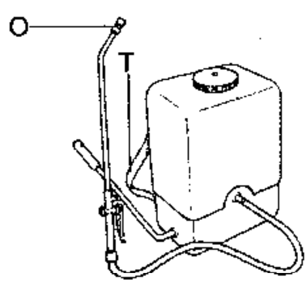
P

i. Name the parts labelled **A, B, C, D** and **F**.
ii. Name the equipment **K** and **P**.

(d) Below is a **diagram** of one of the types of sprayers commonly used on the farms of Malawi.



G



M

i. What name is given to sprayers **G** and **M**?
ii. Name the parts labelled **T, W, Q** and **O**.
iii. Name **four** types of chemicals that can be used as adjuvant in herbicide and weed control in the crop fields.

(e) A certain farmer was provided with the following information to use in applying herbicide in her field:

- A 20 litre CP knapsack sprayer
- 1 ha piece of land
- Ametryne herbicide recommended rate of 1.5 *l*/ha
- Any recommended herbicide rate should be diluted in 200 litres of water and be applied to 1 ha , i.e. 200 litres of water per ha.

i. How many m*l* of ametryne should be mixed in one sprayer?
ii. Calculate the number of 20 litre sprayers that can be sprayed per ha.
iii. The same farmer wanted to apply servian herbicide at a rate of 50g/ha together with Blad buff 5 (BB5) at a rate of 30 m*l*/ha using a 20 litre sprayer. Calculate the servian and the BB5.

(f) Determination of the quantity of a pesticide or a herbicide formulation (A) needed to apply a recommended amount of active ingredient (a.i) per hectare (B) using a pesticide or herbicide formulation containing (C) per cent active ingredient in very important in chemical weed or pest control.

i. Calculate the quantity of Atrazine (Gesaprim 80W) applied pre-emergence at the rate of 2 kg active ingredient per hectare in a newly planted 5-hectare cassava field.
ii. Calculate the quantity of a herbicide formulated as an emulsifiable concentrate (25EC) and applied to a 5-ha field at the rate of 2.5 kg per hectare.
iii. Calculate the quantity of Bentazone (Basagram 480E) applied at the rate of 2.0 kg a.i. per ha on a 800 m^2 experimental field which is heavily infested with Cyperus esculentaus.
iv. Calculate the rate of application when 50 kg of a 10% granular herbicide was applied to a 4 ha field of maize.
v. Mr Masamu sprayed a 15 ha field with Galex 500 FW and at the end of operation had used up 30 five-litre capacity cans of Galex. The crop developed injury symptoms within three days after treatment. Farmer blames injury on the type of herbicide recommended, claiming that it was applied according to the recommended rate of 3 to 4 kg active ingredient per ha.

Calculate the correct rate of application used by the farmer.

(g) i. Mention **three** herbicides that can be applied as pre-emergence in weed control.
ii. State **three** herbicides that can be applied as post-emergence in weed control.
iii. Mention any **three** herbicides that can control broadleaf weeds.
iv. State any **three** herbicides that can control water grass weeds (yellow and purple grasses).
v. List **three** herbicides that can be used to control both grasses and broad leaf weeds in Malawi.
vi. Mention any **three** herbicides that can control weeds as a pre and post emergence.

4. **Table** below shows results from soil science laboratory and data from meteorological observations of an extension planning Area. Use it to answer questions that follow:

Characteristics	Soil A	Soil B	Soil C
Percentage sand	40	42	20
Percentage silt	8	6	10
Percentage clay	50	47	60
Soil colour	red	brown	black
Effective depth (metres)	4	1	1.5
Percentage organic matter	2	5	10
Rainfall (mm per year)	2000	1500	1000
Annual rainfall distribution	More even distribution	Uneven distribution	Uneven distribution
Temperature	Medium	Medium	High
Soil pH	5.1	6.2	7.4

(a) i. Which soil is likely to have the highest water holding capacity?
ii. Explain **two** reasons for the answer to question a (i).

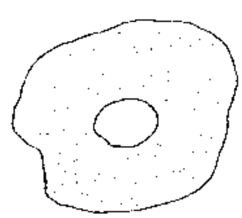
(b) i. Which soil will be good for **three** crops
ii. Explain **two** reasons for the answer to question b (i).

(c) Explain any **two** reasons for the acidity in soil **A**.

(d) i. From which soil would the results show the highest population count of microorganisms?
ii. Explain **one** reason for the answer to question d (i).

(e) State any **three** ways of improving soil **A**.

5. (a) A **figure** below is an outline of an animal cell.



In the diagram draw:
i. **Two** pairs of chromosomes.
ii. **One** mitochondrion.

(b) If the cell in the figure underwent meiosis, how many chromosomes would each daughter cell have?

(c) In pigs the alleles for brown eyes is dominant to the alleles for the blue eyes. However, a blue-eyed litter may be produced by a brown-eyed father and a brown- eyed mother.
i. Using **B** for a dominant allele for brown eyes and **b** for the recessive allele for blue eyes, what would be the genotype of such parents?
ii. Using the genotype you have given above, show with the aid of a labelled genetic diagram how **two** brown eyed parents can produce a blue-eyed litter.

(d) What do the following words mean in crop and animal improvement?
i. Heterozygote
ii. Genetic diagrams

iii. Additive characters
iv. Single factor inheritance
v. Co-dominance or incomplete dominance

(e) A plant breeder carried out cross pollination between two pure breeds of cassava, one with purple flowers and another with white flowers. Purple flower colour in cassava is due to a dominant allele **(R)** while white flower colour is due to a recessive allele **(r)**.

i. Using the symbols **R** and **r** show the cross between the pure breeds to produce the first generation.
ii If the first generation is crossed with another white-flowered plant, what would be the expected results? Show your working.

(f) Suppose flower in cassava is due to incomplete dominance (partial dominance) such that a cross between the pure breeds in (e) produce first generation plants that have pink flowers. What colour would be the expected phenotypes and the ratio among the F2 generation? Show your working.

6. A farmer has a piece of land on which to do her enterprises. She expects the following returns and expenditures:

Returns	**Expenditure**
Milk at K37,400.00	Bought feed at K21,100.00
Beef at K5,100.00	Wages at K14,400.00
Maize at K36,400.00	Fertiliser at K6,300.00
Groundnuts at	Fuel at K6,800.00
K10,600.00	Repairs & maintenance at K13,600.00
Goats at K2,000.00	Miscellaneous at K6,800.00

Prepare a complete budget for this farmer.

PRACTICAL 16

1. You are provided with **specimen X** (an onion) and **Y** (a banana fruit).

(a) Name the specimen **X**.
(b) Draw and label any **three** external parts that you see on the specimen.
(c) i. Take the specimen **X** you are provided with and cut it with a knife longitudinally. Draw and label any **two** internal parts that you see.
ii. What type of propagation is common in specimen **X**?
iii. Mention any **two** advantages of the type of propagation you have given in (ii) above.
(d). i. Name the specimen **Y**.
ii. Draw and label any **two** external parts of specimen **Y**.
iii. Take the specimen **Y** provided and cut it with a knife or razor blade longitudinally. Draw and label any **two** internal parts that you can see.
(e) i. What type of propagation is common in specimen **Y**?
ii. Mention **two** other plants or crops that can propagate like specimen **Y**.
(f) What name is given to asexual reproduction in flowering plants?

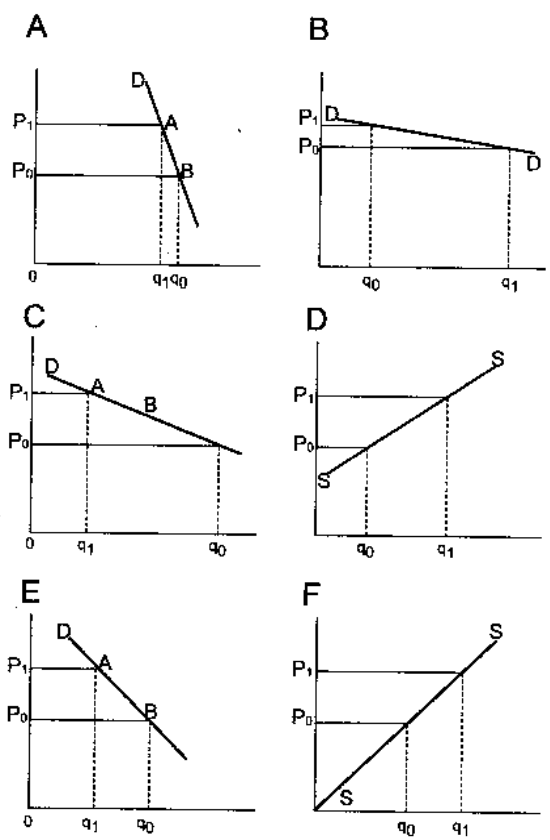
2. You are provided with five different planting materials **P** (sugarcane stem), **Q** (maize seed), **R** (sweet potato vine), **S** (mango fruit) and **T** (pumpkin seed).

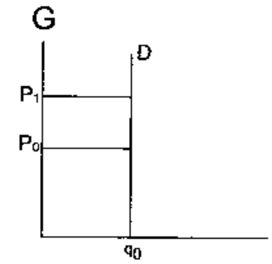
(a) Identify the samples **P, Q, R, S** and **T**.
(b) Mention any **one** characteristic of a good planting material.
(c) Which of the **five** planting materials are propagated by seed?
(d) Give any **two** advantages of propagation by seed.
(e) Give any **two** disadvantages of propagation by seed.
(f) Draw and label any **three** parts of the sample **P**.
(g) Calculate the plant population of specimen **Q** which is planted on 90 cm apart ridges, planting three seeds per station and planting at 0.9 m apart. The area to be planted is 1 ha.

3. (a) White bull (genotype WW) and red cow (genotype RR) of pure breeds were crossed. The resulting calves were pink in colour.
   i. What is the genotype of the pink calves?
   ii. If the pink calves after maturing were self-crossed, what would be the ratio of white, pink and red calves? Show your working.
   iii. Suggest a possible explanation for the ratio you have obtained in (ii) above.

   (b) What do the following words mean in crop and animal improvement?
   i. Incomplete dominance
   ii. Mitosis
   iii. Meiosis
   iv. Speciation
   v. A fair test in experiments

4. (a) The sketches of **graphs** below represent the types of elasticities of demand and supply. Name the **seven** types of elasticities.





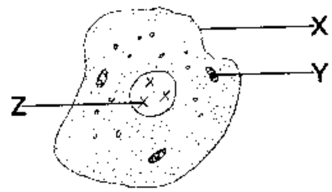
   (b) Mention **five** factors that determine the quantity of a product, which producers will offer for sale at any market.

   (c) Mention **three** ways of describing goods at the market on the basis of the value of income elasticity of demand.

   (d) Briefly state what is happening in graphs **A, B, C, E** and **G**.

5. Mrs Likonye planted maize seeds on a hectare land. Three seeds were planted on ridges spaced 64 cm apart and planting stations were 75 cm apart.
   (a) Calculate the plant population for this maize species.
   (b) Before Mrs Likonye planted her one hectare of land with this maize variety, she planted 400 seeds on a small plot and only 200 seeds germinated. Calculate the germination percentage of this maize variety.
   (c) Calculate the seed rate for this maize species, which had the following characteristics:
   Seed size = 10,000 seeds per kg
   Purity = 50%
   (d) Seed quality is expressed as the pure line seed content (PLSC). Calculate the Pure Line Seed Content for this maize variety.
   (e) State **two** importance of supplying maize wherever germination has failed.
   (f) Mention any **four** importance of planting maize crop early in the growing season.

6. (a) What is livestock management?
   (b) The **figure** below is a diagram of an animal cell that can be used in livestock improvement. Label and state the function of the parts labelled **X, Y** and **Z.**



(c) Mention **three** main methods of livestock improvement that can be practised in agriculture.

(d) What is the difference between in-breeding and out-breeding?

(e) i. List any **four** beef breeds of cattle.
ii. Mention **two** main systems of managing beef cattle in Malawi.

PRACTICAL 17

1. You are provided with **specimens X** (groundnut seed), **Y** (groundnut flour) and **C** (cotton seed).
   (a) Identify the samples **X, Y** and **C**.
   (b) Identify **two** primary products and **one** secondary product from the three specimens.
   (c) Explain **two** ways in which the provision of **C** from the rural areas has contributed to the development of industries in Malawi.
   (d) Remove the testa of specimen **X** and break it longitudinally. Draw and label any **three** parts.
   (e) What raw material produces the specimen **Y**?
   (f) Describe any **two** ways in which specimen **X** is necessary for the economic development of the Malawi.

2. You are provided with **fertiliser samples** labelled **K** (Urea) and **C** (23:21:0 + 4S).
   (a) Identify the samples **K** and **C**.
   (b) What is the common method of applying specimen **C** to a field of genetically modified maize?
   (c) Briefly explain **two** advantages and **two** disadvantages of using the common method of applying **K**.
   (d) State any **one** way in which nitrogen in specimen **K** can be taken by crops.
   (e) Mention any **two** uses of any two elements in sample or specimen **C** for crop production.
   (f) Mr Honda applied four bags of **K** each weighing 50 kg to his crops. Calculate the amount of nitrogen this farmer applied. Show your working.

3. Vegetative reproduction is the asexual reproduction in flowering plants and the vegetative reproduction can be grouped into natural vegetative reproduction and artificial vegetative reproduction.
   (a) What is the difference between natural vegetative reproduction and artificial vegetative reproduction?
   (b) Define with **one** example the natural vegetative reproduction associated with food storage that are listed below:
   i. Bulb
   ii. Corm
   iii. Rhizome
   iv. Stem tuber
   v. Root tuber
   (c) Define with **one** example the natural vegetative reproduction without special food storage that listed below:
   i. Runners
   ii. Stem suckers
   iii. Leaf buds
   (d) Define with **one** example the artificial vegetative reproduction that are listed below:
   i. Cuttings
   ii. Budding
   iii. Tissue culture
   iv. Grafting
   v. Layering

4. (a) A farmer tells you that his goat has given birth to identical twins of a male and female young ones. Explain why this is incorrect.
   (b) In goats, the alleles (allelomorphic genes) for white colour, **D** is dominant to the alleles for black colour, **d**.

i. Write down the genotype for a goat showing the (recessive) conditions for black colour.

ii. Write down the cross, which would result in all offspring being heterozygous.

iii. What will be the phenotype of the offspring in (ii) above?

(c) i. Assuming that the blood groups of the human beings are the same as that of cattle, then it can be said that there are 4 blood groups **A**, **B**, **AB** and **O**. There are 3 genes, **A**, **B** and **O** responsible for these blood groups. Genes **A** and **B** are dominant while gene **O** is recessive. Use the above information to work out blood groups of offspring from parent cattle with blood groups **A** and **AB**.

ii. If the cow is homozygous **B** and the farmer claims that the bull of type **AB** blood is the father of the calf, which is type **A** blood. Is this possible? Show your working.

5. A farmer growing 4 hectares of beans kept the following records:

- Cost of 10 hoes at K300.00 each
- Cost of bean seed at K5,000.00
- Cost of hiring a lorry to carry seed at K2,000.00
- Cost of spraying with malathion at K1,500.00
- Cost of buying CP sprayer at K5,000.00
- Permanent labour – 8 people at K2,000.00 each per month worked for 4 months
- Casual labour – K6,000.00
- The yield of shelled beans is 2,200 kg per hectare
- The price of shelled beans is K60.00 per kg.
- Sale of bean haulms to compost manure-making farmer K3,000.00

(a) Calculate the gross margin.

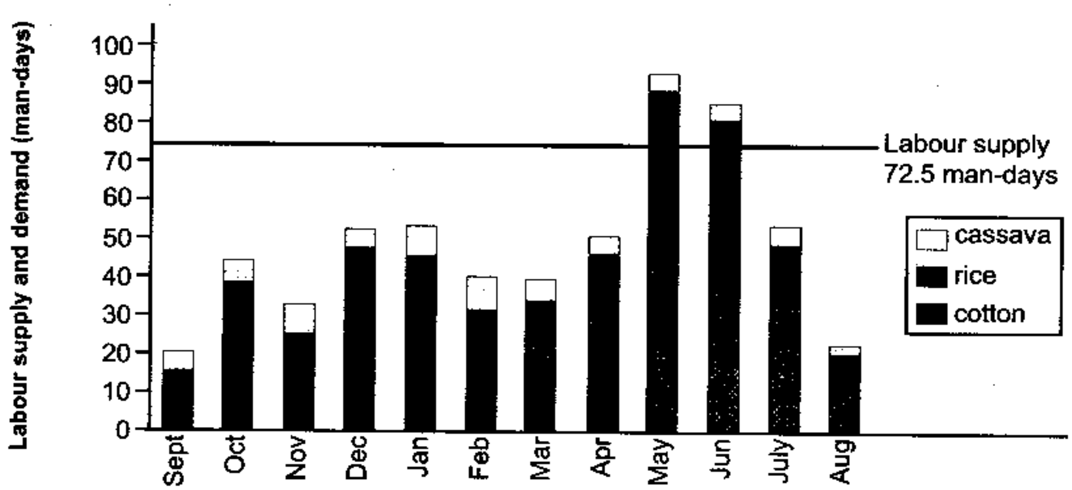
(b) Find the profit.

(c) What is the difference between gross margin and profit?

(d) Give **one** reason why it is normally better to calculate gross margin than profits in business.

6. The **figure** below is a bar graph showing labour profile for cotton, rice and cassava. Use it to answer questions that follow:

Labour profile for cotton, rice and cassava



(a) i. During which months was labour insufficient?

ii. In which month was labour demand lowest on the farm?

(b) i. Calculate the total amount of labour needed to meet demand in the month mentioned in a (i).

ii. Explain any **two** ways in which a farmer could solve the problem in b (i).

(c) Name **one** crop which had the highest labour demand and another which had least labour demand during the year.

(d) Explain any **two** ways in which knowledge of labour demand for different enterprises is important.

(e) i. Give **one** point to explain what would happen to labour demand if a the land on which cotton was grown was used to grow rice.

ii. Other than labour, state any **two** farming resources which are used in production.

PRACTICAL 18

1. You are provided with two **specimens** labelled **X** (*Mpiru*) and **Y** (Tomato fruit).

(a) Identify the specimens labelled **X** and **Y**.

(b) i. Cut specimen **Y** longitudinally. Draw and label any **three** parts.

ii. Mention **one** function of each of the parts labelled in question b (i).

(c) i. If a farmer grows carrots and beans in addition to specimens **X** and **Y**, design a four year crop rotation for this farmer.

ii. Explain the importance of including peas in the rotation in question c (i).

(d) i. Explain the main problem of marketing the specimens labelled **X** and **Y**.

ii. Explain any solution to the problem in question d (i).

2. You are provided with the **three types of rocks**, **I** (igneous rock), **M** (metamorphic rock) and **N** (sedimentary rock).

(a) Identify the **three** types of rocks **I**, **M** and **N**.

(b) With **one** example state how each one type of the rocks is formed.

(c) Draw a diagram and clearly label any **two** structures of rock **N**.

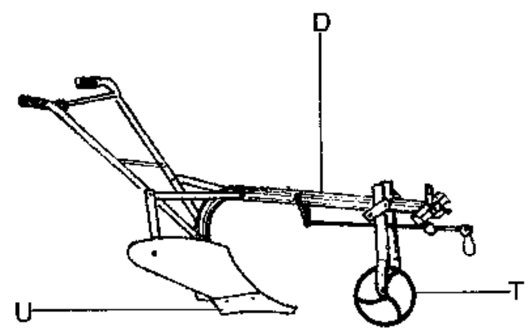
(d) Draw and label any **three** structures of rock **M**.

(e) Name any **two** agents of erosion.

(f) Mention any **two** constituents of the soil.

3. Below is a **figure** of a diagram of farm equipment. Study it and answer the questions that follow.

(a) What name is given to the equipment **A** shown below?



(b) Name the parts labelled **D**, **T** and **U**.

(c) State the function of **T** and **U**.

(d) In what **four** ways can this machine be made to last for many years before it is replaced?

(e) Mention any **four** advantages of farm mechanisation.

(f) Mention any **four** parts of a garden or farm sprayer.

4. **Table** shows results of an experiment on maize. Use it to answer questions that follow:

Plots	1	2	3	4	5
Plot size (m²)	50	50	50	50	50
Rate of DAP (kg/ha)	0	100	200	300	400
Rate of urea (kg/ha	0	100	200	300	400
Yield of maize (kg)	25	40	30	10	5

(a) What was the aim of the experiment?

(b) i. What name is commonly given to treatment in plot 1?
   ii. Why is it necessary for an experiment to have a treatment named in question b (i) above?

(c) i. Which fertiliser rate give the highest maize yield?
   ii. Explain **one** reason for the answer to question c (i).

(d) Explain **one** reason for harvesting 2.5 kg of maize in plot 1 despite the absence of fertiliser.

(e) i. What was the yield of maize obtained from plot 4?
   ii. Convert yields of maize in plot 4 to yield in kilogrammes per hectare.

(f) i. Explain any **two** ways in which the nutrients status of the soil in the plots should have been analysed before applying the fertilisers.
   ii. Explain **one** reason for analysing the soil in the plots before applying fertilisers.

5. A farmer at Ntchentche Village has a mango plantation and during the growing season, plants maize between the spaces, then grows dwarf beans between the maize stations, and finally grows pumpkins in the same field.
   (a) Name the type of mixed cropping system practised by this farmer.
   (b) How many levels or storey would the plot have?
   (c) Apart from this way of practising this cropping system, describe any other **two** ways.
   (d) Explain any **two** advantages of this cropping system.
   (e) Explain any **two** disadvantages of this cropping system.

6. A farmer planted one seed of MH 28 per station of 25 cm apart and on ridges spaced at 80 cm apart. This farmer applied 4 bags of CAN per hectare only once when the plants were knee-high (60 cm).
   (a) Assuming all the seeds germinated and grew into good plants, what was her plant population per ha? Show your working.
   (b) If each bag of fertiliser weighed 50 kg, how many kilogrammes of nitrogen did she apply? Show your working.
   (c) What fertiliser could she have applied which would have supplied 19% more nitrogen?
   (d) Sketch a simple diagram to show the method that the farmer might easily use in applying the fertiliser to her maize crop.
   (e) Mention any **five** ways that were used to arrive at the recommendation of applying 4 bags of Calcium Ammonium Nitrate (CAN) per hectare.

PRACTICAL 19

1. Your provided with **specimen C.**

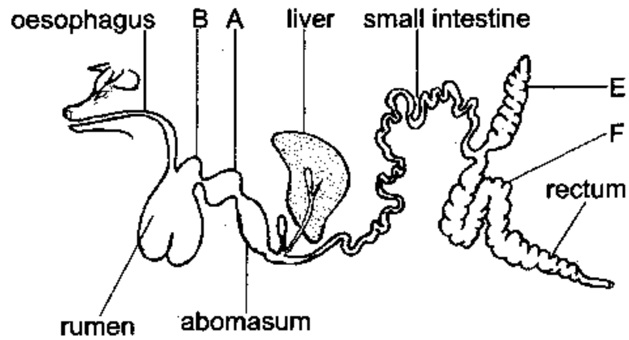
C

   (a) Identify the weed, **C**.
   (b) In what **two** ways does this weed compete with a growing maize crop?
   (c) Mention any **one** parasitic weed of maize.
   (d) What are any **four** signs of witch weed attack on the maize plant?
   (e) Mention any **three** characteristics of a witch weed.
   (f) List **two** characteristics of the roots of the witch weed.
   (g) In what **three** ways can witch weeds be spread or be dispersed?
   (h) State **two** ways of controlling the witch weed.

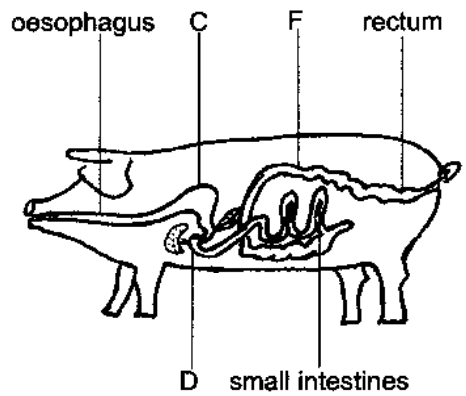
2. You are provided with samples **X** (*madeya*), **Y** (elephant grass) and **Z** (lime)
   (a) Identify the **three** samples.
   (b) Among the three samples which **one** has the greatest energy value?
   (c) Name the sample that can be an additive feed to chickens that lay eggs.
   (d) List **two** other additive feeds that can be supplied to chickens apart from the one mentioned in (c) above.
   (e) Mrs Mazengo plans to graze her twelve cattle on a 1.5 hectare of star grass. However during the wet season there is usually more grass than the number of animals that can feed on them.
      i. If you were a farmer, what would you do in this situation?
      ii. State any **five** reasons for your answer in (i) above.
      iii. Explain any **two** ways in which seasonal production of star grass affects its quality and quantity.
   (f) What **four** factors should be considered before formulating an animal feed?

3. A farmer kept the following information on his farm.
   – 02/03/2010 He sold 30 units of eggs at K7. 00 per unit
   – 03/03/2010 He bought one bag of layers marsh at K800.00
   – 02/03/2010 He bought 2 bags of manure at K50.00 per bag
   – 05/04/2010 He sold vegetables at K500.00
   – 10/06/2010 He sold 6 bags of maize at K15,000.00
   – 12/08/2010 He sold 3 bags of cassava at K6,000.00
   – 15/09/2010 He sold 5 bags of groundnuts at K15,000.00
   – 06/12/2010 He bought 2 bags of CAN at K12,000.00
   (a) Using this financial record, calculate the profit or loss.
   (b) Explain any **two** importance of keeping financial records on the farm.

4 The **diagrams** below show the digestive system of cattle and of a pig.



Digestive system of cattle



Digestive system of pig

   (a) Name the parts labelled **A** to **F**.
   (b) What is the function of the parts labelled **A**, **B**, **E** and **F**?
   (c) Mention any **four** characteristics of non-ruminants.
   (d) State any **three** functions of micro-organisms (bacteria and fungi) found in the rumen of ruminants.
   (e) What are **three** advantages of rumination that takes place in non-monogastric animals?

5. (a) Cross homozygous **(BB)** (pure breeding) black bull with homozygous **(bb)** brown cow for two generation to see the offspring that would result after **two** generations.

(b) What is selection in animal improvement?

(c) Describe the **three** major types of breeding in animals.

(d) How can a pure breed or a pure line be achieved in inbreeding of animals?

(e) i. What is one of the advantages of cross-breeding?

ii. What is hybrid vigour or heterosis?

(f) What is the major genetic effect of inbreeding (selfing)?

(g) Mention **four** disadvantages of Artificial Insemination (AI).

6. A company has a total supply of labour of 200 man days per month. Below is a **table** that shows labour demand for two hectares of maize in man days per month.

Month	Number of days
Jan	250
Feb	240
Mar	300
Apr	180
May	150
Jun	130
Jul	120
Aug	100
Sep	140
Oct	190
Nov	210
Dec	220

(a) Come up with a labour profile in form of a bar graph for the enterprise.

(b) List any **two** months in which the company can cope up with the amount of work being done.

(c) During which any **three** months does the company has peak periods?

(d) State any **four** maize activities that can result in peak periods.

(e) Mention **four** ways in which a smallholder farmer can avoid peak periods.

(f) What are any **five** advantages of work planning?

PRACTICAL 20

1. You are provided with **samples H** (humus), **C** (cow dung) and **S** (sand).

(a) Identify samples **H, C** and **S**.

(b) Among the three samples which **one** is a mineral constituent of the soil.

(c) Describe a method used to determine the proportion of the soil constituents.

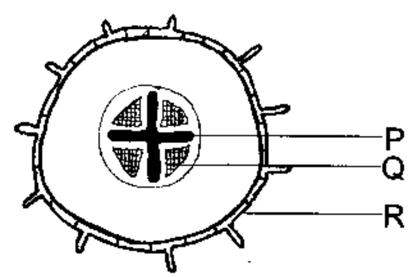
(d) Explain any **three** ways in which the nutritive value of **C** can be maintained in a field of maize crop.

(e) Describe any **four** effects of adding **H** to **S**.

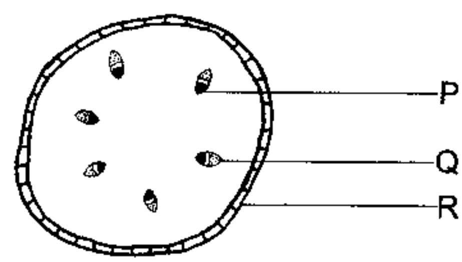
(f) What are **five** disadvantages of applying **C** in a field of maize crop?

(g) State any **four** advantages of applying **C** in a field of maize crop.

2. (a)



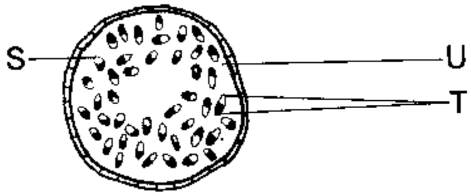
Dicotyledonous root



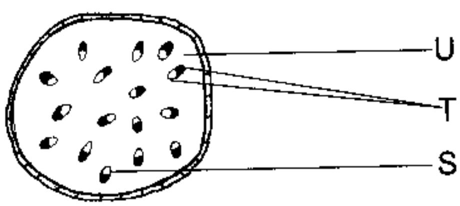
Dicotyledonous stem

Name the parts labelled **P, Q** and **R**.

(b)



Monocotyledonous root



Monocotyledonous stem

Name the parts labelled **S**, **T** and **U**.

(c) Give **two** differences between the stem of a monocot and that of a dicot.

(d) What is the use of the vascular cambium?

3. A tomato farmer kept the following records
   - Land tax at K1,000.00
   - 2 bags of CAN fertiliser at K4,000.00 PER bag
   - Wages of permanent labour K20,000.00
   - Insecticides K1,200.00
   - Casual labour K5,000.00
   - Packets of tomato seed K500.00
   - Depreciation cost of irrigation equipment K4,000.00

   (a) Classify the records into:
      i. Fixed cost
      ii. Variable cost

   (b) What was the total variable cost? Show your working.

   (c) What was the total fixed cost? Show your working.

   (d) If the farmer sold 200 fruits daily on average for a period of 90 days at a price of K10.00 per fruit, calculate
      i. The amount obtained from tomato garden. Show your working.
      ii. The gross margin of tomato enterprise. Show your working.
      iii. The profit/loss of the tomato enterprise. Show your working.

   (e) State any **one** way in which farmers prefer to calculate gross margins to profit?

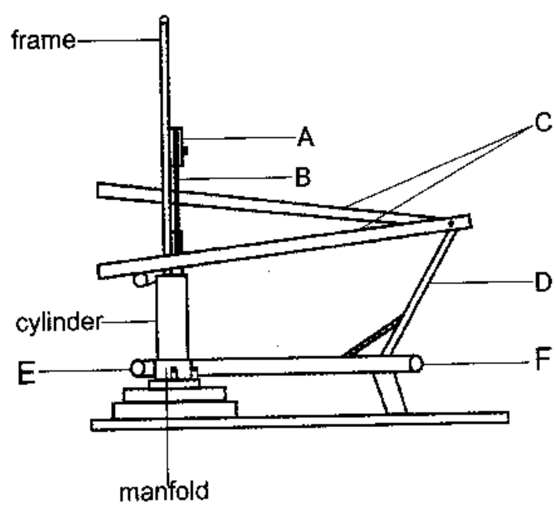
4. (a) What is flushing in livestock production?

   (b) Explain any **three** advantages of flushing in animals.

   (c) i. What is challenge feeding or lead feeding?
      ii. Mention any **three** advantages of challenge feeding or lead feeding.
      iii. What are **two** objections or disadvantages of challenge feeding?

   (d) i. What is steamimg up in animal production?
      ii. Mention any **one** advantage of steaming up in cows?
      iii. Give the name of food component that is only found in colostrums and not in the normal milk.
      iv. Mention any **three** characteristics of colostrums.

5. The **figure** below is a diagram of a treadle pump that is commonly used by small-scale farmers in Malawi. Study it and answer the questions that follow:



   (a) Name the parts labelled **A**, **B** and **C**.

(b) What is the function of the parts labelled **D**, **E** and **F**?

(c) What should be the maximum depth between the shallow well surface and ground water surface for a treadle pump to operate well?

(d) What is the average discharge of a treadle pump?

6. (a) A smallholder farmer sprays her cotton with pesticides but does not use fertiliser. She discovers that fertiliser use would probably increase her yield by 300 kg/ha, selling at K20.00 per kg. However, the fertiliser would cost K3,000.00/ha and to get the required response she would have to add soluble boron to her pesticide spray mixture at a cost of K400.00 per ha. Also the higher yield would raise the cost of casual reaping labour by K600.00 per hectare.

   Should this smallholder farmer apply fertiliser to her cotton?

   (b) Mr Tichasa has two hectares of land where he grows maize crop. However, Mr Tichasa plans to make the following changes:

- To sell 50 bags of maize at K1,000.00 per bag to Rab Processors instead of K900.00 per bag to Chaminade Secondary School, Box 100, Karonga.
- To spend K700.00 per hectare instead of K500.00 per hectare on labour.
- To store his maize in 50 sacks at K40.00 each instead of keeping them in a granary (nkhokwe).
- To spend K500.00 instead of K300.00 on pesticides.
- To apply 5 bags per ha of CAN instead of 7 bags per hectare at K2,500.00

   i. Preapre a partial budget for Mr Tichasa.

   ii. Should Mr Tichasa go ahead with his plan? Explain why.

   iii. Mention any **two** uses of a partial budget.

   iv. Explain **one** main disadvantage of a partial budget.

PRACTICAL 21

1. You are provided with **specimen** labelled **Q** (unshelled groundnuts).

   Process: Shell the specimen

   (a) Name the marketing function performed.

   (b) Explain any **two** ways in which the function named in (a) reduces marketing costs.

   (c) i. Name the type of propagation if a farmer uses the shelled specimen for propagation.

   ii. Give any **two** advantages and any **two** disadvantages of the type propagation named in c (i).

2. You are provided with **specimen X** (chicken gizzard).

   (a) Examine and identify specimen **X**.

   (b) Name the role that the specimen **X** plays in the digestive system.

   (c) How does the specimen **X** accomplish the task of digestion in poultry?

   (d) Mention any **four** poultry diseases you know.

   (e) Mention any **four** parasites of chickens.

   (f) List **three** signs of worms in chickens.

3. You are provided with **specimen T** (CAN) and **K** (lime).

   (a) Identify the samples **T** and **K**.

   (b) Name a common element found in both **T** and **K**.

   (c) Mention **four** roles of the element found in both **T** and **K** to growing crops.

   (d) Briefly explain **one** reason for including specimen **K** in poultry rations.

   (e) Briefly explain **two** effects of applying specimen **K** to the soils.

   (f) Name another important element that is found in specimen **T** apart from the one mentioned in (b) above.

   (g) Mention **four** ways through which the element that you have mentioned in (f) above can get lost.

   (h) Mention **four** trace or minor or micro elements that are needed by crops.

4. **Table** below shows a type of production record for groundnuts kept by Marist Farm. Use it to answer questions that follow:

Date	Work done	Number of persons	Number of days worked
05/10/10	Planting	3 women 2 children	1
20/10/10	1st weeding	5 men 3 women 3 children	2
06/11/10	2nd weeding	4 men 1 child	1

(a) Name the type of the production record.

(b) Calculate the total number of man-days for the first weeding.

(c) Assuming the farmer had a constant supply of a man-days every day, calculate the labour surplus or short fall for the two days of first weeding.

(d) Explain **two** ways in which the record is important.

(e) Other than labour, explain any **two** farming resources which are used in production.

(f) Looking at table **X**, give **one** point to explain the problem faced by Marist Farm in terms of labour demand.

5. A 17-month-old steer of mass 265 kg was stall-fed from 10th January, 2003 to 10th May, 2003 when it was sold after weighing 355 kg.

(a) Find the average mass gained per day for the steer.

(b) Calculate the total revenue if K200.00 was paid per kg gained by this steer.

(c) Calculate the net income if K50.00 per day was spent on variable costs.

(d) State any **one** disadvantage of stall-feeding.

(e) State any **three** advantages of stall feeding.

(f) To what grade would this steer belong at the time of selling?

6. (a) Name **two** types of irrigation channels.

(b) List **four** materials that can be used to construct a lined or built-up irrigation channel.

(c) Name any **four** control structures that can be used to control water in surface irrigation system.

(d) Name any **two** water measuring structures that can be used in surface irrigation system and for each give **three** examples.

(e) What are the **two** types of drainage?

PRACTICAL 22

1. You are provided with **specimens** labelled **Q** and **P**. **Q** is groundnuts and **P** is maize seed. A farmer planted the specimens **Q** and **P** in the same field.

(a) Name the cropping system.

(b) Explain any **three** advantages of the cropping system named in (a).

(c) Give any **two** agro-based industries that can use the specimen **P** as a raw material.

(d) Name the main nutrient that an animal can get from feed made from the specimen labelled **P**.

2. You are provided with the **specimen**, **C** (cement), **D** (fertiliser), **E** (soil) and **F** (lime).

(a) Identify the specimen **C**, **D**, **E** and **F**.

(b) Mention **one** function of sample **E** and **one** function of sample **C**.

(c) Name any **three** characteristics of metamorphic rocks.

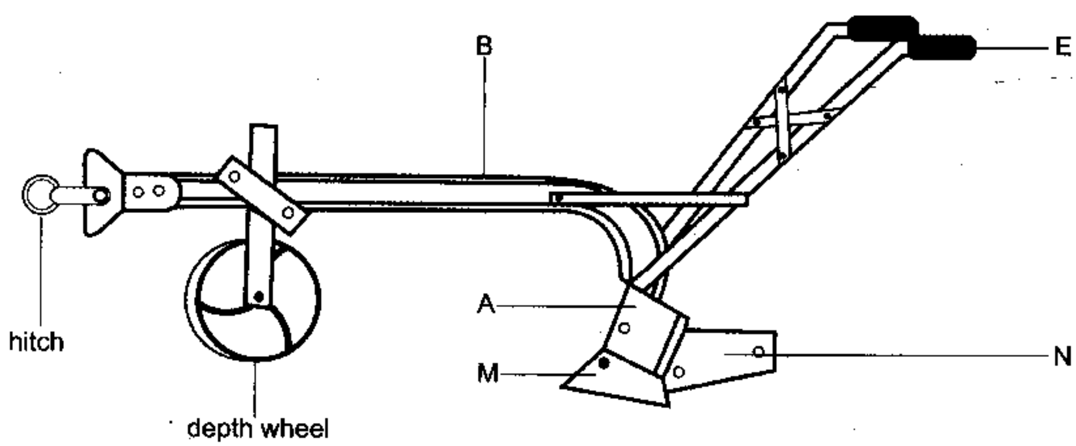
(d) Name any **three** characteristics of igneous rocks.

(e) Name any **three** characteristics of sedimentary rocks.

(f) Mention **three** groups of sedimentary rocks.

(g) Which sample is good for crop growth?

3. You are provided with **specimens K** (sugarcane stem) and **T** (tomato fruit).
   (a) Identify the samples **K** and **T**.
   (b) Draw a longitudinal diagram of specimen **T** and clearly label any **four** parts.
   (c) What is the chief difference between specimen **K** and specimen **T**?
   (d) How can you establish a clone of specimen **K**?
   (e) Name any **two** conditions under which you would expect individual plants from a clone to differ in their appearance and behaviour.
   (f) Mention **five** factors that affect the rooting of cuttings.
4. (a) With the aid of a diagram briefly describe how the oestrus cycle happens in cow.
   (b) Mention any **three** diseases of cattle and for each give **three** symptoms.
   (c) Name **one** parasite of cattle.
5. Below is a **diagram** of a ridger that is ox-drawn.



   (a) Name the parts labelled **M, A, N, E** and **B**.
   (b) Explain **one** way in which you would adjust the ridger to determine:
      i. the distance between the ridges
      ii. the depth of ridging
   (c) Name other **four** common machines and implements that are commonly used by subsistence farmers in Malawi.
   (d) Mention **five** advantages of mechanisation.
   (e) Mention any **two** disadvantages of mechanisation.

6. Study the **table** below and answer the questions that follow:

Fertiliser	Formula	% N	% P	% K	% S
Sulphate of Ammonia	$(NH_4)_2SO_4$	21	-	-	24
Nitrate of Soda	$Na(NO_3)_2$	16	-	-	-
Ammonium Nitrate	NH_4NO_3	34.5	-	-	-
Urea (carbamide)	$CO(NH_2)_2$	46	-	-	-
Calcium Ammonium Nitrate (CAN)	$Ca(NH_4NO_3)_2$	26-28	-	-	-
Diammonium Phosphate (DAP)	$(NH_4)_2HPO_4$	18	46	0	-
Calcium Sulphate (gypsum)	$CaSO_4$	-	-	-	17.5
Muriate of Potash	KCl	-	-	60 K_2O	-
Potassium Sulphate	K_2SO_4	-	-	52 K_2O	
Potassium Nitrate	KNO_3	13	-	37-44	0-2

(a) i. Write any **three** straight fertilisers from the table above.

ii. List any **two** compound fertilisers from the table above.

iii. List any **two** conventional or low analysis fertilisers from the above table.

iv. List **two** high analysis fertilisers from the table above.

v. List **four** complete fertilisers that can be applied to crops.

(b) Mrs Kisebe planted maize seeds on a plot of 5 ridges, each 10 m long and spaced at 0.91 m. She applied 23:21:0+4S fertiliser at the rate of 300 kg/ha. Planting stations were at 0.91 m as well.

i. Calculate the area of a plot.

ii. How much 23:21:0+4S fertiliser should be applied to this plot?

iii. Calculate the amount 23:21:0+4S fertiliser to apply per ridge.

iv. Calculate the amount of 23:21:0+4S to apply per planting station.

PRACTICAL 23

1. You are provided with **specimen X**, (which is a bean seed).

(a) i. Identify the sample **X**.

ii. Draw and label any **three** external parts of the specimen **X**.

(b) Remove the testa and divide the specimen **X** into two parts. Draw clearly the divided **X** and label any **three** internal parts.

(c) Explain **one** function of the **three** external parts labelled in (a).

(d) Name **one** function of the **three** internal parts labelled in (b).

(e) Describe **one** importance of legumes to human health.

(f) Mention **four** natural vegetative propagation methods associated with food storage.

2. You are provided with **sample M** (stem of maize plant) and **sample B** (stem of bean plant).

(a) Identify samples **M** and **B**.

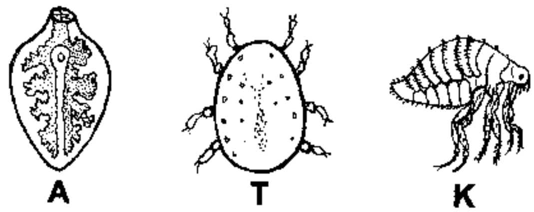
(b) Draw the cross section of sample **M** and label any **four** parts.

(c) Draw the cross section of sample **B** and label any **four** parts.

(d) Mention **three** functions of the root of a crop.

(e) What is a seed?

3. The organisms shown in the **diagram** below can spread diseases.



(a) Name **one** organism that causes diseases in cattle.
(b) Draw and label the life cycle of **T**
(c) Mention **three** ways of controlling organism **T**.
(d) Apart from spreading diseases how can T harm animals?
(e) Mention **three** common diseases of sheep.
(f) Draw and label the life cycle of **A**.
(g) Name **two** types of birds that can be attacked by the external parasite **K**.

4. The **table** below concerns the marketing costs and marketing margins that happened to some produce at Nthalire Market. Study it and answer the questions that follow.

Produce	Farm gate price (MK/kg)	Retail price (MK/kg)	Marketing margins (MK)	% Share of product value
Onions	80.00	85.00	5.00	
Maize	20.00	30.00		
G/nut	40.00	45.00		
Beans	35.00	40.00		
Millet	20.00	25.00		
Beef	100.00	120.00		

(a) i. Calculate the marketing margins of each produce.
ii. Calculate the percent share of product value of each produce.
(b) Which **two** produce have the smallest % share of the product value?
(c) Which **two** produce have the largest marketing margin?
(d) Name any **four** marketing functions that can add marketing costs to the produce listed above.
(e) Mention any **four** marketing agencies

5. The **table** below shows the increasing quantities of labour used to 1 ha of maize.

Fixed factor 1 ha of land	labour (man days)	TPP units of output	MPP	APP
1	1	3	-	3.0
1	2	7	4	3.5
1	3	12	5	4
1	4	16	4	4
1	5	19	3	3.8
1	6	21	2	3.5
1	7	22	al	3.14
1	8	22	0	2.75
1	9	21	-1	2.33
1	10	18	-3	1.8
1	11	13	-5	1.18

labour (mandays)	TPP	MPPx $= \Delta y/\Delta$	APP =y/x
1	3	-	3.0
2	7	4	3.5
3	12	5	4
4	16	4	4
5	19	3	3.8
6	21	2	3.5
7	22	1	3.14
8	22	0	2.75
9	21	-1	2.33
10	18	-3	1.8
11	13	-5	1.18

(a) Plot the graph of TPP (Total physical product), MPP (Marginal physical product) and APP (Average physical product).
(b) What agricultural law is illustrated by the graph you have plotted or shown?
(c) What is the value of total output at the point of inflection?
(d) What is the value of input that would give maximum profit?

(e) How do you know that at the value of input mentioned in (d) would give the maximum profit?

(f) Why is it not good to produce in stage I?

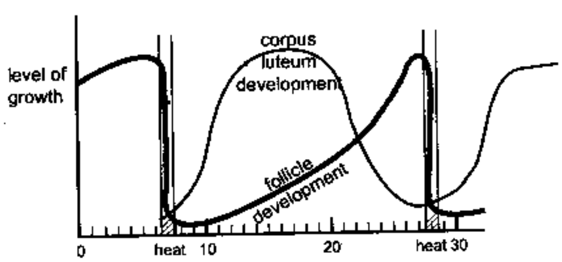
(g) What do the following terms mean in production function?
  i. Point of technical efficiency
  ii. Point of inflection.

(h) i. What is the value of MPP and APP where the value of Elasticity of Production is equal to 1?
  ii. What is the value of TPP where the value of MPP is equal to zero?

(j) i. What is the maximum output produced?
  ii. Briefly define the **three** stages of the graphs you have plotted.

(k) i. Using your graph, where would you advise this farmer to produce his yield?
  ii. What are the values of output and input at the point of technical efficiency?

6. **Figure** below shows cycle of a cow



(a) How many days does it take for the heat period to repeat?

(b) Why is it important for a farmer to know the oestrus cycle?

(c) Mention any **four** signs of heat

(d) Explain the interrelationship between the corpus Latium and follide development during the oestrus cycle

(e) Explain the role played by the corpus Lutium:
  i. before fertiliser
  ii. after fertiliser

PRACTICAL 24

1. You are provided with **specimens P** and **Q**.

P is banana fruit and **Q** is mango fruit.

(a) Identify specimen **P** and **Q**.

(b) Explain how **P** and **Q** are propagated

(c) Name **two** nutrients that can be obtained from specimen **P**.

(d) Explain **two** advantages of the method of propagating **P** you have mentioned in (b).

(e) List down any **two** qualities you would work for when choosing a good variety for specimen **Q**

2. You are provided with two bean seedlings. **Specimen A** was grown in the dark and **specimen B** was grown in light. You are also provided with **specimen M** (mango leaf).

(a) State **three** differences between specimen **A** and specimen **B**.

(b) Make a well labelled diagram of specimen **B**.

(c) Feel the leaf blade of **A** and bend it. Do likewise with a leaf of specimen **B**.
  i. Compare the **two** leaves by feeling them and bending them.
  ii. Which of the **two** leaves would wilt easily?
  iii. Give a reason why the leaf you have mentioned would easily wilt.

(d) Draw the leaf of sample **M** and show any **three** external parts.

(e) Suppose you cut sample **M** with a razor and you used a microscope to observe its internal parts, draw the cut leaf to show any **five** internal parts as seen through the microscope.

3. You are provided with two types of maize seed, **specimen A** (hybrid maize) and **specimen B** (local maize).

(a) Draw the surface view and edge-on view of specimens **A** and **B**.

(b) Cut into halves specimen **B**. Draw longitudinally and label any **six** internal parts you see.

(c) Which specimen is a hybrid maize seed?

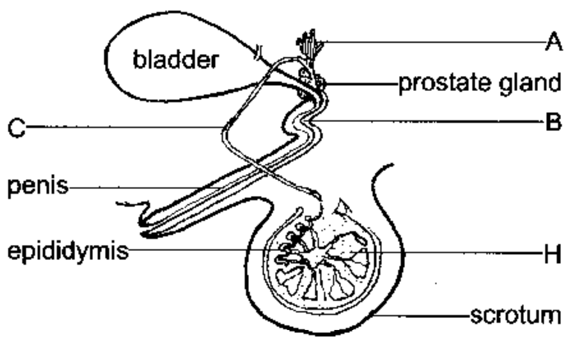
(d) Give a reason for your answer in (c) above.

(e) State **one** disadvantage and **one** advantage of using the hybrid maize seed as a planting material.

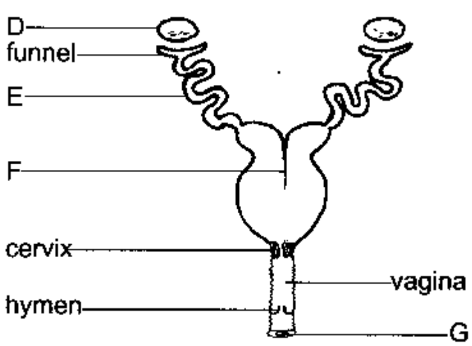
(f) Explain the **three** main stages involved in breeding specimen **A**.

(g) Mention any **two** management recommendations you would give to a farmer who wishes to plant specimen **A**.

4. The **figures** below are diagrams of a reproductive system of a boar (male pig) and a cow.



A



B

(a) Name the parts labelled **A** to **H**.

(b) What is the function of the parts labelled **B**, **C**, **D**, **E** and **G**?

(c) State any **four** factors that affect the rate at which female livestock can attain puberty.

(d) Mention **three** functions of the hormone oestrogen.

5. Actellic is a poison used to kill weevils. Some weevils have evolved which are resistant to actellic. The resistant weevils are pure breeds and have two recessive genes.

(a) If **R** represents the normal genes and **r** represents the resistant gene, state the genotype of the resistant weevils.

(b) i. show by using the box below, a cross between two weevils heterozygous for this condition.

Gametes		

ii. How many weevils would you expect to be resistant in a group of offspring of 16?

(c) How might a resistant gene evolve in a weevil population?

(d) Weevils are pests and need to be controlled. Since the use of chemicals may result in the evolution of resistant genes, suggest the best way of controlling the weevil population.

(e) Describe **five** aims of crop improvement in Malawi.

(f) Describe the **four** methods that can be used in crop improvement.

6. Mr Ngwira bought one bale of sugar from a retail shop at the price of K1,200.00. This sugar went through the following marketing channels:

– Starting with a smallholder farmer whose marketing price (selling price) is K420.00 for the raw sugarcane

– Processing company with 25% share of product value

– Wholesaler with share of product value of 30%

– The retailer's share of product value of 10%

(a) Calculate the marketing margin at each marketing channel.

(b) Calculate the selling price or marketing price of this sugar at each marketing channel.

(c) Find the farm gate price of this sugar.

(d) If K100.00 profit was made by the processing company, K60.00 by wholesaler and K20.00 by a retailer. Calculate the total marketing cost.

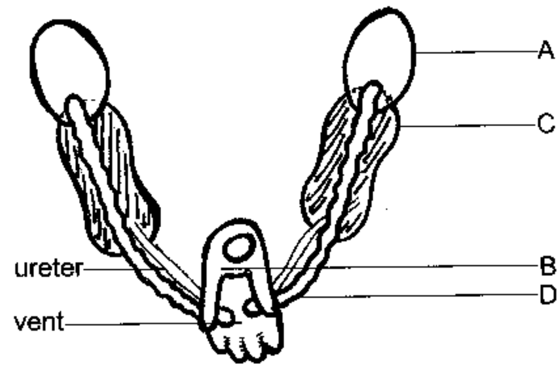
(e) Calculate the total marketing margin.

PRACTICAL 25

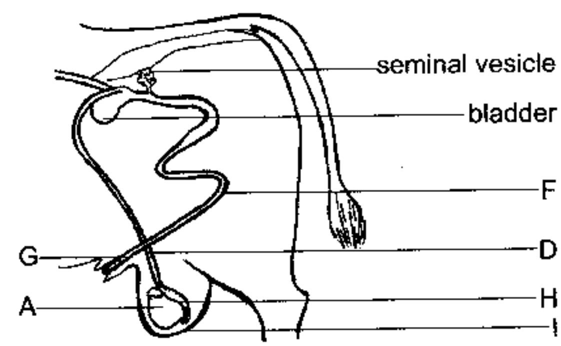
1. You are provided with **fertiliser samples** labelled **K** (CAN) and **C** (DAP).
   (a) Identify the samples **K** and **C**.
   (b) State any **two** ways in which phosphorus in specimen **C** can be taken by crops.
   (c) Mention any **two** uses of elements in sample or specimen **C** for crop production.
   (d) Mr Soko applied four bags of DAP each weighing 50 kg to his crops. Calculate the amount of nitrogen this farmer applied. Show your working.
   (e) What would be the **four** results of excessive nitrogen being applied to crops?
   (f) Mention a common method of applying specimen **K** to a field of maize.
   (g) Mention **two** characteristics of Muriate of Potash (MOP) and **two** characteristics of Urea.

2. Study a tomato **flower** provided.
   (a) Cut the flower from top to bottom (longitudinally) into equal halves.
      i. Draw one half of this flower to show its internal parts.
      ii. On your drawing, label all the female parts of this flower.
   (b) i. Suggest the possible pollinating agent of the flower provided.
      ii. Mention any **three** features by which the flower provided is adapted for pollination by the agent you have suggested above.
   (c) Draw the diagram of this tomato flower to show how it would look like after fertilisation. Label any **three** parts on your diagram.
   (d) Draw the diagram and label any **three** parts of how a ripe fruit would look like after ripening.

3. The **diagram** below shows the reproductive systems of a cock and a bull.



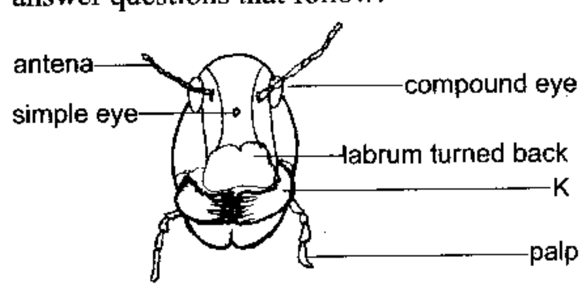
Cock

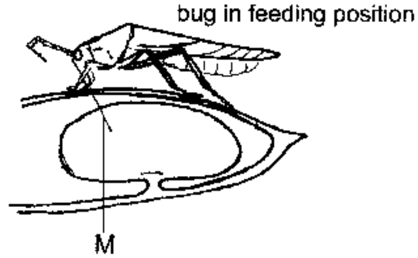


Bull

   (a) Name the parts labelled **A** to **I**.
   (b) What is the function of the parts labelled **A, D, E** and **H**?
   (c) Name **two** parts that produce progesterone in a cow.
   (d) Mention **five** functions of the hormone called progesterone.

4. **Figure** below shows diagrams of biting mouthparts of two insects pests. Use it to answer questions that follow:





(a) i. Identify the mouthpart labelled **M**.
ii. Mention the function of the mouthpart labelled **K**.

(b) Explain any **two** ways in which a aphids can affect vegetable production.

(c) Explain how insects with mouthpart **K** may affect crop production.

(d) Explain any **two** cultural methods of controlling insects with
i. Mouthpart **K**
ii. Mouthpart **M**

5. (a) A certain farmer said that he wondered to see that after two generations a brown calf was born among the red bulls and red cows. Prove if that was possible or not, giving the phenotype and genotype for second filial generations. (The red bulls have alleles **Rr** and the red cows have **Rr** alleles. **R** represents incompletely dominant red allele; **r** represents incompletely recessive white allele; and **RR** offspring will be red, **Rr** offspring will be brown and **rr** will be white.)

(b) What do the following words mean in crop and animal improvement?
i. Performance tested bull
ii. Continuous variation
iii. Discontinuous variation
iv. Gene
v. Genotype

(c) Mention any **two** ways that are used for selecting plants for breeding.

(d) Define the following words as used in hybridisation:
i. Cross-breeding
ii. Pure line
iii. Heterosis

(e) Give **five** examples of kinds of crosses that can lead to hybrids.

6. A machine costs K10,000.00.
(a) Calculate depreciation at 20% per annum on the fixed rate or reducing balance for 10 years.
(b) Calculate the value of machinery at the end of each year for the 10 years
(c) What would be the scrape or salvage value if its life span was 10 years.

PRACTICAL 26

1. You are provided with **specimen O** (onion).
(a) Name the specimen **O**.
(b) Draw and clearly label any **three** parts of specimen **O**.
(c) Name the planting material used for propagating **O**.
(d) What are **two** advantages of propagating using the method mentioned in (c) above?
(e) Mention **four** types of grafting.
(f) Give any **five** reasons for carrying grafting in plants.

2. **Samples M** (maize seed) and **G** (groundnut seed) are both useful in crop production.
(a) Identify **M** and **G**.
(b) Which of the **two** samples has a higher energy value?
(c) Give **two** uses of specimen **G**.
(d) Name **one** element which should be applied to improve the growth of specimen **M**.
(e) Which sample can be applied with gypsum or calcium sulphate?
(f) Mention **two** main types of marketing channels that can be involved in the marketing of **M** and **G**.
(g) Mention any **four** marketing agencies that carry out the various marketing functions of samples **M** and **G**.

(h) State **five** roles or function that can be performed in the marketing of the products **M** and **G**.

(i) List **four** ways in which a farmer reduce the market margins of product **M** and **G**.

3. You are provided with two specimen labelled **L** and **K** (**L** = Maize flour **K** = Tomato fruit).

(a) Identify the specimen.

(b) i. Name any **two** products that can be obtained from processing specimen **K**

ii. Explain any **two** ways in which processing of the specimen labelled **K** is important.

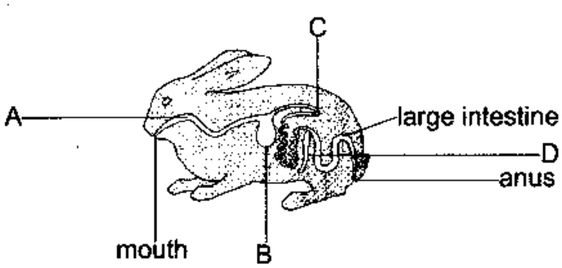
(c) Explain any **two** ways in which the specimen labelled **K** can be kept fresh during marketing.

(d) The demand for the specimen labelled **L** is said to be inelastic in Malawi.

i. Why is the demand for the specimen labelled **L** inelastic?

ii. With the aid of a sketch graph, describe this type of demand.

4. The **diagram** below is of a rabbit.



(a) Name the parts of a rabbit labelled **A, B, C** and **D**.

(b) Mention **four** breeds of rabbits you know.

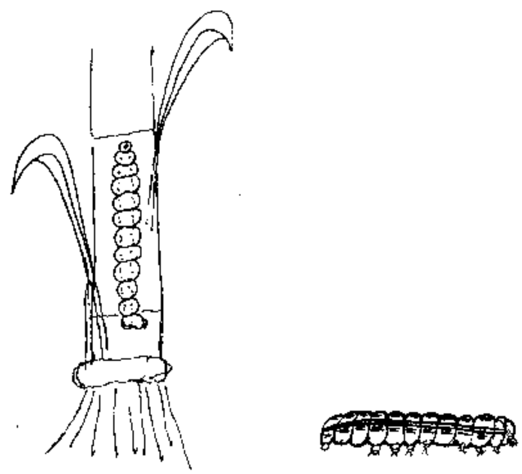
(c) State **four** advantages of keeping rabbits.

(d) What are three diseases of rabbits?

(e) List any **two** common parasites of rabbits.

(f) State any **three** ways of how you can control any **one** named internal parasite of rabbit.

5. The **diagrams** below show pests of crops common in Malawi.



A **B**

(a) Name the pests labelled **A** and **B**.

(b) Draw and label a life cycle of pest **A** or pest **B**

(c) What type of crop is commonly attacked by these two pests?

(d) Mention **four** other pests of the crop attacked in the figure that can attack the crop harvest while in storage.

(e) What are any **three** effects of pest **A** on the crop it attacks?

(f) How can you chemically control the pest **B**?

(g) State any **four** reasons why planting early leads to high yields.

6. A farmer bought a machine at K9,000.00 whose estimated scrape or salvage value after 8 years is K1,000.00. The machine's annual depreciation is 25%.
Calculate the value of the machine at each of the 8 years using:

(i) Straight-line method

(ii) Reducing balance method

(iii) Sum-of-digits method

PRACTICAL 27

1. You are provided with **specimen M** and **specimen D**, which are plants uprooted from the soil. Study them and answer the questions that follow.

(a) Identify the specimen as monocotyledonous plant or dicotyledonous plant.

(b) To which of the **two** specimens does a bean plant belong?

(c) To which of the **two** specimens does a maize plant belong?

(d) How do dicotyledonous roots differ from monocotyledonous roots in terms of:

i. Relative sizes of stele?

ii. Central pith region?

iii. Endodermis?

iv. Arrangement of xylem?

(e) What are the **three** functions of leaves?

(f) How do dicotyledonous stems differ from monocotyledonous stems in terms of:

i. Arrangement of vascular bundles?

ii. Cortex?

iii. Pith?

iv. Cambium?

2. You are provided with **two plant samples** labelled **X** and **Y**. **X** is a maize plant affected by rust disease and **Y** is a maize seed affected by weevils.

(a) Identify the samples and state the abnormality and/or damage associated with:

i. Plant **X**

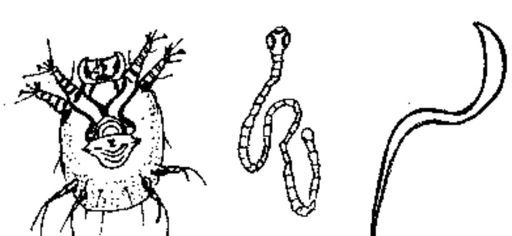
ii. Plant **Y**

(b) Give the organism that caused the abnormality and/or damage in plants **X** and **Y**.

(c) Name **one** way in which each of the **two** above abnormality and/or damage can be controlled.

(d) In what **six** ways are green leaves of a maize plant well adapted to process of photosynthesis.

3. The **figures** below show the diagrams of parasites of livestock.



A **B** **C**

(a) Name the parasites labelled **A, B** and **C**.

(b) Name **four** livestock that can be attacked by mites.

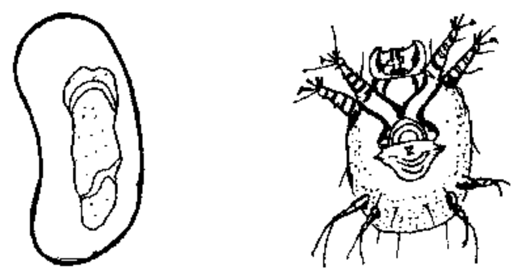
(c) Name **four** livestock that can be attacked by **B**.

(d) Name **four** livestock that can be attacked by **C**.

(e) What are **three** damages caused by the parasite **A**?

(f) State **four** ways of controlling the parasite **A**.

4. Study the **figures** below of parasites of livestock.



A **B**

(a) Identify the parasites **A** and **B**.

(b) Name a monogastric animal that is commonly attacked by **A** and **B**.

(c) Describe with the aid of a diagram the life cycles of:

i. One-host tick

ii. Two-host tick

iii. Three-host tick

5. The **figure** below shows the parasites o cattle.

A **B** **C** **D**

(a) Name four parasites labelled **A, B, C** and **D**.

(b) Which of the **three** letters stand for internal parasites of cattle?

(c) Mention **three** ways of controlling **B**

(d) State any **five** ways in which ticks affect livestock in Malawi.

(e) Mention any **five** cattle diseases that are caused by bacteria.

6. Below is a **figure** of budget layout for Mr Anthony Mwakihana. Study it and answer the questions that follow:

Estimated Income	**K**	**t**	**Estimated Expenditure**	**K**	**t**
Sale of chickens	10,000	00	Chicken feeds	7,500	00
Sale of eggs	12,000	00	Cattle feeds	7,500	00
Sale of cattle	12,000	00	Equipment for feeding cattle	600	00
Sale of milk	9,000	00	Labour for chickens	2,000	00
Sale of chicken droppings	2,000	00	Labour for cattle	1,500	00
Sale of cattle dung	1,000	00	Medicine for chickens	500	00
			Medicine for cattle	600	00

(a) Calculate the estimated returns and costs for keeping chickens.

(b) Calculate the estimated returns and costs for keeping cattle.

(c) Calculate the total returns and total costs for keeping chickens and cattle as an animal enterprise

(d) Calculate the estimated profit from each enterprise.

PRACTICAL 28

1. You are provided with **specimen M** and **specimen D**, which are a cut stem and a cut root of a certain plant. Study them and answer the questions that follow.

(a) Identify the specimens.

(b) Draw and label any **four** parts of a cross section (transverse section) of **D**.

(c) Draw and label any **four** parts of a cross section (transverse section) of **M**.

(d) Mention any **four** parts of a flower.

2 You are provided with three soil samples labelled **A** (clay), **B** (sand) and **C** (silt).
Add a little water to each sample to just moisten it. Rub each wet soil sample between your fingers.

(a) Identify the soil sample labelled **A, B** and **C**.

(b) Mention the method used to identify the three soil samples labelled **A**, **B** and **C**.

(c) Identify the soil sample that has got least pore space in it.

(d) i. Explain any **one** reason why the soil mentioned in (c) above has got least of pore space in it.

ii. What **two** other methods can be used to determine soil texture?

(e) i. Which of the **three** soil samples has the lowest amount of plant nutrient in it?

ii. Explain any **one** reason for the lowest nutrient content in the soil sample you have mentioned in above.

iii Which soil sample is good for constructing farm structures?

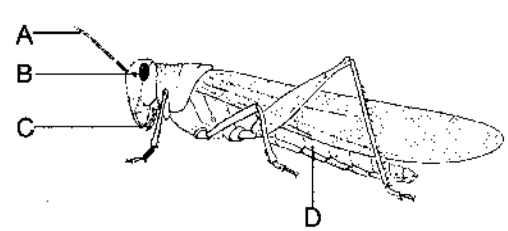
(f) Discuss **one** way how soil structure of sample **B** affects plant nutrient uptake.

(g) Explain any **one** reason why sample **B** easily loses bases especially during heavy down pours.

(h) Mention **two** ways of reducing the pH of soil **B**.

3. (a) With the aid of well sketched diagram describe the life cycle of a termite.

(b) The **figure** below is a diagram of a grasshopper, which is one of the common pests in Malawi. Study it and answer the questions that follow.



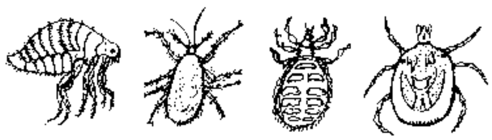
Name the parts labelled **A**, **B**, **C** and **D**.

(c) Mention any **four** harmful effects of insect pest in agriculture.

(d) State any **four** ways in which diseases cause damage to crops in Malawi.

4. The **diagrams** below show some parasites of livestock in Malawi.

(a) Name the endoparasites labelled **A**, **B**, **C** and **D**.



A B C D

(b) What type of livestock is commonly attacked by parasites **A** and **B**?

(c) State any **three** harmful effects of the four external parasites named in (a) above.

(d) Name any **one** chemical control of the parasites.

(e) Name any **two** internal parasites of chicken.

(f) Mention any **four** signs of Gumboro viral disease of chicken.

(g) List **five** commercial feeds that can be provided to chickens.

5. The **table** below shows the fixed costs and the variable costs for maize, cassava, tea and rice at a certain farm in Mulanje. Study it and answer the questions that follow.

	Maize	**Cassava**	**Tea**	**Rice**
Yield (kg/ha)	400	450	800	2,000
Price (MK/kg)	20	50	200	25
Variable costs (MK)				
Seed and fuel	1,000	500	800	500
Fertiliser and transport	8,000	-	10,000	20,000
Pesticides	5,000	150	1,000	-
Casual labour	100	150	200	80

Fixed cost for all the four enterprises (maize, cassava, tea and rice) (MK)	
Regular/permanent labour	20,000
Rent and fuel	5,000
Depreciation	250
Maintenance & repair	3,000
Land tax	3,000
Loan repayment	2,000
Administration & office expenses	1,000
General overheads like licenses and car expenses	8,000

(a) Find **two** crop enterprises that have the highest gross margins (GM).

(b) i. Which crop would you advise a farmer to grow?

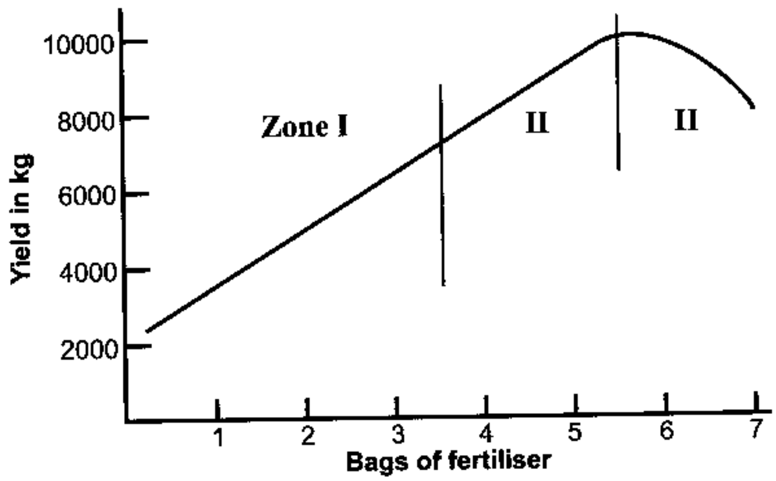
ii. Why would you advise a farmer to the crop you have mentioned in above?

(c) Which crop would be the worst for the farmer to grow?

(d) Calculate the whole farm gross margin.

(e) Work out the whole farm profit.

6. The graph in the **figure** below shows the law of diminishing marginal returns. Study it and answer the questions that follow:



(a) What amount of maize is produced when 5 bags of fertiliser are applied?

(b) Explain **one** reason why it is advisable to apply one hectare only 4 bags of fertiliser.

(c) How would you advise a smallholder farmer who thinks of maximising yield in Zone I of the graph of law of diminishing marginal returns?

PRACTICAL 29

1. You are provided with **samples X** (23:21:0+4S) and **Y** (*khola* manure), which are of economic value to farmers.

(a) i. Identify samples **X** and **Y**.

ii. Which of these **two** samples would you advise farmers to apply to a growing crop of a vegetable such as cabbage?

(b) Give **three** reasons for your answer in a (i) above.

(c) Briefly discuss **two** factors that limit the use of this source of inorganic fertiliser by local farmers.

(d) Apart from using specimen **Y** as a nutrient supplier, state other **three** ways in which, this resource would be utilized by a farmer practising mixed farming?

(e) Mention **five** effects of soil erosion.

2. You are provided with **soil samples C** (clay), **L** (silt) and **S** (sand) in funnels placed on conical flasks. Pour the water to each of the soils at the same time and allow the sample to stand for 20 minutes before observing the results.

(a) Which of the three soil samples has the highest water retention/?

(b) Which of the three soil samples has the lowest water retention?

(c) Give any **two** reasons for the differences in water retention among the three samples.

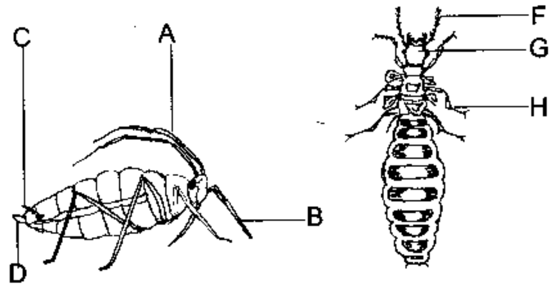
(d) What conclusion can be drawn on the permeability of the three soil samples?

(e) Name the sample that would be very unsuitable for rice growing.

(f) Give **two** reasons why the soil you have mentioned in (e) is very unsuitable for growing rice.

(g) Mention **four** ways of improving the sample **C** so that it becomes good soil for growing different crops.

3. Study the **diagrams** of an adult wingless aphid and a termite below.



Wingless aphid **Termite**

(a) Name the parts labelled **A, B, C, D, E, F, G** and **H.**

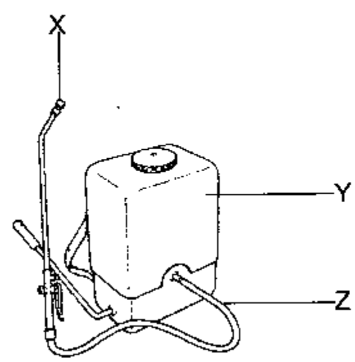
(b) What type of insect pest is an aphid?

(c) With the aid of labelled diagram, describe the life cycle of an aphid.

(d) Mention ant **three** effects of termites in agriculture.

(e) Mention **five** harmful effects of aphids in agriculture.

4. **Figure** below is a **diagram** of farm implementation. Use it to answer questions that follow:



(a) i. Name the farm implement.

ii. Name the parts labelled **X,Y** and **Z.**

iii. State **one** function of the part labelled **X.**

iv. State any **one** form of power that can be used to operate the farm implement.

(b) i. Explain **one** way in which use of the farm implement can improve beef production

ii. Explain any **one** way of maintaining the farm implement.

5. The **diagrams** below show the signs of a poultry disease and signs of a poultry external parasite.

A **B**

(a) i. Which letter stand for a parasite sign and which letter stands for a sign of a disease?

ii. What causes **A** and what causes **B**?

iii. Mention any **one** way of controlling **A**?

(b) Mention any **four** signs of **B.**

(c) List **four** other poultry diseases apart from the one shown above.

(d) What are **five** layer breeds of chicken that you know?

(e) What are any **two** breeds of broilers or meat type of chickens?

6. Mr Mlangeni has one hectare of land (fixed factor) planted to rice. He applies different quantities of NPK fertiliser (variable factor) and each weighs 50 kg. The results are shown below.

Fixed factor (1 haof land)	Input of variable factor (x) bags	TPP (kg of maize)	MPP=Δy/Δx	APP=y/x
1	0	0	-	-
1	1	100	100	100
1	2	230	130	115
1	3	265	135	122
1	4	510	145	128
1	5	665	155	133
1	6	820	145	137
1	7	950	135	136
1	8	1,075	125	134
1	9	1,175	100	131
1	10	1,250	80	125
1	11	1,310	60	119

1	12	1,345	35	112
1	13	1,355	10	104
1	14	1,359	4	97
1	15	1,361	1	90
1	16	1,361	0	85
1	17	1,355	-6	80
1	18	1,345	-10	75

(a) Plot the graph of TPP (Total physical product), MPP (Marginal physical product) and APP (Average physical product).

(b) What agricultural law is illustrated by the graph you have plotted or shown?

(c) What is the value of total output at the point of inflection?

(d) What is the value of input that would give maximum profit?

(e) How do you know that at the value of input mentioned in (d) would give the maximum profit?

(f) Why is it not good to produce in stage III?

(g) What is the value of MPP and APP where the value of Elasticity of Production is equal to 1?

(h) i. What is the value of TPP where the value of MPP is equal to zero?

ii. What is the maximum output produced?

(i) If the value of each unit of input or each bag of fertiliser is K1,000.00, what is the cost of inputs that would produce maximum profit (from output)?

(j) If the price of each kg of maize or each unit of output is K30.00, what is the total money obtained after selling the output that would give the maximum profit?

(k) i. What is the value of total output at the point where MPP and APP are equal?

ii. Using your graph, where would you advise this farmer to produce his yield?

iii. What is the value of input at the point of inflection?

PRACTICAL 30

1. You are provided with **specimens A, B** and **C**, which show different stages of maize germination.

(a) Draw and clearly label any **three** features of **C**.

(b) Explain the physical changes that a germinating seed undergoes as you have seen from the **three** stages of the specimen.

(c) Besides water, what other **two** basic things are needed for a seed to germinate.

(d) Describe any **two** important chemical processes that a germinating seed undergoes between stages **A** and **C**.

(e) Draw and label any **three** parts of a growing plant of a bean.

2. You are provided with **specimen W**, which is a maize weevil. Study it and answer the questions that follow:

(a) Draw clearly the diagram of a maize weevil and label any **five** parts.

(b) Describe **one** way in which maize weevil affects maize production.

(c) What **one** chemical method can be used to kill the maize weevil?

(d) What **three** cultural methods can be used in preventing the pest from attacking maize seeds

(e) When does the maize weevil attack the maize seed?

(f) Name the type of mouth part that is found in maize weevil.

(g) Mention the environment that would encourage the multiplication of weevil pests.

3. You are provided with specimens labelled **A**, **B** and **C**. Use them to answer questions that follow:

(a) i. Identify the specimen **A**, **B** and **C** (A = Stargrass, B = *Madeya* C=Leucena)

ii. Classify them into roughages and concentrates.

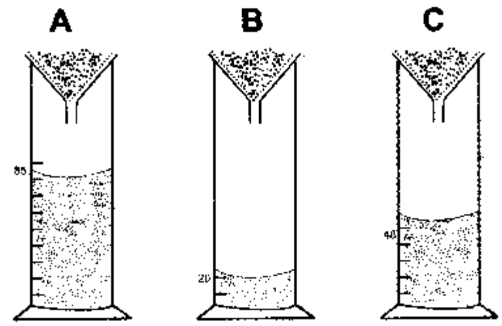
(b) Explain **two** ways in which specimen **C** where you have planted specimen **A**.

(c) Explain **two** ways in which specimen **C** may improve agriculture production.
(d) Which feed is rich in
   i. Protein?
   ii. Carbohydrates?

4. (a) White flowers (genotype **WW**) and red flowers (genotype **FF**) of pure bred balsam plants were cross-pollinated. The resulting flowers were all pink.
   i. What is the genotype of the pink flowers?
   ii. If the pink flowers were self-pollinated, what would be the ratio of white, pink and red flowers? Show your working.
   iii. Suggest a possible explanation for the ratio you have obtained in (ii) above.
(b) Mention **four** factors that should be considered when feeding animals for breeding.
(c) What **three** characteristics should you look for in a good mutton sheep for breeding.
(d) List **five** signs of a goat on heat.

5. Form three students wanted to compare water holding capacity in different classes of soil based on their texture.

Procedure:
- They put soil samples in the funnels of measuring cylinders and label them **A**, **B** and **C**.
- They added 100 m*l* of water into each of the funnels.
- After fifteen minutes the results were as shown in the diagrams below:



(a) From these results which soil samples has drained
   i. More water?
   ii. Less amount of water?
(b) Suggest reasons for your answers in a (i) and a (ii).
(c) Calculate the amount of water held by the soil sample **B**. Show your working.
(d) Which soil sample is likely to be
   i. Sand?
   ii. Loam?
(e) Explain a reason for your answer in d (i) and (ii).
(f) Which soil sample is suitable for the growing of
   i. Cassava?
   ii. Rice?
   iii. Maize?
(g) Suggest a reason for your answer in f (i), (ii) and (iii).
(h) Explain any **two** ways in which soil **A** can be improved.

6. The following **information** has been obtained for a typical subsistence farmer of 3 ha growing 2.0 ha maize, 0.4 ha groundnut, 0.4 ha cotton and 0.2 ha vegetables for sale.

Crops	**Seed (kg)**	**Fertiliser (kg)**	**Chemicals (litres)**	**Casual labour (days)**	**Mechanical unit hire (hours)**	**Transport (Tonne km)**
Maize	25 at K0.42	100	-	5	5	0.45
G/nut	90 at K0.63	-	-	80	7.5	-
Cotton	12 at K0.55	50	10	K0.035/kg	5	0.75
Vegetable	2.5 at K4.20	150	30	-	10	-
Unit price		K140/ton	K1.40	K0.56	K3.50	K5/tonn km

GROSS INCOMES

Crop	**Yield/ ha**	**Price/ unit yield**
Maize	20 bags	K6.30
Groundnuts	10 bags	K21.00
Cotton	1,500 kg	K0.42
Vegetable	2,000 kg	K0.28

Fixed costs (common costs)

- Loan repayment, e.g. mortgage = K10.00
- Managerial salary = K20.00
- Administrative and office expenses = K20.00
- Insurance = K50.00
- Depreciation = K50.00

(a) Calculate the total revenue (TR) or gross income (GI) for each crop enterprise.

(b) Calculate the total variable cost (TVC) for each crop enterprise.

(c) Calculate the gross margin (GM) per ha for each crop enterprise.

(d) Calculate the gross margin (GM) for each crop enterprise.

(e) Calculate whole farm gross margin.

(f) Calculate the profit of the whole farm.

AGRICULTURE ANSWERS

(*Theory Paper I*)

TEST 1

1. (a) Volatilisation is the release of nutrients from the soil in form of a gas whereas immobilisation is the fixing of soil nutrients as insoluble compounds in the soil.
   (b) i. Plate-like structure occurs when individual soil particles are cemented to form aggregates which are flat sheets (thin horizontal plates) laid on top of the other.
   ii. Granular structure has rounded soil aggregates which leave large intervening spaces.
   iii. Prismatic structure has soil aggregates which form vertical pillars that are tightly parked to each other.
   iv. Blocky structure are reduced to smaller six-sided blocks with very little intervening space.

2. An experiment is an enquiry to obtain new information or facts, or to test the results of the previous experiment.

3. (a) Large seeds for planting may help increase crop production because such seeds have a larger food reserve for their use during the first stages of germination than have small seeds of the same kind. There are less chances of germinating plant starving in large seeds than in small ones.
   (b) 1ha = 28 kg of maize

$\therefore$ 5 ha = $\dfrac{28 \text{ kg} \times 5 \text{ ha}}{1 \text{ ha}}$

= 140 kg of maize

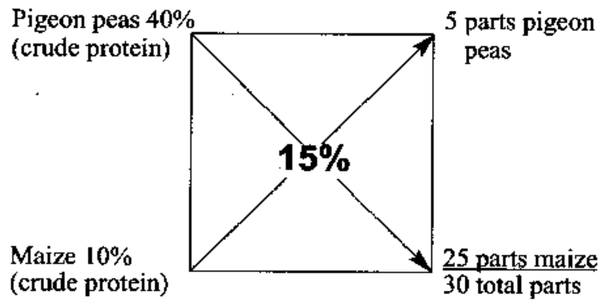
If at 100% germination = 140 kg

$\therefore$ at 80% germination = $\dfrac{100 \times 140}{80}$

= 175 kg of maize

4. (a) Gender roles are socially and culturally accepted duties for men and women.
   (b) i. Individuals
   ii. Society

5. (a)



Percent of pigeon peas should be $\dfrac{5 \times 100}{30}$

= 16.67%

Percent of maize should be $\dfrac{25 \times 100}{30}$

= 83.33 %

(b) i. Amount of pigeon peas:

$= \dfrac{16.67 \times 1000 \text{ kg}}{100}$ = **166.7 kg**

ii. Amount of maize:

$= \dfrac{83.33/100 \times 1000 \text{ kg}}{100}$ = 8333.3 kg

= 8.3 metric tonnes

6. (a) i. International trade enables the benefit of large-scale production to be obtained by a country, e.g. tractors are produced in large quantities at low costs. These products cannot be exploited in home markets so they are exported to other countries.
   ii. International trade promotes the benefit of political links with other countries, e.g. through Ambassadors.
   (b) i. Creating good relations to reinforce the good relations. There should be country's representatives, e.g. Ambassadors and High Commissioners in foreign countries.

ii. Holding Trade Fairs within or in foreign countries to promote trade so that other countries should know what commodities Malawi is producing.
iii. There should be good communications in terms of internet, e-mail, phones, transport and language.
iv. Security. General good security entails protection of investiments. This builds trust for foreign businesses to invest in the country.
v. Good taxation policy attracts investors.

7. (a) Mulching prevents excess loss of water from the seedbed.
   (b) Deworming controls internal worms such as roundworms and tapeworms that attack our livestock.
   (c) Castration prevents undesirable males from breeding, thus enables the farmer to use only proven bulls or rams.
   (d) Cross-breeding improves the hybrid vigour of the offspring for inbreeding results in producing genetically weak offspring.
   (e) Agricultural credit helps farmers to get loans so that they can invest in their farming business. Most farmers lack capital and once given loans, they will be able to produce high yields from their farming operations.

8 (i) Straight-line or fixed installment method
  (ii) Reducing balance method
  (iii) Sum-of-digits method
  (iv) Annuity method
  (v) Use-adjusted method
  (vi) Revaluation method

9. **The two advantages are:**
   (a) i. Improvement of quality of plants is possible because the offspring are genetically different from the parents.
   ii. The offspring produced may not easily be attacked by the diseases from the parents, for they contain somehow different genes. Some of the new varieties produced may be more successful than the parents.

   The two disadvantages are:
   i. Slow growth because the seeds have a dormant stage.
   ii. There is a need for two parents (male and female) whenever you want to produce offspring.

   (b) i. The seeds must be uniform (morphologically the same) i.e. the seeds, once planted, should produce uniform plants, e.g. hard or soft seeds.
   ii. The seeds, once planted, should be producing same quality under favourable conditions.
   iii. Growing length: The seeds that belong to the same variety should have the same growing period.
   iv. Should be equally resistant or attacked by same pests and diseases.

   (c) i. **Grafting:** Grafting is the union of the cambium layers of two woody structures of the same or closely related species, e.g. the union of a stem to a root or more commonly the union of two stems. The upper part is called the scion and the lower part is called the stock.
   ii. **Layering:** Layering involves the induction of the plants to produce roots on their stems before these stems are removed from the parent plant to be used for planting.

   (d) i. May easily be attacked by pests and diseases, thereby lowering yield.
   ii. Planting the low drought resistant varieties will result in low yield once the rains are not enough.
   iii. Poor planting material, e.g. of impure seed, will result in poor germination and eventually in low yields.

iv. Poor planting material, e.g. of bad characteristics will result in consumers not liking the product eventually depriving the product of the much-needed market.

(e) i. It should be pure to type.

ii. It should be disease-resistant.

iii. It should be whole in the sense that it should not have any sign of physical or insect damage.

iv. It should be viable in order that it should germinate once planted.

10. (a) i. Transporting of agriculture goods from one point to another

ii. Grading through sorting of agricultural commodities to quality standards by a uniform specification (uniform qualities).

iii. Financing through provision of credit to facilitate various activities done by farmers.

iv. Storage of agricultural products to be sold when in need or when scarce.

(b) i. Frequent cultivation which loosen soil aggregates in a soil.

ii. Excess loss of colloidal particles (humus and clay particles) from a soil through soil erosion.

iii. Excess use of heavy machinery (e.g. tractors) which crushes soil aggregates.

iv. Cultivating too dry soils will loosen the soil aggregates in a crumby structure.

v. Splash erosion on bare grounds detaches soil particles thereby destroying soil structure.

(c) i. The government can intervene economically in the agricultural market by controlling the supply or price of farm inputs such as seeds, fertilisers or pesticides: The supply of a product or its quality can often be raised by supplying inputs at a subsidised price at the right time and within easy reach of farmers. The government will set prices for certain products.

ii. The government can introduce quota system on certain agricultural products: Quota system is often introduced to control output so that the output can be sold at a high price. When the supply is less the demand becomes higher, thereby increasing the price of the product.

(d) i. The price of the product: The price of the agricultural product affects supply in the sense that the higher the price, the more the farmers will choose to produce that product and the more the product will be available at the market; the lower the price, the fewer the farmers will choose to produce that product and the less the commodity will be offered.

ii. The cost of production: If the price of the input, e.g. seeds is high, supply will be low since less will be produced because of high cost of producing that product.

(e) i. Marketing provides inputs to the farmers so that they can use them to produce agricultural products, e.g. seeds from ADMARC.

ii. Marketing helps various groups of people to earn an income which can be used to buy more inputs or hire labour to use in agricultural production.

11. (a) i. **Soil texture:** The coarseness or fineness of the soil particles will affect the aeration, drainage, moisture content and ease with which the soil can be worked.

ii. **Soil structure:** The arrangement of soil particles in the soil is important, for it influences the soil air and soil water movement.

iii. **Soil colour:** Soil colour is caused by mineral composition of the soil, organic matter and water-logged condition and this will influence the soil temperature in which the crops grow.

iv. **Soil temperature:** Soil temperature plays a big role in the activities of microorganisms in the soil and plant, and these are essential for crop growth and development.

v. **Soil consistency:** Soil consistency is the state of soil under different moisture content (soil conditions) which influences the ease with which the soil can be worked on.

vi. **Soil depth:** Soil depth influences the water-holding capacity of the soil and development of roots, which are necessary for crop growth and development.

vii. **Porosity:** Porosity or the ratio of pore space to total volume of soil affects the way air and water moves in the soil for crop development.

(b) i. frequent cultivation which loosen soil aggregates in the soil.

ii. Excess loss of colloidal particles (humus and clay particles)

iii. Excess use of heavy machinery (e.g tractors) which crushes soil aggregates.

iv. Cultivating too dry soils will loosen the soil aggregates crumpy structures.

v. Splash erosion on bare grounds detaches soil particles, thereby destroying soil structure.

12. (a) i. Increased crop production enables the provision of more and better quality food to combat malnutrition and undernutrition.

ii. Increased crop production enables availability of raw materials for industry; expansion of industry consequently encourages farmers to produce raw materials.

iii. Increase in crop production results in local availability of raw materials, thereby reducing importation of raw materials hence money saved is used for opening other industries or developments.

iv. Increased crop production increases export of both primary and secondary commodities (international trade) hence importation of capital goods such as processing machines, tractors, vehicles, etc.

v. Increased crop production results in increasing income of Malawian farmers. This acts as an incentive to farmers to work hard for more income.

(b) i. The government should educate farmers on agriculture, for educated people are less resistant to change and are more innovative.

ii. The government should establish more research stations which aim at improving agronomic and husbandry techniques for producing high yielding varieties of crops.

iii. The government should provide extension services to the farmers. The extension workers will teach and advice farmers, introduce new methods of farming, identify pests and diseases and suggest means of treating and controlling them.

iv. The government should build roads and marketing facilities for farmers so that transporting and selling of agricultural commodities should not be a problem.

v. The government can provide farmers with short-term and medium term loans since many farmers lack capital for agriculture development in their areas.

vi. The government should provide low cost inputs to farmers so that they can afford to buy them to use to produce food crops.

TEST 2

1. (a) These are plants nutrients whose deficiency is characterised by deficiency symptoms in a plant.
   (b) Micro-nutrients are elements needed by plants in small quantities and are harmful when available in the soil in large quantities; a good example of a micro-element is iron.
   (c) Symptoms of potassium deficiency in maize: The lower older leaves have yellow outer margins which become scorched (burnt) with time starting from the tip to the base.
   Symptoms of nitrogen deficiency in maize: Lower older leaves have yellow colour (chlorosis) starting from the tip moving towards the stem following the mid-rib, forming a V-shape.

2. (a) Partial budgeting is a quick way of assessing the financial effect of a proposed change in policy or prices in a basically satisfactory farm business where the overall farm organisation is unchanged while a complete budgeting is a type of budget that assesses the effect of changes made to the whole farm system such that all expenses and receipts likely to be incurred are included.
   (b) i. When a plan for a new farm or new farmer is needed regardless of whether the land is virgin or not
   ii. When a large basic change is being considered that would affect most or all the farm costs and receipts.
   iii. When the profit potential of an existing farm needs to be assessed either when tendering for a farm tenancy or for later use as a check on actual performance.

3. (a) i. Cultural weed control: This involves providing conditions which will assist crop plants grow faster than the weeds in order for the dense canopy to keep sunlight away from the weeds, thus weakening or killing them. For example, crop rotation, correct spacing, etc.
   ii. Mechanical weed control: Mechanical weed control involves the use of farm implements and machinery to control weeds. For example, hand tools like slashing and uprooting (rouging) and tractor- drawn implements.
   iii. Biological weed control: Biological weed control involves the control or suppression of weeds by the action of one or more organisms accomplished naturally or manipulation of the weed, control organism or environment. In biological control, insects, birds, sheep, goat and cattle may be used.
   iv. Chemical weed control: Chemical weed control refers to all weed control practices in which toxic chemicals known as herbicides are used to kill, suppress or modify weed growth in such a way as to prevent interference with crop establishment, growth and production of economic yield.

4. (i) Insects with biting and chewing mouthparts: Their mouthparts have the following features:
   - Lower lip or labium, below the mouth with a sensory palp
   - An upper lip or labium, above the mouth
   - A pair of strong mandibles on both sides of the mouth
   - A pair of first maxillary, beside the mouth, with a sensory palp.

   Examples of biting and chewing mouthparts are locusts, grasshoppers, cockroaches, termites, beetles and leaf miner.

   (ii) Piercing and sucking insects: Mouth parts of these insect pests are modified to pierce tissues and suck out the contents or juice. The mandibles and maxillae form piercing stylets.

Examples are from the hemiptera such as capsids, nezara viridula, cotton stainer, white flies, fruit flies, aphids, scale insect and mealy bugs.

(iii) Boring insects: Members of this group usually bore into the host material. Examples are maize weevils, bollworms and bean weevil (storage pests).

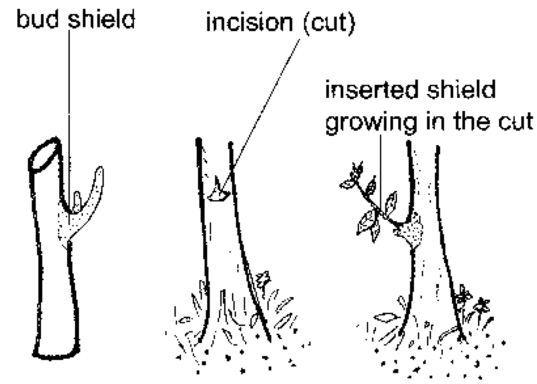
5. (a)

	Year 1	Year 2	Year 3	Year 4
Plot I	Rape	Paprika	Maize	Peas
Plot II	Peas	Rape	Paprika	Maize
Plot III	Maize	Peas	Rape	Paprika
Plot IV	Paprika	Maize	Peas	Rape

(b) Through following this rotation sequence, you are going to reduce the occurrence of certain pests and diseases. For example, the pests and diseases of legume peas will not attack rape in year 2 of **plot II**, thereby reducing the occurrence of such pests and diseases and improving the crop yield.

6. (a) i. Avoids problems of seed dormancy.
ii. Maintains uniformity, i.e. desirable traits in crop plants.
iii. Planting material can be obtained easily (e.g. stem cuttings) from previous season's crop.
iv. It offers the only way of propagating crops whose seeds are not viable, e.g. cassava.
v. Vegetative planting materials are more handy than seedlings from seeds.

(b)



Using a budding knife, an incision is created in a rootstock and a vegetative bud or scion (not a flowering bud) cut from a desirable tree is inserted into the cut. The bud union is wrapped with a tape or ruffia. This vegetative bud then germinates.

7. (a) i. Manufacture plant food especially young ones that contain chlorophyll.
ii. Stores plant food e.g. sugarcane.
iii. Protect the whole plant from lodging and support other plant parts, e.g. fruits, leaves, etc.
iv. Exposes leaves for photosynthesis and flowers for pollination.
v. Conduct water and nutrients from the soil through xylem and food through the phloem.

(b) i. Family A
ii. – By practising irrigation in order to harvest more than once in a growing season.
– By intensifying crop production through mixed cropping in order to increase crop yields per unit area.

(c) If the area has a lot of people, it means a lot of money is needed to buy medicine in the hospital. This money would have been used for other development work, e.g. construction of roads, had it been that the population density was low.

8. (a) Absorption is the mineral uptake by plants whereas adsorption is the fixation of mineral elements to soil particles.
   (b) Gestation is the period of pregnancy whereas parturition is the process of giving birth in livestock.
   (c) Hay is sun-dried herbage whereas silage is herbage preserved by fermentation for dry-season feeding in livestock management.
   (d) Roughages are livestock feeds high in fibre content whereas concentrates are livestock feeds low in fibre but high in nutrient content.

9. (a) i. Plant analysis: Plant analyses are based on the premise that the amount of a given element in a plant is an indication of the supply of the particular nutrient and as such, it is directly related to the quantity in the soil where the plant is grown. Quick sap tests, total plant tests and tissue tests are among the methods used to measure nutrient levels in the plant or plant part.
   ii. Soil analysis: A soil test is a chemical method of estimating the nutrient supplying power of the soil. The soil to be sampled is at least sampled from 10 sites to make a composite sample.
   iii. Looking at nutrient deficiency symptoms: If a plant is lacking in a particular element, more or less characteristic symptoms may appear and with experience, these symptoms can be helpful in spotting nutrient-deficiencies of a particular soil.
   (b) i. Too much rainfall can cause leaching of nutrients: Too much rainfall may result in leaching of nutrients to layers beyond which plant roots cannot reach.
   ii. Acidity from too much rainfall may cause unavailability of nutrients: Too low or too high acidic conditions results in some nutrients being fixed and therefore not available for plant use.
   (c) i. Organic sources of plant nutrients are usually from living things, which upon decaying and decomposing, release nutrients into the soil while sources of inorganic nutrients are not from living things.
   ii. Many times organic sources of plant nutrients have fewer nutrients which are released than have inorganic sources.
   (d) i. Urea is absorbed by maize plant in form of nitrates (NO_3^{2-}) and ammonium (NH_4^+) through the roots of the maize plant.
   ii. Urea mainly contains about 46% of nitrogen, which helps the maize to form proteins; the nitrogen also helps to form part of chlorophyll molecule in maize, which increases rate of photosynthesis threby increasing the size of grains and also regulating the availability of K and P in the maize plant.
   (e) i. **Deficiency symptoms of Phosphorus (major element)**
   - Stunted growth in the crop
   - Purple or brown colour especially of young leaves

   ii. **Deficiency symptoms of zinc (minor element)**
   - Small leaves on plants, which are thin and purple
   - Flat growth of leaves close to the ground

10. (a) i. Many people are poorly housed.
   ii. Many people have low education.
   iii. Many people are poorly clothed.
   iv. Many people have less and poor food.

(b) i. Through increasing food crop production so that people have more and better quality foods.

ii. Through increasing cash crop production so that there is enough money for building houses and clothing.

(c) i. **Birth rate:** A number of individuals are born per year within the Malawian population, thereby increasing the population.

ii. **Immigration:** Many people come to Malawi to live or work, thereby increasing the population of Malawi.

(d) i. **Results in malnutrition:** High population will result in shortage of food, which will cause malnutrition in people.

ii. **Easy spread of diseases in high density areas:** High population will result in easy spread of diseases especially contagious ones. Tuberculosis also spreads very fast where people are crowded such as in highly populated areas.

(e) i. With good nutrition, people have enough energy to enable them to work.

ii. Good nutrition helps to check deficiency diseases, e.g. marasmus.

iii. Good nutrition protects the body from germs.

iv. Good nutrition helps the body parts to function and develop properly.

11. (a) i. **Oversowing:** Sowing of pasture seed on already established pasture.

ii. **Drilling:** Sowing of pasture seed in made trenches followed by covering with the soil.

iii. **Broadcasting:** Sowing of pasture seed on the soil surface before putting them into the soil.

iv. **Vegetative planting:** Establishing of pastures using existing parts of pasture such as sets and root parts.

v. **Undersowing:** Sowing of pasture seed under a growing arable crop.

(b) i. **Time of sowing:** Pasture should be sown in good time, not too late.

ii. **Preparation of land:** The land where the pasture will be grown should be well prepared with fine tilth.

iii. **Selecting good quality seed:** Seeds of good quality should be sown in order to improve quality and quantity of pasture.

iv. **Selecting the right amount of seeds per hectare (seed rate):** This ensures the correct plant population for best yield results.

v. **Fertiliser application:** To improve and increase yield, pasture should be applied with the right amount and type of fertiliser.

12. (a) i. **Use of acid-producing fertilisers**: Using acid-producing fertilisers, e.g. Sulphate of Amonium, lower the pH of the soil.

ii. **Soil microorganisms**: Microorganisms found in the soil lowers the soil pH through production of hydrogen ions as they decompose organic matter. Just like any living thing that respires they too release carbon dioxide that will increase the acidity, thereby lowering the soil pH.

iii. **Leaching of nutrients:** Nutrients leach down the soil when there is a lot of rainfall, leaving behind the negative ions which readily combine with the hydrogen ions, making the soil acidic.

iv. **Uptake of nutrients by plants:** Plants use nutrients such as Ca^{2+} and Mg^{2+} which are replaced by the hydrogen ions, thereby making it acidic.

v. **Weathering of parent material:** Different parent materials contain different mineral elements, which, upon weathering, may either result in acidifying or making the soil basic.

vi. **Drainage:** Poor drainage increases the acidity of the soil. The soils that are heavily drained leach heavily as well resulting in lowering of soil pH.

vii. **Type of vegetation:** Vegetation affects the pH in many ways; for example, it lowers the soil pH through decomposition as nutrients are released, and it can also reduce leaching, thereby protecting the soil from becoming acidic.

(b) i. **Crop removal:** A lot of nutrients are removed from the soil where the crop was grown through harvested crops and not replacing the crop residues.

ii. **Soil erosion:** Soil erosion takes away a lot of nutrients from the soil to elsewhere, e.g. rivers, etc.

iii. **Application of fertilisers:** Fertiliser use affects the soil by adding nutrients to the soil.

iv. **Acidity of the soil:** Some nutrients are not released if the soil is too acidic; even the activities of some microorganisms cease at certain levels of soil pH.

v. **Soil composition:** For the soil to release the nutrient, it depends on its composition of being either organic or inorganic.

vi. **The texture and structure of the soil:** They influence the physical, chemical, and biological properties of the soil, thereby affecting the soil chemical properties.

vii. **Farming methods:** The way the fields are managed will affect the way in which the nutrients are taken away or replaced in the soil, e.g. harmful burning destroys vegetation necessary for nutrient release.

TEST 3

1. (a) Cation exchange capacity is the ability of the soil to exchange positively charged ions at a given pH and per unit mass of soil.

(b) i. **Denitrification:** This is the biological reduction of NO_3^- and NO_2^- to volatile gases like NO and N_2. The reduction is carried out by some facultatively anaerobic bacteria which can use nitrate in place of atmospheric oxygen.

ii. **Immobilisation:** Immobilisation is the incorporation of nitrogen into microbial tissue during the decomposition of organic residue in the soil.

2. (a) i. Size of the farm
ii. Labour availability
iii. Value of the crop
iv. Technical know how
v. Infrastructure

(b) i. **Through practising comparative advantage (one village one product):** The farmer should concentrate on those enterprises or their combination that can best be produced in their areas or farms.

ii. **Through practising supplementary or complementary enterprises:** The farmer should go for complementary enterprises so that the production of one contributes to production of another enterprise, e.g. poultry and vegetable production.

3. (i) Implements using human or animal power, e.g. a hand hoe and a ridger.
(ii) Implements and machines drawn or mounted by a tractor (engine power), e.g. ripper and a harrow.

4. Rinderpest, pneumonia, enterotoxaemia, mastitis, foot and mouth disease, foot rot, etc.

5. (i) **Temperature:** Some crops mature early or late depending on the temperature of the area where they are grown.
   (ii) **Soil fertility:** Crops will usually mature early in good fertile soils as compared to poor soils
   (iii) **The variety of the crop:** Some crop varieties normally mature earlier than others due to their different genetic make-up.

6. (a) $\frac{8}{50} \times 100 = 16\%$

   (b) – This slope is too big, so soil erosion can easily occur.
   – It is difficult to use machinery, e.g. plough at such a slope.

7. (a) **X** is the egg yoke.
   Y is the air space.
   Z is the egg shell.
   (b) **Y** provides air for the growing chick inside the egg.
   Z protects the egg from any physical damage.

8. (a) Soil microbes release carbon dioxide (through respiration) which reacts with soil water to form carbonic acids. The acids so formed increase the acidity of the soil (reducing soil pH).
   (b) Plants absorb soil nutrients, most of which are exchangeable bases. This leaves behind the hydrogen ions in the soil which increase the acidity of the soil.
   (c) Leaching washes down most of the exchangeable bases from the top layers of soil, leaving hydrogen ions dominating in the top soil, making it more acidic.
   (d) Poor drainage encourages accumulation of salts in the top soil due to water logging. These soils may increase salinity and soil pH.
   (e) Vegetation reduces loss of soil nutrients (exchangeable bases) from the top soil, thereby maintaining the light soil pH.

9. (a) i. Feeder grade A
   ii. Feeder grade B
   iii. Standard grade
   iv. Commercial grade
   (b) i. Choice grade
   ii. Prime grade
   iii. Standard grade
   iv. Commercial grade
   v. Inferior grade
   (c) i. They have a slow growth rate, low mature weight, and produce low quality mutton.
   ii. Select a breed of sheep which is adapted to the local environmental conditions. It must produce the largest amount of the intended product which is of good quality.
   (d) i. - Docking ensures even distribution of fat around the body of sheep, thereby improving the quality of mutton.
   - It exposes the opening to the female reproductive tract for easy mating.
   - It enables the farmer to remove easily external parasites from around the anal region of the sheep.
   - It prevents infection of the anal region from dirty dung.
   ii. Trimming prevents lameness in sheep which may results from overgrown hooves.
   (e) Goats mostly pick on leaves, shoots and twigs by browsing whereas sheep normally cut young tender plants from the ground surface through nibbling.

10. (a) i. Cheap where there is a lot of labour.
   ii. Minimal use of farm implements.
   iii. Best for removing weeds and crop injury is reduced.
   iv. Easy to do since it requires less technical know-how.
   v. Through uprooting, the farmer can be sure that the weed is dead.
   (b) i. Too involving.
   ii. Very slow process.
   iii. May not be very effective especially if done during the rainy season.

iv. May be done too late when the plant nutrients have been depleted in the soil.

(c) i. Cheap to use.
ii. Easy to use.
iii. Only makes use of agronomic practices for the particular crop.
iv. Cannot control all the weeds.

(d) i. Expensive to buy the machine.
ii. Difficult to remove weeds on the row of crops.
iii. Requires technical know-how to operate the machine.
iv. The machine may injure the crops.
v. Cannot completely kill the weeds.

(e) i. Difficult to enforce.
ii. Cannot control weeds on individual fields.
iv. It concerns only few noxious weeds.
v. Not very effective, for people will still bring strange things into other countries through unauthorised ways.

11. (a) i. **Crop varieties:** Fertilisers work well on improved varieties of crops that are well-suited to the area.
ii. **Weather or condition of the field:** During the time of application of fertilisers the soil should be moist so that the fertiliser can dissolve easily.
iii. **Weed-free fields:** To avoid competition between weeds and crops for fertiliser, it is good to apply the fertiliser when the fields are weeded.
iv. **Soil nutrient content:** The poorer the soil, the greater its response to fertiliser application. Fertilisers in very rich soils might not have effect at all.
v. **Crop growth stage:** Most fertilisers are best applied during planting or soon after germination for luxuriant vegetative growth. It is also applied soon before flowering to improve fruit development.

(b) i. **Good soil drainage:** Good soil drainage ensures that soil nutrients are not lost through processes such as denitrification.
ii. **Soil pH control:** Soil pH affects the availability of nutrients in the soil, for some nutrients are fixed in the soil at certain soil pH.
iii. **Controlling of weeds:** Weeds take away a lot of nutrients that should have been available in the soil.
iv. **Controlling erosion:** Erosion has to be controlled, for it carries away very important nutrients from the soil.
v. **Use of crop rotation:** Crop rotation improves soil fertility through incorporating crops such as legumes.
vi. **Application of manufactured fertilisers:** Application of manufactured fertilisers to the soil adds the required elements into the soil.

12. (a) i. **To improve seasonal crop productivity:** Through adapting the crop growth and maturity of crop to growing season period so that the crop will be able to make full use of the growing season for maximum yield.
ii. **To increase biomass:** Biomass can be achieved through growing crops that are able to produce and retain enough dry matter quantity.
iii. **To improve partition:** To improve partition through growing cultivars that are able to divert biomass to the desired harvestable parts of the crop.
iv. **To increase resistance to pests and diseases:** To increase resistance to pests and diseases through growing cultivars that are able to withstand pests and diseases and produce maximum yield.
v. **To increase and improve tolerance to bad environment:** To increase and improve tolerance to bad environmental conditions through

growing cultivars that are able to withstand adverse conditions and produce somewhat high yields.

(b) i. To increase the nutritive value of the crop products in order for them to have high protein and vitamin to be fed to livestock.

ii. To improve processing qualities of products of crops so that they can be produced with qualities that are required by the processors of the products.

iii. To achieve uniformity not only in the fields for ease of operation of farm machinery but also in the produce for ease of product grading.

iv. To increase the market value of the crop through developing products of better texture, colour and taste as required by the consumer.

v. To promote dwarfness in certain crops. for dwarfness in plants such as fruits makes harvesting faster and cheaper and reduces lodging in crops such as rice.

TEST 4

1. Salinity is the accumulation of soluble salts in a given substance such as soil and water.

2. (a) i. Mango scales
ii. Mango stone weevil
iii. Fruit flies

(b) i. Powdery mildew (*Oidium mangiferae*)
ii. Anthracnose

3. (a) i. **Porosity** is the proportion of the volume of soil that is taken up by pore space.

ii. **Bulk density (BD)** is the sum of the pore spaces and solid particles of the soil.

iii. **Particle density** is defined as the mass of a unit volume of soil solid, usually expressed in g/cm^3.

(b) i.

Bulk density (BD) $= \dfrac{\text{Mass of oven dry - soil}}{\text{Total volume of soil}}$

$= \dfrac{260\text{ g}}{200\text{ cm}^3}$

$= \mathbf{1.3\ g/cm^3}$

ii.

Particle density (PD) $= \dfrac{\text{Mass of oven dry - soil}}{\text{Volume of soil solids}}$

$= \dfrac{260\text{ g}}{100\text{ cm}^3}$

$= \mathbf{2.6\ g/cm^3}$

iii.

% Solid apace $= \dfrac{\text{Bulk density}}{\text{Particle density}}$

$= \dfrac{1.3\text{ g/cm}^3 \times 100}{2.6\text{ g/cm}^3}$

$= \mathbf{50\%}$

iv.

% Pore space (porosity) = 100 – % solid space

OR $= \dfrac{(1 - \text{bulk density}) \times 100}{\text{Particle density}}$

$= \dfrac{100 - \text{bulk density} \times 100}{\text{Particle density}}$

$= \dfrac{100 - 1.3\text{ g/cm}^3 \times 100}{2.6\text{ g/cm}^3}$

$= (100 - 50)$

$= \mathbf{50\%}$

OR $= \dfrac{(1 - 1.3) \times 100}{2.6}$

$= 0.5 \times 100$

$= \mathbf{50\%}$

4. (i) Wear and tear
(ii) Obsolescence
(ii) Gradual deterioration with age

5. (a) i. To provide an estimate of experimental error, i.e. a measure of

the variation that exists among the treatments.

ii. Improves the precision of an experiment, i.e. if you replicate, the standard variation decreases.

iii. Increase the scope or validity of the inference of the experiment.

(b) i. The function of randomisation is to remove personal biasness to ensure valid and unbiased results.

ii. Avoids environmental effects to the experiment, e.g. border effects.

6. (a) Randomisation reduces prejudice (favouritism) which may occur when allocating treatments to various field plots in agricultural experimentation.

(b) It become useful where:
- There are localised fertile spots in the experimental plots.
- The researcher has preconceived ideas about performance of some of the experimental plants.
- There is a wide range of other environmental factors which are likely to interfere with the performance of the plants.

7. (i) Each of the two variables (treatments) is assigned to either of the two sides of the coin and the coin is tossed each time when a treatment is to be allocated to the plot in question.

(ii) Small pieces of paper on which each of the treatments are written separately are picked at random from a box and the treatment written on the paper is allocated to the plot in question.

(iii) Each treatment is assigned a different number and a number series from the random number table is used to allocate the treatments to the various plots accordingly.

(iv) A quadrat (or even a hat) is thrown into the experimental plot while facing the opposite direction – each time a treatment is to be allocated to a plot.

8. (a) Gender is the way a person is distinguished by sex; roles played by both genders that are considered to be acceptable to society.

(b) Power is the ability to do work.

(c) Cation exchange capacity is the ability of the soil to exchange positively charged ions at a given pH and per unit mass of soil.

(d) Agricultural marketing is an act of transferring goods and services from producers to consumers.

(e) Farm structures are features erected on the ground which aid agricultural production.

9. (a) i. **Applying humus to the soil:** This humus will make the soil porous ,thereby improving the structure of the soil in which it is applied.

ii. **Planting cover crops:** cover crops will protect the soil from erosion, thereby maintaining its structure.

(b) i. **Controlling soil erosion**: Erosion whether by wind or water carries away nutrients from one place to another, so controlling it would mean nutrients will not be taken away from any field.

ii. **Weed control:** If weeds are not controlled, they will use a lot of nutrients from the soil, making it lose its nutrients.

(c) i. Organic fertilisers buffer the soil pH, and nutrients are released slowly, making the plant use the nutrients for a long period of time.

ii. Organic fertiliser improves soil structure and soil tilth through holding soil particles together.

iii. Organic fertiliser increases the water-holding capacity and infiltration rate of the soil due to its colloidal nature.

iv. Organic matter improves soil aeration.

(d) i. It prevents lodging by strengthening the stem in cereal crops.

ii. It encourages the formation, development and establishment of roots, in particular, secondary roots.

iii. It imparts disease resistance to certain crops.

iv. It is important during flowering, seeding and fruiting.

v. It is important in several metabolic processes (in the plant) such as cell division, photosynthesis and amino acid metabolism.

(e) i. Death of terminal buds, so has a tendency towards resetting (developing new buds), which may result in the plant producing low yield, for some buds have died.

ii. Veins turn brown and collapse, which will make the plant leaf fail to make plant food.

10\. (a) i. Physically counting the number of pigs a farmer has, e.g. number of sows and boars.

ii. Physically measuring of pig houses, e.g. weaning house and farrowing houses.

iii. Estimating the value of pigs a farmer has, using present market value, e.g. value of litter and adult pigs.

(b) i. Knowing the measurement of pig houses will help the farmer plan well when to breed the pigs. The farmer will make sure that he or she breeds when he or she has enough pig houses.

ii. Estimating the value of the pigs using the present market value will help the farmer budget well for his or her enterprise. He or she will know how many pigs to buy, how much feed to buy, etc, so that the pig enterprise can improve.

(c) i. Pig starter

ii. Pig finisher

iii. Sow and Boar meal

(d) i. Helps farmers to cull unproductive livestock so that only healthy and productive livestock are kept for more profits.

ii. Helps farmers to know when to breed their livestock so that more livestock of good quality are kept, thereby increasing production

(e) i. **Reducing amount of water applied to seedlings:** This is accomplished through applying less water to the seedlings than usual while maintaining the number of times of water application that was being followed per day.

ii. **Reducing the number of times of water application:** This is accomplished through reducing the number of times of water application that used to be followed while maintaining the number of times of water application per day.

11\. (a) i. **Soil loss:** The soil is lost through cultivation of marginal lands.

ii. **Loss of plant nutrients:** Plant nutrients are lost through erosion resulting from deforestation.

iii. **Sedimentation and silting of rivers:** Erosion from overstocked areas results in silting of water bodies.

iv. **Flooding of land and crop fields:** Deforestation removes soil cover that slows and holds water such that a lot of water reaches streams which overflood.

v. **Poor sward composition and pasture re-growth:** Owing to overstocking and overgrazing, there will be low pasture pressure recovery and poor sward vigour.

(b) i. **Low land productivity:** Land degradation results in land becoming less productive due to loss of soil fertility.

ii. **Difficult in farming a particular land:** Farming becomes difficult because erosion takes away some land good for farming.

iii. **Increases demand for land:** Land degradation makes land expensive, for farmers will be competing for good land.

iv. **Requires heavy fertiliser application:** Land degradation leads to loss of soil nutrients making the land require heavy fertiliser application if at all farmers need to yield anything.

v. **Reduces land for non-crop use:** If all the land is cultivated then the land for other purposes will decrease, e.g. for wild animals.

12. (a) i. – Some herbicides destroy weeds through direct kill of the plant tissue on which they fall.
– Others are taken into the plant tissue and are transported into the vascular tissues, to the growing points of the weed plant where they stop cell division and growth.

ii. Some herbicides are applied into the soil from where they are taken up by plant roots into the plant tissue.

iii. Others ere sprayed or dusted over the plant tissue surface and either diffuse in or kill plant cells by contact.

(b) i. They increase the cost of production since they are mostly expensive.

ii. They leave behind some residual effects in the soil, thereby polluting soils and poisoning crop plants.

iii. They are washed down stream together with soil during soil erosion and eventually deposited into water bodies in which they poison water life and contaminate the water.

iv. They pollute air – posing hazards to terrestrial life.

v. Some of them are highly toxic and may cause damage to both human and plant body tissues during application.

TEST 5

1. (a) It is ground layering.

(b) i. It allows propagation of plants whose cuttings do not root easily.

ii. It offers an easy way of obtaining vegetative planting materials as compared to air layering.

(c) i. Air layering (marcotting) in which a woody branch of a tree is slit open on one part to expose cambium for easy rooting. The wounded area is covered in moist soil in a polythene bag. The branch is cut after rooting.

ii. Stem cuttings are obtained from a parent plant, e.g. in cassava. Each cutting has some buds from which new shoots sprout when it is planted in the soil.

2. (a) i. Natural pasture.

ii. Improved or cultivated pasture.

(b) i. **Digestibility:** Improved pastures have higher digestibility than natural pastures.

ii. **Dry matter content**: Improved or cultivated pastures produce higher dry matter yield than natural pastures.

iii. **Protein content:** Improved pastures have higher protein content than the natural pastures.

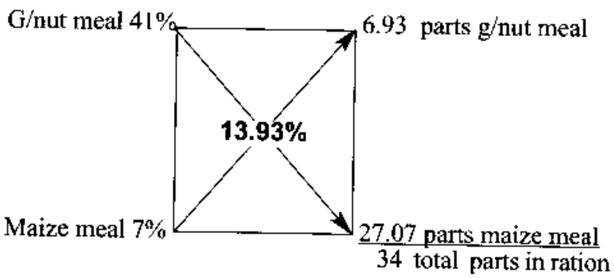
(c) Cultivated or improved pasture.

(d) i. **S** is the sperm duct.
D is the epididymis.
E is the scrotum.

ii. **S** is the passage of sperms from the epididymis to the glands.
D stores sperms after being manufactured by the testes.

3. (i) Crop grown and the extent of its root system.
   (ii) The previous land use.
   (iii) The climate of the field.
   (iv) The soil pH.
   (v) The type and structure of the soil.

4. (a)



Proportion of groundnut meal should be

$$\frac{6.93}{34} = \mathbf{0.2038}$$

Proportion of maize meal should be

$$\frac{27.07}{34} = \mathbf{0.7962}$$

(b) i. Amount of groundnut meal
= 0.2038 x 100 kg
= **20.38 kg Dry matter (DM) basis**

(b) ii. Amount of maize meal
= 0.7962 x 100 kg
= **79.62 kg Dry matter basis**

5. **P** is absorption.
   Q is ammonification.
   R is denitrification.
   S is oxidation.
   T is (nitrogen form) – Nitrites (NO_2^-).

6. (i) Political empowerment of female farmers
   (ii) Economic empowerment of female farmers
   (iii) Cultural empowerment of female farmers
   (iv) Social empowerment of female farmers

7. (i) Make farmers transport their produce to markets easily.
   (ii) Help farmers to make use of expensive machinery.
   (iii) Farmers buy input at cheap price in bulk.
   (iv) Farmers are able to secure much required loans from banks, e.g. from Stanbic Bank.

8. (a) **Drainage:** Drainage is the method of rehabilitating land by removing excess water from an area that is water-logged.
   (b) **Rogueing:** Rogueing is the removal of the whole plant with all its roots.
   (c) **Seed inoculation:** Seed inoculation is the process by which a strain of rhizobial bacterium is applied to the seed of a legume before or after sowing.
   (d) **Colostrum:** Colostrum is the first milk of the cow that is produced during the first four days after it has calved (parturition).
   (e) **Variable costs:** Variable costs are costs which vary or change with the level of the output.

9. (a) The crops grown under irrigation do not meet the constraint of erratic and inadequate rainfall that rainfed crops may meet. This makes the crops grown under irrigation produce high yields.
   If crops are grown under irrigation they can be grown more than three times in a year, thereby increasing the yields.
   (b) This principle of comparative advantage is a law that states that a nation should produce and export goods where its efficiency relative to other nations is the highest and this will contribute to agricultural production in the following ways:
      i. Production of quality products which will fetch more money, for the producers become experts in producing the product.
      ii. Production of a lot of the plant products since the nation can produce them at its best and therefore earn more money after selling.
   (c) i. Farmers in the farmers' clubs encourage one another in the

production of agricultural products and in the end all produce high yields.

ii. When farmers are in a club they can easily get loans as a group to improve and invest in the agricultural enterprises. Most of the money and input lenders shun giving loans to individuals. The loans obtained by the club can be used to increase agricultural production.

iii. Farmers in a club can be easily reached and taught (by extension workers) the new methods of farming to improve agricultural production.

(d) Registered land ownership or land registration is the process of getting an official document from the government, known as **title deed**, to establish ownership, and this can contribute to agricultural development in that:

i. There is security of tenure, for the owner is sure that the land belongs to him and this gives him an incentive to invest his capital and produce to the maximum. Nobody can invest a lot of his or her money where there is no security.

ii. Land registration allows the farmer to get a title deed to the land, surrendering it to the money lenders e.g. MRFC, for a loan to develop his or her land for agriculture development (mortgaging the land).

iii. The occupant can lease part of her registered land and get extra income for agricultural development.

iv. After registration of land, disputes about land ownership and boundary demarcation is avoided. Cases of boundary disputes require a lot of money and waste a lot of time. This means that the farmer can spend all his or her time and money on agriculture, thereby developing it further.

(e) i. Agro-based industries use raw materials from agriculture; in this way, they encourage farmers to produce more of such agricultural produce, thereby encouraging agricultural development. Farmers know that they have ready market for their produce.

ii. Agricultural based industries produce goods that are exported to other countries and other countries send their products in exchange, e.g. tractors, which will be used to develop agriculture even further.

10. (a) i. Can be done timely before there is much competition from weeds.

ii. Chemicals reduce the amount of tillage that might affect soil structure.

iii. There is no root damage and disturbing of the soil so that no deep weeds come to the surface.

iv. Convenient where use of machine is difficult, e.g. in rice fields.

v. More efficient than tillage in weed controlling, thereby improving yields.

(b) i. Expensive to buy chemicals.

ii. Can be poisonous to human beings.

iii. If used without care can give injury or destroy the crops.

iv. Some chemicals have got residual effect on the soils and crop applied.

v. Herbicides can pollute the air and water.

(c) i. Should be applied at the correct stage of growth of the crop. Some chemicals should not be applied any time.

ii. Should be applied at the recommended rate.

iii. Should be applied at the correct stage of weed growth.

iv. Should be sprayed when it is dry (not followed by rains).

v. Should not be applied during windy days.

(d) i. Biological control
Physical control
Cultural control
Legislative control

ii. Bullet

(e) i. Agricultural Trading Company (ATC)

ii. Admarc

iii. Agrochemicals

iv. Monsanto Malawi

11. (a) i. **Monocropping:** Cropping system where the whole land is cultivated each year to only one crop.

ii. **Shift cultivation:** The practice of moving to another piece of land for cultivation once fertility in a particular area has been exhausted.

iii. **Monoculture:** Growing only one crop to a piece of land or the whole farm.

iv. **Bush fallowing:** Cropping system where the farmer leaves the land temporary to another fertile land in order to become fertile again.

v. **Mixed cropping:** The growing of two or more than two crops on the same piece of land at the same time.

(b) i. Competitive ability of weeds such as vigorous vegetative growth makes them compete better for sunlight, and proliferation of their root system makes them compete better for soil mineral and water than most crops farmers grow. All these assist weeds to survive.

ii. **Number of seeds produced and timing of seed production:** A weed plant may produce large numbers of seed before control measures can be applied or often before control measures are terminated.

iii. **Seed dormancy:** Seed of some species may remain dormant, with some of them germinating each year, thus the seed from one plant may cause a continuing problem for many years, e.g. seeds of buffalo beans will remain in the soil for a long period of time without decay.

iv. **Ability to withstand clipping or mowing:** This may be accomplished by fast re-growth and fast production of seeds, fast re-storage of carbohydrate reserves in stem or root tissue or a low growth habit that avoids the clipping or mowing process.

v. **Resistance to herbicides:** Certain weed species and certain plants within weed species are more resistant to specific classes of herbicides. These resistant plants tend to increase, relative to susceptible plants, in an area where the specific herbicide is used.

12. (a) i. Cropping continuously, exhausting the soil, making it vulnerable to soil erosion.

ii. Cultivating on steep slopes and riverbanks, thereby promoting soil erosion through running water.

iii. Use of heavy machinery, which damages the structure of the soil, encouraging soil erosion.

iv. Cultivating the soil when too wet or too dry destroys the soil structure, leading to soil erosion.

v. Encouraging rill and gully erosions through making ridges along the slope, leading to more soils being lost from a particular field.

(b) i. Pollution of water resources, making water plants and animals such as fish die.

ii. Water sources drying up leading to scarcity of water to be used for agriculture, e.g. for irrigation.

iii. Loss of fertile loose top soil, leading to low crop yields.

iv. Grazing land is reduced, leading to lack of land for grazing animals.

v. High incidences of flooding that can lead to loss of crops and livestock.

TEST 6

1. (a) Marketing costs are payments made to marketing agencies for the services in the marketing channel.
   (b) i. The community can help to increase the volume of production of a particular product for export, e.g. growing paprika, and in such a way international trade can improve.
   ii. The community can help by improving the quality of agricultural products they produce so as to attract foreign buyers.

2. (a) Farm gate price is the price of the produce received by the farmer whereas marketing margin is the difference between the costs of buying the produce and selling it.
   (b) i. The percentage share for the producer in the final price paid by the consumer is high.
   ii. The retail price paid by the final consumer is reasonably low.

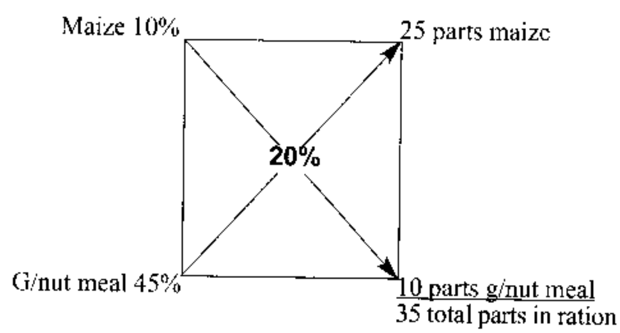
3. (i) Mammals, e.g. monkeys, rats, mice, giant rats and warthog.
   (ii) Birds, e.g. doves, chickens, guinea fowl, weavers, quelea, etc.
   (iii) Nematodes, e.g. roundworms called eelworms.
   (iv) Insects, e.g. biting and chewing insects such as bean beetles, piercing and sucking insect pests and boring insects pests (have mouth part adapted for biting and chewing) e.g a weevil.

4. (a) i. Soil pH or soil reaction
   ii. Cation exchange capacity (CEC)
   iii. Salinity
   (b) i. Soil texture refers to the coarseness and fineness of soil whereas soil structure is the arrangement of the individual soil particles in a soil.
   ii. They are both influenced by the proportions of sand, silt and clay particles, i.e. sandy textured soils have a low percentage of porosity as compared to clay textured soils.

5. (a) i. Source of foreign exchange
   ii. Source of employment
   iii. Source of valuable food nutrients
   iv. Source of income
   (b) Haden, Zill, Irwin, Kent, Anderson, Davis-Haden, Keitt, Palmer, Tommy Atkins, Boribo, Ngowe, Domasi, Kapanthi and Boloma.

6. (i) **Seed germination:** for the seed to germinate, water is one of the most important requirements.
   (ii) **Fishing:** People get fish in water bodies such as lakes.
   (iii) **For hydro-electric power:** Water generates electricity for domestic and industrial use.
   (iv) **Medium for nutrients:** Dissolution and uptake of plant nutrients is done in water.
   (v) **Helps in plant and animal cooling:** Water cools living things through respiration and evaporation.

7. (a)



Proportion of maize should be $\frac{25}{35}$

Proportion of groundnut meal should be $\frac{10}{35}$

(b) i. Amount of maize = $\frac{25 \times 100 \text{ kg}}{35}$

$= \mathbf{71.4\ kg}$

(b) ii. Amount of groundnut meal

$$= \frac{10 \times 100 \text{ kg}}{35}$$

$$= \mathbf{28.6\ kg}$$

8. (a) Drenching
   (b) A catchment
   (c) Quota
   (d) Herbicide
   (e) Weathering

9. Productivity of the soil can also be improved and maintained through the application of fertilisers.
   (a) i. They improve soil structure through supplying humus to the soil.
   ii. They are cheap since they can be made easily.
   (b) i. There will be stunted growth in maize, for it is lacking a nutrient necessary for growth and development.
   ii. Lower older leaves have yellow colour (chlorosis) starting from the tip moving towards the stem following the midrib forming V-shape.
   (c) i. Denitrifying bacteria which thrives under water-logged soils break down soil nitrates and release them as a gas into the atmospheric air.
   ii. Bacteria in the soil take in some nitrates in the soil and use them for protein synthesis.
   (d) i. Some nutrients such as phosphorus become fixed (locked up) when the soil pH is below 6.
   ii. Microbes such as bacteria which carry out decomposition become less active when soil acidity is high.
   (e) i. By applying agricultural lime to the soil.
   ii. By applying Calcium Ammonium Nitrate (CAN) to the soil.

10. (a) i. Deep soils allow easy root penetration to absorb a lot of nutrients that can be used by crops, thereby improving agricultural production.
   ii. Deep soils are able to hold water for crop growth and development so that high yields can be realised.
   (b) i. Low soil pH (acidic conditions) lowers the availability of some nutrients to crops, e.g. at low pH phosphates tend to be fixed.
   ii. Rainfall, if too high, will encourage loss of nutrients in the soil through leaching and soil erosion, thereby depriving crops of essential nutrients for growth.
   (c) i. **Through transpiration** where infiltrated water in the soil or in the ground reaches the plants through the capillary action and is transpired into the atmosphere due to sunlight and in this way it will return into natural water cycle.
   ii. **Through evaporation:** Farmers dig wells, which will collect the water infiltrated into the soil. In the end this water will be evaporated once the weather is hot and goes into the atmosphere, thereby returning into the water cycle.
   (d) i. **Mulching of crops:** Mulching is where the dry, disease-free crop residues are put over soil surface to reduce the moisture loss due to high temperatures.
   ii. **Correct plant population:** Correct plant population will ensure that the maximum ground is covered with plants, thereby reducing excessive loss of water from the ground.
   (e) i. **Transpiration from plants:** Plants get water from the soil with their roots. This water is then lost from the plant as transpiration into the atmosphere, thereby lowering the water table from where this water comes.

ii. **Drawing of water from shallow and deep wells:** Farmers draw water from wells which come from the water table, thereby lowering it.

11. (a) i. **Soil and water conservation:** Ridging helps to conserve soil and water needed for crop growth.

ii. **Breaking hard pan soil surface:** Breaking of hard pan helps to allow water to infiltrate into the soil easily and be used by the plants for their growth.

iii. **Kills weeds, pests and soil-borne diseases:** During land preparation, some weeds, pests and diseases are buried or exposed to the sun and then die or are controlled.

iv. **Adds organic matter into the soil:** Land preparation buries organic matter from the previous season's crop into the soil for it to turn into humus after decomposition.

v. **Removes weeds and bushes:** During land preparation, weeds and excess bushes are removed from the land so that seedbeds are easily prepared.

(b) i. **Clearing:** Removing of grass, bushes and trees from the field using materials such as pangas, axes, hoes and rakes.

ii. **Ploughing:** Digging land using a plough or hoe to break up the hard surface and loosen the soil.

iii. **Harrowing:** Harrowing involves breaking large clods of soil using a harrow or a rake into small and fine particles which are made during ploughing.

iv. **Ridging:** Involves making ridges by using a hoe or a ridger.

v. **Box or tie ridge making:** Involves making box ridges at alternate intervals in the furrow of made ridges.

12. (a) i. The topography of land; for example, basin irrigation works best where the land is flat; however, the sprinkler is suitable for any area.

ii. The type of crop, because some crops are not best irrigated using furrow irrigation but sprinkler irrigation; for example, tea can do well with overhead irrigation. Also crops that should be put to irrigation should be only those that give more returns than expenditure.

iii. Availability of water in the locality; for example, surface irrigation would not do well in areas with less water supply. Where water is in limited supply, drip or overhead irrigations would be suitable.

iv. Initial and maintenance costs to be incurred by the farmer. This is one of the important factors to consider because the amount of money present will determine which method to choose. For example, overhead irrigation would be more expensive than earth canal irrigation using gravity to bring and apply water to crops.

v. Labour availability: Some methods of irrigation need more labour than others, e.g. centre pivot overhead irrigation will require less labour than surface furrow irrigation.

(b) **Advantages**

i. No levelling of land is required. The method saves money that would have been used to levelling the land.

ii. Fertilisers and herbicides can be mixed in water tank and applied uniformly.

iii. Soil erosion is minimised and is an ideal method to use in sandy places and in hilly areas.

Disadvantages

i. Top soil may harden due to the impact of water droplets.

ii. A lot of labour is required (can be experienced) in moving and joining laterals from one part of the field to another.
iii. If the weather is windy, application of water becomes uneven especially in the corners of the fields.

TEST 7

1. (a) Roughages are feeds with high moisture and fibre content and low in protein.
Concentrates are feeds high in protein and carbohydrates and low in moisture and fibre content.
(b) i. Energy concentrates
ii. Protein concentrates

2. Transporting, processing, financing, selling, risk bearing, storage, product promotion, pricing, grading, product planning, market intelligence, market research, etc.

3. (a) Partial budget
(b) It is because most farmers are involved in small changes that cannot affect the whole farm organisation. Partial budget is quick and needs little mathematical skills.

4. (a) i. Direct marketing channel
ii. Indirect marketing channel
(b) i. **Money or capital obtained from farming:** Money obtained from selling agricultural products is all spent on buying patient's drugs and care and never put back into the field for further agricultural development.
ii. **Labour force:** Farmers who are supposed to be working in the garden are busy caring for the sick. In some cases, farmers themselves fall sick, making it impossible to work in the fields and improve agricultural production.

5. (a) i. Depreciation is the permanent decrease in value of an item over a period of time.
ii. Randomisation is the allocating of treatments in an experiment. It is the choosing of items by chance.

6. (i) Late planted crops meet a lot of pests and diseases. These attack the crops and weaken them or eat them (in case of pests), thereby lowering the yields.
(ii) Late planted crops may fail to mature because the growing period is affected by rains which stop before they mature. This will lead to crop failure or low yields.

7. (a) **X** is testis.
Y is epididymis.
Z is vas deferens.
(b) **X** (testis) produces spermatozoa.
Y (epididymis) is where sperms are stored and get matured.
Z (vas deferens) is where sperms pass when coming from the epididymis to the seminal vesicles.
(c) It is a closed operation method which uses a burdizzo.
(d) i. Castration using a knife (open operation) where an incision is made in the scrotum and the testes are completely removed.
ii. Castration using a burdizzo (bloodless or closed operation method) and a burdizzo is essentially a large clamp that is used to crush the blood and nerve supply of the testes. In this method there is no open wound but the testes will degenerate due to the lack of blood and nerves.
iii. Castration by elastrator (use of the loop) and the elastrator is any instrument used for stretching a strong rubber ring. It is placed around the scrotum above the testes. The ring cuts off the blood supply to the testes and the scrotum; and this results in their eventual sloughing off.

8. (a) Labour
(b) Colostrum

(c) Deforestation
(d) Desertification
(e) Habitat

9. (a) i. Lack of water will lead to low crop development because it is where nutrients that are required by plant get dissolved and are transported through it; so if there is no water there will be nothing to dissolve and conduct nutrients for plant use.

ii Water is an essential raw material for photosynthesis. Lack of water means the plant will be unable to manufacture food and eventually there will be low growth.

(b) i. Too much rainfall will result in a lot of soil erosion, which will carry away necessary nutrients for crop growth, leading to low yields.

ii. When there is too much rainfall, weed control is very difficult, for once weeded, they do not die. This will result in low yields because most of the plant nutrients will be lost to the weeds.

(c) i. The parent material influences the physical properties of the soil because the physical properties of the soil depend on the source of rocks that have formed a particular type of soil. For example, coarse grained soils are formed from granite and gneiss.

ii. The parent material influences the chemical properties of the soil in the sense that the soil formed will contain the minerals of the parent rock. For example, rock containing calcite, feldspar and ferromagnesium minerals are likely to produce deep heavy fertile soils having some of these minerals in them.

(d) i. Soil structure determines the pore space hence improving soil structure will result in improving water holding capacity of the soil. The water is necessary to the crops for their growth and development.

ii. Improved soil structure facilitates drainage, thereby avoiding water logging in crop fields so the crops grow healthy.

(e) i. Infiltrating water and ground water can become part of the water cycle if they are taken by plant roots and later on get transpired into the atmosphere.

ii. Infiltrating water and ground water can become part of the water cycle if people dig wells for domestic use or drinking of livestock. The water from these wells will evaporate into the atmosphere.

10. (a) i. Plants absorb rock minerals as nutrients, thereby weakening the rock in general. The rock will later break down into smaller particles.

ii. Plants, using their roots, push on the rocks or between the rocks, thereby breaking the rock into smaller particles.

(b) i. **Porosity:** Influences the amount of space found in the soil.

ii. **Soil depth:** Soils which are well developed and matured tend to be deep, while soils which are not well developed tend to be shallow. Deep soils will have good structure.

(c) i. Soil contains microorganisms some of which fix nitrogen in the soil for crop growth and development.

ii. Soil anchors the plants when they are growing so that they do not lodge and are able to get the nutrients supplied by the same soil.

(d) i. It is made up of smallest, flattest particles.

ii. It has high porosity, i.e. large total pore space, composed of many tiny pores.

iii. It swells on wetting, shrinks on drying.

iv. It is highly cohesive, particles

flocculate, i.e. stick together in groups.

(e) i. Soil reaction or Soil pH (power of hydrogen): This affects the availability of different nutrients in the soil, for different nutrients are available in soil at different pH level. Some like acidic conditions while others like basic conditions.

ii. Cation exchange capacity of the soil will affect the type of cations to be present in the soil. The cations presence in the soil depends on the cation capacity of the soil.

11. (a) i. **Early socialisation to technology:** Boys are exposed to technology, e.g. through toys while girls are busy with domestic chores.

ii. **Confidence in males:** Males have more confidence in using technology than females, for they get exposed to technology at an early stage.

iii. **Exposure to role models:** Young males see old male farmers working with technology, e.g. driving a tractor and admire to do suit while old women are never seen using technologies and this hinders females from imitating.

iv. **Exposure to technological information:** Boys have greater chances of being exposed to technology than girls because they are normally free to move in society, more supported in education and have more chances of learning from male extension workers who are mostly men.

v. **Attitudes and gender mentality:** Many times females are discriminated in being offered loans – they are taken as poor users of acquiring and using technology.

vi. **Accessibility to capital:** Males being heads of the families have more chances of controlling the house money, thereby being responsible for buying technological items that can be used on the farm.

(b) i. **Population distribution by occupation, income or economic activity:** The distribution based on what people are doing to earn money. In Malawi a very small population of people is economically sound and this is mainly for the rural farmers.

ii. **Population distribution by gender:** The distribution based on sex of people. In Malawi females are more than males in all the regions of the country.

iii. **Population distribution by age:** The distribution based on the number of years of the individuals. Children under 18 years are numerous among the Malawian population in all the regions.

iv. **Population distribution by Location or spatial:** The distribution based on place where people live. In Malawi many people live in the Southern Region than in any other region in the country.

v. **Population distribution by education and literacy:** The distribution based on the level of learning. In Malawi, the most educated people are from the Northern Region and more males are educated than females.

12. (a) i. **Seed technology:** Involves providing good quality seed for improved crop varieties to subsistence farmers for the purpose of increasing crop production.

ii. **Provision of farm inputs:** Providing farmers with recommended inputs and ensure they are used properly.

iii. **Extension and training:** Offering of technical information on modern methods of farming in order for farmers to increase their production.

iv. **Crop protection:** Ensuring that weeds, pests and diseases do not attack crops and crop produce.

v. **Irrigation:** In order to reduce the danger of crop failure due to lack of water so that high yields can always be realised.

(b) i. **ADMARC:** Provides the services of crop protection and seed technology.

ii. **Malawi Rural Finance Company:** Provides services of providing agricultural credit to subsistence farmers for agricultural development

iii. **Agricultural Development Division:** Through provision of Ox-Training Unit to train farmers on farm mechanisation.

iv. **Bvumbwe and Chitedze Research Stations:** These provide the services of soil testing so that the correct amount and type of fertilisers are applied to different soils in which farmers grow their crops in order to have high yields.

v. **Food and Nutrition Unit in the Ministry of Agriculture**: Provides the services of food nutrition so that farmers eat balanced diet food in order to be healthy and work hard to develop the agricultural sector.

TEST 8

1. Refers to the patterns, techniques, procedures or practices followed in cultivation and production of crops.

2. (a) A balance ration is the amount of feed that contains all the required nutrients in the correct proportions.

(b) i. Maintenance ration

ii. Production ration

(c) i. Pelleting is the practice of sticking a thin layer of material like gypsum and lime around each seed to improve legume establishment through correcting the soil pH or soil nutrient deficiencies.

ii. Inoculation is the process of mixing legume seed with the correct type of rhizobium bacteria before sowing in order to ensure successful nodulation and nitrogen fixation.

3. (i) Heart water, pneumonia, brucellosis, enterotoxaemia, mastitis, sheep pox, foot and mouth disease, foot rot, etc.

4.

Year	Fraction	Annual depreciation
1	10/55	10/55 of K9,000.00= K1,636.36
2	9/55	9/55 of K9,000.00 = K1,472.73
3	8/55	8/55 of K9,000.00 = K1,309.09
4	7/55	7/55 of K9,000.00 = K1,145.45
5	6/55	6/55 of K9,000.00 = K981.82
6	5/55	5/55 of K9,000.00 = K818.18
7	4/55	4/55 of K9,000.00 = K654.55
8	3/55	3/55 of K9,000.00 = K490.91
9	2/55	2/55 of K9,000.00 = K327.27
10	1/55	1/55 of K9,000.00 = K163.64
Total 55		**= K9,000.00**

The depreciation in the 10th year is **K163.64**

K9,000.00 is used and not K10,000.00 because there is still a scrape value or salvage value of K1,000.00; so it is K10,000.00 – K1,000.00 = **K9,000.00**

5. (a) i. Use of watering can.

ii. Sprinkler irrigation.

iii. Using hose pipe to irrigate crops.

iv. Capping with hands from a water source.

(b) i. **P** is hammer.
X is nozzle.
Y is tension spring.

ii. **T** – The spring on top pushes the swing arm back again.
P – The opposite arm moves when the first swing arm moves.
N – Another jet of water comes out of this nozzle.

J – The jet of water hits the curved swing arm forcing it to move back.

X – water comes out of this nozzle in a fine jet.

6. (a) i. Overgrazing resulting from overstocking
   ii. Increased human population growth.
   iii. Deforestation resulting from careless cutting down of trees.
   iv. Uncontrolled fires for bush clearing.
   v. Bad Farming practices.
   (b) i. Biological control.
   ii. Physical control.
   (c) i. Biological soil degradation whereby plants and animals, e.g. people, termites weaken the soil structure, making it prone to soil erosion.
   ii. Physical soil degradation when the soil structure is damaged by rain, wind or machine.
   iii. Chemical soil degradation where use of chemicals such as fertilisers, pesticides and herbicides can destroy the soil structure.

7. (a) A catchment area is an entire area from which drainage is received by a body of water.
   (b) i. Deforestation will lead to loss of water from the catchment area because trees in the catchment area help to conserve water.
   ii. Trees in the catchment area cover the soil so if they are cut, the soil will be exposed to all agents of weathering. This will lead to occurence of soil erosion in the catchment area and siltation of the rivers where soil will be deposited.

8. (a) Overgrazing is the excessive grazing due to too much animals being kept in a small area.
   (b) Strip cropping is the alternating of crops with strips of grass.
   (c) Rill erosion is the type of erosion where running water causes small channels.
   (d) Scarification is the process by which hard seed coats, testas of legume seeds are softened or abrased in order to improve permeability and hence speeding germination.
   (e) Drenching is the orally (by mouth) giving of liquid medicine to animals.

9. (a) i. Seasonal variation of cattle feed supply contributes to low production in that during the time that there is low animal feed, the animals do not produce a lot of beef, milk, and even breeding is a problem since cattle do not get enough nutrients for their body function.
   ii. In communal grazing there is a tendency to overstock, which results in overgrazing, denudation of land and consequent soil erosion and difficult-to-control diseases which will lower the production of livestock.
   (b) i. Make silage for the animals to feed during the dry season, e.g. from crop residues like beans.
   ii. Making hay to be fed to animals during the dry season, e.g. drying the grass such as elephant grass, Lucerne and sweet potatoes.
   (c) i. Since cattle movement is restricted, beef animals fatten up more quickly than in other grazing methods, e.g. in extensive system.
   ii. Since cattle are confined in one place, disease and parasite control is easier than in other systems of grazing.
   (d) i The animal has difficulties in breathing.
   ii. There is uncontrollable nasal discharge in the animal.
   (e) i. The major advantage of inbreeding (mating sires and dams of the same herd) is to increase number of pairs

of genes that are homozygous for a desired characteristic, e.g. high beef-production.

ii. The disadvantage of inbreeding is that it increases the uniformity (pure lines) of the herd of animals, which means any adverse condition that can arise, e.g. disease, will lead to all the animals perishing (reduction of hybrid vigour).

10. (a) i. Time is wasted because of movements from one farm to another, leading to less work being done per day therefore the efficiency of the machine will be reduced, i.e. less work done compared to time spent.

ii. A lot of fuel is wasted in movements while the actual work done is very little therefore the efficiency of the machine will be reduced, i.e. less work done compared to fuel used.

(b) i. It is very difficult for heavy machine to turn and work efficiently on a small land.

ii. In most scattered and small gardens, there are no big roads or the roads are very bad where heavy machines cannot travel, thereby making it difficult to reach and work on a particular farm.

(c) i. This may cause problems in conservation of soil and water because fragmented fields are involving and difficult to have well-designed conservation measure, for they are found in different areas and of different topography and with different field layouts.

ii. If the gardens are too small, farmers may not be willing to offer part of their small fields to construct soil conservation measures.

(d) i. Transportation of goods may take a long time because the tractors have to move from one field to another and if not careful, some produce can get spoiled by pests and bad weather.

ii. Transportation costs may be very high because of fuel and oil which will be used from one field to another that might be very close but using very long roads to reach them or being equally at distant places.

(e) i. Land can be consolidated by having all farmers who own close small gardens form a club and be farming as a group so that their land can be one provided they know how much of the land each farmer owns.

ii. Land consolidation can be done by a farmer buying other farmers' small plots which are close to his or her farm so that he or she forms a big farm.

11. (a) i. **The soil type:** If the soil has low available moisture, it needs frequent light irrigation.

ii. **Water quality:** The water for irrigating crops should be free from salt or toxicity.

iii. **Water quantity:** Some crops also require less water while others require a lot of water, so apply water according to the crop requirements.

iv. **Type of crop:** Some crops whether you irrigate or not always perform the same, e.g. irrigating mango trees will not benefit much production. So go for crops that will benefit much from irrigation in terms of production.

v. **Cost of irrigation:** Make sure that when you are irrigating crops, you are using very cheap means, otherwise no profit can be realised from your farm business.

(b) i. **Two advantages are:**

- Very little levelling of the land is required, thereby saving a lot of money that would have been wasted in land levelling that can be done

with other types of irrigation methods.
- Fertiliser and pesticides can be mixed in a tank and applied uniformly to crops, thereby saving money that would have been spent on labour applying the fertiliser and the chemicals.

ii. **Three disadvantages are:**
- High labour costs are expected in moving and joining (in case of sprinkler irrigation) laterals from one part of the field to another.
- If the weather is windy, application of water becomes uneven especially in the corners of the fields.
- It is expensive to buy and maintain the sprinklers, laterals, nozzles, the engine or motors for pumping water, even fuel or electricity for running the motor or the engine.

12. (a) i. **Soil conditions or types:** Soil type determines the distribution of crops, for different crops grow best in different soil types, due to their differences in structure, fertility, pH and texture. Cassava, for example, grows mainly in sandy soils while rice in clay soils.

ii. **Climatic conditions:** Different crops grow best within a certain climatic condition, e.g. maize does well in almost all areas except in areas with relatively low temperature and low rainfall; crops like tea and coffee prefers cold areas, while sugarcane prefer hot weather.

iii. **Preferential demands by farmers:** Farmers would rather grow food crops on their land on the basis of comparative advantage. Farmers would grow crops in their fields that consumers want.

iv. **Manageability and low input demand of a crop:** Some areas are grown with crops that farmers feel they can manage them; again with those crops that are less demanding in terms of input. Inputs like fertilisers are very expensive, so farmers would rather grow potatoes and cassava which do not require a lot of inputs in their areas than growing paprika or tea.

v. **Occurrence of pests and diseases:** All other factors can be favourable for a particular crop to be grown but if the area is badly attacked by a certain pest or disease then the solution will be to grow only the varieties that are disease- or pest-resistant, e.g. RG 1 (Roy Gibbon 1) variety of groundnut will be found in Mulanje because it is resistant to a virus disease of groundnuts called rosette that attacks other groundnut varieties such as Chalimbana.

(b) i. Mixing crops that have fibrous roots with those that do not have fibrous roots will help prevent soil erosion because fibrous roots hold the soil, something non-fibrous roots cannot do.

ii. Mixing legumes with non-legumes will make legumes fix nitrogen for the other crops, thereby improving yield.

iii. Mixing crops that are attacked by different pests and diseases will prevent the pests and diseases from spreading fast, for they will not survive on non food plant since they are host specific.

iv. Mixing several crops on one field ensures high total production per unit area because a lot of harvest will come from one area.

v. Mixing crops ensures security against total crop failure and efficient labour use; if one crop fails, the farmer will depend on the one that has survived.

TEST 9

1. Sodic soils are soils with a lot of sodium in them.

2. (a) i. Small East African goat
   ii. Malawian goat

   (b) i. Boer goat
   ii. Angora
   iii. Toggenburg
   iv. British Saanen
   v British Alpine

3. (a)

Adults (4 x 300 kg) + 300 kg (for labourer)

$$= 1{,}500\text{ kg}$$
$$+\ 750\text{ kg}$$
$$2{,}250\text{ kg}$$

1 ha (hybrid maize produces) 45 bgs x 50 kg

$$= 2{,}250\text{ kg}$$

Family requirement + 20% household allowance

$$2{,}250\text{ kg} + \frac{20 \times 2{,}250\text{ kg}}{100}$$

$$2{,}250\text{ kg} + 450\text{ kg} = 2{,}700$$

$$\text{Land required } \frac{2{,}700\text{ kg} \times 1\text{ ha}}{2{,}250\text{ kg}}$$

= **1.2 ha**

4. (a) Puberty is the age at which an animal reaches sexual maturity.

   (b) i. **Environmental factors:** Puberty may be delayed due to unfavourable climatic conditions, e.g. drought which leads to scarcity of feeds and water.

   ii. **General management:** It is known that calves that are properly fed and well looked after tend to reach puberty earlier than those that are poorly managed.

   iii. **Type and breed of animal:** Some types and breeds of animals mature more quickly than others.

   iv. **Mating:** Mating it self may hastern maturity.

   (c) i. Proestrus
   ii. Oestrus
   iii. Metoestrus
   iv. Dioestrus

5. (i) Inventory records
   (ii) Production records
   (iii) Financial records

6. (a) i. Making use of complementary enterprises where an increase in output of one results in an increase in yield of the other, e.g. maize and cattle in which case maize can be fed to the cattle and cattle produce manure to be applied in the same maize plant, or maize and climbing beans in which case beans fix nitrogen and maize plant provides support for beans to obtain sunlight for photosynthesis.

   ii. Making use of supplementary enterprises to utilise underutilised resources, e.g. raising broilers in tobacco shades in dry season or growing beans (second crop) after harvesting main crop in places of longer wet seasons.

   (b) i. Promotes farmers to concentrate on producing enterprises which they can manage very well, e.g. farmers in Dwangwa have more managerial experience in sugarcane production than those in Ntcheu and Dedza.

   ii. Encourages farmers to concentrate on producing crops that are best suited to their areas (specialisation), e.g. rice should be produced in Karonga and Nkhotakota while tea in Thyolo and Mulanje.

   (c) i. **Food processing technology:** Good food processing technologies will ensure the availability of food at all times. Some foods are perishable but also seasonal Such foods could be available throughout the year, thereby improving food security at household level.

ii. **Storage facility of food products:** Good storage facilities of food products will ensure the availability of food at all times and this will improve food security. Some families are forced to eat all food products because such food products cannot be stored for long periods of time.

iii. **Planting early maturing varieties for food:** Early maturing varieties will mature in good time before all the people's food reserves have exhausted and in this way households will have enough food all the time.

7. (a) i. **Warmth:** Warmth fastens the chemical reactions in seeds to take place so that the seed can start germinating.

ii. **Air:** Air contains oxygen for the respiration of a seed.

iii. **Moisture:** Water assists in chemical reactions and dissolution of stored food in the seed.

(b) (i) Water

(ii) Temperature

(iii) Air

(iv) Sunlight

(v) Relative humidity

(vi) Soil nutrients

8. (a) **Staking** is the process of supporting plants with sticks, e.g. in tomatoes, so that the stems do not touch the ground mostly to avoid rotting of the stems and fruits.

(b) **Evapotranspiration** is the combined loss of water from a given area by evaporation from the soil surface and by transpiration from plants.

(c) **Sheet erosion** is the type of erosion that occurs on flat land where the surface layer of soil is removed and deposited elsewhere.

(d) **Terracing** means levelling a hilly area in the form of steps so that planting is done in the horizontal portion while the vertical section is the retaining wall.

(e) Gully erosion is the type of erosion where water makes large and deep channels.

9. (a) i. It will mount other cows and may also allow other cows to mount it.

ii. There is loss in cow's appetite and reduced milk production in lactating animals.

iii. There is mucus or slimy discharge from the vulva. This discharge can be seen on the lips of the vulva and under the tail.

iv. The vulva swells and changes its colour. Normally the colour of the lips of vulva is pink. During period of heat (oestrus) they turn red.

(b) i. During the dry off period, each quarter of the udder receives a tube of mastitis control antibiotic known as dry-cow therapy. This helps to reduce the problems of mastitis during the following lactation.

ii. Cows are able to replenish minerals and vitamins lost in the previous lactation through steaming up the cow.

(c) i. The cow becomes restless, arches her back and may strain at times.

ii. The area around the base of the tail becomes soft and relaxed.

iii. The water bag may be seen between the lips of the vulva.

iv. The udder fills with milk.

(d) i. Colostrum is the first milk from an animal produced for the first four days after giving birth, e.g. in cow.

ii. Colostrum is very nutritive for it contains high quantities of vitamin A and proteins.

It is a natural medicine which helps the calf remove sticky faecal matter known as faecal meconium which collects in the digestive system. Colostrum contains antibiotics, which temporarily give resistance to the calf against certain infections of the alimentary canal.

(e) i. Puberty in cattle is markedly influenced by the feeding regime: The faster the rate of growth, the earlier the sexual maturity, and puberty in cattle occurs at a particular weight or body size rather than at fixed age. For instance, severe restriction of energy or protein leads to infantile (small) ovaries and delay of puberty in heifers.

ii. Nutrients are also needed for both the conceived cow and the calf in the uterus during pregnancy, and cattle will not conceive when there is less feed and that is why most of the cattle in Malawi conceive during rainy season (January – December) when there is plenty of grass.

10. (a) i. Through research which aims at improving farming techniques, seeds, food, breeds, etc, so that a lot of food is available to the households.

ii. Improving the health of farmers through increased medical facilities and through health education so farmers are healthy and work hard in their fields to have bumper yields.

iii. Building roads and providing markets for farmers so that the produce from the producers can be transported and sold without difficulties thus ensuring everybody has enough food at the right time. Roads can also help farmers transport farm inputs so that it is used in the field to produce a lot of food for the population of Malawi.

iv. Through provision of extension services to the farmers so that they improve on ways of farming to increase food production for the Malawian population.

(b) i. International trade enables the benefit of large scale production to be obtained, e.g. aeroplane and cars are produced in large numbers at low costs. This helps the nation not spend a lot on importation and therefore the money saved will be used to provide other services to the people like in education, thereby helping to raise the living standards of the people.

ii. International trade increases competition, thereby promoting efficiency in production particularly where monopolists might gain control of the home market. Efficiency in production means that the country will be producing the best goods that people like. This will result in helping the people to be eating good food as well as putting on good cloth that are made within their country.

(c) i. Migration (immigration and emigration)

ii. Industrial development

iii. Climate and soil fertility

iv. Water availability

(d) i. There will be shortage of land for agriculture, leading to food shortage. The country will start importing food, thereby reducing its economic development.

ii. When the population increases, there will be shortage of medical care such that sick people will be unable to contribute to agricultural development. Low agricultural production means the country will have less for export.

(e) i. The rural population releases labour to work in the expanding industries in the urban areas, thereby making the urban areas depend on the rural for its source of labour.

ii. The rural population provides food to the urban population. It is the people who live in the rural areas that produce food that is consumed by the urban population.

11. (a) i. **Climate:** Different types or breeds of animals require different types of weather such that animals requiring cold areas are found in cold areas and those requiring warm weather are also found in warm areas.

ii. **Religious beliefs:** Some animals are tamed or not tamed in certain areas because of religious beliefs, e.g. Moslems and SDA do not eat pigs, so pigs will not be found in areas of such faiths.

iii. **Food and water availability:** Animals will only be found where there is a lot of feed and some water to drink.

iv. **Slaughtering and theft of animals:** Some areas do not have a lot of livestock because of too much slaughtering for beef as well as people stealing the animals.

v. **Availability of parasites and diseases:** Not many animals will be found in areas that are prone to parasites and diseases. Parasites such as tsetse fly and diseases such as Foot and mouth disease of cattle lower animal production.

(b) i. **Low number of eggs produced:** Local chickens produce fewer eggs than the exotic breeds of chickens.

ii. **Low meat production:** Local chickens produce less meat as compared to the exotic breeds of chickens.

iii. **Small egg produced:** Local chickens produce small eggs compared to the exotic breeds of chickens.

iv. **Poor response to commercial feeds:** Local chickens do not respond well to commercially formulated feeds like layer's mash because they are genetically poor at extracting nutrients from a given feed.

v. **Slow growth:** Local chickens genetically grow very slowly as compared to the exotic breeds of chicken which some of them are eaten within 4 weeks.

12. (a) i. Cash can be used to pay for labour which can be employed to work in agriculture enterprises in order to improve agricultural production.

ii. Capital can be used to buy the much needed farm inputs to be used in the agricultural production.

iii. If there is capital, the owner of the agricultural enterprise can go for further training or education or train his managers so that they are able to manage the farm well to get good profits realised from increased production due to the training.

iv. Capital items of machinery (dead stock) can be used to work in the farm. Since machinery such as tractors work very fast and efficient then the farming operations can start and finish in time. This will in the end contribute to the farmer producing very high yields.

v. Capital items of farm buildings will encourage the farmer to produce more agricultural products, knowing that he she has somewhere to store the produce. Most agricultural products are bulky and perishable and therefore need to be stored well for some profits to be earned so that the money can be used for further agricultural increase.

(b) i. **Private money lender:** This is a private lender of money to farmers who may want to invest the money in farming business.

ii. **Relatives and friends:** Credit can be taken from relatives and friends who trust farmers that they can pay back after investing in the farming business.

iii. **Government-sponsored credits:** There are some Government sponsored organisations and companies that can lend money to the farmers for the purpose of farming, e.g. MRFC, ADMARC, SELDOM, etc.

iv. **The merchant:** The merchants are another good source of credit for smallholder farmers to invest in farming business.

v. **Hire purchase:** Getting credit on hire purchase for business of farming, e.g. from Stanbic Bank.

TEST 10

1. (a) i. Maize
   ii. Sorghum

   (b) i. By competing against crop plants for factors of growth, i.e. water, nutrients, space and air.
   ii. Through adulteration of crop yields, e.g wild oat seed mixed with wheat grain.
   iii. Fields infected with weeds demand a lot of labour force during harvesting.

2. (i) **Indigenous**: Malawi fat-tailed sheep.

   (ii) **Exotic**: Merino
   : Karakul
   : Black head Persian

3. (a) It denies the weed plant of its proximity to crop host or crop plant.

   (b) The mulch suppresses growth of weeds by denying them access to sunlight for photosynthesis.

   (c) It enables the crop to grow faster, overtake and choke the weed.

4. (i) Furrow irrigation method or system
   (ii) Basin irrigation method or system
   (iii) Border strip or flood method or system

5. (i) Rain infiltration is improved.
   (ii) Conserves soil erosion.
   (iii) Improves structure through addition of organic matter to the soil.
   (iv) Kills weeds through smothering.
   (v) Improves soil fertility after decomposition of organic matter.
   (vi) It lowers the soil temperature.

6. (a) **A** is phloem.
   B is xylem.
   (b) It transports water and dissolved nutrients up the plant.
   (c) Substances are translocated in the xylem through the transpiration pull whereas in the phloem they flow by gravitational pull.

7. (a)

Day	Time	Nthalire	Salire
1	8 Hours	750	520
	14 Hours	450	250
2	8 Hours	760	500
	14 Hours	440	245
3	8 Hours	780	490
	14 Hours	447	247
4	8 Hours	720	400
	14 Hours	380	230
5	8 Hours	650	350
	14 Hours	410	200
Total	**10 times**	**5787**	**3432**
Average		5787/10	3432/10
Answers		**= 578.7**	**= 343.2**

i. Average daily rainfall of Nthalire = **578.7 mm**

ii. Average daily rainfall of Salire = **343.2 mm**

(b) i. Helps the farmer to know when rains are expected to come so that he or she can start preparing the gardens and buying of farm inputs.

ii. Helps the farmer to know the trends of rain in his or her area so that best crop varieties can be planted in order to suit a particular rainfall pattern.

iii. Helps the farmer to know if rains fallen on a particular day are sufficient for the crops in the fields or else he or she has to supplement with the irrigation.

8. (a) Splash erosion
   (b) Subsidies
   (c) Agricultural policy
   (d) Buffering capacity
   (e) Bulk density

9. To increase subsistence agricultural development, there is a need to study the modern farming systems of the smallholders.

(a) i. A farming system is a method used by different communities or farmers for producing crops and livestock in order to supply human needs.

ii. Crop rotation
Mixed farming
Bush farming

(b) i. Through provision of advice on modern methods of farming, to farmers. e.g. irrigation technology.

ii. Helping the farmers to raise their production by supplying them with the necessary inputs, e.g. starter pack.

iii. Offering maximum protection to the soil by laying out soil conservation measures such as contour bunds.

iv. Through offering agricultural loan schemes to Malawians so that they can be engaged in agriculture.

(c) i. An area should have deep well drained rich soil suitable for a particular crop.

ii. The climate should be suitable for a particular crop.

iii. There should be enough water supplies for the crop or irrigation for the crop in question.

iv. Generally flat areas with good roads are good for agricultural development.

(d) i. Selecting good varieties of crops and breeds of animals which can produce highly in order to increase production.

ii. Applying the recommended fertilisers to crops and proper feeding of the animals so that they produce high yields.

iii. Controlling pests, parasites and diseases of both crops and livestock with the aim of making the crops and animals healthy and produce high yields.

iv. Weeding of crop fields so that they produce high yields, and proper housing of livestock to protect the animals from bad weather and predators, thereby making the animals produce well and increase in number.

(e) i. Use of improved planting materials and improved breeds of animals.

ii. The nutrition of the villagers and workers should be improved. Hungry people cannot work efficiently in the fields to produce high yields.

iii. Good management such as following good cultural practices should be practised.

iv. The villagers should have good health in order to work hard in the fields.

10. (a) i. The profit he would have obtained from CAN.

ii. The returns from guava

(b) i. Type of soil (soil fertility)

ii. Slope of the land

11. (a) i. **Practise good livestock husbandry:** Through proper housing, feeding and medication of animals to ensure high production in livestock in Malawi which can be a good source of beef and milk.
   ii. **Fair pricing policies:** Fair input prices encourage farmers to buy and use them to obtain high yield for food.
   iii. **Use of crop diversification:** Growing more than one crop within the same year or growing season so that a lot of food is produced in the country to feed the people.
   iv. **Use of improved seed and animal breeds:** Improving livestock breeds and crop so that early maturing, disease-resistant, fast growth and high yields can be obtained to feed the nation.
   v. **Use of good land husbandry:** Using piece of land according to its capability without causing soil erosion and loss of soil fertility will lead to high crop yields for food.

(b) i. **Source of farm power:** Animals are used to transport produce at the farm as well as cultivating using the implements.
   ii. **Source of leather for clothing:** Leather from animals is used as a raw material for making different leather materials such as shoes.
   iii. **For social obligation:** Animals are used as a social obligation like in the case for paying for dowry (*lobola*).
   iv. **Source of income:** Animals are a source of income after selling both the slaughtered or live animal.
   v. **Source of organic fertiliser:** Animal dung is a good source of organic manure which can be used for crop growth.

12. (a) Improving or increasing the living standards means increasing the comfort of ordinary people by making them afford more needs and luxuries.
   i. Beef obtained after the animal has been in stall for some time can be used as a source of more and better food, thereby improving the living standard of the people consuming the meat.
   ii. Labourers involved in feeding the animals will get money after offering their services, which they will use to buy clothing to improve their living standard.
   iii. Feed for feeding stall fed animals is bought from other people who are going to get money after selling the feed. The money will be used in buying luxuries such as TV and cars.
   iv. The owner of the animals in stall will get a lot of money after selling their animals, thereby being able to pay for their training or education of their wards.
   v. Labourers involved in feeding the animals will get money after offering their services, which they will use to build modern houses to improve the living standard.

(b) i. **Choosing the breeds of the steers:** Major breeds used in the stall feeding programme are Malawi Zebu, Brahman and their crosses. Dairy cross steers are also used as by products of dairy farming.
   ii. **Housing of the steers:** One steer is put in a properly constructed pole and thatch *khola* of space 2.1 m long, 2.1 m wide and 2.4 m height. Provide feed trough and feed racks. Steers remain in stall for about 150 days.
   iii. **Feeding the steers:** In stall feeding system, steers weighing about 250 kg live mass with up to 4 permanent teeth can be fed with concentrates, maize stover, bean haulms, groundnuts, etc.

iv. **Controlling of parasites and diseases of steers:** The steers are dewormed before stall feeding them including controlling of any sign of a disease.

v. **Marketing of steers:** Steers are finished in about 150 days and can be sold to different markets in the country or slaughtered for beef.

TEST 11

1. (a) Food security means that every individual has access to adequate food all times of the year.

   (b) i. Irrigation
   ii. Herbicide application
   iii. Mechanisation
   iv. Fertiliser production technology

2. (a) i. By growing crops that are suited to drier conditions, growing with little moisture (adaptation to drought) and yielding even if there is little moisture.
   ii. By growing early maturing crops that will mature before the rain stops and be fed to the people.
   iii. By growing crops that are easy to store such that they are available to the population at any time.

   (b) (i) Millet
   (ii) Cassava
   (iii) Sweet potatoes
   (iv) Sorghum

3 (a) Statistical design of an experiment is simply a specification of manner in which treatment will be allocated to the experimental plots or units and data collected from these experiments will be analysed.

   (b) i. Replication is the repeating of the treatments (basic experiment) in space or in time.
   ii. Randomisation is the process whereby each treatment of an experimental unit has an equal chance of receiving any of treatments under experimentation.
   iii. Local control or control error is a technique used to increase the precision of an experiment.

   (c) i. Feeder grade A
   ii. Standard grade
   iii. Commercial grade
   iv. Inferior grade

   (d) i. If the horns are removed, people and other animals will be safe from being hurt by horned animals.
   ii. The animals with horns removed will occupy less space than will those with long horns.

4. (a) i. Should be pure to type.
   ii. Should be disease and weed free.
   iii. Should be whole without being damaged.
   iv. Should be large and plump.
   v. Should be viable in order to germinate.
   vi. Should be of high yielding variety.

   (b) i. Used as feed for grazing animals.
   ii. Improves soil fertility.
   iii. Improves soil structure.
   iv. Controls soil erosion.
   v. Controls pests and diseases.

5. (a) Treadle pump

   (b) **A** is handle.
   B is pulley.
   C is treadles.
   D is discharge pipe.
   E is base board.
   F is suction pipe.
   G is rope.

   (c) i. Pulleys
   ii. Ropes

6. (a) i. Partial budget
   ii. Complete budget
   iii. Cash-flow budget

   (b) i. Money borrowed from companies, e.g. MRFC.
   ii. Money borrowed from banks, e.g. from National Bank of Malawi.

iii. Money from farmers' own savings.
iv. Credits obtained through farmers' club.

(c) i. **Competence:** Repayment capacity will depend largely on the profitability of the use to which the borrowed money is put as such lenders should know if the farmer can pay back the money. Farmers may produce cash flows.
ii. **Collateral or security:** Farmers may use deeds of their farms or other materials as security.
iii. **Character of farmer:** The farmer has to be a trusted person as prospective lenders need to know the farmers technical training, past business record and reputed character.

7. (a) Nitrogen is used for formation of proteins in the plants.
(b) Stunted growth and poor poding.

8. (a) The amount of returns that have been foregone or given up.
(b) Cation exchange capacity is the sum total of exchangeable cations (measured in mille-equivalent, meq) that can be adsorbed by 1 g of that soil.
(c) Back-cross is a cross of an offspring with one of the parents.
(d) Culling is the removal of unhealthy animals in the herd or flock.
(e) Price elasticity of supply is the degree of response of supply in relation to changes in price.

9. (a) i. ADMARC
- Buying the produce, e.g. maize, pigeon peas and beans from farmers.
- Selling the inputs to the farmers in different parts of the country.
- Provision of modern methods of farming so that farmers produce bumper yields from their harvest.

(b) i. Creating good relationship with other countries to reinforce relations, e.g. there should be representatives, e.g. Ambassadors.
ii. Good communications in terms of transport, language, fax, e-mail, Internet and phones.
iii. Good education in accountancy and business to train trade personnel which is necessary in order to ensure smooth running of the trade.
iv. Fair trade agreements, e.g. reduced import duties may help improve international trade such as COMESA and SADC free trade area.

(c) i. Intensification of production means increasing of production so that it becomes more than the usual production.
ii. Food security at household means availability of food at household level to satisfy people's needs at all times.

(d) i. Helps the urban growing population to have raw material for industries, which come from increased production of crops.
ii. Helps the urban population to have enough food from the increased produced food crops.

(e) i. **Multiple cropping:** Multiple cropping which is the growing of two or more crops on the same piece of land in a year so that a lot food is produced per specific time and space.
ii. **Crop rotation:** The repetitive cultivation of an ordered succession of crops (or crops and fallow) on the same piece of land so that high yields can be obtained while fertility of the soil is maintained or improved. It also ensures that carryover pests and diseases from one another is reduced to a minimum so that high yields are obtained for feeding the population.

10. (a) i. Manure helps to conserve soil moisture for crops.

ii. Manure improves soil structure as the colloidal material it contains bind loose particles together while cellulose and lignin separate clay particles.

iii. Manure has buffering effect on the soil, i.e. it balances the alkaline/base condition of the soil, making it good for growing crops.

iv. Supplies energy for soil micro-organisms that help to decompose organic matter for crop use.

v. Manure reduces rapid soil temperature fluctuations; its dark colour readily absorbs heat during the day and loses it slowly during the night.

vi. Improves soil fertility since mineralisation of manure adds nutrients to the soil, which leads to an increase in crop yield.

(b) i. High rainfall intensity encourages soil erosion which carries away nutrients needed by the crop.

ii. High rainfall intensity causes defoliation and boring holes on the leaves, e.g. maize leaves, thereby reducing the photosynthetic area of the plant and eventually low yields.

iii. High rainfall intensity causes flooding of rivers and fields and this may wash away crops, leading to lowering of crop yields.

iv. Heavy rainfall causes leaching of nutrients, thereby making nutrients not available for plant growth, leading to low yields.

(c) i. A deep soil having a well-developed profile has great potential for agriculture because it is able to hold more water for crop growth and development.

ii. Shallow soils on the other hand do not have a lot of nutrients to support crop growth; as such crop cannot grow healthy to produce high yields.

(d) i. Insect pests will induce or inject toxic substances into the plant, which may harm the crop.

ii. Insect pests, will transmit diseases by ovipositing or laying eggs in plant tissue.

iii. Insect pests by nesting on or in the plant affects its growth and photosynthesis to occur properly.

iv. By feeding, through consuming tissue in crops with their chewing mouth parts and through removing juices in crops with sucking mouth parts.

(e) i. Different plants at various stages of growth and developments have a minimum and a maximum temperature below and above which they can survive, e.g. coffee grows well between 7.5°C and 26.7°C.

ii. Temperature influences soil formation such that in a hot climate soil is formed faster and is deeper than in cold areas. Deep soil improves crop production for it has a lot of crop nutrients.

iii. High temperatures can lead to hot weather which plus the moist condition results in fast decomposition of organic matter which releases nutrients for crop growth and development.

iv Reproduction of soil organisms is faster in warm, moist soil; the processes they perform are also faster, e.g. nitrification, a process in which nitrates are made available in the soil. These are microorganisms that help to improve soil fertility for crop growth and development.

11. (a) i. Source of income to the farmer, after selling the groundnuts, which will influence his or her purchasing power, thereby expanding Malawians internal market. Money obtained can also be spent on buying clothes.

ii. Groundnut is a source of foreign exchange. This helps Malawians to purchase goods that are not produced in Malawi but are needed for either consumption or development, e.g. buying of cars.

iii. Groundnut is a source of food (oil or confectionery) which is required to provide the essential nutrients to sustain the increasing population of Malawi.

iv. Groundnut farming is a source of employment both in the farms and processing industries. People working in farms or industries get paid after working and money will be spent or used in buying things they need, e.g. medicine and food.

v. Groundnut is used as feed for animals. Groundnut products, both primary, e.g. groundnut haulms, and secondary, e.g. groundnut cake, are used as a source of feed for the growth and development of livestock industry. The livestock will be eaten by the Malawian population.

(b) i. **Choice of the mango varieties:** Use the improved grafted varieties which have small stone and are fibreless, e.g. Haden, Tommy Atkins and Ngowe that are even good for export market.

ii. **Soil type requirements for mangoes:** Mangoes do best in deep, well-drained sandy loam soils and the optimum pH ranges from 5.5 to 7.5.

iii. **Rainfall requirements for mangoes:** Despite the fact that most mango varieties are drought-resistant, a minimum of 650 mm per year of rainfall is required while a dry period is required during flowering and fruiting. Best altitude ranges from 1 – 500 m.

iv. **Land preparation:** Make planting holes 2 months before planting. The holes should be made 90 cm in diameter and 90 cm deep for poor soils, 60 cm in diameter and 60 cm deep for fertile soils. The holes should be refilled with top soil mixed with 5-10 kg of well decomposed manure.

v. **Time of planting and spacing:** Plant at the beginning of rains for successful establishment and trees should be spaced at 9 m x 9 m or 10.5 m x 10.5 m or 12 m x 12 m depending on the soil types and the variety of the mangoes.

12. (a) i. Drought makes animals and people lack water for drinking so that in the end they become weak and unable to work in their fields.

ii. Drought leads to crops lacking water, resulting in low crop yield and at times, even to death of plants.

iii. Drought makes the top soil friable and easily carried away by wind (wind erosion), leading to loss of soil and nutrients from a particular soil.

iv. Drought reduces the amount of pests and diseases because they multiply well when the environment is moist.

v. Drought makes the soil very hard such that some farming operations, e.g. ploughing, weeding, making ridges, are difficult to do.

(b) i. Land preparations should be done soon after harvest. Plough and dig the land to a depth of 30 cm. Ridges should be made 90 cm apart.

ii. Seeds for planting should be taken from the previous year or be bought from ADMARC. Shelled seeds be used and select uniform, disease-free, undamaged seeds. Plant one seed per planting station at 15 cm apart except for Malimba, which should be 10 cm apart.

iii. Weeding should be done as soon as weeds appear in the field for these grab a lot of nutrients and water for the crop. Hand weeding after pod formation is encouraged. Banking should be done at the time of pegging.

iv. Fertiliser should be applied to the groundnut especially gypsum ($CaSO_4$) in which the sulphur is for protein formation and the calcium for the formation of hard shells.

v. Pests and diseases should be controlled in groundnut to achieve high yields. Diseases such as early and late leaf spot and rosette should be controlled if any sign of attack is observed.

TEST 12

1. (a) It is a method of crop improvement which involves cross-pollination of plants to combine certain desirable traits.

   (b) i. It enables identification of desirable characteristics which are to be combined in the progeny.

   ii. It helps to eliminate some recessive genes which might bring out certain undesirable traits.

   iii. Enables the cross-breed to have an improved vigour.

2. (i) The type of the soil
   (ii) The slope of the land
   (iii) Availability of water
   (iv) Capital, i.e. initial and maintenance costs of the method or system
   (v) Value of the crop

3. i. Controls weeds and soil erosion in the field.

   ii. Mulching material releases nutrients after decomposition.

   iii. Mulching helps to regulate the temperature due to shading effect.

   iv. Mulching helps to conserve water since it reduces evaporation from the soil surface.

4. (a) i. Should be replicated.
   ii. Should be randomised.
   iii. Should have a local control/control error.

   (b) i. Branding is the putting of an identification mark or number on the animal done by cold or hot branding irons, e.g. ear notch in pigs.

   ii. Disbudding is the stopping of the growth of horn buds, e.g. by using caustic soda.

   iii. Castration is the removal of testes from male animals, e.g. by using a burdizzo.

   iv. Dehorning is the removal of horns by using a hot iron.

   v. Debeaking is the cutting of beaks in birds.

   (c) i. One-host ticks
   ii. Two-host ticks
   iii. Three-host ticks

   (d) i. Blue tick transmits Red water disease
   ii. Bont tick transmits Heart water
   iii. Brown tick transmits East Coast Fever.
   iv. Red-legged tick transmits East coast fever

5. (a) i. **Short-term credit or seasonal credit:** The type of credit given to farmers in form of farm inputs is repayable within the same season, usually used up in production.

   ii. **Medium-term credit:** The type of credit that is used for minor things and improvements such as fencing, purchase of farm equipment and livestock and is repayable in a period of 2-7 years, depending on initial value, usually used up in production.

   iii. **Long-term credit:** The type of credit used for purchase of assets, e.g. land that are not used in production, or major improvements on land and is payable up to 25 years.

(b) i. **Short-term credit or seasonal credit:** Examples are seeds and pesticides.

ii. **Medium-term credit:** Examples are partly fixed capital such as breeding of livestock, temporary buildings and tractors.

iii. **Long-term credit:** Examples are laying on drainage and clearing of bush.

6. **Partial budget for substitution of machine for hand-shelling**

LOSSES			GAINS		
New costs	**K**	**t**	**New Income**	**K**	**t**
Annual sheller payments	3,000	00	2,340 kg whole nuts at K50/kg	117,000	00
Average annual interests (10%)	300	00	1,260 kg damaged at K20/kg	25,200	00
Income lost			**Costs saved**		
3,600 kg whole nut at K50 per kg	180,000	00	Hand-shelling labour	7,000	00
			Net loss	**34,100**	**00**
	183,300	**00**		**183,300**	**00**

Since there is a net loss of K34,100.00, Margaret Magwedeza should be advised not to buy a mechanical sheller.

7. (i) Completely Randomised Design (CRD)

(ii) Randomised Complete Block Design (RCBD)

(iii) Randomised Incomplete Block Design (RIBD)

(iv) Latin-Square Design or LSD (Three way classifiable)

(v) Graeco-Latin Square Design (GLSD)

8. (a) Cation exchange is interchange of cations in soil solution and those on solid surfaces such as clay, organic colloid or root surface.

(b) Photoperiod is the length or duration of sunlight per day.

(c) Closed season is a season when the crop is not supposed to be grown in the field with the aim of breaking the life cycle of pests so that next time the plant is planted, the pests and disease population will be too low to cause economic losses, e.g. in cotton.

(d) Companion crop is a crop grown together with another crop but later harvested separately.

(e) Double cross is the offspring of two single cross.

9. (a) i. Should have maximum development of muscles with low fat content.

ii. Should have more thickness through the rear quarters and shoulder than through the back.

iii. Should have full back with well-arched ample width.

iv. Should have wide, deep, well-developed and full hams.

v. Should have sides that are long, deep and smooth.

vi. Should have a trim head.

vii. Should have a trim neck that is not too long.

viii. Should have a trim and firm jowl that is not heavy or flabby.

ix. Should have a trim underline.

x. Should have sound straight legs of medium length.

(b) i. **Slow growth:** Most of the local breeds of pigs grow very slowly to reach maturity when they can be sold or eaten.

ii. **Less meat:** Most of the local breeds of pigs produce less meat than do exotic ones. This means less money will be obtained after selling local breeds of pigs.

(c) i. Through crossing pork breeds with local breeds to produce hybrid hogs, which will produce better pork than the local breeds.

ii. Through crossing bacon breeds with local breeds to produce hybrid hogs, which will produce better bacon than the local breeds.

(d) i. Proper housing of the pigs so that the pigs are protected from parasites, heat, cold, diseases and predators.
ii. Controlling parasites and diseases of pigs so that pigs are always healthy and produce the best bacon or pork for more profits.

(e) i. Promotion of pig keeping by the Ministry of Agriculture.
ii. Promotion of proper housing for pigs by the Ministry of Agriculture.
iii. Promotion of proper feeding of pigs by the Ministry of Agriculture.
iv. The Ministry of Agriculture provides the veterinary personnel to train farmers on how to control and prevent parasites and diseases of pigs such as African Swine Fever in various areas of the country.

10. (a) i. Land
ii. Labour
iii. Capital
iv. Managerial ability

(b) i. Risks and uncertainties
ii. Climate
iii. Market
iv. Quota

(c) i. **Health of farmers:** Healthy farmers work harder than sick farmers, thereby increasing agricultural production.
ii. **Capacity of farmers to work:** Farmers who are able to work produce high yields while those who fail to do so produce low yields.
iii. **The number of people working:** More people finish the work in good time than fewer people, thereby improving efficiency in production
iv. **Willingness of people to work:** For production to increase people should be willing to work hard and long hours.

(d) i. Marketing costs are expenses incurred by marketing agencies or payments for their services whereas marketing margin is the difference between the costs of buying the produce and selling it.
ii. – By raising the farm gate price.
– By skipping some of the marketing agencies.
– By reducing the retail price.
– The producer performing some of the marketing functions.

(e) i. **Time work or daily work:** Employees work for set hours each day and apart from overtime earnings, they receive daily, weekly or monthly rate of pay for attendance.
ii. **Task work:** Here the worker is given a set task to be done in a day, e.g. hoeing 100 m of maize row, and when the task is completed and inspected he or she can go and get a full day's pay.
iii. **Piece work or Contract work:** This, like bonus system, is a system of payment by results where payment depends on the amount of work done rather than time worked.
iv. **Bonus work:** This is really a combination of either time work or task work with piece work. A bonus is paid for output above normal and should be paid not later than the end of the week in which it was earned.

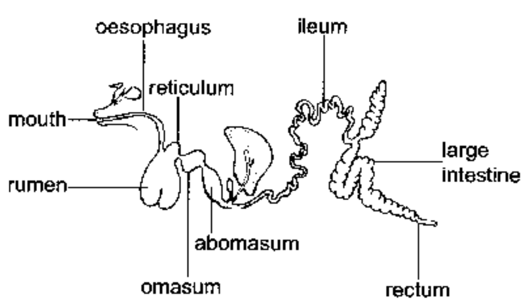
11. (a) It encourages deforestation which leaves the ground bare. This results in increased run-off and reduced infiltration, causing lowering of water table and drying of water bodies. Deforestation leads to drought due to reduced evapotranspiration which normally contributes to the hydrological cycle.

(b) i. It is used for domestic purposes, i.e cooking, bathing which make the farmer refreshed thereby increasing his/her performance in agricultural production.

ii. Water conserved in dams can be used for dry-season cropping through irrigation.
iii. Farmers use electricity for heating and lighting in livestock structure. This electricity is generated through waterfalls in water bodies.
iv. Conserved water is also used for fish farming in fish ponds to supplement supply of fish from natural water bodies.
v. Conserved water is used for drinking which increases livestock production in farm animals.

12. (a) i. **Age and size of the animal:** Young animals require less feed than older animals. Some young animals even depend on milk only during early stages of their growth.
ii. **Purpose for which the animal is kept (Breed or type of the animal):** Animals kept for power will require more feed than animals not used for power.
iii. **Lactating period in animals:** Animals that are producing milk will require more feed than the ones that are not in the lactating stage.
iv. **Health of the animal:** Sick animal will require more feed than the healthy animals.
v. **Pregnant period in animals:** Animals that are pregnant will require more feed than those not pregnant.

(b)



i. **Mouth and oesophagus:** Roughages are chewed by teeth and mixed with saliva in the mouth so that it can pass easily through the oesophagus (gullet). From the gullet the roughages (feed) moves by peristalsis to the rumen (pouch).
ii. **Rumen (pouch):** Rumen contains microorganisms which break the cellulose into products of nutritional value. The feed is also temporarily stored and softened before returning to the mouth for rumination.
iii. **Reticulum (honey comb):** The second chamber where bacterial action continues and separation of finely ground material from coarse ones is done. Foreign materials, e.g. stone, wood, etc, are retained therein before passed on to the omasum.
iv. **Omasum (manyplies):** The food particles are temporarily stored here before being ground. Water is absorbed from feed on its way to the abomasum.
v. **Abomasum (True stomach) and small intestines (duodenum and ileum):** It is in the abomasum where protein digestion starts, for it has got glands which secrete enzymes for the digestion of proteins. Digestion continues in the small intestines using enzymes from the pancreatic juice.

TEST 13

1. (a) Irrigation is the artificial application of water to crops when rain is not enough, unreliable, even when not available.
(b) i. **Supplemental irrigation:** The type of irrigation where water is supplied to crops only in a part of the growing season, e.g. irrigating of sugarcane at Dwangwa.
ii. **Total irrigation:** The type of irrigation where the crop growth solely depends on the irrigated water, e.g. in deserts.
(c) i. **Surface irrigation system:** The irrigation system or water application method where water is

applied by letting it flow over the soil surface.

ii. **Overhead irrigation system:** Where water is applied through the air, after it is released under pressure through small holes in a closed pipe-system.

iii. **Drip or Trickle irrigation system:** where water is applied close to the plant, released through tiny holes, in a low volume but continuously through a closed pipe system.

iv. **Sub-surface irrigation system:** The irrigation system where water is applied through the soil, through channels beneath surface level.

2. i. Guide distribution of agricultural services.
   ii. Make sure that population growth agrees with the size of land on which they depend.
   iii. Ensure that increased growing population conserves the agricultural resources.
   iv. Guide planning in national development.

3. (a) An agro-based industry is any industry that uses raw materials from agriculture or produces inputs for agriculture.
   (b) i. Source of employment, e.g. Unilever South East Africa.
   ii. Providing markets for agricultural products.
   iii. Processing of raw materials.
   iv. Supplying farmers with inputs.

4. (a) Soil erosion is the removal of top loose layer of the soil.
   (b) i. Splash erosion
   ii. Sheet erosion
   iii. Rill erosion
   iv. Gully erosion
   (c) i. Overgrazing animals on a piece of land.
   ii. Uncontrolled bush fires.
   iii. Steep slope cultivation.
   iv. Constructing ridges along the slope.
   (d) i. Water
   ii. Wind
   (e) Conservation means protecting something from loss, waste, damage or destruction.
   (f) i. Physical conservation method, e.g. making ridges with tie-ridges and making contour bunds.
   ii. Biological conservation, e.g. applying manure to the soil and practising crop rotation.
   (g) i. People should replant trees.
   ii. Clearing of fire breaks.
   iii. Starting of woodlots.
   iv. Avoiding careless (wanton) cutting down of trees.

5. (a) i. Climatic factors, e.g. rainfall, temperature, sunlight and light duration (photoperiod).
   ii. Edaphic factors or soil factors, e.g. soil texture, soil structure, soil type, soil nutrients and soil pH.
   (b) i. Plants such as legumes fix nitrogen in the soil for other crops.
   ii. Animals such as rats and earthworms make tunnels in the soil so that there is readily available air in the soil for crop root respiration.

6. (a) **O** is mitochondrion.
   P is cytoplasm.
   Q is chloroplasts.
   R is nucleus.
   T is cell membrane.
   (b) i. Plant cell has chloroplasts while an animal cell has no chloroplasts.
   ii. Plant cell has cell wall while animal cell has no cell wall.
   (c) i. **Q:** To contain chlorophyll which absorbes energy from the sun.
   ii. **O:** Synthesis or production of digestive enzymes.

7 (a) i. Bucket
   ii. Shadoof
   iii. Persian wheel
   iv. Pumps

(b) Intensity of irrigation is the actual area irrigated in a year from an outlet.

(c) i. Afridev bore hole pumps
ii. Treadle pumps

8. (a) **Mass selection** is the selection and multiplication of plants from their appearance.

(b) **Forage crop** is a plant grown for feeding livestock.

(c) **Pure line** is an organism that is genetically pure or homozygous as a result of continued inbreeding.

(d) Selfing is the pollinating or crossing of a plant with its own pollen.

(e) Variety is a group of identical individuals with taxonomic rank of species.

9. (a) i. Can be repeated as much as possible.
ii. Relatively easy method of pest, control.
iii. It is cheap and individual farmers can use on their own.
iv. Many pests can be controlled using broad-spectrum pesticides.
v. Produce fast and easy results.

(b) i. Provides only temporary solution to pest management.
ii. Resistance can be developed in pests, thereby reducing the effectiveness of the pesticides on the pest.
iii. Pesticides rarely kill all the pests such that the pests that survive cause a lot of economic damage.
iv. Chemicals can be toxic to beneficial insects, e.g. pest parasites, pest predator and pollinators.
v. Chemicals are expensive to manufacture and buy.
iv. Pesticides may cause environmental pollution and may remain in agricultural produce (residual effect).

(c) i. The soils are low in exchangeable cations required as crop nutrients.
ii. Nutrients applied as cations, e.g. magnesium, ammonium, potassium, etc, are only weakly held and so may easily leach out.
iii. Conventional fertilisation practices may lead to nutrient imbalances where cations are low.
iv. Rapid soil acidification occurs where ammonium sulphate and to a lesser extent, urea (carbamide), are used.

(d) i. They damage the living cells on the tissue which they come in touch with.
ii. They enter the body through the respiratory tract and damage it, thereby killing the pest from inside.
iii. They are taken in together with plant fluids from plant tissue and cause damage to the digestive lining of the pest.

(e) i. Water soluble herbicides
ii. Emulsifiable concentrates (EC)
iii. Wettable powder (WP)
iv. Granular formulation

10. (a) i. A goat has four-chambered stomach while a pig has mainly one stomach.
ii. A goat can chew the cud while a pig does not chew the cud.

(b) i. Goats through regurgitation are able to chew the cud with teeth once more into smaller particles which can then be easily absorbed into the body unlike in pigs which do not have time to regurgitate the feed.
ii. Goats have a rumen that assists them in digesting high fibre content feed which are not present in pigs.

(c) i. There is higher competition for food with pigs because pigs feed on almost all feed that human beings can eat (both are not ruminant).
ii. There is lower competition for food with goats because goats depend much on high fibre feeds which human beings cannot chew and digest (goats are ruminants and human being are not).

(d) i. Pigs have more serious parasites and disease, which need to be controlled for a successful livestock production than in goats.

ii. More houses are required for pigs than for goats. Pigs will require weaning houses, farrowing houses, etc, which is not the case with goats.

(e) i. Pigs, if well cared for, will have more returns than goats because they produce many litters per farrowing.

ii. Pigs, if well cared for, will have more returns than goats because they produce a lot of meat as compared to goats.

11. (a) i. **Source of raw material:** Vegetables such as tomatoes, mangoes and guavas are used as raw materials to produce different juices, e.g. guava fruit juice.

ii. **Source of income to the farmer:** The farmer growing vegetables may sell them and get some income.

iii. **Source of vitamins and minerals for the farmers:** Vegetables improve the diet by providing vitamins and mineral salts needed for the body.

iv. **Vegetables are a source of animal feed:** Vegetables grown can be fed to livestock, e.g. cabbage can be fed to rabbit and chickens.

v. **Source of proteins for the farmer:** Vegetables such as beans and pigeon peas supply proteins to the body.

(b) i. Washes out or dilutes salts in the soil which would affect the crop growth and would result in poor crop production.

ii. Softens the ground for tillage operations to be done without difficulty so that high yields can be obtained from the fields.

iii. Makes possible two or more times of cropping within a year, thereby increasing production per unit area.

iv. Cools the soil and atmosphere, thereby creating more favourable environment for plant growth and development.

v. Provides crop insurance against dying during short duration droughts in which case the farmer is assured of some crop harvest.

12. (a) i. **Helps to come up with recommendation on seed rates:** Different crop varieties require different seed rates for them to perform well; this is proved through research or experimentation.

ii. **Brings about good seed varieties:** For researchers to come up with good seed varieties, they use agricultural experimentation.

iii. **Helps in bringing better crop production practices:** Trials on different crop production practices will help find the best crop production for each particular crop.

iv. **Assists in coming up with best time of planting and best planting materials:** Experiments will help find out the best time of planting and the best planting material for each crop.

v. **Assists in coming up with best systems of irrigation:** Trials help develop the best irrigation system for a particular area and crop.

(b) i. **Helps in bringing better pasture and fodder management ways:** Best ways of managing pasture and fodder can be achieved.

ii. **Assist in coming up with best animal feeds and feed ration:** Best animal feed and feed ration can be obtained through experiments.

iii. **Helps in bringing best animal breeds and types:** Best animal breeds and types can be obtained through research and experiments.

iv. **Assists in bringing best animal protection methods:** Best ways of protecting livestock from diseases, parasites, predators and bad weather are known.

v. **Helps to improve fish farming:** Agricultural experiments will try to bring the best fish farming methods for the farmer.

TEST 14

1. (a) Farm business management is a process by which resources and situations are manipulated with less than full information to achieve the objective of the business enterprise.
   (b) i. Decision making
   ii. Farm budgeting
   iii. Financing
   iv. Farm records
   v. Production
   (c) i. Farm budgeting is an estimate of future expenditure and income from an agricultural enterprise.
   ii. Financing is the use of money to carry out various aspects of marketing.
   iii. Production means changing inputs into outputs required by consumers while increasing profits.

2. (i) Breeding trials
   (ii) Feed trials
   (iii) Fertiliser trials
   (iv) Variety trials

3. (a) i. It is foot and mouth disease
   ii. – Slaughter and burn infected animals.
   – Restrict movement of stock.
   – Vaccinate all other animals.

4. (i) Treatments
   (ii) Replication
   (iii) Randomisation

5. (i) Encourages both men and women to work hard because both contributed to the decision for the work to be done.
   (ii) Promotes unity from both men and women because they are sure that the income will be used together.
   (iii) Promotes good feelings of ownership of the work to be done since both males and females contributed in decision making.
   (iv) Ensures common goal and responsibility for both men and women contributed in decision and know the goal of the activity to be done.

6. (i) Limited access to loans
   (ii) Limited access to credit facilities for capital
   (iii) Limited access to land
   (iv) Limited time for agricultural development
   (v) Limited time for agricultural services and training

7. (i) Introduction
   (ii) Selection
   (iii) Hybridisation

8. (a) Cultural control is the manipulation of regular agronomic crop husbandry practices for weed or pest control.
   (b) Refers to the fixation of atmospheric nitrogen into the soil.
   (c) A herbicide is a phytotoxic chemical used for killing or inhibiting the development or growth of plants.
   (d) A clone is a group of plants originating as buds or cuttings or divisions.
   (e) Dormancy is the condition of a seed or bud characterised by lack of visible growth.

9. (a) i. It provides the best way of discovering and establishing high yielding potential of certain crop varieties and livestock breeds based on proven scientific evidence.
   ii. It provides the best way of discovering and establishing high yielding farming practices based on proven scientific evidence.

(b) i. It reduces environmental interference on the results for each experiment.
ii. It provides a basis or standard against which yields from all other experiments are to be compared.

(c) i. In order for the report to be meaningful and useful by emphasising the facts rather than personalising them.
ii. In order to portray exactly what you want to say.
iii. They provide a way of presenting numerical quantities or comparisons between different experimental treatments so that they can be easily viewed and understood.

10. (a) i. High rainfall intensity encourages loss of nutrients through leaching, thereby lowering the pH of the soil.
ii. High rainfall intensity may create anaerobic conditions where microbes will be unable to decompose humus which have buffering capacity, resulting in acidic conditions.
iii. High rainfall intensity will encourage soil erosion, which will carry away nutrients from the soil, making the soil acidic.
iv. High rainfall intensity will encourage carbonation or acid rain, which will result in increased soil acidity.

(b) i. **Rainfall distribution:** Short season crops (early maturing) grow well in areas with short rainy season while late maturing crops can be grown in areas of longer duration of rainy season.
ii. **Rainfall intensity:** Crops that are able to protect the soil against erosion and allow infiltration to occur, e.g. cover crops such as groundnuts and pumpkins should be planted in areas with high rainfall intensity.

(c) i. Different crops favour different pH levels of soil.
ii. Most of the beneficial soil microbes, e.g nitrogen fixing bacteria, become less active under acidic environment.

(d) i. The leaves lose turgidity and curl, resulting in low yields because the stomata close, leading to leaves not allowing enough water for food manufacturing.
ii. Leaves become pale due to poor nutrient absorption since nutrients move in water and this pale colour will not absorb sunlight energy hence low yield, for there is no food manufacturing.

(e) i. Water is a raw material in the process of photosynthesis so that the plants can produce high yields.
ii. Water is a medium of transportation of mineral salts in plants so that plants can grow and develop to produce high yields.

11. (a) i. They are used for storage of crop produce so that they are not attacked by bad weather like rain and humid conditions.
ii. They are used to store crop produce so that they should not be attacked by pests and diseases.
iii. They are used for storing equipment and other materials at the farm, e.g. farm equipment store room, so that they are safe from being stolen or safe from bad weather, e.g. rain.
iv. Animals are housed in buildings to protect them from parasites and diseases, e.g. have enough livestock pens to avoid contagious diseases.
v. Some buildings are built for the purpose of spraying or showering animals with chemicals to kill the ticks and other external parasites, e.g. spray races.

(b) i. They should have a strong roof to keep off rain and sun since these make a building wear fast and stop doing its function.

ii. They should have a hard impervious floor so that living things like termites and rats do not come into contact with the produce kept inside; some may even destroy parts of the building in which case, it cannot last long.

iii. The inside of the buildings should always be dry, well drained to avoid keeping moisture conditions which encourage microorganism growth and reproduction that can cause decay to part of the building, making it not last long.

iv. The buildings should have good drainage around to avoid getting too wet during rainy season. Buildings standing on water-logged grounds easily collapse.

v. The building should have a large space between tops of the walls and roof for good ventilation, adequate light and duration for livestock and people to look out.

12. (a) **Advantages are:**

i. Results are effective (reliable) with chemicals because the chemicals can act on every pest and disease-causing agent at almost the same time, i.e. it is fast.

ii. Chemical control is economical, for small amounts of chemicals can be used to kill several pests and disease-causing agents.

iii. Cost benefit reward (ratio is generally good), e.g. K10.00 loss will produce K80.00-K100.00 since you spend relatively less money on buying chemicals and yet the profits will be much as far as you apply at the right time and recommended rate.

Disadvantages are:

i. Insect pests and disease-causing agents may develop resistance particularly if applied incorrectly.

ii. They lead to pest and microbe resurgence (for each crop or animal) since chemicals may eliminate parasites, microorganisms and predators of other microorganisms or pests such that the ones that were not serious at first will now become pests because you have killed their parasites and predators.

(b) **Advantages are:**

i. There are no toxic effects (no poisoning at all) because they do not produce poisonous substances that can harm crops and animals even people.

ii. No problems of pests developing resistance because biological killing does not involve the reaction of the chemical with the genetic makeup of the pests and disease-causing organisms that their genetic makeup should change to a resistant type.

iii. There is no residual in food or animal product because the biological agent does not release any chemical that can be taken in by either a plant or animal in the course of applying the method. The biological agent attacks the pest only.

Disadvantages are:

i. Very slow in eliminating the pest and disease causing organisms because once they have satisfied their diet, they will stop eating them until they are hungry again.

ii. Difficult to store the living organisms once they have eliminated the pests and the disease causing agent especially if they have increased too much in their population.

TEST 15

1. (a) Is a method of testing a hypothesis in order to find out the truth through observation and to draw conclusions through induction.
   (b) It involves comparing maize yields from the different experimental plots amongst themselves as well as against the control.
   (e) It will enable farmers to know and use the fertiliser that will produce the highest maize yield possible.

2. (a) It protects goats from contracting pneumonia.
   (b) It speeds up growth and milk production in goats.
   (c) It enables the goats to thrive under the prevailing local environment.

3. (a) It increases total yield from the different types of crops grown.
   (b) Minimises yield loss that may result from pest attack.
   (c) It increases the total maize yield per unit area by supplementary soil nutrients.

4. (a)

$$\text{Plant population} = \frac{\text{Area x seeds per planting station}}{\text{Ridge spacing x planting spacing}}$$

$$= \frac{10{,}000\ m^2 \times 3\ \text{seeds}}{80\ \text{cm} \times 75\ \text{cm}}$$

$$= \frac{10{,}000\ m^2 \times 3\ \text{seeds}}{0.8\ m \times 0.75\ m}$$

$$= \mathbf{50{,}000\ plant\ /\ ha}$$

(b)

$$\text{Seed rate} = \frac{\text{Plant population per hectare}}{\text{Seed size x purity \% x Germination \%}}$$

$$= \frac{50{,}000\ \text{seeds} \times 1\ \text{kg} \times 100 \times 100}{1\ \text{ha} \times 9{,}000\ \text{seeds} \times 40 \times 60}$$

$$= 23.148\ \text{kg/ha}$$

$$= \mathbf{23.15\ kg/ha}$$

5. (a) i. The organisms introduced might be parasites of crops apart from the weeds you want to control.
   ii. The organism introduced might not be strong enough to control all the weeds in the field.
   iii. The organism introduced may kill even other predators of the same weeds.

   (b) i. **Classification based on use**
   - **Selective herbicides:** Will kill or impair the growth of certain plant species when applied to a mixed plant population but cause practically no injury to other treated plants, e.g. 2, 4-D.
   - **Non-selective herbicides:** Will indiscriminately kill all plants that they come into contact with, e.g. glyphosphate.

   ii. **Classification based on mode of action**
   - **Contact herbicides:** Kill plant tissues that come into direct contact with them through diffusion. All contact herbicides are applied to the foliage of plants (leaves and shoots), e.g. gramoxone.
   - **Translocated (systemic) herbicides:** Growth regulators that are absorbed by the weeds through leaves, stems or roots. They affect plants through system action, i.e. the chemicals are carried throughout the plant with food supply. This is how weeds are killed, e.g. with atrazine, diuron, alachlor and simazine.
   - **Soil sterilants:** Soil sterilants prevent the growth of all plants when present in the soil generally at high concentrations. Their effect may be temporary or may last for many years depending upon the type of herbicides and rate used, e.g. high rates of simazine and diuron.

iii. **Classification based on time of application**

- **Pre-planting herbicides:** Herbicides applied before the crop is planted. It can be foliar, selective or non-selective herbicides applied to control fallow vegetation, e.g. glyphosate and paraquat.
- **Pre-emergency herbicides:** Herbicides applied before emergency (coming out of soil) of the crop and/or weeds, e.g. atrazine, diuron, alachlor, etc.
- **Post-mergency herbicides:** Herbicides applied after the emergency of the weeds. They have to be applied to foliage of weeds. They may be contact or systemic in action, e.g. 2, 4-D.

6. (a) i. Inorganic fertilisers or chemical fertilisers.
   ii. Organic fertilisers.

   (b) i. **High analysis (concentrate) fertilisers:** Fertilisers that contain a total of 45% nitrogen, phosphorus and potash combined (NPK).
   ii. **Low analysis (conventional) fertilisers:** Fertilisers that contain less than 45% nitrogen, phosphorus and potash combined.

   (c) i. DAP 18:46:0
   ii. Urea 46%

   (d) i. 20:20:0
   ii. 23:21:0+4S
   iii. Sulphate of Ammonia (S/A) 21% N and 24% S
   iv. CAN 27% N

   (e) i. Straight fertilisers are fertilisers that contain only one required element, e.g. Urea contain 46% nitrogen.
   ii. Compound fertilisers are fertilisers that contain more than two required elements e.g. 23:21:0+4S.

   (f) i. Nitrogen
   ii. Phosphorus
   iii. Potassium
   iv. Sulphur
   v Zinc

   (g) It means this fertiliser does not contain the element potassium.

   (h) Zinc.

7. In applying the principle of comparative advantage, farmers tend to specialise and trade in the agricultural product for which its relative advantage is greatest or its relative disadvantage is the least. The farmer becomes an expert and produces very high yields.

8. (a) Mixed farming is the integration of animal production and crop production on the same piece of land.

   (b) Grading up is the system of breeding in which pure bred sires of a given pure breed are mated to local or grade dams to improve the performance of the local stock.

   (c) Oestrus cycle is the period from the onset of one oestrus to the onset of the next oestrus.

   (d) Capital are live or dead stock plus money required for business activity.

   (e) Leaching is the removal of dissolved nutrients from the soil by downward drainage.

9. (a) i. **Through measuring the variables:** Measuring of the variables using any measuring instrument such as a ruler, beam balance, tape measure, etc.
   ii. **Through direct observation of what is happening to the variables:** Some information can be obtained through seeing what has happened.

   (b) i. The number of blocks is equal to the number of treatments.
   ii. Each treatment appears once in each block.
   iii. It follows randomisation unless where randomisation results in the same treatment being present in a block or row.

iv. Each treatment appears once in the horizontal plots.

(c) i. Each treatment is present in every block.

ii. Treatments are randomised in each block.

iii. There are two or more blocks, i.e. two or more replications.

iv. When comparing treatment differences, the block will cancel out so that by the end of the day, the block will cease out.

(d) i. Randomisation
Treatment
Replication

ii. Row and Column Blocking

(e) i. Title and introduction of the experiment.

ii. An explanation on materials and method used to carry out an experiment.

iii. What is observed and the results of the experiment.

iv. A discussion and conclusion of the experiment.

10. (a) i. Ridging along the slope.

ii. Cultivating along the river banks.

iii. Overgrazing/overstocking.

iv. Uncontrolled burning of pasture.

(b) i. Establishing wind breaks around crop fields.

ii. Planting trees and bushes.

iii. Practising strip cropping and crop rotation.

iv. Practising minimal tillage.

(c) i. Spreads soil-borne diseases, making the diseases attack crops, lowering crop yields.

ii. Breakdown of soil structure due to force of impact from raindrops. This soil will poorly support the growth of crops.

(d) i. Gradient/slope/steepness of the land.

ii. Soil type.

iii. Shape of the waterway to be made.

iv. Amount of water to carried in it (flow rate).

(e) i. Reduces the amount of arable land so that the farmer does not have adequate land for cultivation or it will be expensive to refill the gully.

ii Makes movement of machines difficult, leading to problems in transporting of inputs and outputs to and from the field.

11. (a) i. Availability of crop products from agriculture, e.g. seeds, cotton wool, sugarcane, tea leaves, etc, have led to the introduction of different industries in the country, e.g. Makandi Tea Factory in Thyolo.

ii. Availability of animal products from agriculture, e.g. meat, milk, eggs and leather, have led to opening of industries like dairy industries.

iii. Agriculture can lead to opening of steel industry for the production of machinery and implements to be used on the farm, e.g. industries to make tractors and ploughs.

iv. Agriculture can lead to opening of chemical industries, for these chemical are needed in agriculture, e.g. fertilisers, herbicides and pesticides.

v. Agriculture products are bulky and need to be stored for future use so this means that storage facilities will be constructed with materials such as cement hence opening of cement industries such as La Farge Cement Company.

(b) i. Rural people should be provided with agricultural loans so that instead of going to town to look for employment, they can be self employed in their homes using the loans taken.

ii. Agricultural schemes should be introduced so that rural people are busy with farming to earn their living other than going to town because they have nothing to do in the villages.

iii. Improve communication for the rural people so that they do not have to admire the communication in urban areas, otherwise they will decide to go to town to have the same means of communication.
iv. Rural people should be taught better methods of farming so that production from fields does not fail because if it fails they will quit the rural area and flow to the urban areas.
v. Establishment of many agricultural business training centres so that farmers go to these training centres and get some training on how to do farming business so that they do not waste time going to urban areas to do business.

12. (a) i. The Malawi Zebu cattle are able to walk long distances in search of food and water without getting excessively tired and losing condition or weight.
ii. They are better converters of roughage into utilisable products, namely milk and beef (good feed conversion ratio).
iii. They are relatively tolerant to tick-borne diseases such as East Coast Fever, red water, heart water, etc. therefore more chances of surviving to produce high meat or milk products.
iv. They have fewer problems of reproduction and they can breed relatively up to 15 years of age, thereby resulting in many live calves being born which means more money to the farmer after selling them.
v. They are hard for they can stand adverse conditions because they have been adapted to Malawian conditions for a long time. They can stand hot or cold conditions well while other breeds like the exotic ones will die in very hot areas.

(b) i. Both parents should be resistant to diseases so that the offspring are not easily attacked by diseases and produce high quality products.
ii. Both parents should be fast-growing so that the offspring produced should be growing fast, leading to fast maturity and fast sales.
iii. The parents should be tolerant to adverse condition so that they are able to produce products of high quality at all weather times (cold or hot).
iv. The female parent should be a better milk producer and the male parent should come from the family of high milk-producing cows so that the offspring are able to produce high quality milk.
v. The parents should be able to convert herbage into animal products (good feed conversion ratio).

TEST 16

1. (a) i. Sandy soil
ii. Loam soil

(b)

Micronutrients	**Macronutrients**
Molybdenum	Sulphur
Boron	
Iron	

(c) i. It must be directly involved in metabolic processes in plants.
ii. Its deficiency must cause specific deficiency symptoms in plants.
iii. The deficiency symptoms so caused can be corrected only by supplying the plant with that nutrient.

2. (a) i. Local breeds of cattle, which are usually small in size, may not support the mass of exotic bulls which are mostly huge and heavy.

   - ii. A local breed cow may have difficulties in giving birth to the large size foetus.

   (b) i. Mastitis
   ii. Brucelosis

3. (a) i. Nitrogen
   ii. CAN or Urea
   iii. CAN has 26% Nitrogen
   Urea has 46% Nitrogen

4. (i) **Physically**:
   – Too much water will cause water logging of the soil and poor plant growth because of lack of air.
   – Too much water in the soil will make machines have difficulty in working because the soil particles will be sticking together and to the machines.

   (ii) **Chemically**:
   – Too much water will cause rising of the water table that will bring dissolved salts from lower layers of the soil to the surface where they accumulate due to evaporation (salinity) and affect plant growth and development.
   – Too much water can cause high concentration of hydrogen ion after the bases have leached out from a particular soil.

5. (i)

•	•	•	•	•	•
•	•√	•√	•√	•√	•
•	•√	•√	•√	•√	•
•	•√	•√	•√	•√	•
•	•√	•√	•√	•√	•
•	•√	•√	•√	•√	•
•	•	•	•	•	•

   (ii) In order to avoid boarder effects on the experiment.
   (iii) Boardering sorghum plants are more likely to be affected by external factors such as wind, pests and diseases as compared to those from the net plot.
   (iv) It will enable farmers to grow and harvest sorghum more than once in a growing season through irrigation.

6. (a) The response was 10 bags.
   (b) The bags are 30.
   (c) The law of diminishing marginal returns.
   (d) This law can help the farmer know which zone he or she should be producing his or her groundnut for him or her to have much produce. The best zone is the second one, i.e. the rational zone, for the resources used will give the highest yield.

7. (a) It is the capacity to do work.
   (b) Because green plants, which are primary food producers, obtain their energy for photosynthesis from solar energy.
   (c) i. Do not expose fuels to a naked flame or fire.
   ii. Electric wires should be treated as live at all times to avoid being electrocuted.

8. (a) Complementary enterprises are enterprises which support or help (the main ones) one another, e.g. maize growing enterprise and cattle keeping enterprise; crop residues from maize can be fed to cattle for their growth and development while dung from cattle can be applied in a field of maize for their growth and development.
   (b) Conformation is the physical form, shape and overall appearance of an animal.
   (c) Maintenance ration is the food needed by the animal to keep it alive without gaining or losing mass.
   (d) Steaming up is the practice of giving extra (protein concentrates) feed to pregnant cows 6-8 weeks before calving.
   (e) Providing a lot of nutritious food to a female animal a few weeks before mating to enhance ovulation.

9. (a) i. Identifying the problem to be solved.
   ii. Coming up with the hypothesis of what you want to test.
   iii. Carrying out the experiment or investigation to test the hypothesis.
   iv. Collecting the information.

   (b) i. Through throwing a dice.
   ii. Make use of numbered pieces of paper.
   iii. Coins can be tossed.
   iv. Through making use of random number of tables.

   (c) i. Depth of planting trial.
   ii. Amount of fertiliser to apply trial.
   iii. Ridge spacing trial.
   iv. Time of planting trial.

   (d) i. The title and introduction.
   ii. Aim or objectives of the experiments.
   iii. Materials and methods used in carrying out an experiment.
   iv. Data collected, data analysed and results obtained.

   (e) i. Have a scientific attitude and not personal.
   ii. Write short sentences and should be well structured.
   iii. Making use of graphic aids like graphs and drawings.
   iv. Have paragraph structure that contain only one main idea and should be short.

10. (i) Remove dirt and debris from tubers to prevent multiplication of pathogens in the storage structure.
   (ii) Bruised or damaged tubers should be thrown away to avoid infecting other tubers.
   (iii) Spreading out tubers in a cool dry shaded place for thickening of potato skin.
   (iv) Piling the delicate potato tubers carefully on a soft bed of grass to avoid breakages.
   (v) Providing a cool, dry, dark place for potato storage which is well ventilated.

11. Growing vegetables on the clay soils through irrigation using water from the big river. The vegetables should be fertilised using manure from poultry house while roughage for poultry is taken from the vegetable garden.

12. (a) i. **Physical control:** Physical control includes the use of various barriers to prevent pests from physical contact with their hosts and mechanical removal or destruction of the pests. The barriers may be mechanical, chemical or behavioural.
   ii. **Legislative pest control:** Using laws and regulations to prevent the importation of pest organisms into the country and restrict the spread of pests in places where they are already established. They include quarantine, eradication and certification.
   iii. **Cultural control:** Cultural control involves the agronomic practices which aim at disrupting the development and life cycles of pest either by denying them their food or by exposing stages in their life cycles to adverse conditions so that they are killed. Cultural control measures include crop rotation, close season, resistant varieties, etc.
   iv. **Biological control:** Biological control involves the deliberate use of organisms to reduce populations of pests. Parasites, predators and pathogens can be used.
   v. **Chemical control:** Chemical control is the method of reducing or preventing economic pest damage using toxic substances to kill or repel pests on their host crops or animals.

   (b) i. Reduction in denitrification and NH_3 volatilisation losses so that a lot of nutrients are used by the crops for a long period of time.

ii. Reduction in leaching losses of applied nitrogen, resulting in it being fully used by the crops for their growth and development.
iii. Better seasonal distribution of growth of vegetation because the nutrients are used almost throughout the growing period of the crop.
iv. Reduction in chemical and biological immobilisation, leading to a lot of nutrients being used by the crop for its growth.
v. Reduction in seed and seedling damage from localised concentration of salts because the nutrients are released slowly and in small amounts.

TEST 17

1. (a) A parasite is an organism, which lives on or inside a plant or animal (the host) and depends on it for food.
   (b) i. Internal parasite – Kidney worm
   ii. External parasite – Itch mite (pig mange).
   (c) i. Kidney worm can be prevented by good drainage to prevent moist condition where the kidney worm likes to live.
   ii. Itch mite can be controlled by spraying the floors and walls with chemicals to kill the itch mite (pig mange).

2. (a) Tomato variety **Y**.
   (b) It ranges from 26 kg to 40 kg per m^2.
   (c) If 20 m^2 produces 38 kg of tomato
   I ha (10,000 m^2) produces? More

$$= \frac{10{,}000\ m^2 \times 38\ kg}{20\ m^2}$$

$= 500 \times 38$ kg

= **19,000 kg of tomato**

3. (i) Using ear tags
   (ii) Using tattoos
   (iii) Using hot branding
   (iv) Using freeze branding

4.

Year 1		K30,000.00
Depreciation at 15% of K30,000.00	=	K4,500.00
Valuc at end of year 1	=	K25,500.00
Year 2		K25,500.00
Depreciation at 15% of K25,500.00	=	K3,825.00
Valuc at end of year 2	=	K21,675.00
Year 3		K21,675.00
Depreciation at 15% of K21,675.00	=	K3,251.25
Value at end of year 3	=	K18,423.75
Year 4		K18,423.75
Depreciation at 15% of K18,423.75	=	K2,763.562
Value at end of year 4	=	**K15,660.19**

5. (a) i. Problems resulting from characteristics of agricultural products or produce.
   ii. Problems from the characteristics of production.
   iii. Problems from marketing process, associated with unstable and relatively low farm prices and incomes.
   (b) i. **Bulkiness of agricultural products:** Most of the agricultural products occupy a lot of space in relation to their value, making them expensive to transport and store.
   ii. **Perishability of agricultural products:** Most of the agricultural products, e.g. vegetables, milk, go bad easily.
   iii. **Quality variation:** The quality of agricultural commodities varies from year to year and from season to season.
   (c) i. **Annual variability in production;** in that aggregate farm output varies from year to year.
   ii. **Seasonal variability in production;** in that in addition to the annual production variability, much of agricultural production is highly seasonal.

iii. **Geographical concentration of production;** in that because of biological nature, it is a trend that the production of some products is geographically concentrated within particular areas.

iv. **Varying cost of production;** in that farmer's cost of production is affected by climate, technology, farm size and individual managerial skills.

v. **The costly farm supplies;** in that the farm supply industry provides inputs such as labour, chemicals, machinery, capital, seeds and land and the farm's income can be increased by skilful buying of such supplies.

(d) i. Farmers do not have control over the output of their production activities to the same degree as non-farm firms.

ii. Farmers have difficulty to improve the price through independent or group activities. Farmers are price-takers, they cannot individually influence the price of their produce through their output decisions.

iii. The competitive conditions of agriculture tend to keep farm price close to the cost of production.

iv. The superior bargaining power of the buyers of farm products as compared with that of non-farms.

v. Problems from changing of food market efficiency.

6. (i) Women own and control little land for growing food crops.

(ii) Few women farmers have access to loans and credit which they can use for food crop growing.

(iii) Agricultural extension service and training on food crops is not done to women, for many do not belong to clubs.

7. (i) Provide them with agricultural extension services and training just as men.

(ii) Women should be provided with enough credits as well as men.

(iii) Women should be able to own and control a lot of land as well as men do.

(iv) Women should be members of clubs just like men.

8. (a) Oestrus or heat period

(b) Genotype

(c) Phenotype

(d) Zoonosis

(e) A commodity

9. (a) Potassium

(b) Infected maize tussel and silk which produce a dark brown to black powdery stuff.

(c) Clean seed is free from contaminants which may include fungi responsible for headsmut in maize.

10. (a) i. Overgrazing results in animals eating up all the palatable species leaving the unpalatable ones to get established and make the pasture poor. This leads to animals losing mass due to lack of food.

ii. Overgrazing destroys ground cover, which protects the soil from direct raindrop impact. This will lead to soil erosion, carrying away nutrients that might have been used by pasture. Poor pasture growth will retard animal growth.

(b) i. Making silage.

ii. Making hay.

iii. Drying and keeping crop residues, e.g. maize crop residues.

iv. Drying and keeping crop products, e.g. maize grains.

(c) i. Legumes supply high nutritive value even after maturing, thereby providing the required protein in the dry season.

ii. If grasses are sown together with legumes, the legumes will fix nitrogen to the soil for the grass, thereby making them grow healthy and benefit the animals that will feed them.

iii. The legumes have a higher protein content, which will improve the nutrient content of the feed given to the animal.

iv There will be a combined higher yield from legumes and grasses than from pure stand, and animals will consume both.

(d) i. Burning controls pests and diseases through burning the pest and infected pasture.

ii. Burning lowers competition for growth between selectively grazed palatable species and ungrazed unpalatable pasture species, through burning of the unpalatable pasture species and letting palatable ones grow.

(e) i. Rotational grazing.

ii. Zero grazing or cut and carry method of grazing.

iii. Continuous grazing.

iv. Deferred grazing.

11. (a) i. **Time:** The soil that is exposed or subjected to the forces of weathering for a long time will be deeper and more mature than the one that is exposed for a short period of time.

ii. **Topography (slope):** The steepness, smoothness and the length of the slope affect the degree of erosion and deposition. For example, there will be less erosion and deep soils on a gentle slope while there will be more erosion and shallow soils on a steep slope.

iii. **Living organisms:** Vegetation, microorganisms and major organisms, e.g. people, play a role in the development of soils. Vegetation slows down the removal of surface minerals by reducing natural erosion. Vegetation improves soil structure and fertility when it has decayed and decomposed. The decomposed matter mixed with the mineral matter form layers of the soil called soil profile.

iv. **Parent material:** Parent material affects chemical and physical properties of soil; it provides the skeletal (part) for every soil. For example, coarse-grained soils are formed from granite and gneiss.

v. **Climate:** Rainfall, temperature, wind, etc. affect the breakdown of rocks, leaching of nutrients, etc. Climate is the most influential factor since it determines the nature of weathering that occurs. For example, high rainfall areas have acidic soils due to leaching of base-forming factors.

(b) i. Mixed cropping makes better use of the environment, i.e. space, water, nutrients and light so that a higher planting density can be supported.

ii. The variety of crops reduces the risk of specific pests and diseases spreading so easily, for there are crops of different types and therefore attacked by specific pests and diseases.

iii. The leaf cover and more extensive root systems from different crops protect the soil from erosion and may assist to reduce weed establishment.

iv. Mixed cropping involving legumes and non-legumes will make legumes provide surplus nitrogen to other crops, thus making other crops grow and yield highly. For example, beans will fix nitrogen for maize, if they are a mixed stand.

v. Greater total yield are obtained from a unit area because many crops are grown per unit area.

12. (a) **Environmental requirements for maize:**

i. **Temperature:** Maize is a warm

weather crop. Average temperature ranging from 19°C to 32°C during the growing season favours maize production.

ii. **Rainfall (precipitation):** Maize requires rainfall of between 375 mm and 600 mm per annum.

iii. **Altitude:** The optimal altitude for maize is 600-1,500 m above sea level.

iv. **Day length (photoperiod):** Maize is a short day plant and does not mature early where days are long because long days increase the length of vegetative growth, but delays flowering.

v. **Soil type:** Maize grows well on deep, medium textured soil with good water holding capacity. The ideal soil pH is from slightly acidic to neutral, pH of 6.0-7.0.

(b) **Husbandry or cultural or agronomic practices of maize:**

i. Land preparation should be done early in order to plant early. The best time to plough the land and make ridges is soon after harvest. The ridges should be made across the slope at 90 cm apart.

ii. The seed rate of maize is 20-25 kg per hectare. Plant 3 seeds per planting station on ridges spaced 90 cm apart. The planting stations should be 90 cm apart as well.

iii. Fertiliser can be applied by using the dollop or side dressing method. Fertiliser is placed at 7.5 to 10 cm away at a depth of 7.5 cm on either side of the planting station.

iv. Maize fields should be weeded as soon as the weeds appear in the fields. Weeds absorb a lot of plant nutrients which is supposed to be used by the crops

v. Pests and diseases need to be controlled in a maize field. The pests of maize include stalk borer, weevil and army worm while the diseases of maize include maize rust, maize streak, smut and northern leaf blight.

TEST 18

1 (a) i. Livestock management is the way livestock are cared for in terms of housing, breeding, feeding and controlling parasites and diseases.

(b) i. Feeding

ii. Housing

iii. Breeding

iv. Controlling diseases and parasites

2 (a) A maintenance ration constitutes an amount of food given to an animal to maintain normal body processes only whereas a production ration constitutes the additional amount of food meant for any production in the animal.

3. (i) Exchange function, e.g. buying and selling.

(ii) Physical function, e.g. storage and transportation.

(iii) Facilitating function, e.g. grading and marketing intelligence.

4. (a) i. Marketing directs resources of the farm to produce the commodities that consumers want.

ii. Trading directs resources to bring about a sale or purchase.

(b) The marketing costs will always add up to the marketing margin at each level of the marketing channel.

5. (i) Mulching reduces loss of water from the soil through evaporation so that most of the water is used by the crop.

(ii) Mulching, upon decomposition, is a good source of organic matter and nutrients for the crops.

(iii) Mulching protects the soil from erosion that can be caused by strong raindrop impact.

6. (a) A clone is a group of plants originating as buds or cuttings or divisions.

(b) Sugarcane and cassava

7. (a) It is a burdizzo.
   (b) It has blunt edges which are pressed at the neck of the scrotum to break the blood vessels and spermatic cords inside.
   (c) i. Cutting open the scrotum and then physically remove the testicles.
   ii. Placing a tight rubber elastrator at the neck of the scrotum which eventually cuts off the testicles

8. (a) It is a fertilised mature ovule.
   (b) **X** is endosperm.
   Y is plumule.
   (c) i. It enables plants to maintain certain desirable traits such as improved quality disease resistance, high yielding ability, etc.
   ii. It enables the crop to escape adverse environmental effects, thereby ensuring early crop yield.

9.

Asset	Quantity	Estimated value
1. Land	10 ha	K50,000.00
2. Maize	100 bgs	K500,000.00
3. Broilers	200	K100,000.00
4. Goats	20	K60,000.00
5. Feed	20 bgs	K60,000.00

10. (a) i. Its canopy cover from leaves intercepts raindrop impact that could cause detachment of soil particles.
    ii. It holds soil particles together through the binding action of roots.
    (b) i. Improved pastures are more palatable than natural pastures. This increases feed intake in livestock.
    ii. Improved pastures are highly digestible as opposed to natural pastures. This increases nutrient uptake in the body of the animal.
    (c) i. It uses a high seedrate which increases cost of production.
    ii. Weeding and fertiliser application could be difficult since the pasture plants do not grow in rows.
    (d) i. Climbing pasture legumes, for example, must be interplanted with tall growing, grasses.
    ii. The cut and carry method, for example, requires tall growing pasture plants for easy handling and cutting.
    (e) i. It provides a cheap source of livestock feed to farm animals during the dry season.
    ii. It provides the much needed cellulotic tissue which aids in peristalsis in livestock.

11. (a) i. **Promotion of income-generating activities:** The government can start activities in the areas so that people get some money for buying food or farming.
    ii. **Increasing food for work programmes:** Healthy people may work and get food.
    iii. **Keep food reserves:** Food can be kept by government in silos so that it is provided to people during hunger periods.
    iv. **Allowing private traders in food crop marketing:** Private traders in food will help government supply food crops to many people.
    v. **Assist farmers with food aid:** People who have completely nothing to eat can be provided for by government as aid.
    (b) i. By making sure that people living in the urban areas have all the food they require to eat in good time.
    ii. By making sure that farmers get food all the time to eat, e.g. through relief aid.
    iii. By helping in keeping the prices of food at least low for most people to afford.

iv. By making sure that all people especially the poor have enough food to eat. Very poor people can be given free food.
v. By making sure that children have enough food to eat throughout the year.

12. (a) i. **Absenteeism from farming:** Farmers attending to AIDS patients, neglecting farms.
ii. **Labour force becomes weak:** AIDS patients do not have much energy to use in farming, leading to low agricultural production.
iii. **Misuse of farm capital:** Money obtained from farm agricultural production is spent on drugs, leading to low agricultural production.
iv. **Death of most productive farmers:** Most productive farmers die of AIDS, leading to low or even no agricultural production at all.
v. **Disturbance of farmers' emotional balance:** Farmers and relatives living with AIDS do not work hard in their fields because they are helpless and always worrying.

(b) i. **Use of irrigation:** Irrigation will make a lot of yield be produced, for crops can be grown twice or thrice in a growing season.
ii. **Use of improved farming technology:** Farming technology such as use of a tractor will cultivate a large area within a short period of time and doing other operations in time. This will increase the yield automatically and plenty of food for the individuals.
iii. **Practise mixed farming:** Mixed farming makes it possible to produce alot of food all the times and if one fails, the people will depend on another for food.
iv. **Practise of fair land policy:** Fair land distribution will ensure that all people get some land where they can grow some crops for their food.
v. **Good crop husbandry:** These will ensure that the crops grow healthy and produce high yield for feeding the people in the population.

TEST 19

1. (a) These are associations formed by farmers for purposes of buying inputs and selling farm inputs in groups.
(b) i. Participation is voluntary.
ii. Cooperatives are impartial and not based on political or religious grounds.
(c) i. The cooperative should have adequate capital to meet all its needs.
ii. The cooperative must be efficiently and effectively organised.

2. (a) **A** is the mammary duct (milk duct).
B is the gland cistern (milk cistern).
C is the alveolus.
(b) i. **Manufacture milk:** These cells take blood sugar, amino acid and fatty acids and use them to manufacture lactose (milk sugar), casein (milk protein) and butter fat (milk fat). Vitamins and minerals are taken from the blood and appear in milk by filtering through cells.
ii. It stores the manufactured milk before it goes to the gland cistern.
(c) i. **Oxytocin:** It opens the constriction such as the annular fold so that milk may pass through.
ii. **Adrenaline:** It counteracts the action of oxytocin such that when the cow is excited adrenaline is produced. It also helps in the production of another hormone, vasopression, which increases the blood pressure of the annular fold and sphincter muscles so that the downward flow of milk from the gland cistern is stopped.

(d) i. **Relaxin:** Responsible for the contraction and relaxation of the pelvic girdle during parturition.

ii. **Oestrogen:** Brings about oestrus (onset of heat); influences the pituitary grand to produce luteinising hormone; influences the development of mammary glands.

3. (a) It is a period of sexual receptivity in female mammals.

(b) i. There is a mucus discharge from the vulva.

ii. Animal on heat shows mounting behaviour.

iii. There is frequent bellowing and moving.

4. (a) i. Unreliable rainfall that ends earlier than the crops requires it (falling enough but for a short period of time) will deprive the crop of moisture, leading to low crop yield.

ii. Unreliable rainfall that falls in small amounts (falling not enough but for a long period of time) leads to less moisture for crop growth and low yields.

(b) i. Planting early maturing varieties so that they grow and mature within the short period the rains are falling.

ii. The farmer should resort to irrigation so that crops receive water at the right time.

5. (a) Private land tenure system.

(b) i. Developments such as fencing, erecting buildings and buying durable machine for farming enterprises can be carried out without fear that the land will be given to another person. These are going to help in promoting farming.

ii. The owner can use the land to the best of his or her knowledge since he or she feels secure with the land and as such he or she works very hard to develop it through farming.

(c) The owner can sell the whole or part of the land when he or she is in financial problems because it belongs to him or her so has the right to do anything with it.

6. (a) – A rectangular (blocky) conformation.
– A lot of flesh around the skeleton.
– Animals grow fast and mature quickly.

(b) Enables animals to grow and reach slaughter weight faster through intensive feeding.

7. Depreciation per annum:

$$= \frac{\text{Cost of asset} - \text{estimated salvage value}}{\text{Estimated number of years of life of an asset}}$$

$$= \frac{\text{K}40{,}000.00 - \text{K}5{,}000.00}{10 \text{ years}}$$

= **K3,500.00 per year**

8. (a) Goods that give the consumer nearly the same amount of satisfaction.

(b) The suitability of a given form of technology to the socio-cultural and economic traits of the intended user.

(c) The reduction in value of an item over a period of time.

(d) Plants which have the male and female flowers on separate plants.

(e) The emergence of a shoot from the seed when environmental conditions are favourable.

9. (a) i. Farm records assist the farmer to apply for credit to finance production activities.

ii. Farm records tell the farmer whether she is making a loss or a profit from her business.

iii. Farm records assist the farmer to check on her method of production.

v. Farm records assist the farmer in farm planning and budgeting.

(b) i. – Inventory records, i.e. assets the farmer has on the farm, e.g. livestock.
– Production records, i.e. crop and livestock records.

– Financial records.

ii. Into physical records and financial records.

(c) i. Stock control (inventory) records, e.g. fuel, fertiliser, feed and spares held in store, received and issued.

ii. Labour records, i.e. classifying its use by type of labour, time of the year and enterprise.

iii. Livestock records including a monthly record of numbers, births, deaths, sales, farm slaughtering and purchase; and breeding records.

iv. Crop records including areas, yield, planting and harvesting dates, inputs used including irrigation water and rotations.

v. Tractor and fuel use record by enterprise.

(d) i. The nature of the enterprise.

ii. The availability of farming resources.

iii. The economic principles of opportunity cost.

iv. Comparative advantage.

(e) i. Capital for running the cooperative.

ii. Trustworthy and expertise of people running the cooperative.

iii. Commitment of all members to the cooperative and its success.

iv. Efficiency and effectiveness of organising a cooperative.

10. (a) i. Vaccinating the sheep before they are attacked.

ii. Treat the diseased sheep with antibiotics.

iii. Cleanliness during milking and around milking place should be practised for milk sheep.

iv. Use disinfectants to kill bacteria which cause the mastitis disease in sheep.

(b) i. They grow very slowly.

ii. They produce less wool.

iii. They produce less milk as compared to the exotic breeds of sheep.

iv. They have small body size therefore less meat.

(c) i. By cross-breeding with exotic milk producers so that the local breeds also produce better milk.

ii. By cross-breeding with exotic meat producers so that the local breeds also produce better meat.

(d) i. Should consider properly housing of the sheep so that they are protected from bad weather, predators, parasites and diseases in order to produce well.

ii. Proper breeding of the sheep is also necessary so that the sheep kept are able to produce a lot of good milk, wool and meat in order to earn more money after selling.

(e) i. Should have good body mass.

ii. Should be able to grow and mature fast.

iii. Should come from ewes of good mothering ability.

iv. Should be resistant to diseases.

11. (a) i. **Increasing production cost:** Cost is increased through paying for labour that is involved in removing the weeds.

ii. **Harbouring pests and diseases of crops:** Weeds keep pests and diseases which can affect the production of crops.

iii. **Smothering crop plants:** Weeds suppress crops, e.g. through shading effect.

iv. **Poisoning livestock:** Some weeds are poisonous to animals, killing them or making them unhealthy to produce well.

v. **Reducing the value of agriculture land, e.g. through lowering the nutrient status of the soil:** Weeds rob the soil of its nutrients through absorbing the soil nutrients, rendering it productless.

(b) i. **Cultural control:** This involves providing conditions which will assist crop plants grow faster than the weeds in order for the dense canopy to keep sunlight away from the weeds, thus weakening or killing them, e.g. proper plant spacing.

ii. **Mechanical control:** Mechanical weeding involves the use of farm implements and machinery, e.g. animal-drawn implements and tractor-drawn machinery being used in weeding.

iii. **Biological control:** Biological weed control involves the control or suppression of weeds by the action of one or more living organisms accomplished either naturally or by the manipulation of the weed, control organism or environment, e.g. using insects, birds, sheep, goat and cattle to control weeds.

iv. **Chemical weed control:** Chemical weed control involves all weed control practices in which toxic chemicals known as herbicides are used to kill, suppress or modify weed growth in such a way as to prevent interference with crop establishment, growth and production of economic yield.

v. **Legislative weed control:** Involves passing laws to control weeds and their spread.

12. (a) i. **Provision of farm input to farmers:** Farmers get land, labour and capital that are needed for production through agricultural marketing.

ii. **Goods and services distribution:** Goods such as farm inputs, raw materials and finished products are made available to the users at the right time due to marketing.

iii. **Source of income:** People of various groups such as assemblers, retailers and wholesalers get their income through marketing process.

iv. **Addition of value to farm products:** Value is added due to the work that is done on the product, e.g. transportation.

v. **Provision of fresh food and finished products to consumers:** Locally produced food and finished products will be available to farmers at lower prices.

(b) i. **Input rationing:** The farmer applies less than the optimum quality of input, so that should the unfavourable production condition lower, or should price become reduced, the loss the farmer suffers is less than the maximum he or she would have suffered

ii. **Diversification:** Even when the farmer is quite sure that specialisation in one product would achieve maximum profits, uncertainty will influence him or her to engage in the production of several produce in case his or her major enterprise fails.

iii. **Flexibility in production methods:** This involves selecting less than optimum production methods which will make it possible to move from one product to another should production or market conditions dictate a change, e.g. cattle house into a chicken house.

iv. **Selecting a more certain enterprise:** The farmer selects an enterprise which is more certain to yield a return than a more profitable one, e.g. going for maize and not paprika for fear of losing despite paprika being more profitable than maize.

v. **Insurance:** Sometimes enterprises can be insured against loss of any kind, e.g. theft, poor yield, damage, etc.

TEST 20

1. (a) It generates passive immunity in calves.
   (b) i. Milk yield increases from first parturition and later declines as the animal is ageing.
   ii. The milking should be completed within the next eight to ten minutes, beyond which milk yield starts to decline.

2. (i) Agriculture products are mostly directed towards places of high population for marketing.
   (ii) Places for small populations such as Likoma normally use direct marketing channels.
   (iii) Products are usually transported in trucks, lorries, trains in areas of large populations since they are needed in large quantities.

3. (a) i. It seeks to keep future growth of population manageable and sustainable in order to reduce population pressure on land.
   ii. It seeks to lower population growth and total fertility rate for Malawi in order to increase farm income.
   (b) It ensures that as many families as possible have access to land to practise farming for food security in the country.

4. (a) The stalk borer makes holes in the stem and on the leaf, thereby affecting the movements of manufactured food from the leaf to other parts of the plants and also since it attacks leaves the food manufacturing process in the leaves is affected.
   (b) Closed season makes pests that were attacking crops in a certain field starve and die or disappear because their food is not present; in this way these pests are controlled.

5. (i) Wind
   (ii) Water
   (iii) Electricity
   (iv) Sun

6. (i) Dystokia means difficult birth in animals.
   (ii) Breeding is the careful crossing, or selection and pairing living things to improve their offspring.

7. (i) Marketing covers a broad range of activities, i.e. grading, processing and storage while trading covers a narrow range of activities, i.e. buying and selling.
   (ii) Marketing uses selling as a means of communication with the customer while trading uses it as a means to an end.
   (iii) Marketing seeks selling to anticipate, manage and satisfy demand at a profit whereas trading seeks to dispose a surplus at a profit.

8. (a) Dried grass reserved for dry season feeding.
   (b) Increased vigour, growth or fruitfulness that results from crossing genetically different plants, lines or varieties.
   (c) Division of land into small plots, usually to distribute to family members.
   (d) Keeping too many animals in a given area.
   (e) Organism or plant or planting material or seed that is genetically pure or homozygous as a result of continued inbreeding or self-fertilisation.

9. (a) It provides better yielding crop and livestock breeds, which increases agricultural production.
   (b) It enables farmers to grow and harvest more than once in a growing season.
   (c) It ensures continuous supply of even highly perishable commodities when they are off season.
   (d) It ensures sustained high crop yields from soils which would otherwise be depleted.
   (e) Enables farmer to accomplish most of the operations, e.g. land preparation, in time

so as to plant with the first good soaking rains.

10. (a) i. By providing rural communication for transportation of commodities.
    ii. By increasing efficiency of production to achieve surplus from rural farmers.
    iv. By promoting good relations with neighbouring countries
    v. Through promoting Rural Growth Centre development, e.g. Bolero Rural Growth Centre.
(b) i. It promotes more efficient resource allocation, e.g. capital in a nation.
    ii. It allows urban families to obtain food.
    iii. It is a source of employment and economic activity.
    iv. It encourages the development of local agro-industries since there will be raw materials and markets.
(c) i. Allows nations to earn foreign exchange.
    ii. Enables a nation to obtain money through charging tax at import or export points.
    iii. Provides consumers with wider choice of products.
    iv. Provides incentives for a country for production through buying required consumer goods from other nations.
(d) i. Through promoting peace.
    ii. By removing surtax on agricultural commodities.
    iii. Improving transport networks within the nation.
    iv. Providing enough market information.
(e) i. Promoting good international relations, e.g. through diplomatic relations of having an embassy.
    ii. Improving sales promotion and advertisement of commodities.
    iii. Improving transport and storage facilities for commodities.
    iv. Increasing the amount for production for export commodities.

11. (a) i. **Soil pH or soil reaction:** Different crops grow best under different soil pH. For example, tea grows best in low pH soils and maize in high pH soils.
    ii. **Soil depth:** Deep soils can accommodate more roots to reach nutrients and water than shallow soils.
    iii. **Well drained soils:** Well drained soils allow free water movement so that the crop roots grow well and are able to obtain nutrients.
    iv. **Pest and disease-free soils:** Soils affected by pest and diseases will make the crops be affected and in the end not able to grow healthy and obtain nutrients from the soil.
    v. **High nutrient status in usable form:** Unless the nutrients are in the form that they can be used by the crop, their presence in the soil will be useless.
(b) i. **Soil erosion:** Nutrients can be lost through water erosion or wind erosion.
    ii. **Leaching:** In leaching due heavy rainfall, nutrients go deep into the soil beyond the root zone of crops.
    iii. **Weeds:** Weeds found in the soil also take away a lot of soil nutrients.
    iv. **Loss of nutrients through selling of produce:** Once the crop produce is sold to a different area, its nutrients never come back to the same land.
    v. **Alteration of soil pH:** Alteration of soil pH through, for example, misuse of certain fertilisers will lead to the soil losing some of its nutrients.

12. (a) i. Platy structure occurs when soil particles are cemented to form aggregates which form leaflets laid one on top of the other.
    ii. In a prismatic structure, the soil aggregates form vertically lined

pillars which do not leave as much intervening spaces between them.

iii. A block-like structure develops where the original vertical pillars in a prismatic structure have been reduced to six-sided small figures.

iv. A granular structure is characterised by rounded soil aggregates which may not be porous.

v. A crumby structure has rounded soil aggregates which are porous.

(b) i. It must be well aerated in order to supply adequate soil air for plant root respiration.

ii. It must be well drained in order to allow free flow of water in the soil without getting water-logged.

iii. It must have the optimum soil pH for the crop to be grow well.

iv. It must supply most of the essential plant nutrients for plant growth and development.

v. It must have an optimum soil temperature for seed germination and metabolic processes in plant roots.

TEST 21

1 (a) Farming system refers to the decisions and functions that farmers make to utilise land by growing crops and raising livestock to produce food and other requirements.

(b) i. Intensive farming system

ii. Extensive farming system

2. (a) i. Crop rotation involves exchanging different types of crops in a proper sequence on a given piece of land whereas land rotation involves cultivating and fallowing pieces of land at interval.

ii. Relay cropping involves growing of a second crop on the same piece of land when the first crop is almost matured whereas inter row mixed cropping involves growing a second crop between first crop.

(b) i. Intra-row mixed cropping

ii. – The crops may support one another.

– It increases the total crop yield per unit area of land.

3. (a) It is called inbreeding.

(b) i. The advantage is that inbreeding increases the pairs of genes that are homozygous for a characteristic, e.g. milk. And the outward results are to increase the uniformity of herd or flock of animals.

ii. The disadvantage is that inbreeding will result in loss of vigour, i.e. energy and strength, and performance in animals for undesirable traits or characteristics are passed on to offspring from their parents.

(c) Outbreeding

4. (a) i. Legislative control (in **A**)

ii. Physical control (in **C**)

(b) It gets rid of a breeding area for pests and pathogens, which would otherwise have a carryover effect.

(c) i. **Advantage:** It prevents strange pests and diseases from being introduced into an area.

ii. **Disadvantage:** It cannot be used in controlling pests and diseases in individual farms.

5. (a) Balanced ration, if given to animals, they get healthy and produce a lot of quality animal products.

(b) Thinning ensures that crops are planted with no congestion or with enough space so that they are able to get all the required amount of sunlight, nutrients, water and air for their growth and development with the aim of increasing yields.

6. (a) It is the initial stage in the oestrus cycle which is characterised by follicle development and swelling of vulva under the influence of oestrogen.

This is the stage in the oestrus cycle when the corpus luteum is formed.

7. (a) Forage is any material substance for feeding livestock, which contains more than 18% crude fibre.
   (b) An additive is a substance that is added to the feed to meet a specific purpose.
   (c) Soil degradation is the loss of soil in terms of value and quantity.
   (d) Pasture is grassland that is used for grazing livestock or Pasture is grass or herbaceous plant grown for feeding livestock.
   (e) Technology is the creative process that uses tools, resources and knowledge to solve problems so that life is improved and human needs satisfied.

8. (i) Climatic changes occurring
   (ii) Increased human population
   (iii) Poor farming methods and technology
   (iv) Increased animal population

9. (a) i. **Surface irrigation method:** System where water is applied by letting it flow over the soil surface. Types of surface irrigation are basin, furrow and border strip irrigation.
   ii. **Drip or trickle or micro irrigation:** System where water is applied close to the plant, released through tiny holes, in a low volume but continuously, through a closed pipe system, e.g. at Sable Coffee Farming Estate, Mapanga, Blantyre.
   (b) i. Dissolution and conduction of plant nutrients.
   ii. Water is needed for seed germination.
   iii. Water is essential raw material in photosynthesis.
   iv. Plants are cooled by water through the process of transpiration.
   (c) i. Water-logged fields have poor aeration, rendering the crop roots lack enough oxygen for respiration.
   ii. Excessive water lowers the soil temperature, thereby affecting the growth of the roots as well as microbes in the soil that decomposes organic matter for plant growth.
   iii. Excessive water leads to leaching of the nutrients that were supposed to be used by the plants.
   iv. Excessive water causes soil erosion which takes away the soil that is supposed to anchor the plants and nutrients are also lost instead of being used by the crops.
   v. Water-logged soil condition leads to loss of nitrogen through denitrifying bacteria.
   (d) Cereals such as maize require the greatest amount of water during silk and ear development because for pollen grains to grow on the stigma they need some water.

   Water use and water use efficiency are related to fundamental physiological process of photosynthesis. Both are high when photosynthetic rate is high. During silking and ear development the plant should make a lot of plant food to provide even for the silk and cob. At this particular time, the cereal has the greatest number of roots and leaf area so that it manufactures a lot of food through absorption of a lot of water and nutrients, and also absorption of CO_2 through leaf stomata.
   (e) i. Using surface drainage in which the water is removed from the field before it infiltrates into the soil; it is removed in surface drains. This method is suitable for high rainfall intensities, floods and irrigation run off.
   ii. Using sub-surface drainage in which the water is removed after it has infiltrated into the soil; it is removed through ditches or pipes dug deep into the soil or by tube wells. This

method is suitable for leaching salts, canal seepage, artesian conditions and prolonged rainfall.

10. (a) i. Animals take time to reach the age of slaughter or selling, for they walk long distances looking for food and this results in low productivity.
    ii. Overgrazing and land degradation result since many animals are kept on a small area.
(b) i. Brown Swiss
    ii. Friesian
    iii. Jersey
    iv. Guernsey
(c) i. By cross breeding with exotic milk producers, such as Friesian so that the local breeds also produce better milk.
    ii. By cross breeding with exotic meat producers such as Brahman so that the local breeds also produce better meat.
(d) i. Vaccinate the cattle before they are attacked.
    ii. Dipping cattle to control ticks which spread the disease.
    iii. Restrict movement of cattle.
    iv. Treat cattle with the recommended drugs like Tetracycline and Berenil.
(e) i. Mating fastens puberty and maturity of animals.
    ii. General management like feeding.
    iii. Type and breed of the animals.
    iv. Environmental factors such as climate.

11. (a) i. Land capability class wrongly used: it was discovered that a moderately steep slope land (classes VI and VII) which is supposed to be used for plantation or left for grazing animals has been planted with a cereal crop (arable crop).
    ii. Deficiency diseases or nutritional diseases are diseases that are caused by lack of certain nutrients, e.g. if cereals lack nitrogen, they will have stunted growth.
    iii. Physiological diseases, which are caused by malfunction of body systems, e.g. respiratory system or hormone such as auxins.
    iv. Pathogenic diseases are those that are caused by (other organisms) parasites, e.g. microorganism. Examples of pathogenic deseases are smut, northern leaf blight in maize and macroorganisms such as aphids, e.g. maize streak in maize.
    v. Pest attack by cereals: it was also observed that cereals could be attacked by pests such as stalk borer.
(b) i. **Soil erosion control**
    - Use of organic matter so that the land is able to hold water and not let it flow away with the topsoil.
    - Make use of tie ridges so that as much water as possible is kept within the furrow so that it does not carry away topsoil with it.

    ii. **Reducing pests and diseases**
    - Smut can be reduced by planting the resistant varieties of the cereals so that they are not attacked when planted.
    - Nitrogen deficiency can be reduced by applying the correct rate of nitrogen fertiliser to the cereal crop so that the crop gets the nutrient and grows healthy.
    - Stalk borer attack can be reduced by applying 2.5% Dipterex so that the pest is killed.

12. (a) i. Rainfall of between 375-760 mm per annum should be available for healthy growth.
    ii. Soil of good soil structure and texture so that it is able to provide

enough air and water for the pasture as well as nutrients.

iii. Land should be prepared early in the dry season to give more time for perennial weeds to die and buried residues to decompose.

iv. Weeding should be done to remove undesirable, poisonous or weedy plants since they decrease the value of pasture.

v. Fertiliser, e.g. 20:20:0 or 23:21:0+4S at the rate of 200 kg of nitrogen are required per ha. Fertilisers are applied to pasture in order to increase yield, thus increasing the carrying capacity while at the same time improving the nutritive value of the pasture.

(b) **Rotational grazing**

i. Soil erosion is controlled because the grass land is given 3-4 weeks rest without being eaten, thereby allowing the grass to grow. This protects the soil from erosion.

ii. In rotational grazing, there is no selective grazing to the point that the grass is completely finished but all the grass strands are eaten, grow and cover the soil equally.

iii. In rotational grazing the farmer is able to do some other operations in his pasture land, e.g. weeding and fertilising, so that the grass land grows healthy and covers the ground.

iv. It ensures that the urine and dung from the animals are distributed to all parts of the pasture for increased pasture nutrient and productivity.

v. It avoids trampling of grass and soil by animals since the animals graze only for 2 weeks then the pasture land rests for about 4 weeks.

TEST 22

1. Culling is the removal of unprofitable birds from the flock.

2. (i) Time and money is wasted because of movement from one place to another.
   (ii) It is much difficult to plan and carry out good management practices, for the plots are found in different areas.

3. (a) An experimental design on different rates of Muriate of Potash applied on tomatoes.

	Block 1	**Block 2**	**Block 3**
Plot 1	50 kg	0 kg	160 kg
Plot 2	0 kg	160 kg	120 kg
Plot 3	160 kg	120 kg	40 kg
Plot 4	120 kg	40 kg	50 kg
Plot 5	40 kg	50 kg	0 kg

(b) i. By calculating average yields for similar treatments.
ii. By plotting curve graphs showing comparison in yields of tomatoes from the five treatments.

4. (a) i. Grafting
   ii. Layering
   iii. Budding

   (b) Grafting is a method of vegetative propagation which involves the union of the cambium layers of two woody stems, e.g. the union of a stem to a root or union of two stems (stock and scion) while budding is a method of vegetative propagation which involves the union of a bud with a stock.

5. (a) Labour cannot be stored if not used so it has to be planned well in order to be fully utilised.

   (b) i. They should decide well on what crop or animal the farm should produce.

ii. They should decide well on the size of the enterprise (how much to produce).
iii. They should decide well on what method of production to take.
iv. They should decide properly on when and where to buy inputs and sell the produce.

6 (a) i. Coccidiosis is caused by protozoa called coccidian.
ii. Pneumonia is caused by bacteria or virus.
(b) crop processing involves handling of crop products for safe keeping in storage whereas storage involves the actual preservation (keeping safe) of crop products to avoid spoilage.
(c) i. **Cassava:** Peeling, slicing and sun drying.
ii. **Mangoes:** Peeling and forming mango juice.
iii. **Sweet potatoes:** Cleaning and removing debris and dirt from sweet potato tubers.
iv. **Maize:** Drying of maize grain
v. **Groundnuts:** Drying the pods or seeds of groundnuts.

7. (a) Between November and May because there is excess grass for feeding animals some can be conserved in form of hay and silage.
(b) Between May and November the grass is not enough for the animals therefore the animals can be supplemented with the conserved hay or silage between November and May or buy extra feeds for the animals.
(c) Exotic pastures are pastures which have grown and are mainly used for grazing livestock while local pastures are uncultivated lands occupied mainly by indigenous plants necessary for grazing, e.g. dambo pastures.

8. (a) i. Fruits provide a valuable source of vitamins and mineral salts in human diet.
ii. Fruits are a valuable source of foreign earnings to a country through exports.
iii. They are a source of income to the farming family which enables them to have basics needs.
(b) i. The mango trees must be short in height in order that harvesting of fruits could be done by hand-picking in order to preserve quality of fruits.
ii. The fruits must be fibreless in order to have a high exportable value.
iii. The mango plants must be adapted to the prevailing local environment in order to achieve high yields.
(c) i. Anthracnose which is characterised by discolouration of young leaves in mango plants.
ii. Powdery mildew – characterised by some white substance appearing on flowers on the mango plant.
(d) i. Land preparation which involves removal of outgrowth and marking out planting stations.
ii. Planting which involves transferring of seedlings from the nursery to the main bed (field).
iii. Mulching which involves covering soils around seedlings with dry leaves or grass to reduce evaporation.
iv. Weeding, which may involve slashing, particularly of areas between planting stations.
v. Application of manure or fertiliser around each mango plant at the beginning of each rainy season.

9. (a) i. The soil should be properly drained
ii. Practise crop rotation.
iii. Minimising soil disturbances to conserve its organic matter content and moisture.
iv. Weeding the fields
v. Controlling soil pH by liming it when too low or applying acidifying fertilisers when too high.

vi. Controlling soil erosion, for it carries away soil nutrients.

(b) Dark coloured soils absorb heat which may keep soils warm enough for seed germination.

(c) i. Soil structure, i.e. the arrangement of soil particles influences the movement of water and air in the soil, heat transfer and amount of water and air in the soil so a good soil structure will encourage good crop growth and development.

ii. Soil texture determines its ability to absorb and retain nutrients and water. The soil with large air spaces, e.g. sand, is loose and open and cannot hold soil moisture; but soil with small particles have the ability to hold water because of their ability to attract water and ions. The water and nutrients can be used for crop growth and development.

(d) i. **Seed size:** As a general guide, a seed should be buried not deeper than three times its diameter. Small seeds should be planted shallowly while large seeds should be planted a bit deeper.

ii. **Amount of moisture in the soil:** Seeds are planted slightly deeper in dry soils than in wet soils.

iii. **The type of the soil (soil condition):** Seeds will emerge from greater depth in sandy soils than in clay soils and warm soils than in cold soils, so seeds can be planted deeper in sandy soils than in clay soils.

(e) i. Size or growth habit of the crops.

ii. Amount of rainfall in an area, e.g. for some varieties of crop, wider spacing is used in drier areas than wetter areas.

iii. Soil fertility.

iv. The purpose for which the crop is grown, e.g. maize grown for fodder is spaced more closely than maize grown for seed.

v. The type of machinery to be used.

10. (a) i. **One physical soil formation process:**
Rocks are broken down into smaller particles by temperature: Changes in temperature results in expansion and contraction of rock mineral and since the different classes of mineral respond to different rates, the rock eventually produces cracks and breaks.

ii. **One chemical process:**
In carbonation process, rain water combines with atmospheric carbon dioxide to form acid rain and this carbonic acid will dissolve limestone which causes the rock to break down into smaller particles.

(b) i. Topography affects a particular type of soil in that the steepness, smoothness and length of slope may influence degree of past erosion. For example, on steep or rolling topography, there would be more erosion and shallow soils develop and on gentle slope, there would be less erosion and deep soils will develop.

ii. Parent material influences the physical properties and chemical properties of the soil. For example, coarse grained soils are formed from granite and gneiss. Rock containing calcite, feldspars and Ferro magnesium mineral are likely to produce deep heavy soils.

(c) **To determine the amount of sand in the soil use sedimentation method:**

This can be done by putting 50 g of garden soil in a 250 cm^3 cylinder and add 4 times its value of water containing some sodium carbonate to help in the dispersion of particles. Cover the mouth of the cylinder and shake vigorously for about 2 minutes. Place the cylinder on a bench for an hour or more.

The particles will settle according to their surface area and density, small stones first, then sand and clay so that more or less distinct layers appear. Large organic particles or humus will float on top.

$$\% \text{ Sand} = \frac{\text{Vol. of sand x 100}}{\text{Vol. of soil sample}}$$

ii. To determine humus in this soil type, mass of gently heated soil before burning strongly red hot should be weighed and known (A).

Mass of gently heated soil after burning strongly red hot should also be weighed and known (B).

The difference between soil mass before burning and soil mass after burning will give you the mass of humus

$$\% \text{ Humus} = \frac{\text{(A)} - \text{(B) x 100}}{\text{(B)}}$$

(d) i. Vegetation or vegetative cover
ii. Soil type and humus content
iii. System of cultivation and cropping
iv. Climate

(e) i. Physical conservation measures involves construction of physical structures which will catch and hold as much water as possible and allow surplus to flow gently and slowly without causing damage to the soil. Examples of physical conservation measures are tie ridges and contour bridges.

ii. Biological soil conservation measures involve farming practices which use the protection brought about by vegetation to reduce erosion and encourage rain water to enter the soil.
Examples of biological soil conservation measures include correct plant population and avoiding of burning of vegetation.

11. (a) i. **Land preparation:** Make planting holes of 90 cm in diameter and 90 cm deep which should be refilled with top soil mixed with 5-10 kg of well decomposed manure.

ii. **Planting:** Mango trees should be planted in December or January when rain begins. The spacing should be at 9 m x 9 m or 10.5 m x 10.5 m.

iii. **Manuring and fertilising:** 5-10 kg of manure be applied at the beginning of each rainy season. CAN, Triple Super phosphate and Muriate of potash can also be applied from year 1 to year 16.

iv. **Weed control:** Keep the basin area weed-free while slashing the rest of the area outside the basin area.

v. **Insect pest and disease control:** Mango stone weevil and fruit fly are common pests while Anthracnose and powdery mildew are common mango diseases. Control both of them in order to realise high mango yields.

(b) i. **Temperature:** They do well in warm to hot areas.

ii. **Altitude:** Mangoes do well in altitude ranging from 0 to 750 m above sea level.

iii. **Rainfall:** Mangoes being drought resistant, require a minimum of 650 mm of rain per annum and dry periods for flowering and fruiting.

iv. **Soil type:** Deep, well drained fertile sandy soils are best with pH ranging from 5.5 to 7.5

v. **Photoperiod:** Mangoes are long day plants, which require more day hours than night hours.

12. (a) i. Cultivating soils at the right moisture content. This ensures that soil aggregates are not broken down.

ii. Protecting soils from rain drop impact which may detach soil particles.

iii. Adding manure which produces a cementing effect.

iv. Avoiding overgrazing which makes soil vulnerable to erosion.
v. Practising crop rotation including land fallow which helps the soil structure to rebuild itself.

(b) i. **Slope of land:** Flat land is best for crop production because it suffers least erosion of all land slopes (which unlike flat land experience a lot of erosion).
ii. **Wetness of the soil:** The best soil for most crops is the one well-drained. Water-logged conditions make the crops have less oxygen for root respiration, and fewer microbes for mineral release. However, some crops such as rice can grow well in water-logged conditions because the roots have specialised tissues (aerenchyma), which enable the crop to grow under low oxygen conditions.
iii. **Surface hindrance:** Some soils have a lot of hindrances such as rocks and stones which affect high crop production. The best soil surface for crop production is the one which is free from surface hindrance.
iv. **Soil texture:** Soil texture is the percentage or proportion of sand, silt or clay in the soil and it determines the ability of the soil to absorb and retain water and nutrients. It also affects the volume of soil pores, which later affects the quality and movement of water and air in the soil for crop and microorganism use.
v. **Soil permeability:** If the soil is impermeable to water, crop yield will be low as the crop will lack enough water. The best soil should be permeable so that water infiltrates easily to be used by plants.
vi. **Degree of past erosion:** The land should be free from erosion, for eroded land cannot be cultivated and planted to crops.

TEST 23

1. Gender is the way a person is differentiated by sex including roles played by both males and females (genders) that are taken to be accepted by the society.

2. (a) i. Leaching of bases by percolating water, which in turn are replaced by hydrogen ions, thereby lowering soil pH or increasing the acidity.
ii. Plants use bases in the soil by using them as nutrients with the result that they are replaced by hydrogen ions, thereby lowering soil pH or increasing the acidity.
iii. The breakdown of organic matter by microorganisms produces acids, e.g. carbonic acid and sulphuric acid, which release hydrogen ions upon ionisation. Respiration of roots of plants release CO_2 which forms carbonic acid which later produces hydrogen ions on ionisation, thereby lowering soil pH or increasing the acidity.

(b) Low soil pH lowers the availability of some of the important nutrients to the crops like phosphorus and molybdenum. Deficiency of these results in low yields.

3. (i) Families almost eat the same type of food.
(ii) Families resort to eating unusual foods, e.g. cooked mangoes.
(iii) Families reduce the number of meals and amount of food per day.

4. (a) i. Availability of capital
ii. Size of the farm
iii. Technical know-how (knowledge of how to operate the machine)
iv. Labour availability

(b) i. It is expensive to purchase machinery.

   ii. Labourers can lose their jobs for intensive mechanisation results in labourers being laid off.

5. (a) It is an indirect marketing channel.
   (b) i. **Advantage:** It increases the farmer's percentage share in the ultimate price paid for the product.
   Disadvantage: The farmer may not be able to reach out to all consumers for the product.
   ii. **Advantage:** The consumer gets the product at a reasonably low price.
   Disadvantage: The consumer may not get the product in the desired form since there is no processing.

6. (a) **T** is the ovary.
   F is the shell gland.
   P is the infundibulum.
   (b) **E** is the fallopian tube where the egg is fertilised as it moves through it.
   K is the shell membrane producing region.

7. (a) i. Greyish soils contain a lot of silica (quartz).
   ii. Reddish soil contains a lot of iron.
   (b) Soil colour, e.g. dark coloured soils are able to absorb heat which speeds up chemical reactions in the soil.

8. (a) The process of cross-breeding.
   (b) Loss of value or quality of land.
   (c) Land not suitable for arable cropping.
   (d) Mating of unrelated animals.
   (e) Mating of unrelated animals within the same breed.

9. (a) Different rates of fertilisers.
   (b) No fertiliser application.
   (c) Increase in yield with an increase in fertiliser rate.

10. (a) i. Clearing forest to open land for animal grazing.
   ii. Clearing forest to erect infrastructure shops.
   iii. Clearing forest to open land for cultivation.
   iv. Clearing forest to have land for building houses.
   (b) i. Results in drought.
   ii. Leads to soil erosion.
   iii. Leads to desertification.
   iv. Results in silting of water bodies, e.g. rivers, due to lack of trees to hold back sediments.
   (c) i. Causes desertification.
   ii. Causes soil erosion.
   iii. Causes trampling by animals.
   iv. Causes sward degeneration.
   (d) i. Pasture productivity improves.
   ii. Pasture carrying capacity increases.
   iii. Results in physically healthy animals.
   iv. A lot and quality products are produced, e.g. milk.
   (e) i. Exposure of plant roots.
   ii. Sediments left by running water.
   iii. Silting of rivers, streams, lakes and dams.
   iv. Muddy running water in rivers and streams even in foot paths.

11. (a) i. **Physical control:** This involves the use of various barriers to prevent pests and diseases from physical contact with their hosts and mechanical removal or destruction of the pest. The barriers may be mechanical, chemical or behavioural.
   ii. **Legislative control:** Using laws and regulations to prevent the importation of pest and disease organisms into a country and restrict the spread of pests and diseases in places where they are already established.
   iii. **Chemical control:** Reducing or preventing pest and disease damage using toxic substances to kill or repel pests and diseases on their host crop.

iv. **Cultural control:** involves the agronomic practices that aim at disrupting the development and life cycles of pests either by denying them food or by exposing stages in their life cycles to adverse conditions so that they are killed, e.g. closed season.

v. **Biological control:** Involves the deliberate use of microorganism to reduce populations of pests and disease causing organisms.

(b) i. Crops are a source of food for both people and animals so that they obtain necessary nutrients for their body use.

ii. Crops are a source of income; after selling the produce people get money for everyday usage.

iii. Crops are a source of gainful employment through people working in the farms, industries and other agro-based industries.

iv. Crops are a source of raw materials for the industries because the crops produced can be used to produce other secondary products after being processed, e.g. wheat into wheat flour.

v. Crops are a source of foreign earnings: countries, which mostly rely on agriculture, are able to earn foreign exchange through export of agricultural products.

12. A crop rotation with the sequence maize, groundnuts, millet and beans can starve the witch weed and at the same time, she should replenish nitrogen levels in the soil.

TEST 24

1. (a) Deforestation is the removal of forest resources.

(b) Overstocking means keeping more animals in a grazing area than the pasture can support.

(c) Overgrazing means grazing too many animals that pasture cannot support.

2. (a) i. **A** is rostrum or snout.

ii. **B** is antenna with swollen end.

iii. **C** is the elytra (hard wing case).

iv. **D** is the leg.

(b) It bores and penetrates the endosperm of maize and feeds on it resulting in the grain having holes and losing mass.

(c) i. Dry the maize cobs thoroughly before storing, for maize weevil does not breed and multiply fast in grains of moisture content of less than 11%.

ii. Do not store maize near the alternative breeding host such as rice and dried cassava.

(d) Applying chemicals like Super Guard Dust.

3. (a) **A** is tap root system.
B is fibrous root system.

(b) **X** is secondary root.
Y is tertiary root.
Z is primary root.

(c) i. **Fibrous root (B)** – It is able to hold most of the particles together in the top soil.

ii. **Tap root (A)** – It extends deeper to the subsoil.

iii. **Fibrous root (B)** – The plant is uprooted with the entire root system intact during transplanting.

iii. **Tap root (A)** – it develops lateral roots spreading out in almost all soil layers.

(d) i. Fibrous root B

ii. Tap root A

4. (a) **X** is the sperm duct.
Y is the testes.
Z is the epididymis.

(b) **Y** is to produce sperms.
Z is used to store the sperms once produced by the testes.

5. (a) i. Girl child lacks early socialisation to technology.

ii. Men are favoured in the acquitision of technological information from a tender age.

(b) i. Agricultural production by female farmers limited by their dependence on unimproved farm technology.

ii. Food production will be inadequate in the female-headed households.

6. (i) Scraping off the soil after working.
   (ii) Tightening bolts and nuts, and checking wearing parts.
   (iii) The plough should be washed and oiled.
   (iv) The plough should be protected from rain and be put in the shed.

7. **Advantages are:**
   (i) Eliminates the problem of trampling and fencing all the pasture.
   (ii) Eliminates the problem of provision of water facilities and rejection of coarser portion of the fodder by animals.
   (iii) Eliminates the danger of overgrazing.

   Disadvantage is:

   Labour costs are very high in fetching for pasture and feeding cattle in the *khola*.

8. (a) A cell or organism that has a single set of unpaired chromosomes.
   (b) A cell or organism in which there are two sets of chromosomes.
   (c) Means a secondary product.
   (d) The release of milk by the cow.
   (e) Mating of related animals.

9. (a) i. Choosing or buying the pure line parent varieties whose features you want to produce in the hybrid. Or breed two different pure lines through self-fertilising or crossing for several times with related species for many generation such that the desirable characteristics they possess do not change from generation to generation.

   ii. Finding a suitable land where cross breeding can take place without any interference, e.g. from shortage of moisture, shortage of nutrients, etc.

   iii. The hybrid maize is bred by crossing two maize plants that are genetically different. The hybrid maize is bred by crossing one pure line (bred) species of maize with another pure line species whose dominant characteristics (such as high yield, disease resistant and tolerance to heat, drought and wind) are markedly different.

   iv. To produce a hybrid, pollen production of one of the parent must be controlled to avoid self-pollination and allow cross pollination to take place at the same time. Tassels for the parents selected as female or seed breeding parent is removed. Several kinds of hybrids are possible such as single cross, double cross, three way and top cross.

   (b) i. Environmental requirements should be suitable for the maize crop where the crossing is going to take place, e.g. temperature should be between 19°C and 32°C, rainfall of between 375 mm and 600 mm and areas that have short days.

   ii. All important cultural practices should be followed: Land should be well prepared, planting at the correct spacing, applying the recommended fertilisers and controlling of pests and diseases.

   (c) i. Loss due to rodent attacks in the granary (nkhokwe).
   - Control rodents (rats) by having rat guards on our granary.

   ii. Maize can be attacked by weevils
   - Control weevils by applying Super Guard Dust.

   (d) i. **Handling procedures:**
   - Maize can be packed into bags.

- Maize can be transported to the market.

ii. **Marketing procedures:**
- Maize can be sold in exchange for money.
- Maize can be sold in exchange for other goods.

(e) i. Maize cobs droop.
ii. Stems, leaves and cobs are dry.
iii. Rattling of maize grains when shaken in cupped hands.
iv. Creaking of cobs when twisted.

10. (a) i. 30th May 1994 to 7th August 1994
ii. 15th May 1994 to 1st October 1994

(b) It is a cultural control measure will helps in controlling serious pests and pathogens for tobacco by starving them out.

(c) Breeding seasons for pests and pathogens differ from one environment to the other.

(d) Cotton.

(e) It kills them by starving since the host crop plant is taken away.

11. (a) i. **Soil texture:** Different crops grow well in soils that have good soil texture and thus where they will be found most growing.

ii. **Soil structure:** Different crops grow well in soils with good soil structure. Most crops will be growing in soils that have good soil structure unlike where there is not good soil structure.

iii. **Soil temperature:** Different crops will be grown in soils with different soil temperatures depending on what type of soil temperature they grow best.

iv. **Soil pH or soil reaction:** Different crops do well at different soil temperature levels. Different crops will be found in different areas depending on the pH that they grow best.

v. **Cation exchange capacity of the soil (soil fertility):** The ability of soil to exchange positively charged ions at a given pH will affect the distribution of crops. A lot of crops will be grown in rich soils.

(b) i. **Rainfall amount:** Different crops require different amounts of rainfall and as such crops are grown in different areas depending upon the amount of rainfall, e.g. crops such as rubber and tea grow best in high rainfall areas.

ii. **Rainfall distribution:** The crops will produce high yields where the rains are evenly distributed throughout the year in terms of space and season.

iii. **Rainfall Reliability:** The crops will be grown a lot and produce high yields in areas where rainfall is reliable, starts and ends when expected.

iv. **Rainfall intensity:** The crops will not usually grow well in areas of high rainfall intensity and cannot produce high yields in such areas.

v. **Rainfall pattern:** If the rainfall pattern of an area changes, the crops to be grown in that particular area will also change. The bad change in pattern will start lowering the production unless alternative crops are found.

12. (a) i. **Develops local industries:** Raw materials produced locally can lead to development of local industries, e.g. Bakhresa Grain and Milling company.

ii. **Source of food:** Produced products can be used as a source of food for the growing population.

iii. **Source of income:** Farmers sale the farm produce and get money to earn their living.

iv. **Source of foreign exchange:** Exported agricultural products bring foreign exchange to the country for importing goods made abroad.

v. **Source of employment:** Many people are employed in the agriculture sector.

(b) **At village level**

i. Trading promotes productivity of the village, for each village member does what she is used to do.

ii. Income from sales of commodities raises the living standards of all village members on top of adding economic wealth to the village.

iii. Trading promotes each village member to engage in an enterprise that is most profiting to her.

At national level

i. It makes products of specialisation in one place to be exchanged for those found cheaper in another area.

ii. It promotes the development of local agro-industries through providing raw materials and markets.

TEST 25

1. (a) Food supply means food present that is required to satisfy people's needs.

(b) i. Population growth
ii. Scarcity of land
iii. Poor methods of farming
iv. Droughts and floods

(c) i. Practising irrigation farming so as to grow and harvest more than once in a growing season.
ii. Growing different types of crops in a season.
iii. Practising mixed farming in order to get food from both crop and livestock.
iv. Practising dimba cropping during the dry season in order to produce food in the lean periods of the year.

2. (i) Small size of farms
(ii) Lack of enough inputs
(iii) Low supply of labour
(iv) Lack of credit facilities
(v) Low access to agricultural extension services and training

3. (a) i. The pelvic ligaments relax.
ii. The cow becomes restless and looks for a quiet place.

(b) i. Abnormal presentation of the foetus such as one fore limb coming out first.
ii. Large size of the foetus as compared to the birth canal.

4. (a) i. A hoe
ii. Mouldboard plough

(b) i. For heating and cooking.
ii. For operating locomotives.

5. (a) In progeny testing on animal is considered for breeding basing on the performance of its offspring whereas in sib selection the animal will be considered for breeding basing on individual performance.

(b) i. It increases the yield in animal production.
ii. It improves quality of animal products.

6. (a) The farmer yields most of the benefits which would have gone to some marketing agencies.

(b) The cooperative has a stronger bargaining power for better prices than an individual farmer.

(c) The farmer would sell the product at a higher farmgate price because of improved quality of the product.

7. (a) i. Makes it easier to do the work.
ii. Leads to increased agricultural production.
iii. Work is done faster and in good time.
iv. Difficult work could be easily done which human beings alone cannot do.

(b) i. Liquid capital
ii. Working capital
iii. Fixed capital

8. (a) i. Bakhresa Grain and Milling Company.

   ii. Chibuku Products Limited.
(b) i. Maize flour
   ii. Chibuku beer
(c) i. It improves their quality for marketing.
   ii. It prevents the fruits from spoilage in storage.

9. (a) i. **Antibiotic production:** Microorganisms can be used to produce antibiotics which can be used to control disease-causing agent of both crops and animals so that the production is improved.
   ii. **Helps in soil aggregation:** Materials produced by microorganisms such as bacterial gums and fungal hyphae (treads) help to fix soil particles together to make good soil structure so that crops can grow well and produce high yields.
   iii. **Microorganisms** help in the decomposition of organic matter so that mineral nutrients are released into the soil solution as microbial digestive juices (enzymes) act on organic matter and rock particles. These nutrients will be used by the crops for their growth and development.
   iv. **Nitrogen fixation:** Nitrogen from the air is turned into nitrogenous compounds in the soil by the rhizobium species of bacteria and by free-living organisms, e.g. some bacteria and blue-green algae. These nutrients will be used by the crops for their growth.
   v. **Breakdown of poisons:** Microorganisms break down poisons that would otherwise accumulate in the soil and crops, e.g. some weed killers like herbicides are broken down by microorganisms.
(b) i. Conservation of natural resources, e.g. soil, protects the soil from loss of nutrients through erosion, thereby making the crops use all the soil nutrients and produce high yields.
   ii. Conservation of natural resources, e.g. vegetation, protects the soil from heavy raindrop impact which can cause gullies and washing away of the soil on which to grow crops. The result would be lack of land for growing crops and grazing animals.
(c) i. Marketing enables farmers to sell their produce and earn money for buying farm inputs.
   ii. Marketing provides employment to different marketing channels through different marketing functions, thereby providing income to buy agricultural products.
(d) i. Selection of crops and animals that are disease-resistant will produce very high yields.
   ii. Selecting of high yielding varieties of both crops and animals will assist in making the yield very high.
(e) i. Late disease, pests and parasite control will lead to low yields in both animals and crops.
   ii. Late planting, fertiliser application and weeding will lead to low yields because, for example, weeds will have used up all the crop nutrients by the time you start weeding.

10. (a) i. Large population will clear a large land for the construction of their infrastructure.
   ii. Large population will use forest products more for their everyday use, contributing to deforestation.
   iii. Large population will clear a bigger area for opening new gardens, resulting in deforestation
   iv. Large population will be forced to keep more animals because many people will need more meat. These many animals will require more grazing land, making the land (natural resource) more susceptible to soil erosion.

(b) i. For crop production.
ii. For domestic purposes.
iii. For livestock use.
iv. For generating hydro-electric power (HEP).

(c) i. Through relay cropping.
ii. Through mixed cropping.
iii. Through strip cropping.
iv. Through dimba (residual moisture) cropping.

(d) i. Promotes the growing of special crops such as sugarcane.
ii. Encourages the participation of women in agricultural development.
iii. Promotes contribution by people with disabilities towards agricultural development.
iv. Improves dissemination of knowledge of improved agricultural practices to other rural areas.

(e) i. Through death of most productive members of the farming community.
ii. Through taking a lot of time in caring for patients with AIDS other than being in the field, farming.
iii. Through weakening of labour force to be involved in farming.
iv. Through spending much of farm income on buying medicine for people with AIDS other than investing the money back into the farming business.

11. (i) **Overgrazing:** excessive grazing of pasture land due to keeping too many animals in one place.
(ii) **Deforestation:** The removal of forests through careless cutting down of trees.
(iii) **Uncontrolled bush fires** which exposes the ground and soil to erosion.
(iv) **Cultivation along steep slopes** encourages soil erosion which will carry away good top soil and nutrients.
(v) **Making ridges along the slopes** encourages soil erosion, which will carry away good top soil and nutrients.

(b) i. Establishing the woodlots so that they are able to hold the soil particles together.
ii. Practising good farming practices in order not to encourage soil erosion which carries away soil to some other places.
iii. Planting and replanting trees so that the places that do not have vegetation are covered with vegetation and protected from heavy raindrop impact and erosion.
iv. Taking care of the existing forest so that water is not lost in these areas knowing that forests conserve water.
v. Controlling population growth so that there are not many people to be using and cutting trees.

12. (a) (b)

Inbred W x inbred X → *Single cross* WX

Inbred Y x inbred Z → *Single cross* YZ

Single cross WX X *Single cross* YZ

↓ *Double cross*

WXYZ

TEST 26

1. (a) It refers to the way in which land is owned or held.
(b) i. Farmer pays no rent for freehold land as is the case with leasehold land.
ii. Farmer can sell freehold land unlike leasehold land.
(c) It is the private land tenure system.

2. (a) i. Land is allocated free of charge to every member of the community.
ii. Wise elders control tree felling and bush burning on customary land.
(b) i. It provides for traditional leaders to distribute customary land to their people according to their needs.
ii. It provides for the government to buy back idle land from estate owners and redistribute it to smallholder farmers.

iii. It provides for enterprising farmers to lease land from the government through the Department of Lands and Physical Planning.

3. (i) It provides an outlet for surplus from farm holdings.
   (ii) It promotes efficient division of labour which saves time.
   (iii) It increases productivity of the community since each member does what he or she is best suited to.
   (iv) Income from sales raises the living standard of all concerned and adds to the economic wealth of the community.

4. (i) Through using appropriate farm technology.
   (ii) Through good crop husbandry practices.
   (iii) Through good animal husbandry practices.
   (iv) Through good land husbandry practices.

5. (a) i. Land may not be fully utilised if the owner is not interested in farming.
   ii. Large parts of land may lie idle while other people are in need of land.
   (b) i. Ensure that agricultural resources, especially land, are conserved and not too degraded by a rapidly growing population.
   ii. Guide distribution of agricultural and other services.

6. (a) Quota is the largest amount of goods, which a farmer is allowed to produce for sale.
   (b) i. Ensures that just enough commodity is produced for better prices.
   ii. Ensures production of high quality products.

7. (a) i. Sharing of ideas and expertise within the community.
   ii. They should secure the much-needed loans from commercial banks.
   iii. They should buy inputs in bulk at wholesale price.
   iv. They can make use of expensive machinery such as a tractor to overcome labour shortage.
   (b) i. They supply a lot of nutrients per unit mass.
   ii. They are less bulky since they are low in cellulose content.
   (c) i. It may lead to transmission of venereal diseases in livestock.
   ii. Small female animals could be injured by heavy male animals during mating.

8. (a) The process of giving birth in sheep.
   (b) The work done by people.
   (c) Person who travels around selling produce either on foot or on a bicycle.
   (d) Falling of plants due to weak roots and stems.
   (e) A plan of action adopted by government, e.g. agricultural policy.

9. (a) i. Low relative humidity can make plants go wilt, for very low RH encourages loss of water into the atmosphere. A wilted plant will not photosynthesise well, leading to low yields.
   ii. High RH encourages the multiplication and growth of crop pests and diseases which are going to lower the performance of crops.
   iii. High RH helps to cool the plants.
   iv. Areas of low relative humidity many times have high temperatures and receive low rainfall and they are prone to runoff due to high intensities aggravated by little vegetation soil cover.
   (b) i. Wind brings about rainfall for crop growth.
   ii. It helps in pollination of crops.
   iii. Leads to defoliation of leaves, resulting in no photosynthesis in crops and eventually crop failure.
   iv. It causes soil erosion which carries away crop nutrients, leading to low yields.

(c) i. Encourages flowering in plants.
ii. Promotes germination of some seeds.
iii. Encourages photosynthesis in crops.
iv. Encourages respiration and growth in crops.

(d) i. Dissolution and conduction of plant nutrients.
ii. Soil moisture is needed for seed germination.
iii. Soil moisture is taken by plants and is used for hydrolising many food nutrients such as starch so that they can be transferred as required to other parts of the plant.
iv. Plants are cooled by soil water through the process of transpiration.

(e) i. Nitrifying bacteria will release nitrogen in the soil to be used by crop growth.
ii. Some microorganisms cause denitrification, leading to loss of nitrate gases from poorly aerated soil, thereby depriving the crops of important nutrients for their growth and development.
iii. Through mineralisation, which is the release of nutrients into the soil from organic matter as microbial juices (enzymes) acts on them.
iv. Some microorganisms are pathogens causing crop diseases which affect crop growth and development.

10. (a) i. Cleaning sweet potatoes to remove dirt and debris.
ii. Selection of good, not bruised sweet potatoes.
iii. Curing sweet potatoes by putting tubers in cool, dry shaded place.
iv. Piling sweet potatoes on a soft ground.

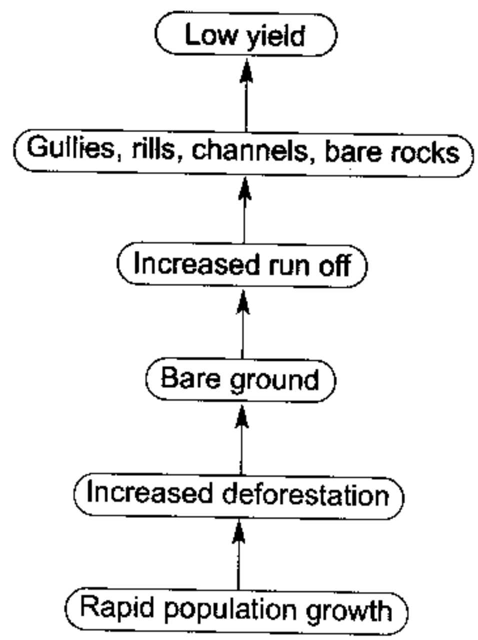
(b) i. Requires skill to operate and maintain the machines.
ii. Capital and operating cost are high.
iii. Lead to soil compaction due to heavy machines.
iv. Requires larger farm holdings.

(c) i. Electrical energy
ii. Mechanical energy
iii. Chemical energy
iv. Solar energy

(d) i. Uses pipes with small holes.
ii. Uses water economically.
iii. Does not require a lot of labour.
iv. Suitable for areas of less water.

(e) i. Through percolation.
ii. Through run-off.
iii. Through evaporation from surface water bodies.
iv. Through transpiration from plants.

11. (a)



Rapid population growth will lead to deforestation since people will cut down the trees for farming and settlements.

Increased deforestation will lead to bare ground which will lead to increased run off.

Increased run off causes soil erosion which results in loss of fertility and therefore low yields.

12. A furrow irrigation system can be established in which water flows by gravity to irrigate the maize crops on the clay soils down slope. Unskilled labour will be used in opening up and maintaining the canals.

TEST 27

1. (a) Land tenure is the way in which land is owned or held.
   (b) i. Public land is the land held and used by the government.
   ii. Customary land is a communal land owned by a group of people and is held under traditional leaders.
   iii. Private land is land held on leasehold or freehold title usually registered as private land under the Registration Land Act.

2. (i) Cost of feed
   (ii) Feed texture, i.e. coarseness or fineness of the feed
   (iii) Palatability
   (iv) The amount of feed
   (v) Condition of the animal
   (vi) Purpose for which the livestock is kept
   (vii) Age and size of the animal
   (viii) Quality of feed
   (ix) Digestibility of feed

3. (i) What to produce (enterprises).
   (ii) How to produce (technologies).
   (iii) How much to produce (production size).
   (iv) When and where to buy or sell (marketing).

4. (a) i. It buys agricultural products, e.g. maize from farmers.
   ii. It sells input, e.g. fertiliser and maize seed to farmers.
   iii. It grows different crops for feeding the nation and selling, e.g. tobacco and maize.
   (b) i. Farmers World
   ii. Rab Processors Limited

5. (a) i. Low response to fertiliser application
   ii. Low total dry matter production
   iii. High dormancy
   iv. Low nutritive value
   v. Early flowering and maturing
   (b) i. Sesbania
   ii. Leucaena
   iii. Silver leaf desmodium
   iv. *Centrosema pubescens*
   v. Alfafa

6. (i) Low level of literacy among females
   (ii) Low social status of women

7. (a) i. Pasture management refers to the practice of caring for established pasture in terms of weeding, fertiliser application, control of pests and diseases, and proper grazing practices to ensure increase in sustainability of pasture productivity while pasture conservation refers to the practice of preserving the plenty herbage in the rainy season so as to be used during the dry season when pasture is scarce.
   ii. Hay
   Silage
   Foggage
   (b) i. Matching grazing to pasture carrying capacity
   Correct stocking rate
   Allowing sufficient grazing interval as rest periods
   ii. Pasture burning
   Continuous grazing
   Deferred grazing
   Zero grazing (cut and carry method)
   Rotational grazing
   Strip grazing
   (c) i. Zero grazing
   ii. Strip grazing
   iii. Rotational grazing

8. (a) Allowing of animals to feed whenever they want to, without restriction.
   (b) Means ability to negotiate.
   (c) A picture or illustration of what labour demand looks like in a given period.
   (d) The process of giving birth to a kid.
   (e) A plant or animal produced as a result of crossing one species or variety with another.

9. (a) i. Through applying artificial nitrogen fertilisers to the soil like CAN and Urea.

ii. Lightning may react with atmospheric nitrogen to form nitrates which can be fixed into the soil when rain falls, i.e. atmospheric nitrogen from lightning.

iii. Through fixation of nitrogen by nitrogen fixing bacteria, e.g. rhizobia, through the process of nitrification.

iv. Through organic matter, e.g. farm yard manure and compost manure, which, upon decomposition, will release nitrogen into the soil.

(b) i. Nitrogen regulates the availability of phosphorus and potassium: Phosphorus is very important for crop, e.g. encourages formation, development of roots especially secondary roots, and potassium is very important for crops, e.g. is needed in nitrogen metabolism and protein synthesis. This means that if nitrogen is lacking the crop is going to produce low yield.

ii. Nitrogen forms part of the chlorophyll in plants: Plants cannot manufacture food without the presence of this green pigment known as chlorophyll; therefore if there is no nitrogen, the crops will yield poorly.

(c) i. Soil erosion, which goes away with soil nutrients like nitrogen.

ii. Leaching of nitrogen in the soil that receives a lot of rainfall.

iii. Nitrogen may be absorbed by the plants and removed out of the soil.

iv. Nitrogen is used by the microorganisms and through volatilisation (loss of nitrogen in gaseous form).

(d) i. **Leaching:** Too much rainwater can wash away some dissolved cations, while others will join the percolating which can accumulate in deeper soil horizon below which plant roots can not reach.

Or, Carbon dioxide dissolved in rainwater forms carbonic acid, which will ionise the released hydrogen ions. These hydrogen ions will replace the alkali and the alkali earth ions because hydrogen ions are more strongly held by clay adsorption complex than the other cations. These cations will then go away with water, leaving the hydrogen ions in the soil, contributing to it becoming acidic.

ii. **The presence of Sulphur compounds, e.g. H_2SO_4:** Very high sulphur content in the soil from, e.g. sulphate of organic substances and pyrites, leads to the soil having low oxygen and very high amount of carbon dioxide, so the reduction condition takes place changing sulphur into hydrogen sulphide, and through oxidation from cultivation or drainage, sulphuric acid is formed. Sulphur is very high in marshy and peat soils.

iii. **Nutrient uptake by plants:** When plants growing in an area die and decay, they release the nutrients back into the soil. However, when crops are cleared and carried, the soil nutrients absorbed by the crop will also be taken away and never replaced and such drain of nutrients will lead to a lower concentration of soil nutrients and a high concentration of hydrogen ions, making the soil acidic.

iv. **Application of fertilisers with acid origin:** Using acidic fertilisers, e.g. ammonium nitrate, ammonium sulphate and sulphate of ammonia, leads to very high acidity. This is so since ammonal radical is used up by plants, hydrogen ions from soil water will combine with sulphate ions (SO_4^{2-}) to form sulphuric acid.

(e) i. Low soil pH increases the concentration of available iron and aluminium in the soil to the extent of becoming injurious or toxic to crops.

ii. Very acidic conditions prevent the activity of soil microorganisms especially nitrifying and nitrogen fixing bacteria (rhizobia).

iii. Low soil pH decreases the availability of soil nutrients, e.g. phosphorus and molybdenum. The crops will not perform to the standard because they will lack such important nutrients for their growth.

iv. Soil pH may affect the balance of different living organisms in the soil by influencing their competitive ability. Low pH, for instance, favours the growth of fungi and nematodes, resulting in many crop diseases that are caused by fungi and nematodes.

v. Low pH causes disintegration of clay minerals, which have a high concentration of nutrients. This will encourage the leaching of important nutrients such as iron, calcium and aluminium and their replacement with hydrogen ions. Hydrogen ions may have toxic effects on the roots of crops and may also prevent further adsorption of important cations.

10. (a) i. Making use of irrigation.

ii. Diversifying farming through growing different crops in a season.

iii. Through controlling of pest and diseases.

iv. Through growing improved varieties of crops.

(b) i. Limited access to loans

ii. Poor farming methods

iii. Lack of income

iv. Food wasting and unnecessary selling of food crops

(c) i. Women are often not provided with credit to assist them in farming.

ii. Most women do not have much land for growing crops.

iii. Women do not control and own a lot of land.

iv. Most women do not join clubs where they can obtain inputs.

(d) i. Low level of technology

ii. Small farm holdings

iii. Low labour supply

iv. Low level of inputs

(e) i. Using appropriate technology.

ii. Practising good animal husbandry.

iii. Practising good crop husbandry.

iv. Practising good land husbandry.

11. (a) i. **Nutrient of the feedstuff available**: so that the feed intake is of high quality to provide all the food nutrients the animal requires.

ii. **The health of the animal:** Diseased cattle should be given the type of feed that should help them solve the problem.

iii. **Age/size of the cattle:** Young animals should be given production ration while old animals should be given maintenance ration.

iv. **The palatability of the feedstuff** so that the animals enjoy or take easily the feed.

v. **The physiological status of the cattle**, for example, lactating and pregnant cattle should be given more nutritious feed than the animal that is not lactating or pregnant.

(b) i. They do not have a long lactation, which leads to the Zebu produces milk within a short period of time and less money from milk sales.

ii. Malawi Zebu has low milk yield as compared to the exotic breeds, leading to low income from milk sales per day.

iii. Malawi Zebu has high infant mortality rate as compared to the exotic breeds, thereby lowering the population of Zebu and money from sales.

iv. Malawi Zebu has low fertility to enable it to calve regularly, which leads to slow increase in number and that means less money from sales.

v. Malawi Zebu has very slow growth rate, which makes it attain adulthood late and therefore delay the sales of the Zebu and flow of income.

vi. Malawi Zebu are genetically small in size such that they do not fetch a lot of money when sold on hoof (alive) or on hook carcass).

12. (a) i. Leads to early planting so that the crops are able to escape late season coming pests and diseases, and produce high yields.

ii. This time the soil is still moist so it is easy to cultivate the fields.

iii. Allows time for the decomposition of crop residues so that they can be used as manure and release nutrients for the crops to be planted.

iv. Controls pests and diseases since some stages of the life cycles of living organisms are disturbed or die when exposed or subjected to sun's heat.

v. Controls weeds since weeds will die upon burying them or exposing them to sunshine.

(b) i. Weeds harbour pests as some weeds act as alternate hosts of certain insect pests.

ii. Weeds increase the cost of production since a farmer has to meet heavy expenses in controlling and eradicating the pests.

iii. Weeds lower the carrying capacity of pasture by utilising the pasture nutrient and making them grow poorly and produce less pasture for feeding animals.

iv. Weeds lower the quality of crop products through contaminating them, e.g. with their seeds.

v. Weeds interfere with the rate of working such that the work is done very slowly or not even well done, e.g. harvesting, planting, fertilising and harvesting.

TEST 28

1. (a) i. Waste and decomposing matter from fish ponds can be used to fertilise the crop yield.

ii. Dried fish can be used in formulation of protein concentrate – fish meal which has to be fed to beef animals.

(b) Women taking care of relatives or spouses suffering from the disease will not be able to concentrate on farming activities, thereby leaving the household vulnerable to food insecurity.

2. (a) i. Hard rocks form gritty or coarse soils which will leach out, leading to acidic soils.

ii. Chemical nature of the soil depends on the chemical characteristics of the parent rock, e.g. parent material containing sulphur will produce acidic and soil containing calcium will produce alkaline soils.

(b) i. Applying of alkaline fertilisers like CAN to displace H^+ from the cation exchange complex.

ii. Liming the soil since lime contains calcium, which will neutralise the acidic soils to remove or displace hydrogen ions (H^+).

3. (a) i. Participation is voluntarily.

ii. Equal voice control. One person, one vote.

iii. A low fixed rate of interest on capital as a first charge on profit.

iv. A cooperative is open to all farming members of the community with a common interest.

(b) i. Single-purpose cooperative
ii. Multi-purpose cooperative

4. (a) **A** is a hitch.
B is a depth wheel.
C is a handle.
(b) Rigid cultivator
(c) i. **Wheel and axle:** Replace wheel and axle when broken or worn out after several farming operations.
ii. **Sweep:** The sweep is worn out when cultivator is placed on the flat surface when the tine arms touch the ground and therefore should be replaced when worn out.
iii. **Hillers and Tines:** hillers and tines are double sided. They are worn out when the cultivator is placed on the flat surface, the arms touch the ground and therefore should be replaced when worn out.

5. (a) By coming up with improved seed of high yielding ability.
(b) Farmers are able to use improved seed, fertilisers, etc. provided which increase crop yield per unit area.

6. (a) i. Essential for cell division in meristematic tissue.
ii. Regulated carbohydrate metabolism.
iii. Important in the translocation of sugars within the plant.
(b) i. Leaves turn light green, starting with young leaves.
ii. Reduced nodulation in legumes.
(c) 23: 21:0+4S and compound S.

7. (a) Food given to animals **or** a feed is a material, which after ingestion by the animal, is capable of being digested, absorbed and utilised by the animal.
(b) Farm mechanisation means use of machines and appropriate technology to improve agricultural production on a farm.
(c) A ration is the amount of feed given to the animals.
(d) A supplement is a feed or a feed mixture used to improve the nutritive balance of the total ration.
(e) It is the yellowing of plants due to lack of nitrogen.

8. (a) i. The equation is stating that the crop productivity (yield and physical appearance) depends on the environment where the crop is grown and (genetic makeup of the crop) inheritable characteristics or traits of the crop.
ii. Crop improvement is the increasing productivity of cultivated plants through developing better cultivated varieties of superior characteristics.
(b) i. To increase yield per unit area (quantity).
ii. To improve yield quality.

9. (a) i. Anglo-Nubian for meat and milk
ii. Toggenburg for milk
iii. Boer goat for meat
iv. Angora goat for mohair
(b) i. They grow very slowly.
ii. They produce less mohair.
iii. They produce less milk than do the exotic breeds of goats.
iv. They have small body size therefore less meat.
(c) i. Through cross breeding with exotic milk producers like Toggenburg so that the local breeds also produce better milk.
ii. Through cross breeding with exotic meat producers like Boer goat so that the local breeds also produce better meat.
(d) i. Should consider proper housing of the goats so that they are protected from bad weather, predators, parasites and diseases in order to produce well.
ii. Proper breeding of the goats is also necessary so that the goats kept are able to produce a lot of good milk,

mohair and meat in order to earn more money after selling.

(e) **Meat goats:**
i. Their body shape should be good.
ii. Their parents should have good mothering ability.
iii. They should be able to grow fast and mature early for selling or consumption even for reproduction purposes.

Milk goat:
i. Should have well-developed udders, which can contain a lot of milk.

10. (a) i. Fruits provide employment.
ii. Fruits are a source of foreign currency.
iii. Fruits are a source of valuable food nutrients.
iv. Fruits are a source of raw materials for industries, e.g. making juices and jams.

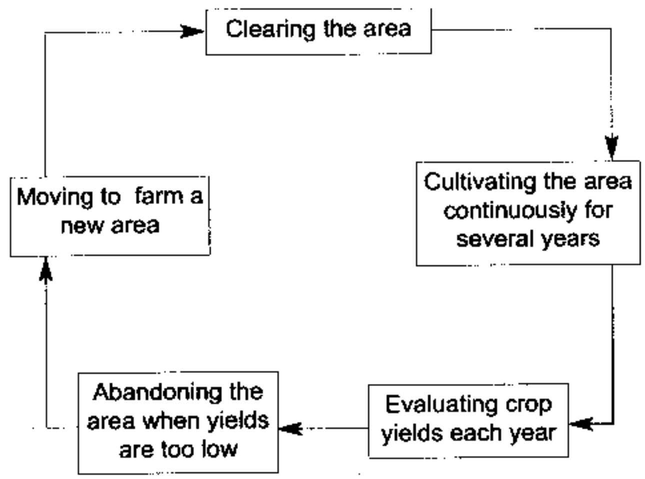
(b) i. Bush fallowing
ii. Shift cultivation
iii. Mono-cropping
iv. Monoculture

(c) i. Pasture controls pests and diseases.
ii. Pasture improves and maintains soil fertility.
iii. Pasture improves soil structure.
iv. Pasture controls soil erosion.

(d) i. Stripping of the maize cob sheath.
ii. Shelling of the grains.
iii. Drying of the shelled grains.
iv. Cleaning of dried maize grain through winnowing to remove chaff.

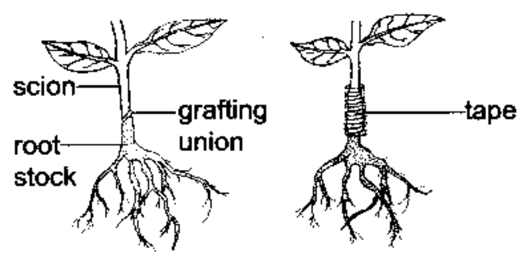
(e) i. Mechanisation
ii. Irrigation technology
iii. Plant and animal breeding
iv. Fertiliser production technology

11.

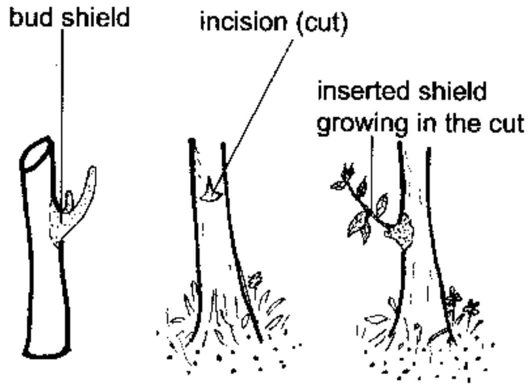


i. The land is cleared of trees and burning follows to destroy the remaining vegetation.
ii. The field is cultivated continuously without applying fertilisers at all.
iii. Crop yields are evaluated each year to know whether the yield is increasing or decreasing.
iv. The land is abandoned when the yields are too low.
v. Then a farmer will move on to farm a new area.

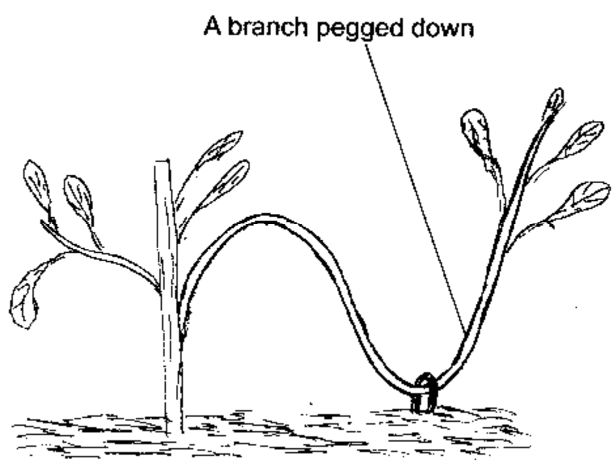
12. (a) Grafting involves joining a scion to a stock and the union is supported by tape or elastic band until it heals.



(b) Budding involves joining a bud to a plant stock by inserting it into a slit opened on the bark of the plant stem; it is again bound by some bands until the wound heals.



(c) Layering involves exposing of cambium on part of a tree branch and put moist soil around that region for root development. All this is done while tree branch is attached to parent plant from where it would be out once roots develop.



TEST 29

1. (a) Desertification is the formation of deserts through loss of vegetative cover. (The means through which deserts are formed.)
   (b) i. Taking care of existing trees.
   ii. Planting and replanting trees.
   iii. Establishing woodlots.
   iv. Avoiding careless cutting down of trees.

2. (i) **Lack of income:** Many people lack income to buy food.
   (ii) **Lack of arable land:** There is less land where people can use for growing crops.
   (iii) **Lack of labour during labour peak periods:** Most crops are damaged during labour peak periods, e.g. during weeding, due to lack of labour.
   (iv) **Poor climate:** Some climates are not favourable for crop growth, e.g. too much rainfall.
   (v) **Lack of unimproved seeds:** Unimproved seeds for crop growth produce low yields.

3. (i) He will get low yields because diseases increase towards the end of rainy season, for they will have multiplied greatly.
   (ii) If crops are planted late they will find that most of the nutrients have leached or are lost by erosion, thereby making them unavailable for plant growth. Nitrogen will also have been lost which could have been used for crop growth.
   (iii) Inadequate moisture at the end of rainy season affects proper crop growth and development, causing low yields.
   (iv) The soil temperatures are low, affecting rate of seed germination and crop growth at the end of the growing season.

4. (a) During mid-season stage, which is flowering stage.
   (b) i. Water shortage affects the turgidity of reproductive cells which will be unable to produce.
   ii. Shortage of water results in less translocation of sugars to fill the fruit.
   (c) Through irrigation of crops.

5. (a) Highly nutritious since the milk contains vitamin A and proteins. It also contains antibodies which temporarily impart resistance to infections especially of alimentary canal of a calf.
   (b) Keeping ducks close to fish ponds will lead to supply of droppings which fish food (planktons) will use when growing while the fish can be fed to ducks as food.

(c) CAN dissolves fast and easily than urea, which can take more than 2 weeks before dissolving.

6. (a) Seed treatment of various species with chemicals prevents or controls bacteria and fungi that can attack seeds to affect their germination and growth.
   (b) i. **The germination percentage:** The higher the germination percentage, the lower the seed rate needed to reach the required plant population.
   ii. **Seed size:** The smaller the seeds, the lower the seed rates as there are more seeds per kilogramme.

7. (a) Afforestation is the practice of planting trees in places where they have died out or never existed at all.
   (b) A balanced ration is the one which contains all the required nutrients, e.g. carbohydrates, fats and proteins.
   (c) A credit that is repayable over 10 years, e.g. repayment for buildings, machinery and breeding animals.
   (d) A cooperative is a group working together towards a common aim for mutual benefit. Or an organisation where people work towards a common goal.
   (e) Antibiotics are chemical substances produced by microorganisms which in dilute solution, have the capacity of inhibiting the growth of the other microorganisms and even destroying them.

8. (i) Cultivation of the soil with heavy machinery leads to soil compaction or soil pulverisation.
   (ii) Cultivation of the soil when wet leads to soil compaction.

9. (a) Prevents introduction of contaminated agricultural materials which could be sources of new infection.
   (b) Provides for individuals in an area to report occurrence of serious pests and pathogens to proper authorities in order that they should be controlled in time.

10. (a) i. Provides an income to many groups of people.
   ii. Assist in providing inputs to the farmers.
   iii. Help to add value to farm products.
   iv. A way of distribution of goods and services.
   (b) i. Quality of goods and services
   ii. Income of consumers
   iii. Price of the commodity
   iv. Size of the population
   (c) i. Change in government policy
   ii. The price of the product
   iii. Change in technology
   iv. The cost of production
   (d) i. Breakages of commodities because of bad packing and poor transport arrangements.
   ii. Stealing of commodities by thieves.
   iii. Destruction of commodities by natural hazards.
   iv. Infection and death of livestock due to an outbreak of a disease, e.g. foot and mouth disease in cattle.
   (e) i. Farmers are scattered in rural areas so it is difficult to move with the commodities from one place to another.
   ii. The nature of agricultural commodities.
   iii. Agricultural production is seasonal, from May to April.
   iv. A bigger number of farmers are subsistence farmers who own small fields.
   v. Fluctuation of market prices
   vi. Distance to markets

11. (a) i. Drug abuse has increased so that people are not afraid of indulging in bad practises at any time.
   ii. High unemployment rate because the jobs present in the country are not enough to carter for every educated individual.
   iii. Frequent outbreak of diseases as a result of poor living conditions.

iv. Frustration because the resources are not enough for the increased population.

v. High crime rate since people would like to survive among the increased population by grabbing what other people have so they end up by killing or assaulting them.

(b) i. Improved water supply through piped water system or boreholes has prevented the spread of water-borne diseases that were making people fall sick and die.

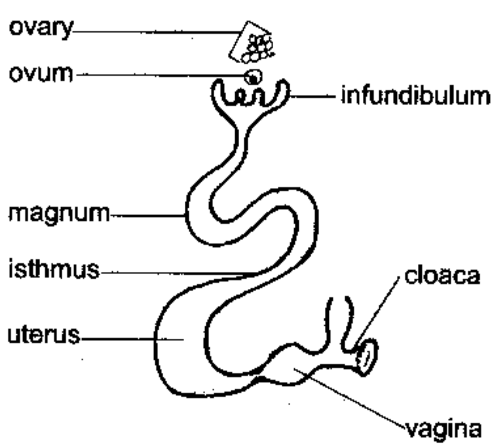
ii. Improved medical facilities have led to many people not dying, for diseases are treated.

iii. Increased agriculture production has resulted in people eating balanced diet, which makes them strong and healthy to produce children.

iv. Improved health education on sanitation, child and maternal care so that most people are able to live longer.

v. Improved nutritional education, which has led to people eating nutritious foods, which protect them from diseases.

12. (a) The process of egg formation in hen:



The whole process of egg formation takes place within 24-26 hours. A hen lays only one egg each day, and the chemical composition of the albumen, the yolk and egg shell comes from the gut or from reserves found in the hen's body.

Ovary: The ovary forms the ova (eggs) or yolk. It also secretes a male sex hormone called endrogen, which is responsible for the size and red colour of combs.

Oviduct: After ovulation the yolk moves down to the oviduct, which is composed of 5 anatomically different parts, namely; infundibulum (funnel), magma, isthmus, shell gland (uterus) and the vagina.

Infundibulum (funnel): The funnel receives the egg coming from the ovary and the chalaza is formed. The chalaza is a membrane of twisted strings, which keeps the egg yolk in its position. The egg stays in the funnel for 15 minutes and is about 11 cm long.

Magma: This is an albumen-producing region, which is secreted and added to the egg. The egg stays in magma (about 33.6 cm long) for 3 hours.

Isthmus: Isthmus is a shell membrane-producing region. Soft shell membrane encloses the egg and the characteristic shape of the egg is determined. Minerals, water and thin outer albumen layers are added. The egg stays in the isthmus (10.6 cm long) for 1¼ hours.

Uterus (shell gland): Uterus is a shell-producing region. A calciferous shell is deposited around the egg. It is a region where pigmentation occurs and albumen formation is completed. The egg stays here for a period of between 18 and 22 hours.

Vagina: When the egg has reached the vagina (6.9 cm long) it is inverted and vaginal fluid is secreted to reduce friction during egg laying. The egg stays in vagina for about one minute before moving down to cloaca (vent), where the egg finally comes out.

(b) i. Sucking sup from plant tissue, thereby causing wilting.

ii. Transmitting rosette disease in groundnuts.

iii Creating holes through plant tissue which may encourage secondary infection.

iv. Injecting their toxic saliva into plant tissues which may leave other plant cells dead. This spoils the quality of vegetables.

TEST 30

1. (a) Drainage is the removal of excess water to maintain a groundwater level suitable for your purpose.
   (b) i. Over-watering or over-irrigating
   ii. Excess rainfall
   iii. Canal seepage
   iv. Artesian groundwater condition (ground-water springs)
   v. Floods from rivers after overflowing

2. (a) Seed dormancy is a condition during which seeds which are supposed to germinate do not germinate because of a hard seed coat, physical factors or age of the seed.
   (b) i. To prevent the seed from germinating when the environmental conditions are not favourable.
   ii. It allows seeds to adapt to changes in the seasonal changes.
   iii. For adaptation to have correct factors for growth.
   (c) Mechanical scarification, e.g. using grinding stones to peel off the seed coat or scarify seeds by rubbing them between sheets of sand paper (coated with silicon carbide).

3. (a) i. Lumps or clots of blood in milk
   ii. Swollen teats
   iii. Hot teats and udder
   (b) i. Minute dark, reddish-brown specks on stems but later become elongated, sunken, dark brown lesions up to 12 mm in length.
   ii. Circular dark-brown spots appear on the pods of beans.

4. (a) In order to avoid natural seeding of the weeds.
   (b) To ensure that the uprooted weeds dry up so that they should not sprout.

5. (i) Parasitic weeds, e.g. witch weed that attach cereals can be controlled through planting non-cereal crops.
   (ii) Soil resources are well used by growing crops with different growing habits, e.g. deep rooted crops get nutrients from deep layers while shallow rooted crops get them from top layers.
   (iii) Pests are controlled, e.g. nematodes which develop under mono-cropping.
   (iv) Disease control through breaking the life cycles of disease organisms.
   (v) Soil fertility may be improved through use of legumes which fix nitrogen in the soil.

6. (a) They reduce yield quantity by competing against crop plants for factors of growth, i.e. moisture, nutrients.
   (b) It provides a cheap source of livestock feed.
   (c) It provides plant nutrients which are essential for plant growth and development.

7. (a) Soil structure is the arrangement of soil particles, in the soil while soil texture is the measure of coarseness and fineness of the soil particles or simply soil texture is the percent composition of sand, silt and clay particles in the soil.
   (b) i. Through sedimentation (floatation method).
   ii. Through sieving.
   iii. Through feeling with hands.

8 (a) A farmer who grows and raises animals mainly for consumption.
   (b) Land degradation is the decline in the value of land, leading to poor yields.
   (c) Food security is the ability of people to have enough food at all times.
   (d) Agroforestry is any farming system in which trees are deliberately integrated with crops and or animals on the same

unit of land in a complementally manner. Or the practice of growing trees together with crops on the same unit of land.

(e) Capital means live or dead stock plus money required for business activity.

9. (a) Labour is both physical and mental effort used to produce goods and services, for example, labour is the work done by mechanics, feed sale person, tractors, drivers, herdsman, etc, and not the farmers themselves.

Planning is a basic but complex management function combining financial, physical and technical aspects for selecting and developing the best of alternative ways of achieving stated objectives. The main objective of planning is to maximise profit within the limits of all the effective constraints.

(b) i. **Land:** The quality and quantity of land limits agriculture production since not all land is suitable for growing crops; good land results in high crop production.

ii. **Capital:** Lack of available capital items or cash to buy inputs may limit the choice or the size of an agriculture enterprise; with enough capital, the agricultural production will be very high.

iii. **Managerial ability (Management):** The technical know-how of the farmer limits agriculture production in terms of choice and combination of farm enterprises assuming that the other factors are not limiting; so good choice and combination of enterprises would result in high agriculture production.

(c) i. The size of each enterprise.

ii. A list of jobs to be done in each enterprise and the method to be used.

iii. The number of workers needed for each job.

iv. The rate of work for each job (usually in ha/day).

v. The times within which each job must be started and finished.

vi. The likely number of available days when work is possible within each time period, allowing for bad weather, public holidays, etc.

vii. The type of workers needed – regular or casual, male/female, etc.

(d) i. Availability of capital to purchase the machine.

ii. The size of the farm – it has to be big enough.

iii. Labour, i.e. where labour is scarce or expensive.

iv. Market demand to buy the produce after mechanise since more will now be produced.

(e) i. Family labour

ii. Communal labour

iii. Contract labour

iv. Casual or temporary labour

10. (a) i. They may lower prices to attract customers.

ii. Product modification, in order to specify quality in a product.

iii. They may change the price of a commodity depending on the prices charged by other competitors.

iv. Production cost may lead to lowering or increasing of prices of commodities.

(b) i. Producer who is actually the farmer herself

ii. Itinerant trader

iii Retailer

iv. Final consumer

(c) i. Avoid some marketing agencies.

ii. Selling through a cooperative.

iii. Increasing prices of farm produce.

iv. The farmer should do some of the marketing functions herself.

(d) i. Tastes and preferences

ii. Prices of related goods

iii. Population

iv. Future expectations

(e) i. Technology and management

ii. Factor prices
iii. Future expectation
iv. Weather

11. (a) i. Lack of improved farming technology where most farmers in Malawi lack new, better and scientific knowledge of growing crops and raising animals.
ii. Poor crop husbandry practices where all cultural practices are done at the wrong time and also wrongly done.
iii. Poor land husbandry practices where the farmers use the land wrongly, for example, growing arable crops on hilly areas.
iv. Poor land distribution where the land is not fairly distributed among the faming communities so that people who want to produce a lot of food are not provided with enough land for them to do so.
v. Lack of irrigation so that crops die during drought periods or are not grown during the dry season due to lack of moisture to sustain growth and development.

(b) i. Improve farming technology through using modern equipment, techniques and input, e.g. prepare the land using machinery.
ii. Make sure all crop husbandry practices such as weeding, fertiliser application and planting are done correctly and at the right time for high yields to be realised.
iii. Make sure that farmers use the land correctly to avoid poor land husbandry practices such as cultivating along the river banks, so that best crops are grown in the best areas while at the same time conserving the soil.
iv. Make sure the land is fairly distributed by policy makers to ensure that farmers who want to farm have enough land to do so and produce bumper yield for our country, Malawi.
v. Provide motorised, treadle pumps or use gravity to irrigate crops when water is not sufficient or is not available so that crops do not suffer from moisture stress but have enough moisture to make them grow and produce high yields.

12. (a) i. Using forage crops, which are pasture plants growing wild or cultivated whose vegetative parts are used for feeding animals during the dry season.
ii. Using silage, which is herbage or fodder cut usually before flowering and converted into a succulent feed through the process of fermentation.
iii. Using standing hay, which is dry, ungrazed herbage or fodder usually low in nutrient value, which is available for grazing in the dry season.
iv. Using hay, which is grass cut and dried within a short period of time so that some nutrients remain in the feed to be consumed by animals during the dry season.
v. Using straw, which is grass or grass with legumes cut, dried and stored. Straw is not nutritious but it is merely fed to animals during the period of food scarcity to maintain their live weight or it is simply a maintenance ration.

(b) i. Uncontrolled grazing leads to soil erosion due to the fact that grass is eaten as soon as it grows so there is no vegetation to protect the soil from soil erosion.

ii. The animals lose a lot of mass due to too much movement from one place to another in search of food and water.

iii. Animals can be easily attacked by pests and diseases because some of the places where the animals will graze are prone to pests and diseases.

iv. A lot of manure which the animals produce and would have been applied to crops, is lost due to animals' movements from one place to another.

v. In some conditions the feet (hoofs) of animals will create a hard soil layer (hard pan), which water cannot infiltrate. Such soil has poor soil structure and grass cannot grow well again.

AGRICULTURE ANSWERS

(*Practical Paper II*)

PRACTICAL 1

1. (a) **K** is *Bidens pilosa*, i.e. black jack.
   L is *Cynodon dactylon*, i.e. star grass or couch grass.
   V is called *Cypress distans*.
   W is *Oryza longistaminata*, i.e. *mpungadziwe*.
   (b) i. **K**
   ii. – Animal dispersal, e.g. desmodium.
   – Wind dispersal e.g. *Tridax procumbens*.
   – Explosive mechanisms.
   – Water dispersal.
   (c) i. Weeds are human food, e.g. *Amarathus hybridus*.
   ii. Weeds are feed and shelter for animals.
   iii. Weeds are source of drugs, for many weeds contain alkaloids and other chemicals that are effective medicine and are required for public health.
   iv. Weeds are used in agriculture to provide ground cover, which protect soil from erosion by rain and also add organic matter to the soil, leading to improved soil structure.
   (d) i. **Floating hydrophytes:** if they are in contact with water and air only, e.g. water lettuce.
   ii. **Emergent hydrophytes:** if they are in contact with substrate water, and air, e.g. white water lily.
   iii. **Submerged hydrophytes:** if they root in the substrate but do not emerge above the water e.g. water weed.
   (e) i. Black Jack – Broad-leaved
   ii. *Cypress distance* – Narrow-leaved
   iii. *Oryza longistaminata* – Narrow-leaved
   iv. *Cynodon dactylon* – Narrow-leaved

2. (a) **C** is CAN.
   U is urea.
   K is Triple Super Phosphate.
   D is farmyard manure.
   (b) i. Age of the animal producing the litter for manure.
   ii. Type of litter used to make manure.
   iii. Type of animal producing manure.
   iv. Age of farmyard manure.
   (c) i. Straight fertilisers are fertilisers that contain only one of the three (NPK) major plant elements while compound fertilisers are fertilisers that contain more than one of the major three elements (NPK).
   ii. High analysis fertilisers are those, which contain a total of 45% or more of nitrogen, phosphorus and potash combined while low analysis fertilisers are those that have less than 45% nitrogen, phosphorus and potash combined.
   iii. Complete fertilisers are compound fertilisers that contain all major plant nutrients.
   (d) i. Sulphate of Ammonia
   Urea
   ii. 23:21:0+4S
   Compound D
   iii. Sulphate of Ammonia
   23: 21:0+4S
   iv. Urea
   DAP
   v. Compound D
   Super D mixture

3. (a) i. $L = \frac{4 \times 100}{100} = \mathbf{4kg/ha}$

   $K = \frac{3.6 \times 100}{120} = \mathbf{3kg/ha}$

   ii. – It helps in selecting the more nutrious pasture.

– It assists the farmer in determining stocking rate for pasture.

(b) i. 1,000 seeds – 200 seeds = 800 seeds

$$= \frac{800 \times 100}{1{,}000}$$

$$= \mathbf{80\%}$$

ii. Plant population = seed rate x seed size x purity % x germination %.

$$= \frac{12.5 \text{ kg} \times 300{,}000 \text{ seeds} \times 30 \times 80}{\text{kg} \times 100 \times 100}$$

= 12.5 x 3000 seeds

= 125 x 300 seeds

= **37,500 plants/ha**

(c) Seed rate of grass pasture L.

$$\text{Seed rate} = \frac{\text{expected plant population}}{\text{ha} \times \text{seed size} \times \text{purity \%} \times \text{germination\%}}$$

$$= \frac{37{,}500 \times \text{seeds} \times \text{kg } 100 \times 100}{\text{ha} \times 300{,}000 \times 30 \times 100}$$

$$= \frac{12{,}500 \text{ kg}}{3{,}000}$$

$$= \frac{12.5 \text{ kg}}{3} = \mathbf{4.17 \text{ kg}}$$

4. (a) i. Foot and mouth

ii. Virus

(b) It has no treatment.

(c) i. K500 + K700 = K1,200.00

ii. – Washing hands with warm water before milking.

– Washing the udder with warm water before milking.

– Cleaning milking utensils with warm water before and after milking.

iii. – Goats

– Sheep

5. (a)

Sales and Receipts	Value (MK)	Purchases and Expenses	Value (MK)
Closing valuation	10,000.00	Opening valuation	8,500.00
Tobacco Sales	24,000.00	Depreciation	1,000.00
		Fertiliser application	7,000.00
		Casual Labour	2,000.00
		Profit	15,500.00
Total	34,000.00		34,000.00

(b) Profit/Loss = Total Income – Total cost

= K34,000.00 – K18,500.00

Profit = **K15,500.00**

(c) i. Farmer can use part of a cash flow to obtain loan from banks.

ii. It shows profitability of the farm.

iii. It assists the farmer in planning for the next production season.

(d) It enables the farmer to estimate the current values of fixed inputs on the farm within a production season.

6. (a) i. **A** is a crop.

ii. **B** is a gizzard (ventriculus).

iii. **C** is a vent.

(b) i. **A** (crop) stores food and softens it.

ii. **C** is where grit swallowed by the hen is held which, along with the muscular walls of the gizzard, helps to grind the food.

(c) Concentrates, which are feed with low fibre content, low moisture content, high protein and carbohydrate content.

(d) i. As offspring were all white, white (**W**) must be dominant to grey (**w**).

White chicken X grey chicken

WW ww

Parents → ww

Gametes	w	w
W	Ww	Ww
W	Ww	Ww
Offspring	All Ww (white)	

WW

ii. Cross of white heterozygous chicken with grey homozygous chicken.

White chicken X grey chicken

Ww ww

Parents → ww

Gametes	w	w
W	Ww	Ww
w	ww	ww
Offspring	Ww,Ww,ww,ww	

WW

Equal Ww (white) and ww (grey)

iii. Are characteristics that pass from carrier heterozygous females to half her sons and are commonly seen in males than in females.

iv. A sex-linked characteristic is found on the unpaired part of the **X** chromosome so:

White male must have **W** on its **X** chromosome; and grey female must be homozygous grey, because they are recessive.

White male X grey female
X^WY X^wX^w

Parents → ww

Gametes	X^W	X^W
X^W	X^wX^w	X^wX^w
Y	X^wY	X^wY
Offspring	See below	

X^WY

X^wY X^wY Grey males (only grey allele)

X^WX^w X^WX^w White females (white dominant)

v. A sex-linked characteristic is found on the unpaired part of the X chromosome so:

Pure white female X grey male
X^WX^W X^wY

Parents → X^wY

Gametes	X^w	Y
X^W	X^WX^w	X^WY
X^W	X^WX^w	X^WY
Offspring	$X^W X^w$, X^WX^w, X^WY, X^WY	

X^WX^W

X^W X^w, X^W X^w white females (white dominant)

X^W Y, X^W Y white males (white allele)

PRACTICAL 2

1. (a) i. **W** is witch weed.
T is called *Tridax procumbens.*
P is Pig weed.
H equals Water hyacinth.

ii. Witch weed

(b) i. Dodder (*Cuscuta species*)
ii. Mistletoe (*Tapinanthus bangwensis*)

(c) i. Finger millet
ii. Sorghum
iii. Maize

(d) i. Use trap crops, i.e. crops purposely grown to stimulate the germination of striaga weeds.
ii. Use herbicides such as MCPA and 2-4-D.

(e) i. Biological weed control
ii. Chemical weed control
iii. Mechanical weed control
iv. Cultural weed control

(f) i. Frequent cultivations can lead to destroying the soil structure.
ii. Cultivation promotes water loss through evaporation.
iii. Condition for germination of certain weed seeds previously buried deep down may be improved.
iv. In some situations extensive root damage may result, e.g. discoing in coffee is feared to cause root damage.

(g) i. Can be used in good time before any competition from the weeds sets in, i.e. pre-emergent treatment.
ii. Can be used more effectively than tillage operations in controlling weeds within the row.
iii. Chemical weed control is convenient where, due to the morphology of the crop, hand weeding may be disliked, e.g. in sugarcane.
iv. Chemical weed control reduces the amount of tillage, which may confer beneficial effects on soil structure.

2. (a) i. **P** is a cassava stem.
Q is a bean seed.
R is called Irish potato (or European potato).
S is the paw paw fruit.

(b) i. **Asexually propagated are:**
Cassava stem (P)
European potato (R)

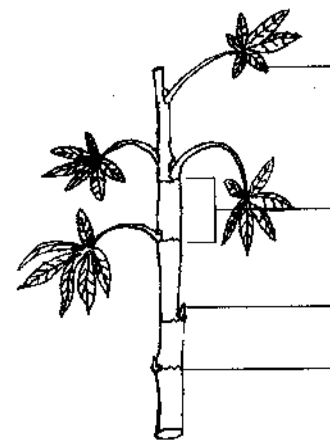
ii. **Sexually propagated are:**
Bean seed (**Q**)
Paw paw fruit (**S**)

(c) i. Yields are obtained easier and faster than seed propagated plants because vegetative propagation eliminates the problems of dormancy and reduces the juvenile period of plants.
ii. Seedless crops such as bananas can be produced easily through vegetative propagation.
iii. Cross-bred plants can be maintained in heterozygous condition indefinitely.
iv. Pollination agents, which can fail to perform successfully, are not required.
v. The hazards of fertilisation are avoided.
vi. The offspring are true to type because there is no mixture of hereditary characteristics.
vii. By budding and grafting it is easy to achieve all sorts of combination, e.g. different varieties of citrus, such as oranges and tangerines can be made to grow on a single stock.

(d) Should be pure to type.

(e) i. It is a sure method of crop improvement since cross-pollination results in variability.
ii. Self-pollination results in offspring, which help in production of pure lines for certain characters.
iii. It is a cheap method of propagation.
iv. Seed embryo remains more viable than buds when stored.
v. Seeds are more easily transported to different areas.
vi. Self-pollination gives rise to offspring, which are like the parents.

(f)



(g) Plant population =

$$\frac{\text{Area x seeds per planting station}}{\text{Ridge spacing x spacing between planting stations}}$$

$$= \frac{1 \text{ ha x 2 seeds}}{90 \text{ cm x } 15 \text{ cm}}$$

$$= \frac{10\,000 \text{ m}^2 \text{ x 2 seeds}}{0.9 \text{ m x } 0.15 \text{ m}}$$

= 148 148.148

= 148, 148 plants per hectare

3. (a) i. NSCM 41 has not been included in the block II.
ii. NSCM 41 appears more once in horizontal plot 1.
iii. Local maize appears twice in horizontal plot 2.
iv. MH16 appears twice under block II.
v.

	Block I	**Block II**	**Block II**
Plot 1	NSCM 41	MH 12	MH 16
Plot 2	Local maize	NSCM 41	MH 12
Plot 3	MH 16	Local maize	NSCM 41
Plot 4	MH 12	MH 16	Local maize

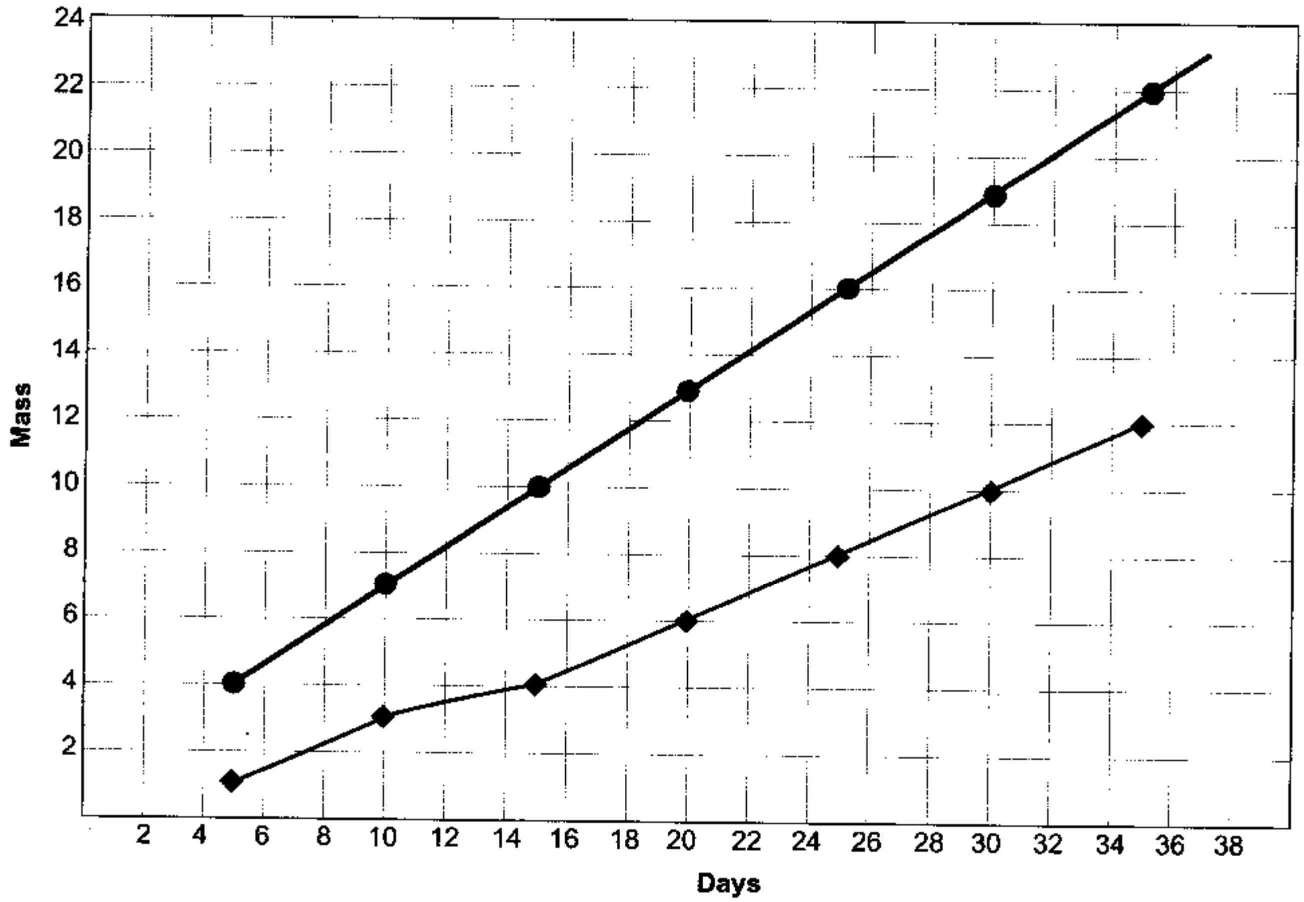
(b) i. Using replication in order to reduce environmental influence on the experiment

ii. Using a control to provide a basis against which findings from all other treatments are compared.

(c) i. Using direct observation as is the case with pest and disease attack.
ii. Measuring plant height in order to estimate growth rate of plants in different field plots.

(d) i. Using tabulated figures to plot curve graphs
ii. Calculating average yield from similar plots.

4. (a) Graph of mass against days:



(b) 21 kg – 11 kg = 10 kg

(c) i. It would produce more beef than breed A upon slaughter.
ii. It would reach slaughter weight faster than **A** due to its increased growth rate.

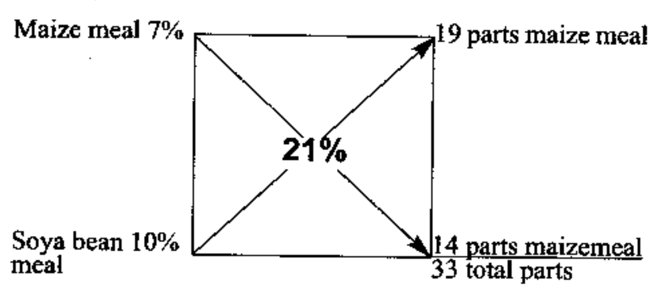
(d) Gross margin = Total Income – Total variables costs.

= K40,000 – (K10,000 + K5,000)

= K40,000 – K15,000

= K25,000.00

5. (a)



(a) A 900 kg ration for the layers would constitute:

$\frac{19 \times 900}{33} = \frac{5,700}{11} =$ **518.2 kg**

Soya bean meal $\frac{14 \times 900}{33} =$ **383.1 kg**

(b) i. The protein content in the required feed mixture for the animal should be known.
ii. Protein content for each of the feed stuffs to be mixed in the ration has to be known.
iii. Feed stuffs of known protein content to be used in formulating rations must be found locally.

(c) i. Provide proteins to layers for body building and growth.
ii. Provide protein for egg formation in layers.

(d) i. Vitamins
ii. Mineral salts

6. (a) i. **P** (type of bacteria) Denitrifying bacteria.
ii. **Q** (type of bacteria) Nitrogen-fixing bacteria in root nodules of leguminous plants.
iii. **R** (process) Death and decay.
iv. **S** (type of bacteria) Nitrifying bacteria (nitrosomonas).
v. **T** (nitrogen form) Nitrates.

(b) i. Hydrological (water) cycle
ii. Carbon cycle
iii. Oxygen cycle

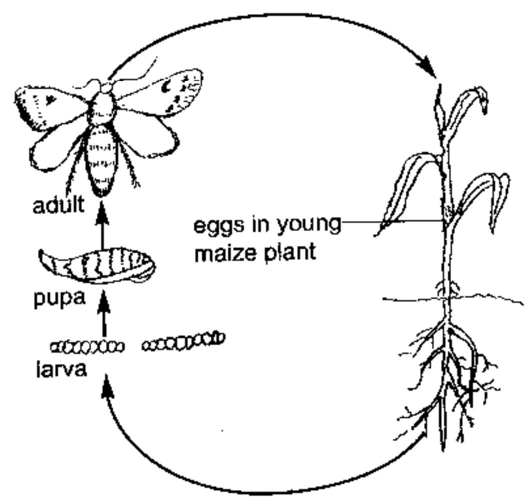
(c) i. NO_3^- and NH_4
ii. Ca^+
iii. K^+
iv. $H_2PO_4^-$ and HPO_4^{2-}
v. SO_4^{2-} and SO_2

PRACTICAL 3

1. (a) **S** is a stalk borer.
C is an aphid.
G is a grasshopper.
A is an armyworm.

(b) i. **Selective breeding:** Plants and animals can be cross-bred to improve their quality and yields. Selecting for higher-yielding strains can alter the genetic resistance levels of the crop attack by particular organisms and these may develop into new pests.
ii. **Natural occurrence:** Insect pests attack crops grown in certain areas suddenly.
iii. **Use of toxic chemicals:** Sometimes when a toxic chemical is used against a particular pest, the chemical is more effective on the parasites and predators, which naturally keep down the populations of other pests. The drastic reduction of the parasite and predator populations of the second insect causes it to increase in numbers and to achieve pest status.
iii. **Introduction of new crops or animals into an environment:** The introduced plants may become preferred food for a range of local insects, which will then develop into pests.

(c)



(d) i. **Biting and chewing:** In this category, the insects consume the parts of the plant with the aid of their biting and chewing mouth parts, e.g. grasshoppers and beetles.
ii. **Piercing and sucking:** Some insects belonging to the hemiptera and Thysanoptera, have mouth parts which are modified and adapted for piercing and sucking plant tissue; Siphunculata and some Diptera have

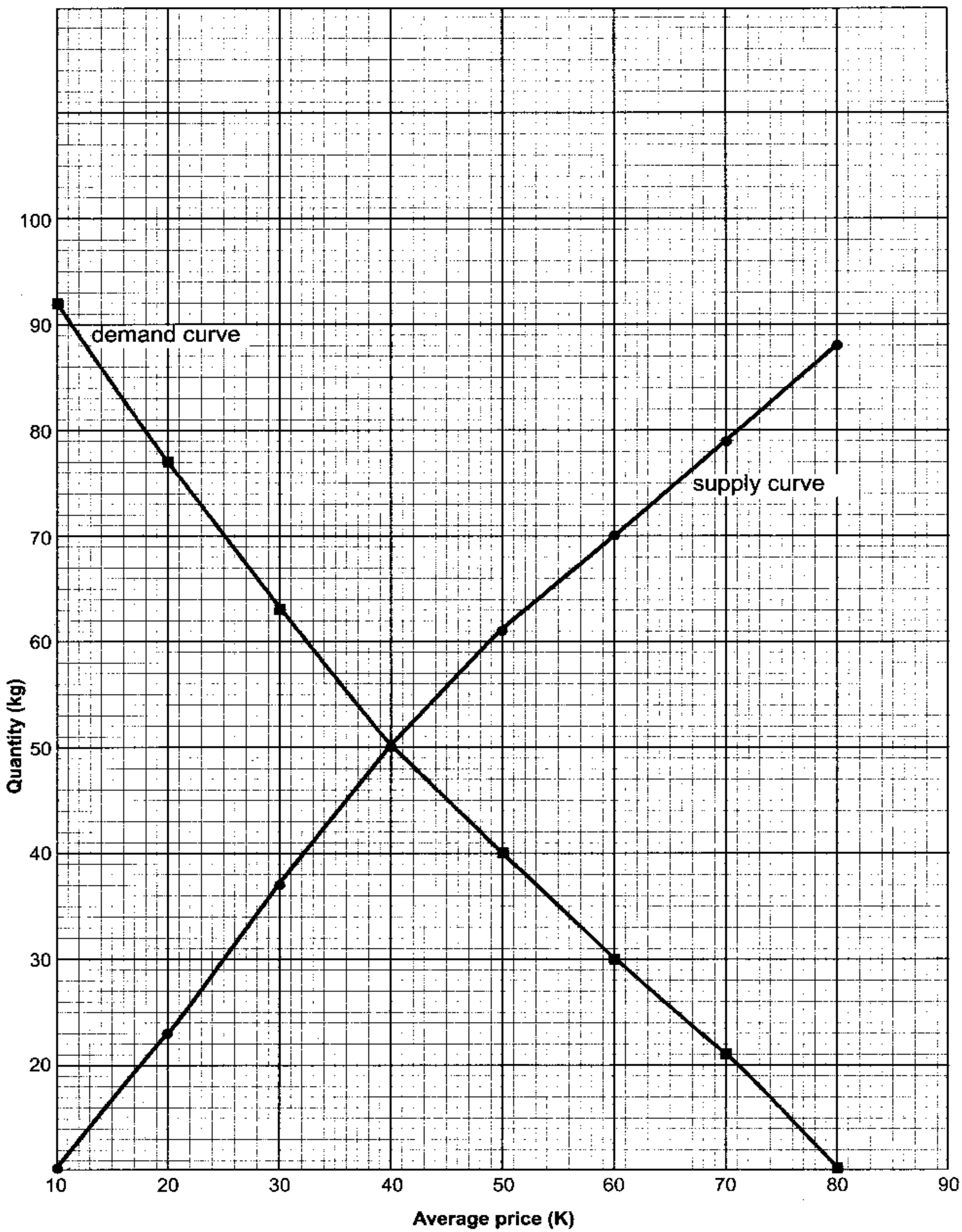
mouth parts for piercing and sucking animal tissue, e.g. Thrips and Tsetse fly.

ii. **Boring:** Some insect pests tunnel into the stems and fruits of crops and remain inside the tissue where they consume large quantities of the tissue.

2. (a) It is milk
   (b) i. Cheese
   ii. Butter
   iii. Water
   (c) i. cow
   ii. goat
   iii. horse
   (d) i. Provides protein for body building and growth
   ii. Provides carbohydrates for generation of energy in the body
   (e) i. Feeding the animal a lot of protein concentrates
   ii. Stall feed the animal to restrict movement and reduce energy loss.
   iii. Include pasture legume in the animal feed so as to increase the supply of protein.
   (f) i. Using conditioned reflex by taking the animal for milking under some environment each milking time.
   ii. Rubbing teats on animal's udder with a clean piece of cloth dipped in warm water.

3. (a) **A** is seminal vesicle.
   B is urethra.
   C is epidydemis.
   D is sperm duct.
   (b) **A** (seminal vesicle) produces sticky fluid called semen in which sperms are carried when being released out.
   B (urethra) allows the urine and sperms to pass out.
   C (epidydemis) where sperms are stored and get matured.
   D (sperm duct) carries sperms from the testicles to the seminal vesicles.

4. (a) Graph of quantity versus average price (See graph next page):


demand curve
supply curve
100
90
80
70
60
50
40
30
20
Quantity (kg)
10
20
30
40
50
60
70
80
90
Average price (K)

(b) 35 kg

(c) i. K40 per kg

ii. The farmer sells at a reasonable price without any excess supply of fish.

(d) i. It decreases from 50 kg to 40 kg.

ii. $\text{edp} = \dfrac{\%\text{ change in demand}}{\%\text{ change in price}}$

$$\%\text{ change in demand} = \frac{50\text{ kg} - 40\text{ kg} \times 100}{50\text{ kg}}$$

$$= \frac{10\text{ kg} \times 100}{50\text{ kg}} = 20$$

$$\%\text{ change in price} = \frac{K50 - K40 \times 100}{K40}$$

$$= \frac{K10 \times 100}{K40} = 25$$

$$\therefore \text{edp} = \frac{20}{25} = \mathbf{0.8}$$

iii. It is inelastic.

(e) i. Increasing the price of fish will reduce fish demand.

ii. Reducing the price of fish would increase fish demand.

iii. Increasing the price of fish beyond the market price results in excess supply of in the market.

5. (a) Profit/loss = Total income –Total cost

Income	**Cost**
40 x K2,500 = K100,100	12 x K2,500 = K30,000
Maize Stocks = K 4,000	6 x K5,500 = K33,000
	K36,000
	20 kg x K150 = K3,000
Total Income = K104,000	Total Cost = K102,000

∴ Profit = K104,000 – K102,000 = **K2,000**

(b) i. – Over-loading the ox-cart each time it is being used.

– Leaving the ox-cart at an open ground during rain season.

ii. Annual depreciation = (Initial cost – salvage value) x 10%

= (K25,000 – K6,500) x 10%

= **K1,850 per annum**

6. (a) **O** is igneous rock.

K is metamorphic rock.

Z is sedimentary rock.

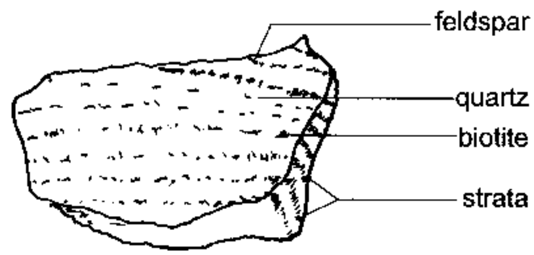
(b) i. Igneous rocks are rocks that have been formed inside the earth under great pressure and heat, e.g. granite and Basalt.

ii. Sedimentary rocks are rocks formed from sediments, which are particles of rocks that have been deposited usually in layers by wind, water or moving ice, e.g. chalk and coal.

iii. Metamorphic rocks are rocks formed from igneous or sedimentary rocks whose structures and appearance have been changed by great heat or great pressure or both, e.g. slate and gneiss.

(c)

(d)



(e) i. Biological weathering

ii. Chemical weathering

PRACTICAL 4

1. (a) i. **A** is the sand soil.

B is the clay soil.

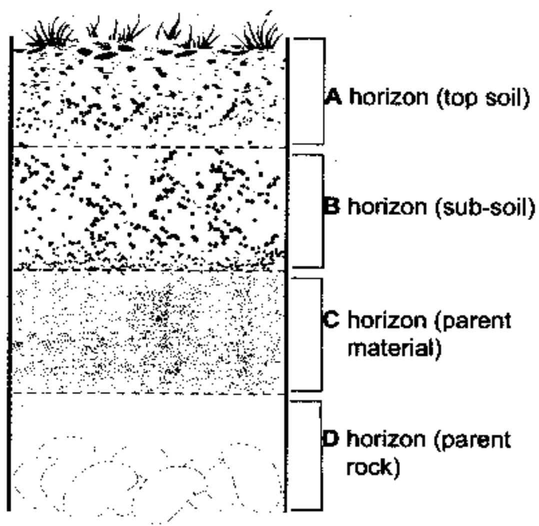
C is the loam soil.

(b) **C**, which is loam soil.

(c) i. **A** (sand soil) can be improved by adding organic matter to improve its structure.
ii. **C** (clay soil) can be improved by adding lime to improve its structure through flocculation.

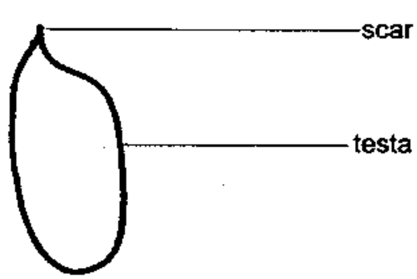
(d) i. Moderately fine-textured
ii. Moderately well-drained
iii. Moderately fertile
iv. Moderately to slightly acidic
v. They contain 30-50% sand, 50-70% silt and clay and 0.1-4% organic matter.

(e)

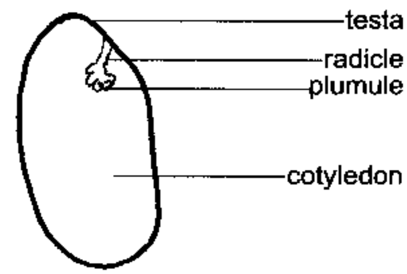


(f). i. Minerals
ii. Air and water
iii. Plant and animals
iv. Artificial fertilisers and manure
v. Chemicals used in crop protection

2. (a)



(b)



(c) i. Testa or seed coat is a protective covering for the embryo against mechanical injury and pathogens.
ii. Scar or hilum is a part on a seed, which remains after the seed has been separated from the pod.

(d) i. Plumule develops into a shoot.
ii. Radicle develops into a root.
iii. Cotyledon is a pair of seed leaves, which contain the food for the developing embryo.

(e) They are a source of protein for body maintenance.

(f) They are able to fix nitrogen in the soil for other crop use.

3. (a) It is Bola.

(b) i. Because it has the shortest calving interval which would increase the number of milking sessions.
ii. It produces a high average milk yield/day with minimum feed intake.

(c) i. It is a period from one parturition to the next (parturition).
ii. Reducing the number of days for milking the animal before the dry period.

(d) i. Cow becomes restless and isolates itself from the flock.
ii. A mucus discharge from the vulva.
iii. Udder becomes large.
iv. The pelvic ligaments relax.

(e) i. It enables the foetus to use much of the nutrients from feed for growth during the lsst days of gestation.

ii. The animal uses most food nutrients in formation of colostrums and milk in the udder.

4. (a) Mouldboard plough
   (b) **X** is a plough share.
   Y is depth wheel.
   Z is a beam.
   (c) **X** is the blade, which cuts furrow slice.
   Y is a wheel used to adjust the depth of ploughing and reduce resistance while ploughing.
   Z holds or supports other parts of the plough.
   (d) i It can be used for ploughing.
   ii. It can be used for weeding.
   iii. It can be used for making ridges.
   iv. It can be used for lifting groundnuts.
   (e) i. Through checking body parts and wheel for wear and obtain replacement parts if necessary.
   ii. Through storing the plough in safe, dry place because any wet condition will encourage rusting and fast wearing of the machine.
   (f) i. **Size of the land:** If the land is just too small then it will not be feasible to use the machine.
   ii. **Technical know-how:** There should be somebody who should know how to operate the implement otherwise owning it will be of no use.

5. (a)

Days in February	= 20 leap yr	Final mass	350 kg
Days in March	= 31	Starting mass	250 kg
Days in April	= 30	Mass gain =	100 kg
Days in May	= 31		
Days in June	= 10		
Total	= 122 days		

∴ Average mass gain per day = 100 kg/122 days
= **0.82 kg/day**

(b) Farmer's total income = 100 kg x K200.00
= **K20,000.00**

(c) Total amount of money spent on medication and labour = K15.00 x 122 days
= K1,830.00

∴ Net income = Total income – Total cost
= K20,000.00 – K1,830.00
= **K18,170.00**

(d) i. The animals gain mass fast.
ii. Easy to check parasites and diseases if they attack the animals so that they can be controlled.
(e) i. Feeding is expensive, for you have to buy or look for feeds.
ii. Labour involving in actual feeding and monitoring of the animal.
(f) Standard grade.

6. (a) **A** is Newcastle disease.
   J is coccidoisis (disease).
   K is fowl pox.
   (b) i. Birds have difficult in breathing eventually egg production may be lowered
   ii. Twisting of head and neck in birds will make the birds produce low meat.
   (c) i. Keeping chicken house and equipment clean to avoid the spread of disease.
   ii. Use drugs in their feeds like coccidiostats to treat the disease.
   (d) i. Internal parasite = tapeworm
   ii. External parasite = tampan
   (e) **K** is caused by virus.
   (f) i Treating sores with Iodine solution.
   ii. Vaccinating chickens at 3 weeks old with Lasota.

PRACTICAL 5

1. (a) It is Elephant grass, Napier grass or Star grass.
   (b) It is roughage.
   (c) i. It high in fibre content.
   ii. It supplies fewer nutrients per unit mass.
   (d) i. It increases total biomass in the feed which satisfy hunger in the animal.
   ii. It provides the much needed fibre which helps in peristalsis.

(e) i. Katambora grass
ii. Emalo love grass

2. (a) i. **T** is a termite.
B is a bean weevil.
G is a grasshopper.

ii. **T** (termite) is a biting and chewing insect pest.
B (bean weevil) is a boring insect pest.
G (grasshopper) is a biting and chewing insect pest.

(b) i. **Biting and chewing insect pest:**
- Can consume the whole vegetation, leading to plant death.
- Can completely eat up the leaves of plants thereby reducing area of photosynthesis.
- Some eat flowers and fruits thereby reducing yield.

ii. **Piercing and sucking insects:**
- Cause mechanical damage to the tissues they pierce, and together with the accompanying loss of plant sap or blood, growth and development of the host are seriously affected.
- In some cases, parts of the plants attacked may be distorted and rendered not fit for sale or human consumption.
- Insects such as thrips which pierce and suck cowpea flowers, cause flower abortion and this leads to fewer fruits being formed, resulting in considerable losses in yield.
- Piercing and sucking insect pests leave wounds, which are invaded by pathogenic organisms, fungi and bacteria that can cause diseases.
- They directly transmit various diseases e.g. cassava mosaic disease.

iii. **Boring insects:**
- Bored plants die quickly.
- Boring insects lower the quality of stored produce and thus lower the farmer's income.

(c) i. Nature of damage caused by the pests
ii. The pest population
iii. Crop yield
iv. Price of product
v. Availability of pest control inputs
vi. Cost/potential benefit ratio
vii. Quality of product
viii. Influence to ecosystem by the control method

(d) i. It can be repeated as often as possible.
ii. It is relatively easy method of control.
iii. The broad-spectrum action of many pesticides makes it act on a complex of pests with one or a combination of pesticides.
iv. It produces quick and easy results
v. It is cheap and individual farmers can take independent action on their own farms.

(e) i. The pesticides applied, rarely kills all the pests and the residual population which survives soon develops to cause economic damage.
ii. Pesticides can be toxic to beneficial insects especially parasites, predators and pollinators. They are potentially toxic to wildlife, fish and people.
iii. Chemical control is repetitive and must be applied whenever there is a pest outbreak; thus it is wasteful.
iv. Pests may develop resistance to a pesticide, which reduces the effectiveness of that pesticide on that pest.
v. Pesticides are expensive to manufacture and buy.

3. (a) Variable costs for maize
K500 + 2,400 = K2,900
Variable costs for G/nuts = K1,200
Variable costs for beans
K1,000 + K2,000 = K3,000

(b) i. Maize
K30 x 6,000 – (K2,900 + K500)

K180,000 – K3,400
Profit = K176,600

Groundnuts
K50 x 6,000 – (K1,200 + K500)
K30,000 – K1,700
Profit = K298,300

– It should be groundnuts since it has the highest profit.

(c) Profit from beans in comparison to that of groundnuts.
K40 x 6000 – (K3,000 + K500)
= K240,000 – K3,500 = K236,500

– The farmer has to be advised not to do the substitution since growing groundnuts is more profitable than growing beans.

(d) It assists farmer in calculating profit where it is used as a fixed cost.

(e) i. Costs for pesticides
ii. Cost for casual labour

4. (a) i. It is cow E.
ii. It is cow U.

(b) i. It is cow E because it relatively produces higher milk (4100g/day) from feed of 900 g/day.
ii. It has very small calving interval, which means can give birth to many calves if compared with other 4 cows.

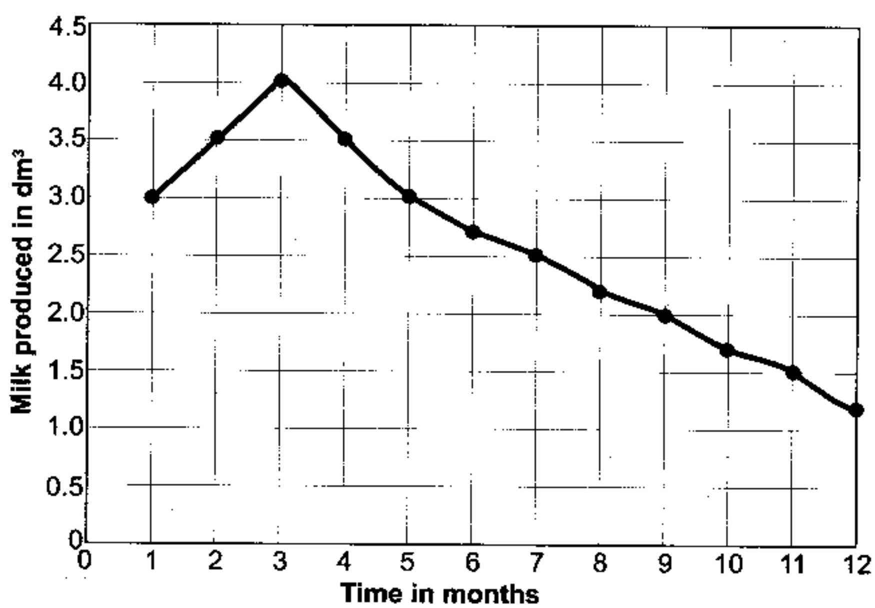
(c) i. **Breed of the animal:** Quality of milk vary with the breed of animal, e.g. Zebu produces very low milk per lactation and Friesian produces milk of high quality.
ii. **Age of the animal:** Young animals produce milk of higher quality than old animals of the same breed.

(d) i. This is the period when no milking is done and the cow is able to replace minerals and vitamins lost in the previous lactation.
ii. The cow is able to provide nutrients to the developing foetus so that it grows into a healthy calf.

(e) i. Cross-breed the animals to introduce the breeds which have a shorter calving interval.
ii. Check for the signs of animals that are on heat so that they can be mated through natural insemination or artificial insemination.

(f) i. Goats are excited.
ii. The vulva becomes red and thick.
iii. Mucus discharges from the vulva.
iv. The goat frequently wags the tail.

5. (a) Graph of milk against time:



(b) During the month number 3

(c) Challenge feed or lead feed

(d) i. British Saanen
   ii. British Alpine

(e) i. **Record of time of breeding:** The farmer would plan to breed to make the goats give birth during the months that the goats produce the highest amount of milk.
   ii. **Record of time of feeding:** The farmer would feed the goats with maintenance or challenge feed for the goats to produce a lot of good quality milk.

(f) i. Helps to know when to breed for best milk production: The farmer would know the best time to breed the goats so that most of them are milked when highest milk is produced.
   ii. Helps her know when she can have a lot of money from milk sales and plan to buy other necessary things like feed and medication for her animals.

(g) Maintenance ration is the amount of food needed to prevent increase or decrease in live mass of an animal while production ration is any food which has been formulated to supply the correct quantities of nutrients needed to produce certain animal product.

6. (a) Soil profile is the vertical section through the soil showing its horizontal layers (called horizons) including bed rock.

(b) **V** is the Superficial layer/ Vegetation humus.
T is a top soil/ A Horizon/ A Zone.
S is a sub-soil/ B Horizon/ B Zone.
K is partly weathered parent material/ C Horizon/ C Zone.
P is the underlying rock/ D Horizon/ D Zone.

(c) It is layer B (sub soil) because it is where nutrients leached in top or superficial layer accumulate.

(d) i. Well-aerated.
   ii. Contains a lot of nutrients since it is where organic matter accumulates.
   iii. Contains a lot of microorganisms.
   iv. More subjected to erosion.

(e) i. Improves soil fertility.
   ii. Supplies energy for soil microorganisms.
   iii. Improves water holding capacity of the soil.

(f) i. Plants (higher or lower) absorb rock minerals, thereby weakening the rock, which will eventually breakdown into smaller particles.
   ii. The roots of plants which grow on the rocks or under rocks gradually grow bigger. As they grow bigger they press more and more into the rock, splitting it apart which eventually break, it down into smaller pieces.

(g) i. Pore space contains water which the crops can use for their growth.
   ii. Pore space contains air which is needed for root respiration of crops.

PRACTICAL 6

1. (a) **X** is the exotic breed.
Y is the indigenous breed.

(b) Breed **Y**, which is a local cattle breed.

(c) i. They have small bodies which means they can survive easily on local conditions of less feed.
   ii. They have small udders to be filled with small amount of milk, which can be produced from little feed that is obtained under local conditions.

(d) Breed **X** is good for dairying.

(e) i. A thin flesh which carries little flesh but more milk from the big udder.
   ii. Wide and well set hind legs to provide a room for the udder for milk to be placed.

(f) i. They are adapted to low ambient temperatures (28-33 °C).
   ii. They are humpless.
   iii. They have small or no dewlaps.
   iv. They have broad and short faces.

2\. (a) i. **G** is the grass pasture.
L is the legume pasture.
F is crushed fish or maize meal.
S is the common salt or NaC*l* (sodium chloride).
M is *mgaiwa* or maize meal.

(b) The most suitable is the legume pasture.

(c) The legume pasture is very nutritious, for it contains a lot of nutrients such as proteins and animals will only graze on plants.

(d) The maturity of **G** (grass pasture) would result in it having a lot of fibre therefore lowering its digestibility.

(e) Conserve in the form of silage.

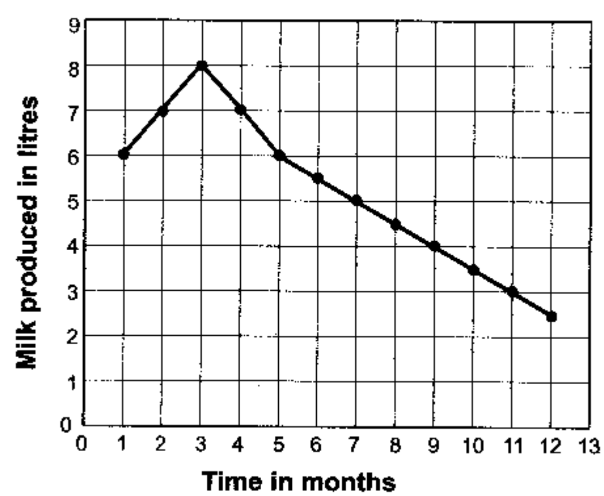
(f) i. Prevents germination of seeds.
ii. Retains maximum quality in the grain or forage by preventing deterioration.
iii. Reduces moisture content in order to prevent microbial infestation and insect attack.

(g) i. Lower grain temperature.
ii. Equalise temperature through the bulk of produce.
iii. Remove unpleasant odours or fumigants.
iv. Reduce moisture content slightly in the storage.

(h) i. **S** (NaC*l*) is beneficial in counteracting cannibalism and feather picking.
S (NaC*l*) improves the growth of layers.
S improves egg production in layers.
S improves appetite of layers for them to eat a lot of food and be healthy.
ii. Fish meal or crushed fish provides calcium, phosphorus, protein and calciferol for strong egg shells.
Fish meal or crushed fish provides appetite for layers to eat more and lay more eggs.
iii. Green vegetables provide calcium to avoid rickets.
Green vegetables contain calcium to avoid rubbery beaks of layers.
They contain calcium for avoiding soft egg shells and drop in egg production.

(i) i. They would have weak bones and egg formation since **M** mainly provides energy (carbohydrate) and no calcium. *Mgaiwa* contains mainly carbohydrates, fats, vitamins and proteins, i.e. an energy concentrate.
ii. Provide the chickens with protein concentrate to give amino acids for growth, e.g. legume grains and their by-products, meat meal, fish meal, minerals and vitamins.
iii. The ration should comprise one part beans (or bean flour meal), one part deya (maize bran) and one part maize (maize meal) and this can be fed to layers as a maintenance ration.
iv. Calcium, phosphorus, potassium, sodium, chloride, magnesium and sulphur.
v. Fe, I, Zn, Cu, Mn, Co and Mo
vi. Vitamins, e.g. Oxy-vit
Minerals, e.g. Mineral licks
Antibiotics, e.g. Penicillin and Oxytetracycline
Hormones, e.g. estrogenic hormones

3\. (a) Graph of milk produced against time:



(b) During the month number 3.

(c) i. Starting from seventh month.

ii. To allow it to bear a large-sized offspring.

(d) It is called production ration.

(e) i. It enables the farmer to estimate feed requirements for animal at different stages in the milking cycle.

ii. It enables the farmer to predict quantities of milk to be collected in each month.

(f) i. Livestock breeding record which takes into account records of offspring born from each animal.

ii. Livestock feeding record which takes into account amount of feed given to each animal per day or month.

4. (a) i. Graded bunds

ii. Contour bunds

iii. Contour ridges

(b) i. Dambo, River line, watercourse (Class V)
Used for grazing livestock.
Grown to special arable crops like rice, sugarcane and vegetables.

ii. Arable land (Classes I-IV)
Used for growing arable crops.
Can be used for animal grazing.

iii. Grazing and plantation land (Classes VI-VII)
Used for animal grazing.
Used for growing plantation crops, e.g. bananas.

iv. Natural bush or Forest (Class VIII)
The land can be planted with forest or left for natural bush.
The land can be left for wild life.

(c) Growing plantation crops such as tea, bananas and coffee.

(d) i. Degree of past erosion

ii. Soil permeability

iii. Soil temperature

iv. Slope of the land

v. Surface hindrance, e.g. rocks and stones

vi. Wetness of the soil

5. **Solution**

(a) Total available moisture capacity in the root zone, i.e. readily available water (RAW) = Water holding capacity available x depth of root zone

= 150 mm/m x 900 mm

= 135 mm

$\therefore$ effective application depth $= \frac{135 \text{ mm} \times 55}{100}$

= 74.25 mm

(b) Depth of water pumped per irrigation

$= \frac{\text{Net application depth}}{\text{Irrigation efficiency}}$

= 74.25 mm/0.7

= 106 mm

(c) Irrigation interval = Effective (net) depth/peak use rate

= 74.25 mm x days/8 mm

= 9.3 days

(d) Required number of hectares to be irrigated per day

$= \frac{\text{Area to be irrigated}}{\text{Irrigation interval}}$

= 35 ha/9.3 days

= 3.8 ha/day

NB : The system must have sufficient capacity to deliver 106 mm of water to about 3.8 ha per day. This is a guide in selecting irrigation equipment.

6. (a) i. To find out if soil contains water and organic matter or humus (This method is by ignition).

ii. To burn the humus which will be lost as gases.

iii. $\% \text{ of humus} = \frac{(\text{Dry mass} - \text{final mass}) \times 100}{\text{Dry mass of soil}}$

$= \frac{(20 \text{ g} - 19 \text{ g}) \times 100}{20 \text{ g}}$

$$= \frac{1 \text{ g} \times 100}{20 \text{ g}}$$

$= \mathbf{5\%}$

iv. % of water in the soil:

$$= \frac{(\text{Original mass} - \text{dry mass}) \times 100}{\text{Original mass of soil}}$$

$$= \frac{(30 \text{ g} - 20 \text{ g}) \times 100}{30 \text{ g}}$$

$$= \frac{10 \text{ g} \times 100}{30 \text{ g}}$$

$= \mathbf{33.33\%}$

(b) i. Mass of water = original mass – dry mass of soil

$= 30 \text{ g} - 20 \text{ g}$

$= \mathbf{10 \text{ g}}$

ii. % by mass of water:

$$= \frac{(\text{Original mass} - \text{dry mass}) \times 100}{\text{original mass of soil}}$$

$$= \frac{(30 \text{ g} - 20 \text{ g}) \times 10}{30 \text{ g}}$$

$$= \frac{10 \text{ g} \times 100}{30 \text{ g}}$$

$= \mathbf{33.33\%}$

iii. Hygroscopicity
Surface tension
Capillarity
Gravity

(c) % by volume of air in the soil

$$= \frac{(\text{Combined volume} - \text{final volume}) \times 100}{\text{Volume of soil}}$$

$$= \frac{(100 \text{ cm}^3 - 90 \text{ cm}^3) \times 100}{50 \text{ cm}^3}$$

$$= \frac{10 \text{ cm}^3 \times 100}{50 \text{ cm}^3}$$

$= \mathbf{20\%}$

PRACTICAL 7

1. (a) i. The potted plants in **W** are growing healthy and strong while those in **X** are wilting.
   ii. The potted plants in **W** are tall while those in **X** are short.

(b) The state of the soil where plants **X** are growing affected the plant growth because it loses water quickly since its soil particles have large spaces between them.

(c) i. The water would infiltrate and percolate in the soil.
   ii. The water would be taken from the soil by the roots through xylem up to the leaf.

(d) i. The soil in pot **X**, which is sand can be improved by adding humus so that its soil structure is improved and be able to start holding a lot of water for the plants.

(e) It is loam soil where crops can grow well.

(f) Land is the solid part of the earth's surface (components associated with it include air, soil, rocks, buildings, etc.) while soil is a mixture of weathered rock particles, organic matter, water and air.

(g) Land degradation is the loss in value or quality of land while soil degradation is the loss in value or quality of soil.

(h) i. Overgrazing
   ii. Uncontrolled bush fires
   iii. Deforestation
   iv. Wanton cutting down of trees
   v. Cultivating along stream and river banks

(i) i. Making use of heavy machinery in the fields
   ii. Cultivating along streams and river banks
   iii. Practising continuous cropping
   iv. Cultivating of too dry or too wet soil
   v. Making ridges along the slope

(j) i. Loss of land for grazing.
   ii. Water resources are polluted.
   iii. Loose top fertile soil is lost.
   iv. Silting of water reservoirs.
   v. Flooding cases increase.

(k) i. Practising crop rotation
   ii. Controlling bush fires

iii. Agroforestry should be practised.
iv. Afforestation should be practised.

(l) i. Caring for the forests
ii. Planting more trees
iii. Avoid careless cutting down of trees.
iv. Controlling bush fires

2. (a)

(b) i. They eat the stem of the maize stalk, thereby interfering with water and food movements.
ii. They eat the grains of maize, thereby directly lowering the yield of maize.

(c) i. Practise crop rotation.
ii. Feed the maize stalks to the livestock so that they are killed as the animals eat the maize stalks.
iii. Practise closed season.

(d) i. Sorghum
ii. Sugarcane
iii. Wild grass

(e) i. Weevils
ii. Moths
iii. Beetles
iv. Rodents, e.g. rats

3. (a) **A** is fowl pox disease.
B is new castle disease.
C is coccidiosis disease.

(b) **D** is a tapeworm.
E is tampan.
F is a louse.

(c) **A**, fowl pox signs:
i. Vesicles (tiny wounds) on wattle, comb and wing web
ii. Ulcers in the mouth

C, Coccidiosis signs:
i. Diarrhoea, dysentery and emaciation
ii. Rough feathers, dullness and drooping wings

(d) **A** is caused by virus.
B is caused by virus.
C is caused by protozoa.

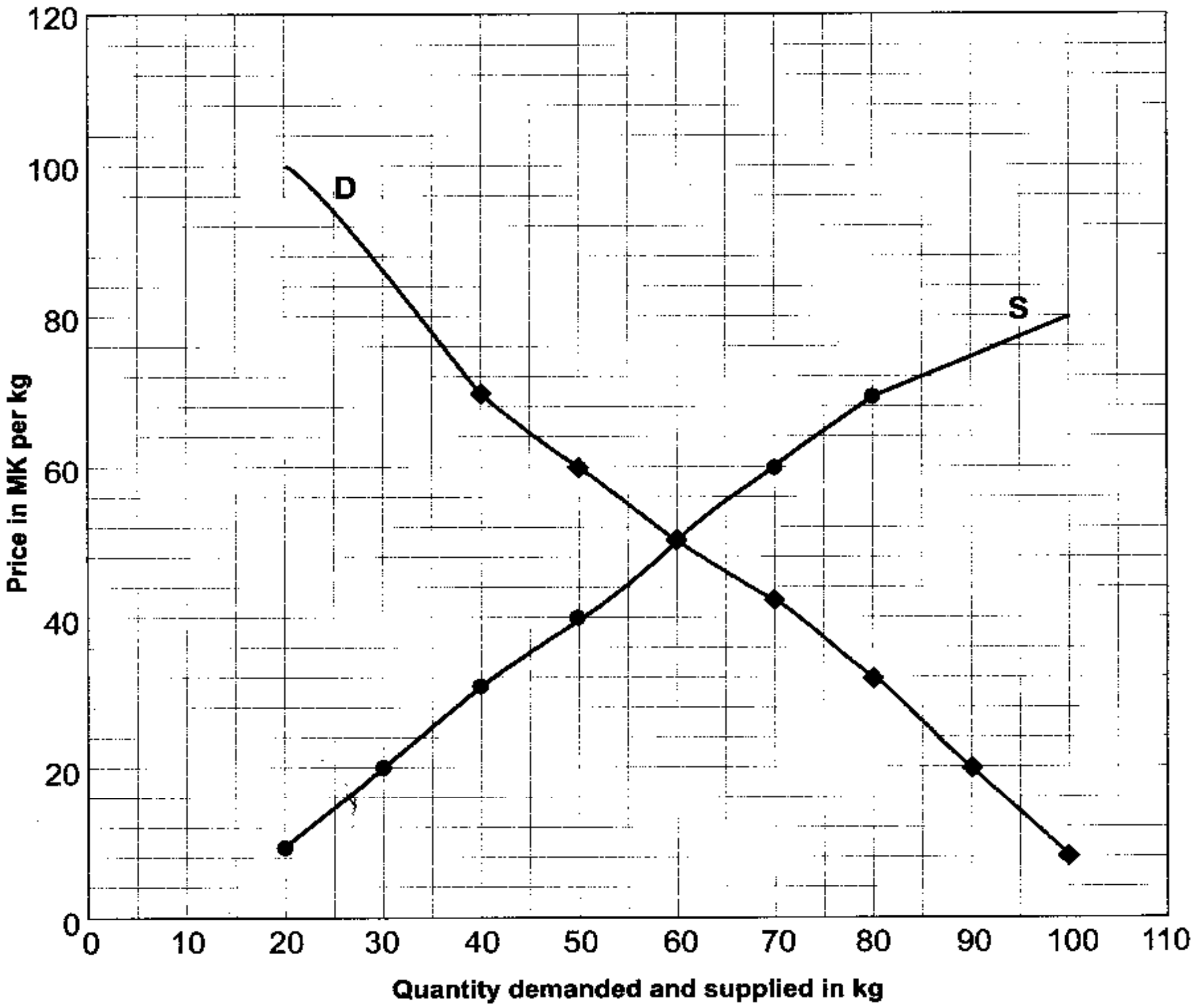
(e) **Control of fowl pox (A):**
i. Kill all affected birds.
ii. Treating sores with Iodine solution.

Control of Newcastle (B):
i. Kill, burn and bury all infected chicks.
ii. Birds should be vaccinated at 3 weeks old.

Control of Coccidiosis (C):
i. Equipment and houses should be kept clean and dry.
ii. Provide chicks with Amprol in water or feed.

(f) i. Overcrowding should be avoided to reduce the incidence of contact.
iii. The parasite can be controlled by using insecticides.

4. (a) See graph of price against quantity demanded and supplied (next page):



(b) 45 kg is supplied.

(c) It is K50.00.

(d) It is a price at which all goods sent to the market are sold and both sellers and buyers are satisfied.

(e) The quantity supplied increases from 30 kg to 60 kg of maize.

(f) Price Elasticity of Supply (ESP) = % Δ in Q supplied/ % Δ in price of commodity

% Δ in Q supplied =

$$\frac{(\text{Original Q supplied} - \text{new Q supplied}) \times 100}{\text{Original quantity supplied}}$$

$$= \frac{(30 - 60) \times 100}{30}$$

$$= \frac{30 \times 100}{30}$$

= 100%

% Δ in price of commodity =

$$= \frac{(\text{Original price} - \text{new price}) \times 100}{\text{Original price}}$$

$$= \frac{(K20.00 - K50.00) \times 100}{K20.00}$$

$$= \frac{K30.00 \times 100}{K20.00}$$

= 15%

Price Elasticity of Supply (ESP) = 100%/ 150%

= 0.6666

= 0.67

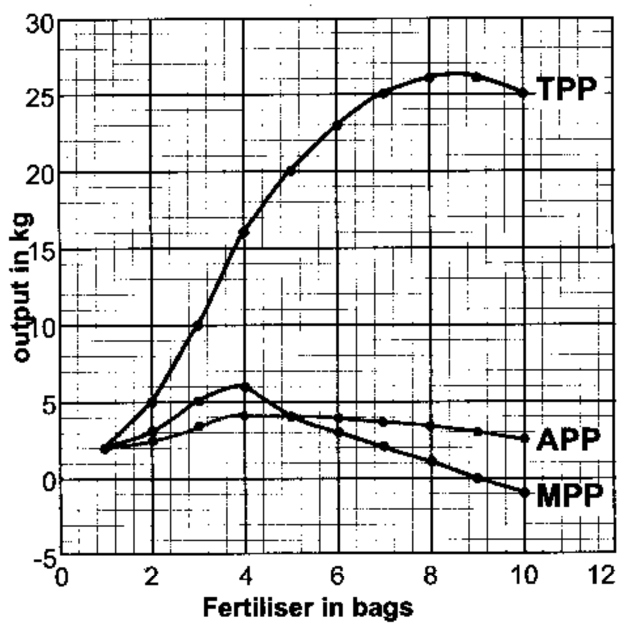
(g) Since the answer is less than one, the price elasticity of supply is inelastic or it can be said that there is relatively small change in supply as compared to change in price.

(h) i. If the price goes up the demand will be low and eventually the supply will low following a fall in demand.

ii. Putting the price at equilibrium point will lead to the same quantity of maize supplied to be equal to that which is demanded.

iii. When the price falls, the demand will increase and eventually leads to an increase in the quantity supplied.

5. (a) Graph of fertiliser against output:



(b) i. The point where marginal physical product and average physical product are equal and it is also where Zone II starts.

ii. The point where marginal physical product is maximum and total physical product stops increasing at an increasing rate and starts increasing at a decreasing rate.

(c) 5 bags of fertiliser.

(d) It is good to produce it in stage or zone II because the resource fertiliser is fully utilised since it is the zone where maximum profits would be achieved from the output.

(e) It is 4.

(f) It is 26 kg of rice.

(g) The maximum output produced is 26 kg of rice.

(h) From the graph it can be seen that 5 bags of fertiliser would produce the input that would produce the maximum profit.

Cost of input = K400.00 x 5 bags

= **K1,000.00**

(i) Total revenue = Yield x price per unit yield

= 20 kg x K100.00 /kg

= **K2,000.00**

(j) i. It is 20 kg of rice.

ii. He should produce within stage II for the resources are neither underutilised nor overutilised.

iii. Output is 20 kg of rice and input is 5 bags of fertiliser.

(k) i. Total physical product is the total yield obtained after utilising a particular quantity of resource.

ii. Marginal physical product of a resource is the change in total product resulting from one unit change in the quantity of that resource used per unit time.

iii. The average physical product is the average product per unit area of resource used and can be determined by dividing total output at that level by the total number of units of that input.

6. (a) A seed rate is the mass or amount of seeds required per hectare, usually expressed in kg/ha.

(b) **Solution**

$$\text{Seed rate} = \frac{\text{Expected plant population per ha}}{\text{Seed size x Purity \% x Germination \%}}$$

$$= \frac{900{,}000 \text{ seeds x } 1 \text{ kg x } 100 \text{ x } 100}{1 \text{ ha x } 200{,}000 \text{ x } 70 \text{ x } 50}$$

= 12.857 kg/ha

= **12.9 kg /ha**

(c) i. Should be viable.

ii. Should be whole, large and plump.

iii. Should be disease and weed-free.

iv. Should be pure to type.

v. Should be of high yielding variety.

(d) i. Growth habit of a particular species of pasture
ii. Method of sowing the pasture species
iii. Seed size of the pasture species
iv. Purity of pasture seeds of the pasture species
v. Germinate percentage of the pasture species

PRACTICAL 8

1. (a) **G** is green manure.
P is DAP.
A is Sulphate of Ammonia.
K is Muriate of Potash.

(b) i. Age of the animal producing the litter for manure.
ii. Method of storage of manure.
iii. Type of litter used to make manure.
iv. Type of feed given to animals producing litter.

(c) i. Improves soil drainage and aeration.
ii. Are cheap, for they can easily be made.
iii. Provides good amounts of micro-nutrients.
iv. Improves sòil structure through the incorporation of humus.

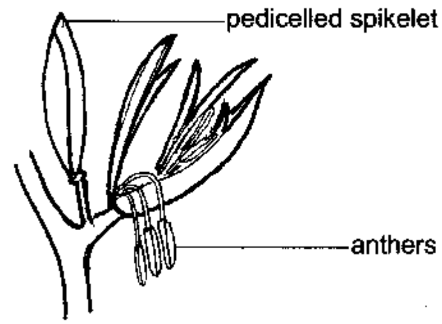
(d) i. The nutrient does not take time to be used by plants.
ii. Can contain many plant nutrients.
iii. Nutrients easily dissolve in soil water.
iv. Relatively require less labour than organic fertilisers during application.

(e) i. Sulphate of Ammonia.
ii. Muriate of Potash.

(f) It is DAP.

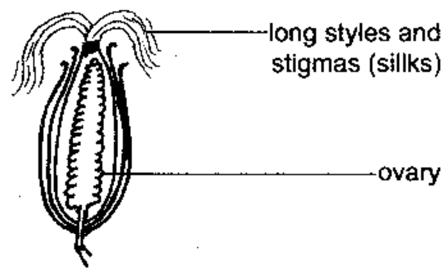
2. (a) i. **Male maize flower (tassel):** Male flowers appear first at the head of the maize plant and produce masses of pollen, which is blown in the atmosphere by wind.

(b) i.



ii. The pedicelled spikelet protects the anthers.
Anthers contain the pollen grains, which are the male part of the flower.

iii. **Figure E** female maize flower.



(c) i. Produces a lot of pollen grains which can be easily blown by wind.
ii. The anthers hang out of mature male floret so that they can easily release pollen grain into the wind.
iii. No nectar produced as no need to attract insects to the flower.
iv. No scented as the flowers do not attract insect with their scents.
v. Petals are absent.

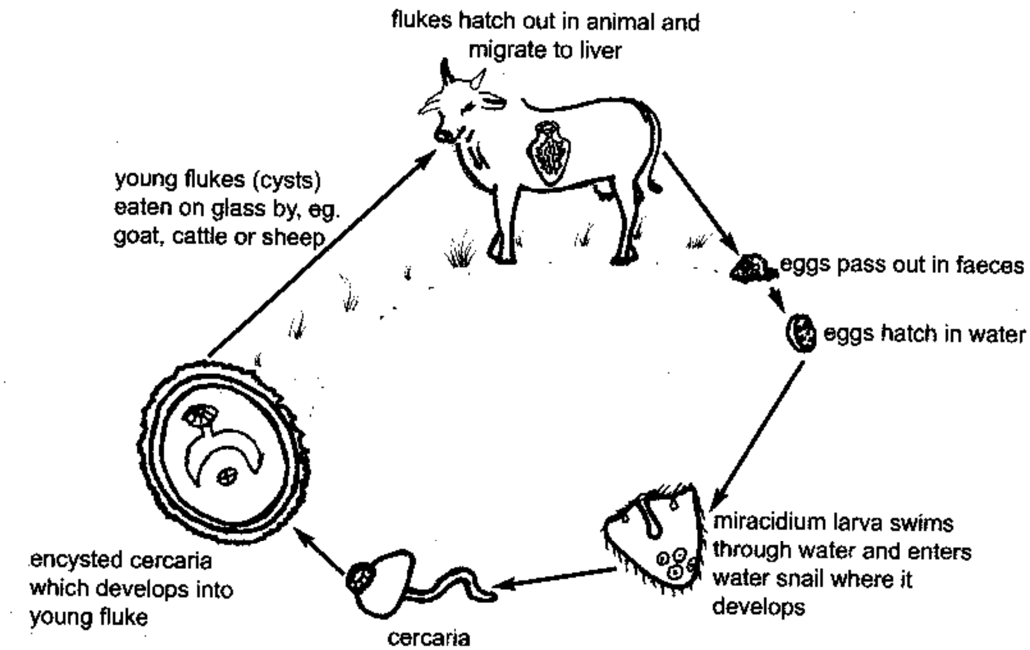
(d) i. Rice
ii. Sorghum
iii. Wheat
iv. Millet

(e) i. Beans
ii. Soya beans
iii. Pigeon peas
iv. Groundnuts

(f) i. Maize rust
ii. Smut

ii. Northern leaf blight
iii. Maize streak virus
iv. Cob rot

3. (a) Adult liver fluke
(b) i. The animal becomes anaemic and weak.
ii. The jaw of the animal swells.
(c)



(d) i. Avoid grazing animals (cattle, goat, sheep, etc) in dambo areas in wet season.
ii. Kill the snails with copper sulphate.
iii. Use BIS 356 containing hexachlorophene to kill flukes in the bile ducts.
iv. Practise rotational grazing.
v. Drain swampy areas or burn affected swampy areas during the dry season to kill mud snails.

(e) i. Since the parasite suck blood from the animals, the animals become weak and anaemic and cannot work in case of drought animals.
ii. Since the parasite stays in the liver, it affects the quality of meat and other products. The liver does a lot of important functions for the body.

(f) i. Cattle
iii. Sheep
iv. Goat

4. (a) To find out the fertiliser application rate that would give the highest maize yield.
(b) i. Replication means the repetition of an experiment in a different place or block.
ii. A fair test is an experiment in which all but one variable is controlled.
iii. An experiment is an activity carried out to test or show a fact or investigate something.
(c) i. Plot 1
ii. Control treatment acts as basis for comparison between the treatments.
(d) i. It is 100 kg/ha of 23:21:0+4S applied with 200 kg/ha of CAN.

ii. Because the yield where 100 kg/ha of 23:21:0+4S applied with 200 kg/ha of CAN has produced yield of 90 kg, which is the highest on the table so far.

(e) The yield in Plot 6 (100 m^2) = 10 kg
If 100 m^2 = 10 kg of maize

$$\therefore 10\,000 \text{ m}^2 = \frac{10\,000 \text{ m}^2 \times 10 \text{ kg}}{100 \text{ m}^2}$$

$$= \mathbf{1{,}000 \text{ kg/ha}}$$

(f) The soil naturally has some nutrients, which the crop in plot 1 might have used to produce some yield of 5 kg.

(g) i. **Leaf sample analysis:** Analysing the leaf to know the nutrients contained or deficient in the soil.
Soil sample analysis: Analysing the soil to know the nutrient it contains or is shortfall of.

ii. Analysing the soil before applying fertilisers helps to apply fertilisers to the fields at the recommended rates for the best crop results, i.e. not too much and not too little.

5. (a) % of water $= \frac{10 \text{ g} \times 100}{30 \text{ g}}$

$$= \mathbf{33.33\%}$$

(b) % of humus or organic matter:

$$= \frac{\text{mass of humus} \times 100}{\text{Mass of soil after first heating}}$$

$$= \frac{1 \text{ g} \times 100}{20 \text{ g}}$$

$$= \mathbf{5\%}$$

(c) % Volume of air:

$$= \frac{\text{Combined volume if no air-final volume}}{\text{Volume of air used}}$$

$$= \frac{(100 \text{ cm}^3 - 90 \text{ cm}^3) \times 100}{50 \text{ cm}^3}$$

$$= \frac{10 \text{ cm}^3 \times 100}{50 \text{ cm}^3}$$

$$= \mathbf{20\%}$$

(d) i. **Hygroscopic water is the water** which is absorbed on the surfaces of soil particles from atmospheric water vapour.

ii. **Surface tension is the force** which exists as a combination of cohesive force between water molecules, and adhesive force between water molecules and sand particles. It also enables water to rise up through narrow pores.

iii. **Capillary water is the water** which rises above water table in the soil and is held in the fine and medium pores of soil particles by surface tension.

iv. **Gravitational water is the water** which can drain from the soil under the influence of gravity.

(e) i. Capillary water
ii. Gravitational water

(f) i. Some water is held in the form of a film on the surface of soil particles. This film of water (hygroscopic water) adheres strongly and is not available for plant use.

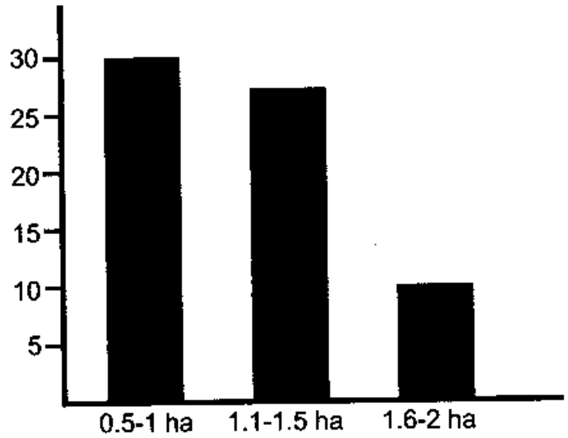
ii. Some soil water penetrates (is imbibed) into clay crystals. This water is also held strongly and so not available for plant use.

iii. Some water drains away beyond the reach of plant roots.

(g) i. It means that a soil sample is heated and weighed and this process is repeated until the mass is constant.

ii. Air-dried soil is the soil that has been dried by exposure to air, in contrast with that which may have been dried in an oven or over a Bunsen burner flame.

6. (a) A bar graph of land holding from 0.5 ha to 2 ha:



(b) 11/100 x 300 = 33 smallholder farmers.

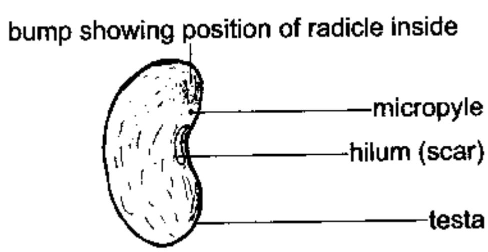
(c) i. The farming family will be food insecure due to inadequate food supply.
ii. There will be no supply for sale and export from farming.

(d) i. Through seed multiplication.
ii. Sparing part of land for Food crop production.

(e) i. It is customary land tenure.
ii. It is allocated to the farmer by the traditional leader (village headman).

PRACTICAL 9

1. (a) i. **S** is a bean seed.
ii.



(b) See diagram for answer.

(c) The micropyle is a small hole near hilum, which is where the pollen tube entered the ovule.
i. It is a place where most of the water is absorbed before germination.
ii. A tiny hole which allows air to pass through for respiration of the embryo.

(d) Germination is the process by which seeds begin to develop into new plants.

(e) i. Viable seed
ii. Water/moisture
iii. Oxygen/air
iv. Suitable temperature

(f) i. **Hypogeal germination:** where the cotyledons remain below ground throughout the stages of germination, e.g. in maize.
ii. **Epigeal germination:** in which the cotyledons are lifted above the ground and act as the first leaves of the newly emerged plant, e.g. in groundnut.

(g) i. When the conditions in the soil are favourable for germination, water enters the seed through the micropyle and causes the seed to swell (imbibition).
ii. The testa then split, open revealing the cotyledons or endosperm.
iii. Soon the radicle begins to grow and emerges from the testa. The radicle grows out from the seed and then turns downwards as the first root.
iv. Next, the plumule develops and begins to grow upwards to become the shoot.
v. The energy needed for germination comes from the food stored in the seed. The main carbohydrate is starch, which is converted to glucose and used for respiration to release energy in the cells.
vi. As the process of respiration continues, new cells are produced and the food reserves of the seed are gradually used up. By this time the shoot is above the ground and turns green. The plant is then able to make its own food, by photosynthesis.

2. (a) **R** is the maize seed.
   T is the groundnut seed.
   (b) i. Chalimbana
   ii. Mani pinta
   iii. RG 1 (Roy Gibbon 1)
   iv. Malimba
   (c) i. It is specimen **T** (groundnuts).
   ii. **T**, which is groundnut, is able to fix nitrogen in the sandy soils for it has nodules, which with the help of bacteria, are able to fix nitrogen.
   T, groundnuts, are able to cover the ground thereby reducing erosion, which can wash away soil together with nutrients.
   (d) i. **Composite maize:** CCA, CCC, CCD, UCA and Tuxpeno
   ii. **Hybrid maize:** MH12, NSCM 41, MH18, MH17 and SC 307

3. (a) Plant population =

$$\frac{\text{Area x plants per planting station}}{\text{Spacing between ridges x spacing between planting stations}}$$

$$= \frac{10{,}000\ m^2 \text{ x } 3 \text{ plants}}{0.6 \text{ m x } 1.0 \text{ m}}$$

= **50,000 plants per hectare**

(b) Seed rate =

$$= \frac{\text{Plant population}}{\text{Size of seeds x purity \% x germination \%}}$$

$$= \frac{50{,}000 \text{ seeds x } 1 \text{ kg x } 100 \text{ x } 100}{1 \text{ ha x } 10{,}000 \text{ seeds x } 60 \text{ x } 60}$$

= 13.888kg/ha

= 13.89 kg/ha

(c)

Number of 50 kg Urea bags applied = 2 bags

Mass of 2 bags of Urea = 2 x 50 kg

= 100 kg of Urea

Percentage of Urea = 46%

∴ Mass of nitrogen applied = 46% of 100 kg of Urea

= 46/100 x 100 kg of Urea

= **46 kg of Nitrogen**

(d) It is CAN, for it has 27% N (i.e. 46% – 19% = 27%)

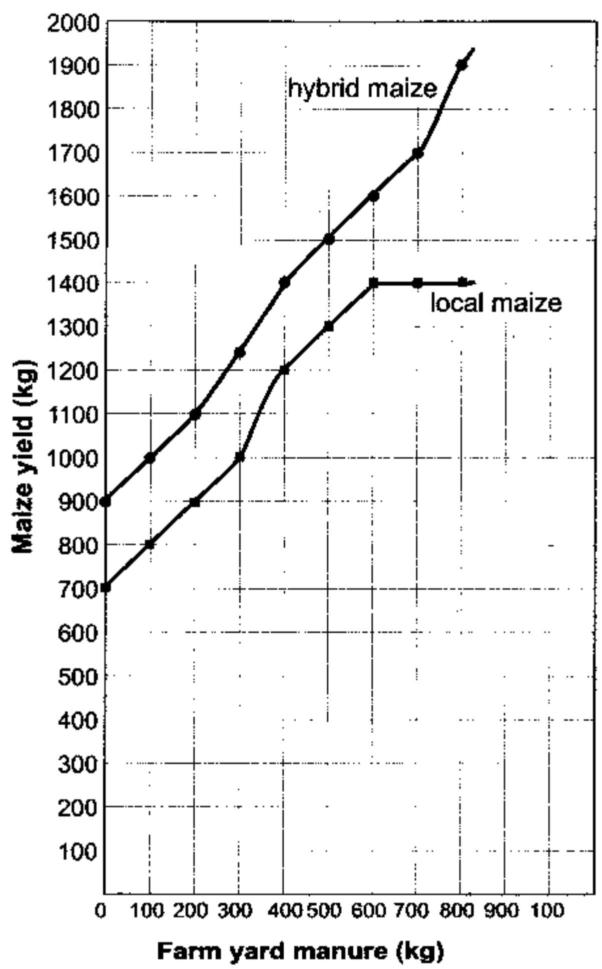
(e) Dollop method or side dressing method

(f) i. The fertiliser is not wasted, for it is applied close to where the crops are grown and are also covered with some soil.
ii. The danger of scotching the crops is avoided, for there is no direct contact of fertiliser with the plants as the case with other methods like foliar.

(g) It is 23:21:0 +4S, the first 23% is for nitrogen

(h) i. DAP (Diammonium Phosphate) 20:20:0
ii. The leaves of maize become yellow. Stunted growth in maize.

4. (a) A line graph on **two** varieties of maize against farm yard manure:



(b) i. To find the effect of different rates of farm yard manure on hybrid and local maize.
ii. Rate of manure application

(c) i. 1,650 kg for hybrid maize
ii. 1,400 kg for local maize

(e) It is genetically superior in terms of yielding ability (as compared) to local maize.

5. (a) i.

Variable costs (VC) for Sorghum

Cost of seed	= K500.00
Cost of fertiliser	= K5,000.00
Total Variable costs	= K5,500.00

Variable costs (VC) for Cassava

Cost of seed	= K1,000.00
Cost of pesticides	= K2,000.00
Total Variable costs	= K3,000.00

Variable costs (VC) for Rice

Cost of seed	= K2,000.00
Cost of pesticides	= K500.00
Cost of fertiliser	= K7,000.00
Total Variable costs	= K9,500.00

ii.

Total Revenue (TR) for Sorghum

TR = yield x Price per kg
= 600 kg x K80.00
= **K48,000.00**

Total Revenue (TR) for Cassava

TR = yield x Price per kg
= 3,000 kg x K50.00
= **K150,000.00**

Total Revenue (TR) for Rice

TR = yield x Price per kg
= 4,000 kg x K40.00
= **K160,000.00**

(b) Calculating the Gross margins (GM) of sorghum and rice

GM for sorghum = TR – TVC
= K48,000.00 – K5,500.00
= **K 42,500.00**

GM for rice = TR – TVC
= K160,000.00 – K9,500.00
= **K 150,500.00**

Rice hectarage should increase because its gross margin (GM) is higher, **K150,500.00** than that of sorghum, **K42,500.00.**

(c) GM for cassava = TR – TVC
= K150,000.00 – K3,000.00
= **K147,000.00**

The farmer should not be advised to substitute sorghum for cassava because the gross margin of cassava is higher than that of sorghum.

(d) It is computed by subtracting fixed costs from the total gross margins from the enterprise combination on the farm.

(e) Depreciation is a fixed cost which has to be subtracted from total revenue or total income in order to obtain a net profit of an enterprise.

(f) i. Using straight-line depreciation method
ii. Using decline depreciation method

6. (a) i. Sulphate of Ammonia
Urea
CAN

ii. DAP
Potassium Nitrate

iii. Sulphate of Ammonia
CAN
Ammonium Nitrate

iv. DAP

v. Compound D
Super D mixture
Potassium Nitrate

(b) i. In SSP there is P and O atoms
RAM for P = 31
RAM for O = 16
Relative Formula Mass (RFM) = $P_2 + O_5$

RFM of SSP = 31(2) + 16(5)
= 62 + 80
= 142 (no units)

RFM for P_2 = 31(2)
= 62

If 62 RFM of P_2 = 40 kg per ha of P

Therefore, 142 RFM of P_2O_5 = $\frac{40 \text{ kg per ha} \times 142}{62}$

= 91.612 kg per ha of SSP

If 100% of P_2O_5 = 91.612 kg of P_2O_5 (SSP)

Therefore, 19% 0f P2O5 = $\frac{100 \times 91.612 \text{ kg of SSP}}{19}$

= **482.1684 kg of SSP per ha**

Thus he requires 484.168 kg of SSP to supply 40 kg of P (Phosphorus)

ii. If I ha = 484.168 kg of SSP
Therefore 48m² = $\frac{484.168 \text{ kg} \times 48 \text{ m}^2}{10{,}000 \text{ m}^2}$
= **2.324 kg**

(c) i. RAM of K = 39.1
RAM of O = 16
RMF of K_2O (MOP) = 39.1(2) + 16
= 78.2 + 16
= 94.2
RMF of K_2 = 78.2

If 78.2 RFM of K_2 = 20 kg per ha

Therefore, 94.2 RFM of K_2O = $\frac{20 \text{ kg per ha} \times 94.2}{78.2}$

= 24.092 kg per ha of MOP

If 100% of K_2O = 24.092 kg of MOP

Therefore, 60% of K_2O = $\frac{100 \times 24.092 \text{ kg per ha}}{60}$

= 40.15 kg of K_2O per ha

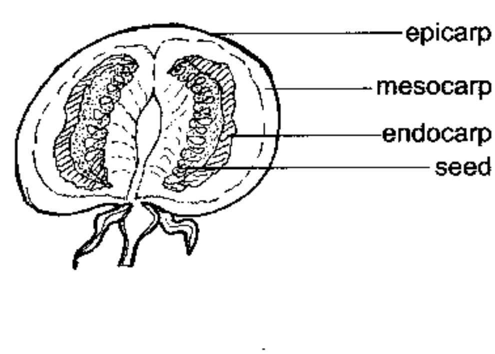
Thus he needs 40.15 kg of MOP to supply 20 kg / ha of K (Potassium)

ii. If 1 ha = 40.15 kg of MOP
Therefore, 18.2 m² = $\frac{40.15 \text{ kg} \times 18.2 \text{ m}^2}{10{,}000 \text{ m}^2}$
= **0.073073 kg of MOP per plot**

PRACTICAL 10

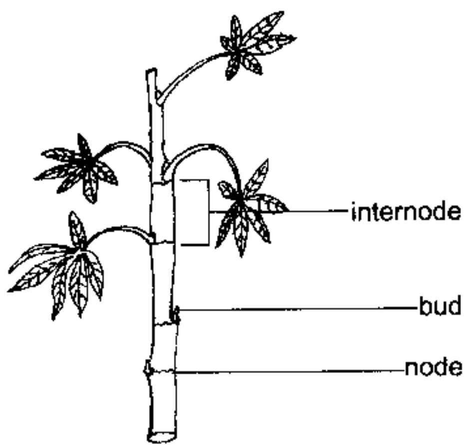
1. (a) **A** is clay soil.
B is sand soil.
C is loam soil.
(b) By feeling with hands.
(c) Soil sample **B** (sand soil)
(d) i. It is because **B**, sand, has large particles, which have got big pores between them where air is trapped.
ii. By sedimentation.
By mechanical analysis in conjunction with textural triangle.
(e) i. It is **A** (clay soil).
ii. Clay is the most chemically active portion of the soil, for clay particles being very fine, expose a large amount of external surfaces, the latter occurring between the plate-like crystals units that make up the particle. Most clay acts as a centre of activity around which reactions and nutrient exchange occur, so it is rich in nutrients.
iii. It is **B** (sand soil).
iv. It is **A** (clay soil).
(f) **A**, clay soil has bad physical properties of having large surface area and the higher the amount of clay, the less water is available to plants. If less water is available to plants then less nutrients will also be available to plants, for nutrients move in water.
Clay soil at the same time provides a strong root hold for plants so that they can absorb nutrients in the same soil.
(g) Because of small surface area and a lot of pore space, which encourage drainage of water together with nutrients in solution, sand soil loses a lot of nutrients.
(h) i. By adding lime.
ii. By adding organic matter.

2. (a) **R** is rape or **R** is a leaf vegetable.
P is a tomato fruit.
Q is a cassava cutting.
(b)



(c) i. Epicarp protects the fruit from pests and diseases and also attracts the animals that eat the fruit.
ii. Endocarp protects the seed from damage by animals that eat the fruit in order to pass out unharmed.
iii. Seed germinates into new offspring.

(d)



(e) The problem of marketing specimens **R** and **P** is that the two products easily go bad (perishable) if not sold in good time or while still fresh.

(f) The legumes are going to fix nitrogen for **R** and **P**, which do not fix nitrogen in the soil for crop growth and development.

3. (a) **W** is the water trough.
F is the feeding trough.
C is an egg candler.
E is an egg brooder.

(b) Poultry

(c) To prevent birds from landing and dirtying (soiling) the feed in the feed trough.

(d) i. Layer's mash
ii. Starter mash
iii. Chick mash
iv. Broiler's mash

(e) This equipment is used to test the fertility of eggs between ninth and fifteenth days. Infertile eggs are known as clears and have an appearance of new laid eggs except for slightly larger air space in the large end of the egg.

(f) By using equipment **C**, an egg candler. fertile eggs contain a dark spot, which is the embryo or developing chick and latter looks rather like a spider's web. Other eggs may show a red blood ring in the yolk due to the early death of the embryo.

(g) Brooding is the rearing of chicks between 1 and 4 weeks old by providing heat. which prevents them from getting chilled.

4. (a) **H** is large intestine (colon).
G is caecum.
B is pancrease.
C is liver.
E is stomach.

(b) i. Pigs
ii. Goats

(c) i. Does not produce enzymes known as cellulase that can help in the digestion of cellulose.
ii. Does not have micro-organisms to digest cellulose and other fibre stuff.
iii. The animals with this type of digestive system do not chew the cud so that thoroughly digestion of cellulose can take place, i.e. rumination.

(d) i. Amylase
ii. Lipase
iii. Trypsin

(e) i. To store food for some time so that further breakdown of starch can take place.
ii. To allow HC*l* to be pulled on the food and the beginning of protein digestion.

(f) It is bile, which is produced by the liver and stored in the gall bladder.

(g) To emulsify the fats: Bile contains sodium chloride and hydrogen carbonate and inorganic bile salts. Bile dilutes the contents of the intestines, and bile salts reduce the surface tension of fats, so emulsify them. This results in fats forming a suspension of tiny droplets, the increased surface so presented allowing more rapid digestion.

5. (a) Number of days kept in stall: From 03/06/04 – 31/08/04 = 28 days (June) + 31 days (July) + 31 days (August) = **90 days** (note that, first and last days are both included)

Mass of Chamie on 31/08/04	=	480 kg
Mass of Chamie on 03/06/04	=	220 kg
Mass gained = 480 kg – 220 kg	=	260 kg

Mass of Bunda on 31/08/04	=	380 kg
Mass of Bunda on 03/06/04	=	310 kg
Mass gained = 380 kg – 310 kg	=	70 kg
Daily mass gain for Chamie	=	260kg/90 days
	=	2.89 kg/day
Daily mass gain for Bunda	=	70kg/ 90 days
	=	0.78 kg/day

(b) Gross margin (GM) = Total revenue (TR) – Total Variable Cost (TVC)

GM for Chamie: TR = yield x price per yield
= 480 kg x K250/kg
= K120,000.00
TVC = K1,000.00

$\therefore$ GM = K120,000.00 – K1,000.00
= **K119,000.00**

GM for Bunda: TR = yield x price per yield
= 380 kg x K200/kg
= K76,000.00
TVC = K1,000.00

$\therefore$ GM = K76,000.00 – K1,000.00
= **K75,000.00**

(c) Daily mass gain for Chamie = 2.89 kg/day
Daily mass gain for Bunda = 0.78 kg/day

$\therefore$ Difference = 2.89 kg/day – 0.78 kg/day
= **2.11 kg/day**

(d) i. It might be due to differences in the ages of the two animals.
ii. It might be due to differences in the breeds or genetic make-up of the two animals.
iii. It might be due to differences in feed conversion ratio.

(e) i. Gross margin is used to evaluate the profitability of each farm enterprise or a farm as a whole.
ii. Gross margin is a quick method of planning, e.g. prices and yields can be easily tested.
iii. Gross margin helps in deciding which enterprise to chose or combine on the farm.

(f) i. During this period, there are plenty of crop residues from the farms, which can be used to feed cattle.
ii. During this period, labour is readily available which can be used during stall feeding for most of the farming activities are through or are not being done.

(g) i. Cost of casual labour
ii. Cost of transport
iii. Cost of animal drugs and medicine

6. (a) It is K170.00 where the quantity supplied and demanded are equal to 5.4 kg
(b) It is a price where all goods supplied at the market are bought so both the supplier and the consumers are satisfied.
(c) The price will increase because the demand will be high for the little amount of beans available.
(d) They should sell the beans when the demand of beans is high.
(e) i.

	Block I	**Block II**	**Block III**
Plot 1	50 cm	70 cm	90 cm
Plot 2	90 cm	50 cm	110 cm
Plot 3	70 cm	110 cm	50 cm
Plot 4	110 cm	90 cm	70 cm

Randomised Block Design (**RBD**)

ii. **Carrying out the investigation or experiment:** Carry out an experiment by making all variables constant except the one being tested (a fair test).

- **Collecting data:** Data can be collected data through direct observation or measuring with instruments such as a ruler, weighing scale, etc.
- **Recording data:** Recording of the collected in form of line graphs, pie charts, bar graphs and tables.
- **Analysis of data collected:** Data collected in the field or experimental garden can be analysed through calculating percentages, calculating averages (means) and calculating the range in performance between treatments.

iii.

Block I	Block II	Block III	Block IV
50 cm	70 cm	90 cm	110 cm
90 cm	110 cm	50 cm	70 cm
70 cm	50 cm	110 cm	90 cm
110 cm	90 cm	70 cm	50 cm

4 x 4 Latin Square method

iv. It is 90 cm, because the standard spacing used in planting maize is 90 cm between planting station and 90 cm between ridges.

v. To avoid environmental interference, e.g. border effect.

PRACTICAL 11

1. (a) **A** is Bahia grass.
B is the Cynodon grass.
C is the Elephant grass or Napier grass.

(b) It is Elephant grass or Napier grass

(c) i. The elephant grass is leafy and nutritious and suitable even for making silage or for stall feeding. It is high yielding for it can yield 112 to 135 tonnes of green material per hectare per year.

ii. The grass improves soil fertility by providing a lot of organic matter, which releases nutrients brought from the lower layers of the soil.

(d) Elephant grass is propagated by root cuttings or by stem cuttings using the nodes, which contain the aerial roots, i.e. vegetative propagation.

(e) i. They are high in nutritive value and digestibility, i.e. increase in feeding value.

ii. Increased in dry matter content, i.e. increased in proteins, carbohydrates, fats, minerals and fats, and hence high carrying capacity.

iii. They have greater ability to improve soil fertility.

iv. They have lower dormancy than natural pasture, for they have soft seed coat and less inhibiting chemicals.

v. They respond very well to fertilisers thus easy for farmers to improve quality and quantity of these pastures.

(f) i. Some grasses do not tolerate grazing pressure.

ii. Some grasses do not produce viable seeds.

iii. Some pastures contain toxic chemicals, e.g. *Leucaena leucocephala* contains mimosine, which may kill livestock.

iv. They need to be fertilised and fertiliser is very expensive.

2. (a) i. Plant **X** is attacked by head smut.

ii. Plant **Y** is affected by stalk borer.

(b) i. Abnormality **X** is caused by fungi.

ii. Sign **Y** is caused by stalk borer.

(c) i. Smut can be controlled by planting resistant varieties and uprooting infected plants, which should be burnt.

ii. Stalk borer can be controlled by applying 2½% Dipterex granules in funnels of each plant.

(d) i. Weevil, which can be controlled by applying Super Guard Dust.

ii. Army worm, which can be controlled by using Carbaryl (seven) and Dipterex.

3. (a) i. The texture of any soil has a direct influence on the volume and dimensions of its pore spaces, which in turn dictate the proportions of air and water, and their movements in the soil.
   ii. The arrangement was modified in the texture class **B** to accommodate the influence of changing proportions of sand and silt upon the textural properties of the clay.

(b) i. Loam soil
   ii. Clay soil
   iii. Sandy soil

(c) i. Loam soil
   ii. Clay soil
   iii. Sand clay loam soil

(d) i. Loamy sand soil
   ii. Sandy clay soil
   NB: Clay follows lines parallel to silt %.
   Sand follows lines parallel to clay %.
   Silt follows lines parallel to sand %.

(e) i. Soil should be cultivated at the correct moisture content.
   ii. Constructing physical conservation measure, which may help reduce soil erosion.

(f)

Clay	< 0.002 mm in diameter
Silt	0.002-0.02 mm in diameter
Fine sand	0.02-0.2 mm in diameter
Coarse sand	0.2-2 mm in diameter
Gravel	> 2mm in diameter

(g) i. Porosity
   ii. Soil colour
   iii. Soil structure
   iv. Soil consistency

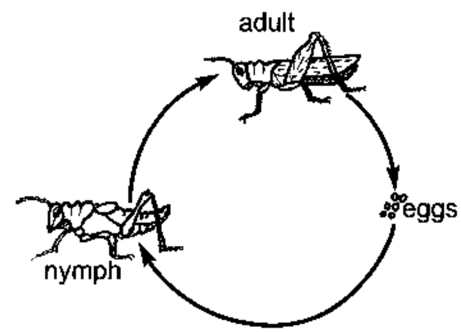
(h) i. Colour of soil particles
   ii. Chemical composition of the soil particles
   iii. Arrangement of soil particles

4. (a) i. **K** is the stalk borer.
   V is the grasshopper.
   W is the maize weevil.

(b) Maize weevil

(c) i. Drying maize grains thoroughly before storing.
   ii. Cleaning storage equipment thoroughly before storing the maize, e.g. cleaning the *nkhokwe*.

(d)



(e) i. Exposing the eggs to the sun so that they are killed.
   ii. Killing the nymphs through feeding to birds.

(f) i. Eat plant leaves thereby interfering with the crop photosynthesis through reducing the photosynthesing area.
   ii. Consume maize grains, thereby reducing quality and quantity of the maize grains for food and selling.

(g) Apply 2½% Dipterex.

(h) i. As seeds were all yellow, the yellow plant must be homozygous and yellow (Y) is dominant to pink (y).

   As pink is recessive, the pink flowered plants must have been homozygous.

Yelow maize X Pink maize
YY yy

Parents → yy

↓ YY

Gametes	y	y
Y	Yy	Yy
Y	Yy	Yy

Offspring All Yy (yellow)

ii. As the yellow maize plant has some pink offspring, it must have been heterozygous to produce a pink allele to some offspring. The ratio is 3:1.

Yelow maize X yellow maize
Yy Yy

Parents → Yy

Yy ↓

Gametes	Y	y
Y	YY	Yy
y	Yy	yy

Offspring YY,Yy,Yy,yy

Genotype 1YY 2 Yy 1 yy

Yellow YY,Yy, Yy and pink yy

Ratio 3 yellow : 1 pink

60 yellow : 20 pink

Total 80

iii. Cross yellow maize plants with recessive pink maize plants. Homozygous yellow give only yellow offspring, heterozygous also give pink offspring.

5. (a) **A** is surface irrigation.
B is overhead irrigation.
(b) i. It uses very expensive equipment.
ii. It can encourage spread of disease through droplet infection.
(c) The trees reduce wind force which would blow showers of water to one side of the field only.
(d) i. They are furrows.
ii. They encourage loss of soil from the land through run-off and erosion.
(e) It enables farmers to grow crops during the dry season.
(f) i. Slope of the land
ii. Type of soil

6. (a) **Solution**

Plant population

$$= \frac{\text{Area x seeds per planting station}}{\text{Ridge spacing x planting spacing}}$$

$$= \frac{10{,}000 \text{ m}^2 \text{ x 3 seeds}}{60 \text{ cm x } 80 \text{ cm}}$$

$$= \frac{10{,}000 \text{ m}^2 \text{ x 3 seeds}}{0.6 \text{ m x } 0.8 \text{ m}}$$

= **62,500 plant/ha**

(b) Seed rate

$$= \frac{\text{Plant population per hectare}}{\text{Seed size x purity \% x Germination \%}}$$

$$= \frac{62\ 500 \text{ seeds x 1 kg x } 100 \text{ x } 100}{\text{ha x } 10{,}000 \text{ seeds x } 50 \text{ x } 50}$$

= **25 kg/ha**

PRACTICAL 12

1. (a) **B** is *Bidens pilosa* or **B** can be *Tridax procumbens*.
(b) i. It competes with crops for air and sunlight.
ii. It competes with crops for soil nutrients.
(c) i. *Tridax procumbens* has hairy leaves, which will help to keep herbicides so that it is easily absorbed.
ii. Thin cuticle of *Tridax procumbens* allows easy penetration of herbicides into the inner parts of the leaf.
(d) i. It is expensive to buy chemicals.
ii. Farmers have problems to get chemicals due to transport.
iii. Farmers lack knowledge of how to use sprayers and chemicals, i.e. lack of technical know-how.
(e) i. Weeding controls pests and diseases that are harboured by some weeds.
ii. Weeded weeds will improve soil fertility upon decaying and decomposing.
iii. Weeding reduces competition of crops against weeds for nutrients hence high yields are obtained.
iv. Weeding improves quality of crop yields since no weeds, weed seeds, dry leaves can spoil the quality of a crop through adulteration.
(f) i. Round up
ii. Bullet
iii. Ametryne
iv. Gramoxone

(g) i. The inflorescence is a composite flower.

ii. *Tridax procumbens* is an extremely common weed with a creeping habit, simple and somewhat hairly leaves and pale yellow composite flowers on long vertical peduncles.

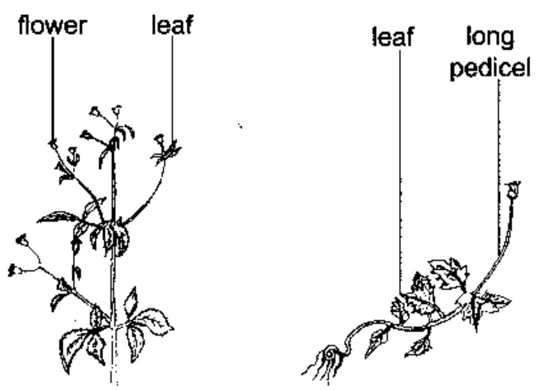
It is not poisonous and its habit of spreading on bare ground helps the leaves to be exposed to light. This spreading is assisted by branching from the axils of the leaves (which are opposite).

Chlorophyll distribution is typical, i.e. mostly in the palisade mesophyll, but the leaves appear on the upper surface because of the relative thinness of the cuticle.

(h) i. To protect the plant from physical damage.

To help reduce the rate of transpiration.

ii.



Bidens pilosa ***Tridax procumbens***

iii. It is dispersed by wind.

iv. Cross-pollination by insects such as butterfly.

2. (a) **G** is farmyard manure.
P is DAP.
A is Ammonium Nitrate.
K is Muriate of Potash.

(b) i. Age of the animal producing the litter for manure

ii. Method of storage of manure

iii. Type of litter used to make manure

iv. Type of feed given to animals producing litter

(c) i. They contain less plant nutrients.

ii. Plant nutrients take time to be released from organic fertilisers.

iii. They require a lot of labour during application.

iv. They are bulky; therefore, a lot of organic fertilisers are needed per unit area.

(d) i. They do not improve the soil structure.

ii. Very expensive to buy them.

iii. Can cause water and soil pollution.

iv. Some of the nutrients may be fixed or leached depending upon the type of fertiliser used.

(e) i. DAP

ii. Ammonium Nitrate

iii. Muriate of Potash (MOP)

(f) It is DAP.

3. (I) **Mode of entry:**

i. Stomach poisons (destruction by ingestion) – pesticides that enter the pest through the mouth with food.

ii. Contact poisons (destruction by contact) -- pesticides applied to the infected organism. The chemical is absorbed through the body surface as the pest comes into contact with the treated surface.

iii. Fumigants (destruction by suffocation) – pesticides that are in vapour form and are absorbed through the respiratory system of the pest.

iv. Systemic pesticides – chemicals applied to the soil or host plant and taken by the host tissue from which the pest will get poisoned.

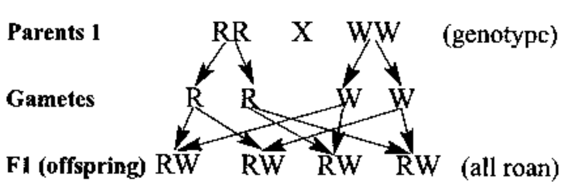
(II) **Mode of action:** Mode of action means the specific way in which chemicals behave within the body of the pest organism.

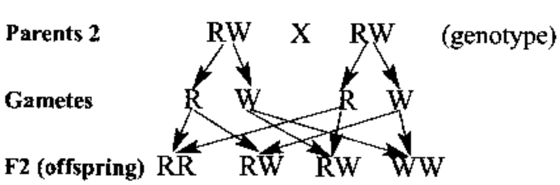
i. Anti-coagulant: They act on the blood of the pest.
ii. Protoplasmic poisons: They disintegrate the tissues.
iii. Neurotoxic agents: They act as nerve poisons affecting the balance and pests' nervous coordination.
iv. Respiratory poisons: They interfere with the mechanism of respiration of pest, leading to death.

(III) **Based on chemical groupings:** These are groupings of pesticides according to the chemistry of the compounds where they are derived.

i. Organochlorines, e.g. DDT, chlordane, endosulfan and tetrasul.
ii. Botanicals, e.g. Nicotine, rotenone and pyrethrum.
iii. Organic oils, e.g. chemical oils from crude petroleum or coal tar.
iv. Biological pesticides, e.g. Thuricide
v. Inorganic salts and elements, e.g. lime sulphur, lead arsenate, aluminium phosphide and sodium fluoride.
vi. Carbamates, e.g. carbaryl, promecarb and primicarb.
vii. Organophosphate, e.g. Bromophos, menezon, diazinone, malathion and fenthion.

4. (a)





Genotypes 1 RR, 2 RW, 1 WW
Phenotypes 1 red: 2 roan : 1 white
Ratios 1 red: 2 roan : 1 white

Or ¼ red ½ roan ¼ white
Or 25 % red 50 % roan 25% white

(b) i. Genetics is the study of the way in which parents pass on characteristics to their offspring.
ii. Heredity is the transmission of characters or traits from the organism (parent) to their descendants (offspring).
iii. Character or trait is any recognisable feature in an organism, e.g. height in crops.
iv. Variation is the differences in a trait or character in an organism. Means differences between individuals of the same species.
v. Mutation is a change occurring within the chromosome, or deletion or addition of parts of or the whole of the chromosome.

(c) i. It is easy to plan breeding programme.
ii. Sperms can be stored and used when needed
iii. Sexually transmitted diseases are reduced because there is no natural mating.
iv. Semen from one male through diluting can serve several females.

(d) i. It is the process of cross-pollinating two crops or varieties with different characteristics in order to produce a new variety that combines the good of qualities of the parents.
ii. Choosing parent with superior characteristics that complement each other.

Self-pollinating the parental lines for several generations (inbreeding) in order to develop pure lines. A pure line always reproduces itself exactly (it breeds true). Inbreeding reduces the plant vigour (inbreeding depression).

Cross-pollinating the pure lines, i.e. male gametes (pollen) from an inbred (pure line) is transferred to female gametes (stigma of the flower of) inbred. Cross-breeding results in increased plant vigour. This new vigour, which the hybrid (crop) acquires through crossbreeding is called hybrid vigour or heterosis.

5. (a) Quantity supplied increases with an increase in price
   (b) i. It is K56.00 per kilogramme.
       ii. Quantity demanded equals quantity supplied at this price.
       iii. There is no excess supply or excess demand at this price.
   (c) 290 kg x K60 per kg = K17, 400.00
   (d) i. Demand is very responsive to change in price.
       ii. Change in demand is proportional to change in price.

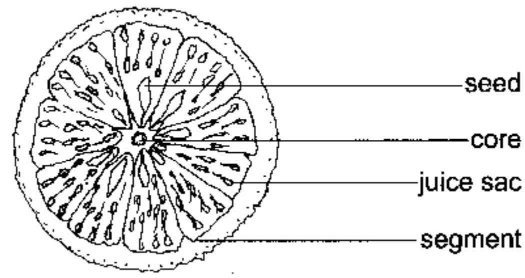
6. (a)

Cost (MK)	Income (MK)
4 bags urea = 5,200.00 @ K1,300	40 bags = 40,000.00 @ K1,000
40 bags maize. = 34,000.00 @ K850	6 bags Urea = 7,800.00 @ K1,300
50 Sacks @ K30= 1,500.00	Actellic @ K300 = 300.00
Actellic @ K500= 500.00	2 Casual labour = 600.00 @ K300 each
Casual labour = 1,200.00	
Total cost = **42,400.00**	Total Income = **48,700.00**

   (b) Yes, because the total income from the change is higher than total cost of change, showing that the change will be profitable.
   (c) i. It is used to expand the enterprise.
       ii. It used to change one enterprise for another.
   (d) It does not take into account some of the variable costs and fixed costs incurred.

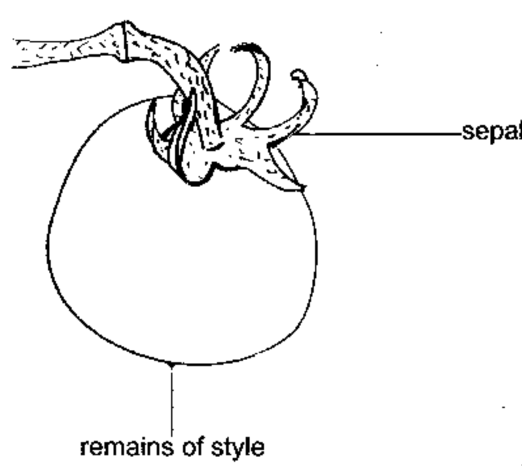
PRACTICAL 13

1. (a) i. **A** is a leaf.
          B is a petiole blade.
          C is a spine (thorn).
          D is an orange fruit.
       ii.

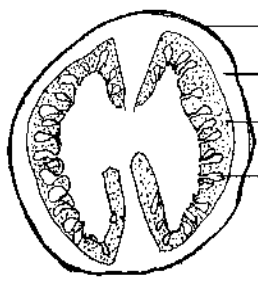


   (b) i. **Sweet orange:** Late Valencia and Jaffa
       ii. **Tangerine:** Common tangerine and Mwanza mandarins
       iii. **Grape fruit:** Marsh seedless and Duncan
       iv. **Lemon:** Eureka and Villa Halls Franca
       v. **Lime:** Tahiti and West Indian
       iv. **Sour orange:** Bitter servile for making Marmalade
   (c) i. Armillaria root rot
       ii. Gummosis (foot rot)
       iii. Greening disease

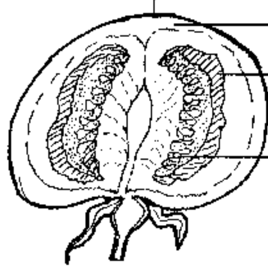
2. (a) i. Roma VF
       ii. Marglobe
       iii. Homestead
       iv. Money maker
   (b) i. Bacterial wilt caused by bacteria
       ii. Leaf blight caused by fungi
   (c)



(d)

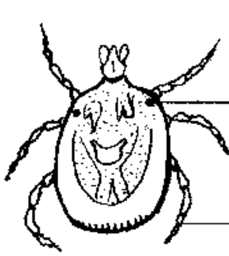


(e)



3. (a) **M** is maize seed.
   N is cassava.
   (b) i. Maize seeds are sun-dried for storage
   ii. Cassava is peeled and sun-dried for storage.
   (c) i. It must be dry to prevent formation of moulds.
   ii. It must be clean to avoid multiplication of pests.
   (d) i. It can be processed into cassava flour for home use as food.
   ii. It can be used while fresh by boiling it for food.
   (e) i. Carbohydrate
   ii. – Cassava flour
   – Starch

4. (a) i. It is a tick.
   (b)



   (c) i. It transmits a lot of animal diseases through carrying the disease causing micro-organisms.
   ii. It sucks the blood of animals thereby weakening the animal and production.
   (d) The reason is that some stages of the life cycle of a tick happen not on the animal that is dipped or treated, e.g. eggs are laid on the ground.
   (e) i. Regular dipping or spraying of cattle with chemicals
   ii. Hand dressing against ticks
   iii. Practising rotational grazing to control a 3-host tick
   (f) i. Goats
   ii. Sheep
   (g) i. Cow Pox attacks the cows.
   ii. Sheep Pox attacks sheep.
   iii. Goat Pox attacks the goats.
   iv. Swine Pox attacks the pigs.
   v. Fowl Pox attacks the poultry.

5. (a) Irrigation is the artificial application of water to crops when rainfall is insufficient, unreliable or unavailable.
   (b) i. Partial or supplemental irrigation- where the crops are partly grown under rain-fed and partly irrigated during the growing season, e.g. Sugarcane irrigation at Nchalo.
   ii. Complete or full irrigation – where crops are always grown under irrigation, e.g. in a desert.
   (c) i. **T** is Surface irrigation system under furrow.
   P is drip irrigation.
   (d) i. Reduces the occurrence of weeds because weeds growing between crops wilt and die due to lack of moisture.
   ii. Drip irrigation makes water reach the plant roots where it is required most.
   iii. As water is not spread on the leaves and stems of plants, evaporation is minimised.

(e) i. Amount of water to be applied can be controlled.
ii. It is an easy system to operate especially if it uses gravity.

(f) i. Requires land with some gradient.
ii. Plants at the end of the row or ridges may get less water due to seepage and less contact time.

(g) i. Irrigation allows crops to be grown at any time of the year as long as the weather is favourable.

(h) i. The soil type
ii. Crop type
iii. Water quality
iv. Water quantity

6. (a) **Solution**

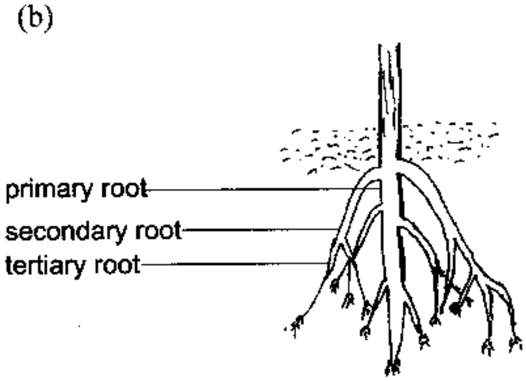
Partial budget to estimate the effect of storing instead of selling groundnuts at harvest

LOSSES			GAINS		
Income Lost	**K**	**t**	**New Income**	**K**	**t**
Sale of bags of g/nut	40,000	00	Sale of 70 bags of stored g/nut	90,000	00
New costs			**Saved costs**		
70 sacks at K30.00	2,100	00	Nil		0
Insecticides	500	00			
Depreciation	70	00			
Casual labour	300	00			
Total costs	**42,970**	**00**	**Total income**	**90,000**	**00**
Net gain	**47,030**	**00**	**Net loss**		**0**
	90,000	**00**		**90,000**	**00**

PRACTICAL 14

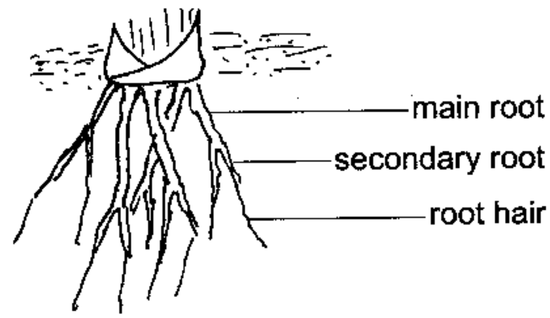
1. (a) i. **T** is a main or tap root system.
ii. **P** is a fibrous root system.

(b)



T

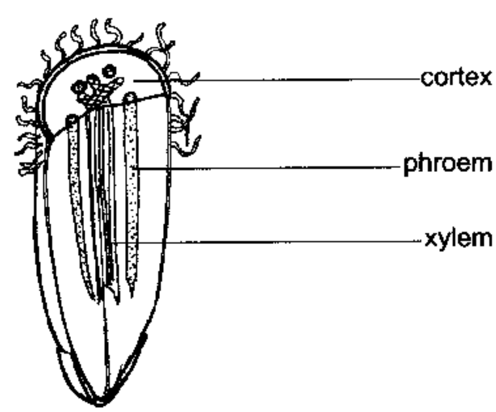
(c)



P

(d) i. **The root cap:** The root cap is a mass of loose unspecialised cells fitting over the region that is actively dividing. The root cap protects the roots from friction or abrasion with the soil particles as the root advances through the soil.
ii. **Region of cell division (meristems):** A region of active cell division from which permanent tissue is derived.
iii. **The region of cell elongation:** In this region the root is actively lengthening mainly by enlargement of its cell.
iv. **The region of cell differentiation:** Is the region where the cells that have grown old become specialised to carry out different functions, e.g. some become xylem, carrying water in the plant.

(e) i.



ii. Allows pollination to take place easily.

Allows fertilisation to take place easily.

iii. Xylem carries water in the plants.

(f) i. **Irrigation interval or frequency of irrigation:** Roots that go deep will require a lot of water therefore more irrigation intervals are required to meet the crop water requirement.

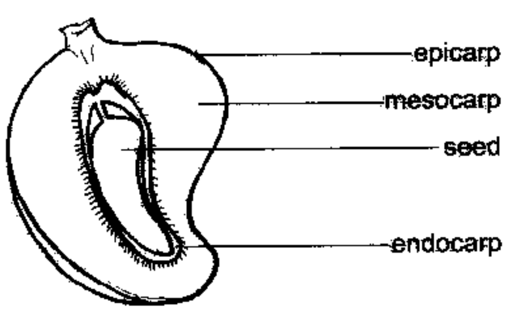
ii. **Irrigation depth or amount of water to be irrigated:** Roots that go very deep like **T** will require more water thus more irrigation depth of water for irrigation than shallow rooted crops.

(g) i. **Tap root system** is a root system made up of one main root with several side roots attached to it.

ii. **Fibrous root system** is a root system where several roots grow downwards from the seed, or growing point, and each of these develop side roots or lateral roots, especially in seeds of grasses and cereals.

iii. **Adventitious root system** is a type of fibrous root system where roots grow not from a main root, but directly from the stem as they do in bulbs and corms.

2. (a)



(b) True fruits are fruits that are formed from developed ovary only while false fruits are fruits formed from ovary and other flower parts.

(c) i. False fruits, e.g. bananas and pineapples.

ii. True fruits, e.g. mangoes and maize.

(d) i. **Cuticle** is waxy and water-proof to prevent water loss.

ii. **Upper epidermis** is a covering layer protecting cells underneath.

iii. **Palisade mesophyll layer** is a single layer of long, tightly packed cells, which catch light and has a lot of chloroplasts.

iv. **Spongy mesophyll layer** is made up of loosely packed cells allowing for easy movement of carbon dioxide in and oxygen out during photosynthesis and has few chloroplasts.

3. (a) i. **B** is a beef breed of cattle.
C is a dairy breed of cattle.

(b) **B (beef breed) characteristics are:**

i. It has square rump, i.e. hips and loins well covered with flesh.

ii. It has block square appearance.

iii. The top and lower lines are almost straight with brisket protruding forward.

iv. The body is deep (thick with muscles) with short legs that are well apart, the udder is small.

C (dairy breed) characteristics are:

i. Have a large stomach.

ii. Wide and well-set hind quarters.

iii. Well formed and well suspended udder.

iv. Thin body which carries little flesh.

(c) Mastitis disease

(d) i. Intravenous or intramuscular injection using antibiotics, e.g. Streptomycin.

ii. Apply hot and cold pads or cloth on the udder. A hot piece of cloth is placed on the udder to increase the milk let-down so that bad milk infected by bacteria can come out. This increases blood flow so that healing is fastened.

iii. Careful hygiene at milking time helps to reduce the incidences of the disease.

(e) i. The offspring produced will produce better milk than **B** (the beef breed).

ii. The offspring produced will produce better beef than **C** (dairy breed).

(f) i. Exotic breeds cannot tolerate high tropical temperatures of Malawi. For instance, the Zebu cattle have about 1.5 times as many sweat glands per unit skin area as compared to exotic cattle and their sweat glands are 2.5 times bigger than those of European cattle. These features make the indigenous cattle withstand tropical heat.

ii. Exotic breeds cannot walk long distances to fetch food and water as indigenous breeds because they easily get tired and lose conditions.

iii. Exotic breeds are not tolerant to diseases like East Coast Fever, which are common in Malawi.

iv. Exotic breeds are poor converters of roughage into utilisable products, namely milk and beef because farmers in Malawi feed their cattle on roughages most of the time.

4. (a) Sow

(b) Increases the frequency for mating as well as chances of conception.

(c) i. – Nanny frequently wags her tail.
– She sometimes mounts other nannies.
– The vulva becomes red and thick.

ii. 27th June plus 20 days = 7th July, 2010

(d) i. 1st August, 2010.

ii. 1st August-36hours almost 2 days before 1st August, 2010 which falls on 30th July, 2010.

(e) It is within the rain season when there is plenty of roughage feed for livestock.

5 (a)

Parents ⟶ Bb

↓

BB

Gametes	B	b
B	BB	Bb
B	BB	Bb
Offspring	BB,BB,Bb,Bb	

Genotype should be BB and Bb, for the ones which have produced the offspring BB and Bb.

Then to find F1 offspring

Parents ⟶ bb

↓

BB

Gametes	b	b
B	Bb	Bb
B	Bb	Bb
Offspring	All Bb	

In this case, phenotype: all will be black litters

OR

Parents ⟶ Bb

↓

bb

Gametes	B	b
b	Bb	bb
b	Bb	bb
Offspring	Bb,Bb,bb,bb	

2 Bb, 2 bb

In this case, phenotype: ½ black, ½ white

(b) i. Parents with horns: hh
Parents without horns: HH
F1 cattle: Hh

ii.

Genotypes	Phenotypes
HH	Hornless
Hh	Hornless
hh	Horned

iii.

Parents ⟶ F1 (Hh)

↓

hh

Gametes	H	h
h	Hh	hh
h	Hh	hh
Offspring	Hh,Hh,hh,hh	

Pure breeding, cattle with horns, and half of the offspring were hornless

6. (a) **Solution**

Partial budget for getting equipment for loan

LOSSES			**GAINS**		
New costs	**K**	**t**	**New Income**	**K**	**t**
Annual depreciation	14,000	00	Extra maize income	25,000	00
Annual repairs	2,000	00	Extra g/nut income	5,200	00
Average annual interest	3,733	33			
Extra feed	3,000	00			
Income lost			**Costs saved**		
Loss from contract carting	6,000	00	Labour for hand-weeding	10,000	00
Net gain	11,466	67			
	40,200	**00**		**40,200**	**00**

NB: Annual payment = Depreciation + loan/3 years

= 14,000.00 + 70,000/3

= **K37,333.333**

Interest (at 10%)= ann. Payment x ave. ann. Interest

$$= \frac{K37,333.333 \times 10}{100}$$

= **K3,733.33**

Conclusion:

(a) Getting the loan would raise the farmer's yearly profit by K11,466.67

(b) No, it would not, because the extra profit (**K11,466.67**) is less than the annual loan payment (K37,333.33). Maximum loan payment in the first year is **K37,333.33** and is not easily recovered.

PRACTICAL 15

1. (a) i. **A** is the top soil.
B is the sub soil.

(b) i. Chemically sample **A** (top soil) has got a lot of nutrients as compared to sub soil.

ii. Physically sample **A** is dark to yellowish in colour and consists of structureless, coarse sandy loam while **B** is a reddish to orange gravelly, sandy clay.

(c) i. Through minerals being used by the crop and never replaced once the crop is taken way.

ii. Through leaching of nutrients to other layers due to too much rainfall or due to the structure of the soil.

(d) i. A well-developed soil profile has deep and rich top soil with a lot of nutrients for crop growth.

ii. In a well-developed soil profile the sub soil is loosely packed for easy penetration of roots, drainage and aeration, required for good crop growth and development.

iii. A well-developed soil profile has a sub soil, which is loosely packed to ensure that erosion does not take place and reduces the degree of run-off.

(e) i. Good drainage to avoid water logging.

ii. Good aeration to promote healthy root development of crops.

iii. Make sure the soils have enough depths to afford plant roots greater volume to exploit.

(f) i. Flat soil structure

ii. Block soil structure

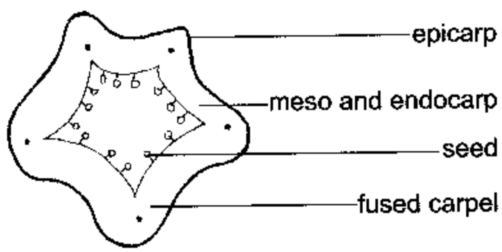
(g) i. Metamorphic and sedimentary rocks are arranged in regular layers, which have been deposited one above the other or side by side.

ii. Both are formed from non-crystalline minerals.

iii. Both are derived from previous rocks.

iv. Both contain fossil remains of plants and animals, which existed when the rocks were formed.

2. (a)



(b) i. **Legume:** Fruits formed from one carpel, e.g. peas.

ii. **Capsule:** Fruit formed from several joined carpels, e.g. cotton.

iii. **Achene:** Simple dry fruit with one seed inside, e.g. clematis.

iv. **Caryopsis:** Achene with testa and pericarp fused together, e.g. maize.

v. **Berry:** Seeds have hard protective testa; skin (epicarp) and flesh (meso and endocarp), e.g. pawpaw and tomatoes.

iv. **Drupe:** pericarp has three regions; skin (epicarp), flesh (mesocarp) and hard layer enclosing the single seed (endocarp), e.g. mangoes.

(c) True dry fruits have pericarp wall thin and dry, e.g. achene, caryopsis, legumes and capsule while fleshy fruits have pericarp outer skin and inner fleshy part, e.g. berry and drupe.

3. (a) i. Knapsack sprayer
Ultra Low Violet (ULV) sprayer

ii. Jackto knapsack
Cooper Pegler 3 (CP3)

iii. Wetting agent is a compound which, when added to a spray solution, causes the spray to spread over and wet surfaces more thoroughly.

Adjuvant is any substance in a herbicide formulation which enhances the effectiveness of the herbicide.

Concentration is the amount of active material in a given mass of a mixture or volume of a solution.

Active ingredient is the chemical in a formulated product responsible for the herbicidal effects (shown as the active ingredient on the label).

Diluent is a liquid or solid material used to reduce the concentration of the active ingredient in a formulation.

(b) i. **High volume (HV):** All spraying in which more than 400 litres per hectare of spray are used.

ii. **Low volume (LV):** All spraying in which volumes ranging between 5 and 400 litres per hectare of spray liquid are used.

iii. **Ultra-low-volume (ULV):** Very tiny droplets spraying in which rate of application vary from less than 50 litres per hectare for tree crops and bushes.

(c) i. **A** is a body.
B is a diesel boom.
C is a tyre.
D is skay.
F is a stripe.

ii. **K** is an ox-cart.
P is an ox yoke.

(d) i. **G** is a garden sprayer or farm sprayer.
M is a knapsack sprayer.

ii. **T** is a shoulder strap.
W is a handle.
Q is a pump barrel.
O is a nozzle.

iii. Agrowett
Armoblen
Complement
Tronic

(e) i. If 200 l = 1.5 l

$\therefore$ 20 l (one sprayer) = $\frac{1500\ ml \times 20\ l}{200\ l}$

= **150 m*l***

ii. If 20 litre = 1 sprayer

$\therefore$ 200 litre (one ha) = $\frac{200\ l \times 1\ \text{sprayer}}{20\ l}$

=**10 sprayers of 20 litres each**

iii. If 200 litre (1 ha) = 50 g

$\therefore$ 20 lit (one sprayer) = $\frac{50\ g \times 20\ l}{200\ l}$

= **5 g of servian**

iv. If 200 lit = 30 m*l*

$\therefore$ 20 lit (one sprayer) = $\frac{30\ ml \times 20\ l}{200\ l}$

= **3 m*l* of BB5**

(f) i. Concentration of Atrazine is 80/100 or 0.8 g per litre

1 ha sprayed at 2 kg active ingredient a (i) will require 2/0.8

$\therefore$ 5 ha will require 2/0.8 x 5 = 12.5 kg

Or Quantity of product (Q) required =

$\frac{\text{Rate of application (R) x area to be treated (A)}}{\text{C\%}}$

Where C is the concentration given in kg per litre for liquids and as a percentage for solids

i.e. $Q = \frac{R \times A}{C}$

$Q = \frac{2 \times 5}{0.8}$

= **12.5 kg**

ii. Concentration of the herbicide is 0.25 kg per litre

1 ha sprayed at 2.5 kg active ingredient (a.i.) will require 2.5/0.25 litres

$\therefore$ 5 ha will require $\frac{2.5 \times 5\ l}{0.25 \times 1}$

= **50 litres**

Or $Q = \frac{R \times A\ \text{litres}}{C}$

$= \frac{2.5 \times 5\ l}{0.25}$

= **50 litres**

iii. $Q = \frac{R \times A\ \text{litres}}{C}$

$= \frac{2.0 \times 800 \times 1\ l}{0.48 \times 10{,}000}$

$= \frac{1{,}600\ l}{4{,}800}$

= **0.333 litres**

= **333 m*l***

iv. 1 kg of formulated granular herbicide contains 100 g of the herbicide

$\therefore$ 50 kg = $\frac{50 \times 100\ g}{1}$

= 5,000 g

= 5 kg

4 ha were applied with 5 kg of actual herbicide

$\therefore$ 1 ha = $\frac{5 \times 1\ kg}{4}$

= **1.25 kg**

$\therefore$ application rate = 1.25 kg a.i. per ha

Or $R = \frac{Q \times C\ \text{kg a.i. per ha}}{A}$

$= \frac{50 \times 0.1\ \text{kg a.i. per ha}}{4}$

= **1.25 kg a.i./ha**

v. Total quantity of Galex used = 30 x 5 = 150 litres
Total area sprayed = 15 ha
The farmer applied at product rate of 10 litres /ha
Since concentration of Galex is 500 g per litre
Actual delivery rate of herbicide =10 lit/ha x 500 g a.i. per litre
= 5,000 g/ha
= **5 kg a.i./ha**
The farmer actually exceeded recommended rate for Galex.
Injury resulted from high dose of herbicide was operator's error.

$$R = \frac{QC}{A}$$

$$= \frac{150 \times 0.5 \text{ kg a.i. per ha}}{15}$$

$$= \mathbf{5 \text{ kg a.i. per ha}}$$

(g) i. Lasso
Atrazine
Authority
Canopy
Merlin
Harness

ii. MSMA
Touchdown
Gramoxone
Servian
Round up

iii. Atrazine
Garlon 4
Canopy
Terbo
MCPA

iv. Servian
MSMA
Round up
Authority
Touch down
Canopy

v. Diuron
Hammer
Sencor
Tebusan
Gesapax

vi. Diuron
Hammer
Sencor
Tebusan
Gesapax
Impi

4. (a) i. Soil **C**.
ii. Has the highest percentage of clay particles.
iii. Has the highest percentage of organic matter.

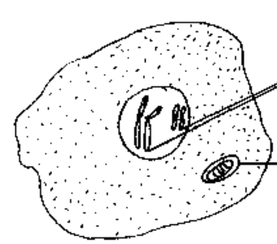
(b) i. Soil **B**.
ii. – Contains medium amount of sand and clay particles hence liable to leaching and waterlogging.
– Contains moderate amount of organic matter.
– It receives medium rainfall amount

(c) i. It is receiving high annual rainfall which leads to washing out of exchangeable bases.
ii. Less amount of organic matter.
iii. Relatively high amount of sand particles.

(d) i. Soil **C**.
ii. Has the highest amount of organic matter that supply nutrient to micro-organisms.

(e) i. Applying organic matter
ii. Applying lime to reduce acidity.
iii. Draining off excess water from the soil.

5. (a)



(b) 2 chromosomes in each daughter cell

(c) i. Mother Bb
Father Bb

ii.

Parents ⟶ **Bb**

↓ **Bb**

Gametes	B	b
B	BB	Bb
b	Bb	bb
Offspring	BB,Bb,Bb,bb	

A litter or offspring with genotype **bb** will have blue eyes.

(d) i. Heterozygote is an individual with 2 different genes for the same character, e.g. Tt.

ii. Genetic diagrams are diagrams that assist us to work out possible combination of genes to give the probable genotype and phenotype of the offspring, e.g. punnett square format method.

iii. Additive characters are characteristics controlled by many genes where one gene is not completely dominant over another and offspring posses characteristics intermediate between the two characters.

iv. Single factor inheritance is the inheritance where one gene is dominant over another and one gene controls one trait or character.

v. Co-dominance or complete dominance is a situation where both genes of an allelomorphic (allelic) pair produce their effects in an individual, i.e. neither allele is dominant to another.

(e) i.

Parents 1 RR X rr

Gametes R R r r

F1 (offspring) Rr Rr Rr Rr

Genotype: all Rr
Phenotype: all purple

ii.

Parents 2 Rr X rr

Gametes R r r r

F2 (offspring) Rr Rr rr rr

Genotype: 2Rr 2rr
Phenotype: 2 purple 2 white

(f)

Parents 1 RR X rr

Gametes R R r r

F1 (offspring) Rr Rr Rr Rr (All pink)

Parents 2 Rr X Rr

Gametes R r R r

F2 (offspring) RR Rr Rr rr

Genotypes: RR, 2Rr, rr
Phenotypes: 1 purple : 2 pink : 1 white

Ratios 1 purple : 2 pink : 1 white

Or ¼ purple ½ pink ¼ white

Or 25% purple 50% pink 25% white

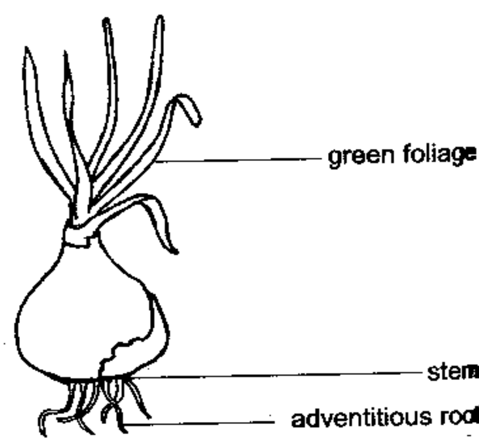
6. **Solution**

Total income	**Total costs**	
Milk at K37,400.00	Bought feed at	K21,100.00
Beef at K5,100.00	Wages at	K14,400.00
Maize at K36,400.00	Fertiliser at	K6,300.00
Groundnuts at K10,600.00	Fuel at	K6,800.00
Repairs & maintenance at		K1,3600.00
Goats at K2,000.00	Miscellaneous at	K6,800.00
= **K91,500.00**		= **K69,000.00**

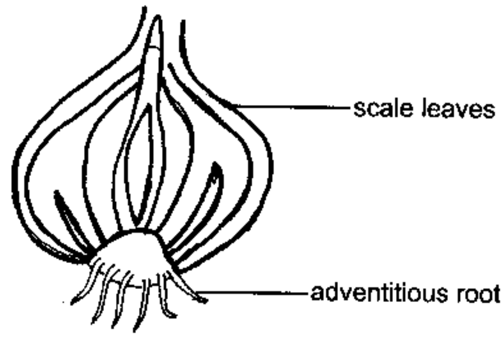
Net farm income = Total income – Total costs
= K91,500.00 – K69,000.00
= **K22,500.00**

PRACTICAL 16

1. (a) **X** is an onion
(b)



(c) i.



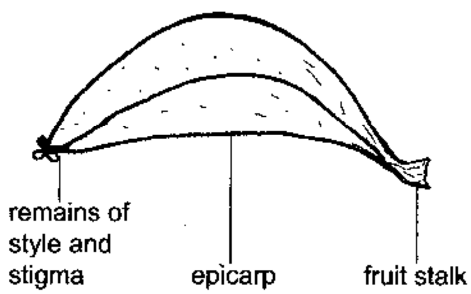
ii. Vegetative propagation

iii. Pollination agents, which may fail to perform successfully, are not needed.

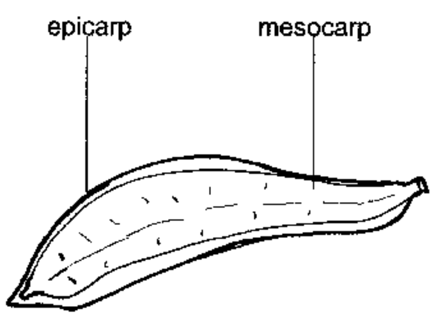
The offspring are true to type for there is no mixture of hereditary characteristics.

(d) i. **Y** is a banana fruit.

ii.



iii.



(e) i. Vegetative propagation

ii. Pineapple
Sweet potatoes

(f) It is called vegetative reproduction.

2. (a) **P** is a sugarcane stem.
Q is a maize seed.
R is a sweet potato vine.
S is a mango fruit.
T is a pumpkin seed.

(b) It must be viable

(c) Maize seed
Mango fruit
Pumpkin seed

(d) i. Seeds are relatively cheap.

ii. Seeds produce offspring that are different from their parents, leading into having some offspring containing better characteristics than the parents.

iii. Seed is easy to saw, handle, and prepare for planting.

iv. Seed is easy to store without significant loss in quality and quantity.

v. Seed can remain viable for long periods.

vi. Seed can easily be sawn mechanically using seed hoppers/drills.

vii. Seed offers the only way of propagating that cannot be propagated vegetatively.

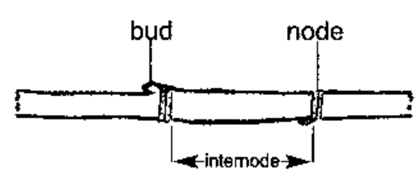
viii. Seed as a planting material minimises the risk of transmitting the diseases from parents to offspring.

(e) i. It requires a well-prepared seed bed on which to sow the seed.

ii. It requires a long juvenile period before it starts producing yields.

iii. It can produce serious variation and off types among the offsprings since no two gametes may be alike.

(f)



(g) Plant population =

$$\frac{\text{Area x plants per planting station}}{\text{Ridge spacing x planting station spacing}}$$

$$= \frac{10{,}000 \text{ m}^2 \times 3 \text{ plants}}{0.9 \text{ m} \times 0.9 \text{ m}}$$

= 37,037.037

= **37,037 plants per ha**

3. (a) i. The genotype is **WR**.

ii.

Parents → **WR**

WR ↓

Gametes	W	R
W	WW	WR
R	WR	RR
Offspring	WW,WR,WR,RR	

The ratios are 1 white : 2 pink : 1 red
RR for red, WR for pink and WW for white

iii. The **W** gene and **R** gene are co-dominant and their combination effect produces white, pink and red calves at the same time.

(b) i. Incomplete dominance is a case where the effect of the recessive allele is not completely masked by a dominant allele.

ii. Mitosis is the process through which ordinary cells (or somatic cells or body cells) are formed in the body of a living thing.

iii. Meiosis is the process through which gamete cells are formed from somatic cells.

iv. Speciation is the origin of species.

v. A fair test in experiments is an experiment where all variables are kept constant except one.

4. (a) **A** is inelastic demand ($E \propto 1$).
B is perfect elasticity of demand ($E = \propto$).
C is elastic demand ($E \propto 1$).
D is elastic supply.
E is unitary elasticity of demand ($E = 1$).
F is unitary elasticity of supply.
G is perfectly (absolute) inelastic demand ($E = 0$).

(b) i. Change in technology

ii. Change in government policy

iii. Changes in climate or seasons

iv. The price of the product

v. The cost of production

(c) i. **A luxury:** when income elasticity of demand is greater than one.

ii. **A necessity:** when income elasticity of demand is less than one.

iii. **An inferior good:** when income elasticity of demand is negative.

(d) i A is inelastic demand ($E \propto 1$): where a change in price results in less than proportionate change in demand.

ii. **B** is perfect elasticity of demand ($E = \propto$): Where a very small change in price leads to an infinitely large change in demand.

ii. **C** is elastic demand ($E \propto 1$): when a change in price results in a more than proportionate change in demand.

iii. **E** is unitary elasticity of demand ($E = 1$): when a change in price results in exactly proportionate change in demand.

iv. **G** is perfectly (absolute) inelastic demand ($E = 0$): when a change in price results in no change in demand.

5. (a) Plant population =

$$\frac{\text{Area} \times \text{seeds per planting station}}{\text{Spacing between ridges} \times \text{spacing between stations}}$$

$$= \frac{10{,}000 \text{ m}^2 \times 3 \text{ seeds}}{64 \text{ cm} \times 75 \text{ cm}}$$

$$= \frac{10{,}000 \text{ m}^2 \times 3 \text{ seeds}}{0.64 \text{ m} \times 0.75 \text{ m}}$$

= **62,500 plant/ha**

(b) Germination % =

$$\frac{\text{Number of seeds germinated} \times 100}{\text{Number of seeds that were sown}}$$

$$= \frac{200 \times 100}{400}$$

= **50%**

(c) i.

$$\text{Seed rate} = \frac{\text{Plant population per hectare}}{\text{Seed size x purity \% x Germination \%}}$$

$$= \frac{62\ 500 \text{ seeds x 1 kg x 100 X 100}}{\text{ha x 10 000 seeds x 50 X 50}}$$

= **25 kg /ha**

(d) $$\text{PLSC} = \frac{\text{Purity \% x Germination \%}}{100}$$

$$= \frac{50 \times 50}{100}$$

= **25**

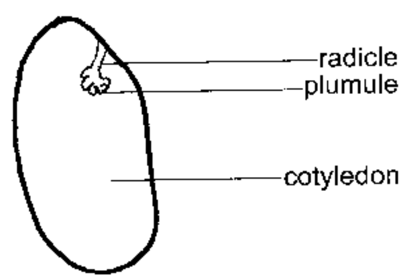
(e) i. The farmer gets maximum plant population.
  ii. Land plus other environmental resources such as air are fully utilised during the growing season.

(f) i. Maize crop will mature before some late pests and diseases attack them during the growing season.
  ii. Maize crop will make full use of the rains and other environmental resources during the growing season.
  iii. Maize crop will establish early thereby reducing competition between weeds and the maize crop.
  iv. Maize roots get established early and absorb soil nutrients before they are leached.

6. (a) Livestock management means the trial to improve the genetic make up of livestock and their surrounding environment for the purpose of increasing production.
  (b) **X** is cell membrane that protects cell contents.
  Y is mitochondrion, area of cell respiration.
  Z is a chromosome for keeping cell genetic information (genes).
  (c) i. Introduction
  ii. Selection
  iii. Breeding
  (d) In-breeding refers to the mating of closely related animals, e.g. a brother and a sister while out-breeding refers to the mating of not closely related animals, e.g. second cousins.
  (e) i. Brahman
  Africander
  Hereford
  Charolais
  Galloway
  Santa Getrudis
  Short horn
  Aberdin Angus
  ii. Extensive system – where cattle graze on communal grazing area.
  Intensive system – where cattle are confined in a stall in which they feed.

PRACTICAL 17

1. (a) **X** is a groundnut seed.
  Y is groundnut flour.
  C is a cotton seed.
  (b) i. **Primary products are**
  Groundnut seed.
  Cotton seed.
  ii. **Secondary product is** groundnut flour.
  (c) i. Source of raw materials to be used in manufacturing industry, e.g. Unilever South East Africa.
  ii. Raw material for making animal feeds thereby improving the milk and beef industry.
  (d)



  (e) **Y** is made from **X** or **Y** is made from groundnut or groundnut flour is made from groundnut.
  (f) i. Provision of employment to people working in industries and farms.
  ii. Provision of food (especially protein) for health productive population.

2. (a) **K** is Urea.
   C is 23:21:0+4S.
   (b) It is side dressing.
   (c) i. **Advantages of Dollop method:**
   There is economic use or less wastage of fertiliser since right amount of fertiliser is applied in each hole.
   There is efficient use of fertiliser since the fertiliser is applied at the right distance from he crop and right depth below the ground.
   ii. **Disadvantages of Dollop method:**
   Labour-consuming, i.e. requires more labour.
   Time-consuming to do the operation, i.e. requires more time.
   (d) It is dissolved in water and after that nitrification takes place to produce nitrate, which is taken by plants.
   (e) i. **Function of Nitrogen:**
   Promotes absorption of phosphorus and potassium.
   Used in protein formation in plants.
   ii. **Function of Phosphorus:**
   Ripening of fruits.
   Used for root growth and development.
   (f) Mass of 4 bags of K (urea) = 4 x 50 kg
   = 200 kg
   % N in K (urea) = 46
   ∴ Mass of N applied = 46/100 x 200 kg
   = **92 kg of N**

3. (a) Natural vegetative reproduction is the type of vegetative reproduction that occurs without the interference of human beings where the tissues connecting parent and daughter plants rot away, and the daughter plants continue their growth.
   Artificial vegetative reproduction is the type of reproduction where human beings make use of the plant's ability to produce new organisms, so human beings separate part of the stem, leaf or root and put it in the soil to produce a new plant.
   (b) i. **Bulb** is a plant having leaf bases swollen with food, on flattened stem with buds, e.g. onion, garlic etc.
   ii. **Corm:** Plants with vertical stem swollen with food and bearing buds, e.g. coco yam.
   iii. **Rhizome:** Plants with horizontal swollen stem, e.g. ginger.
   iv. **Stem tuber:** Plants with swollen end of underground stem, e.g. Irish potatoes.
   v. **Root tuber:** Plants with swollen adventitious roots, e.g. sweet potato.
   (c) i. **Runners:** Plants with horizontal creeping stems, which root at the nodes, e.g. straw berry.
   ii. **Stem suckers:** Plants with lateral buds growing from the base of a stem, e.g. banana.
   iii. **Leaf buds:** Plants with adventitious roots on leaf-of-life, e.g. Bryophyllum.
   (d) i. **Cuttings:** pieces of stem put into the soil that later become new plants. e.g. sugar cane cuttings.
   ii. **Budding:** Buds of one variety joined to a different stock, e.g. oranges and limes.
   iii. **Tissue culture:** A few cells taken from a plant, e.g. an orchid, can be grown in an artificial medium to produce thousands of identical plantlets.
   iv. **Grafting:** Is the uniting of two separate, usually woody structures, e.g. union of a stem to a root or more commonly the union of two stems.
   v. **Layering:** Involves the induction of the plants to produce roots on their stems before these stems are severed from the parent plant to be used for producing new individuals.

4. (a) Identical twins cannot be of different sexes because they replicate (made) from one cell. Identical twins can either be all females or all males.
   (b) i. dd
   ii. **DD X dd**
   iii. All will be white in colour.
   (c) i.

Gametes	**A**	**A**	**A**	**O**
A	AA	AA	AA	AO
B	AB	AB	AB	BO

Offspring AA, AA, AA, AO, AB, AB, AB, BO

The chances or probabilities of offspring having a particular blood group (genotypes) are:

3/8 AA, 3/8 AB
1/8 AO, 1/8 BO

ii.

Gametes	**B**	**B**
A	AB	AB
B	BB	BB
Offspring	AB, AB, BB, BB	

This is not possible because there is no chance of having A blood group offspring as proved from the genetic diagram worked above.

5. (a) Income from bean sales = yield X price per

unit yield = $\frac{\underline{2200 \text{ kg x } 4 \text{ ha x K}60.00}}{\text{ha x kg}}$

= **K528 000.00**

Income from bean haulm sales = K3 000.00
Total revenue (TR) = K528,000.00 + K3,000.00 = **K531,000.00**

Variable costs (VC):

Cost of bean seed	= K 5,000.00
Cost of lorry hire	= K 2,000.00
Cost of malathion	= K 1,500.00
Cost of casual labour	= K 6,000.00
Total Variable Cost (TVC)	= K14,500.00

Gross Margin = TR – TVC
= K531,000.00 – K14,500.0
= **K516,500.00**

(b) Cost of 10 hoes at K300.00 each= K3,000.00
Cost of CP sprayer = K5,000.00
Cost of 8 permanent labour = K64,000.00
K2,000.00 for 4 months at
TFC = K72,000.00
Profit = Gross margin – TFC
K516,500.00 – K72,000.00
= **K444,500.00**

(c) Gross margin – profit
= K516,500.00 – K444,500.00
= **K72,000.00**

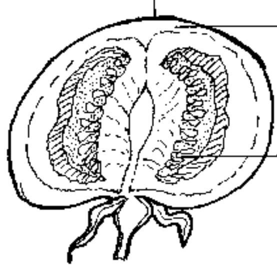
(d) It is an easy method of identifying profitable enterprises.

6. (a) i. May and June
   ii. September
   (b) i. 90 + 85 = 175 man-days
   ii. – Usually casual labour to supplement the available family labour.
   – Substituting farm enterprise with those whose peak periods do not occur during same months.
   (c) i. Cotton
   ii. Cassava
   (d) i. It helps the farmer in distributing labour to different enterprises according to their requirements.
   ii. It prevents the farmer from combining enterprises whose peak periods fall at the same time in the season.
   (e) i. It would decrease.
   ii. Capital and land.

PRACTICAL 18

1. (a) **X** is *mpiru*.
   Y is tomato fruit.

(b) i



ii. – epicarp protects inner part from mechanical damage.
– mesocarp supplies food nutrients to tissues in a developing tomato fruit.
– seed contains the embryonic structures for the plant.

(c) i.

	Year 1	Year 2	Year 3	Year 4
Plot I	Carrot	*Mpiru*	Peas	Tomato
Plot II	Tomato	Carrot	*Mpiru*	Peas
Plot III	Peas	Tomato	Carrot	*Mpiru*
Plot IV	*Mpiru*	Peas	Tomato	Carrot

ii. It replenishes nitrogen in the soil since it is a legume.

(d) i. They quickly spoil since they are highly perishable.

ii. Keeping them under low temperature in cold rooms.

2. (a) **I** is the igneous rock.
M is the metamorphic rock.
N is the sedimentary rock.

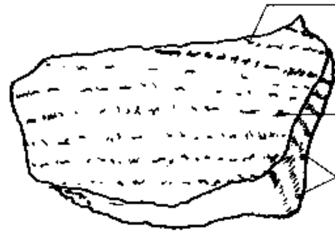
(b) i. Igneous rocks are rocks that have been formed by the cooling of molten mass and are therefore usually massive, e.g. granite.

ii. Metamorphic rocks are rocks that are formed from pre-existing igneous or sedimentary rocks by the action of high temperature and pressure, e.g. quartzite from sand.

iii. Sedimentary rocks are rocks that are produced by the breaking up of pre-existing rocks, and the deposition of their material, e.g. loess and alluvium

(c)

(d)



(e) i. Wind
ii. Water

(f) i. Soil air
ii. Soil water

3. (a) Mould board plough

(b) **D** is the beam.
T is the depth wheel.
U is the plough share.

(c) i. **T** (depth wheel) controls the depth of penetration.

ii. **U** (plough share) is used to make horizontal cuts on the soil, separating furrow slice from the underlying soil.

(d) i. Clean the mould board plough after use.

ii. Lubricating all moving parts to reduce wear and tear.

iii. Tightening all loose bolts and nuts.

iv. Replace worn out parts like mould board, share, etc.

(e) i. It makes work easier to be done.

ii. Helps to increase production.

iii. Operations on the farm are done faster and at the right time.

iv. Provides time for framers to do other important operations.

(f) i. Nozzle
ii. Pump barrel
iii. Handle
iv. Shoulder strap

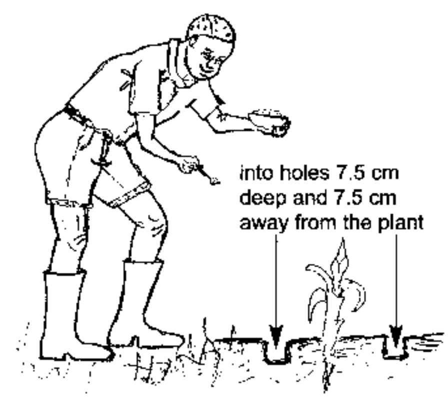
4. (a) It was to find the effect of fertiliser rates on maize yield.
(b) i. Control
ii. It provides a basis of comparison with the rest of treatments.
(c) i. 100 kg DAP/ha and 100 kg urea/ha.
ii. That combination supply the optimum nutrients required for maize production.
(d) Soils normally contain a certain amount of nutrients.
(e) i. 10 kg
ii. $50\ m^2 = 10$ kg
$10{,}000\ m^2 = ?$ more
$$\frac{10{,}000\ m^2 \times 10\ kg}{50\ m^2}$$
$200 \times 10\ kg = 2{,}000$ kg
(f) i. – Using litimus paper/universal indicator solution to test soil pH.
– Using soil samples as culture media for seedlings and observe deficiency signs.
ii. – To estimate the supply of available plant nutrients so as to know what elements to add and in what quantities.
– To determine the alkalinity or acidity of a soil and therefore establish the type of fertiliser to use.

5. (a) Mixed cropping (Relay cropping)
(b) Four
(c) Inter row mixed cropping and intra row mixed cropping
(d) i. It puts land to maximum use.
ii. It ensures food security through increased production.
(e) i. Other crops may suffer shading from mango trees.
ii. It depletes nutrients quickly from the soil.

6. (a) Plant population =
$$\frac{\text{Area x pants per station}}{\text{Ridge spacing x spacing between planting stations}}$$
$$= \frac{10\ 000\ m^2 \times 1\ \text{plant}}{0.8\ m \times 0.25\ m}$$
= **50,000 plants per ha**

(b)
Mass of CAN applied per ha = 4 bags x 50 kg
= 200 kg of CAN
% of N in 50 kg bag of CAN = 27%
∴ Mass of N in 200 kg of CAN = 27/100 x 200 kg of CAN
= **54 kg of N**

(c) It is Urea, (46% – 27% = 19%)
(d)



(e) i. The type of fertiliser
ii. Method of application to be used
iv. Crop variety to be planted
v. Soil conditions
vi. Climatic conditions

PRACTICAL 19

1. (a) It is *Tridax procumbens*.
(b) Compete with crops for air and space.
(c) It is a witch weed (*Striga asiatica*).

(d) i. Stunted growth
ii. Wilting of the maize plant
iii. The plants turn yellow
iv. Roots bear or carry tentacles or haustoria of striga.

(e) i. A small plant with flowers, which can be yellow red or blight red.
ii. Stem slightly hairy with leaves
iii. It can grow 15-20 cm tall and has multiple branches.

(f) i. Roots are water white in colour and produce haustoria that penetrate and get attached to host roots. It reaches host vessels.
ii. The roots have root hairs.

(g) i. Can be spread by wind.
ii. Can be spread by water.
iii. By contamination with farm equipment from one place to another.

(h) i. Use non-host crops, e.g. legumes.
ii. Use trap crop, e.g. sunflower.

2. (a) **X** is *madeya* or *deya* or maize bran.
Y is elephant grass.
Z is lime.

(b) It is *madeya*.

(c) Lime or CaOH or calcium hydroxide.

(d) Oxy-vit and mineral lick.

(e) i. To conserve some of the star grass to be used during times of scarcity like in form of hay and silage.

ii. To protect the feed fro uncontrolled bush fires.

To minimise wastage of pasture.

To preserve the nutritive value of pasture or star grass.

To have a constant supply of feed at all times of the year.

To lead to high pasture or star production because it will re-grow.

iii. In dry season star grass or pasture is scarce and the quality may be low because of high fibre content that makes it less palatable and less digestible (low nutritive value during the dry season).

In wet season there is plenty of pasture of good quality in terms of palatability and digestibility.

(f) i. **Nutrient requirement of the animal being fed:** The feed should be able to satisfy the animal's requirements so that extra feeds are not bought.

ii. **Age or size of the animal:** young animal should be given production ration while old animals should be given maintenance ration.

iii. **Palatability of feed stuff:** The feed should be palatable so that the animal takes easily or enjoys the feed

iv. **Nutrient content of the feed** available so that the feed intake is of high quality.

3. See table below.

Costs (MK)		**Income (MK)**	
I bag layers marsh	= 800.00	30 units @ K7.00 each	= 210.00
2 bags manure @ K50 each	= 100.00	Vegetables	= 500.00
2 bags CAN @ K6,000	= 12,000.00	6 bags maize	= 15,000.00
		Cassava	= 6,000.00
		Groundnuts	= 15,000.00
Total Costs	**= 12,900.00**		**= 36,710.00**

Profit = Income – Costs

= K36,710.00 – K12,900.00

= **K23,810.00**

(b) i. They help farmers to know whether they are making profit or loss from the farming activities.

ii. They help farmers as to the amount of tax they have to pay.

4. (a) **A** is omasum.

B is reticulum.

C is stomach.

D is duedenum.

E is caecum.

F is large intestines.

(b) i. **A** (omasum) squeezes the feed with its folds and absorbs water.

ii. **B** (reticulum) separates large feed particles from fine ones.

iii. **E** (caecum) has microorganism, which digest some cellulose.

iv. **F** (large intestines) reabsorbs water from the gut into the blood stream.

(c) i. Cannot chew the cud.

ii. Cannot make vitamins B and K.

iii. Cannot digest cellulose.

iv. Have one stomach only.

(d) i. They can make proteins from the products of digestive system.

ii. They break down grass and cellulose in the cell walls.

iii. They can make some vitamins like **B** and **K.**

(e) i. Makes the feed be finely digested for it is chewed for the second time.

ii. Ensures that the animal eats a lot of feed within a short period of time.

iii. Enables the feed to be thoroughly mixed with micro-organisms in the rumen through muscular movements and chewing again of the feed.

5. (a)

Parents 1 BB X BB

Gametes B B b b

F1 (offspring) Bb Bb Bb Bb

Parents 2 Bb X Bb

Gametes B b B b

F2 (offspring) BB Bb Bb bb

Genotype: 1 BB 2 Bb 1 bb

Phenotype 3 black 1 brown

(b) Selection is the choosing of animals with certain desirable characteristics for breeding.

(c) i. **Inbreeding:** This is where offspring (progeny) are produced by mating closely related pairs, e.g. father and daughter, mother and son, brother and sister.

ii. **Out breeding (out crossing or line crossing):** This involves mating of individuals which are not closely related but belong to the same breed, for example, second cousins with second cousins. It is used to introduce new blood into the herd.

iii. **Cross-breeding:** This is the mating of animals which belong to different breeds, e.g. Landrace with large white in pigs in order to introduce new blood into the herd.

(d) Pure breed or pure line is achieved through 10-12 generations of continuous inbreeding.

(e) i. It results in hybrid varieties, which show hybrid vigour or heterosis.

ii. Hybrid vigour is the superioty in growth rate displayed by a crossbred progeny, e.g. when Hereford bull is mated to a boron cow, the calf born will grow faster than either of the two parents.

(f) The major genetic effect of inbreeding is an increase in the number of pairs of genes that are homozygous for a characteristic, e.g. good milk. The outward results are to increase the uniformity of the herd of animals.

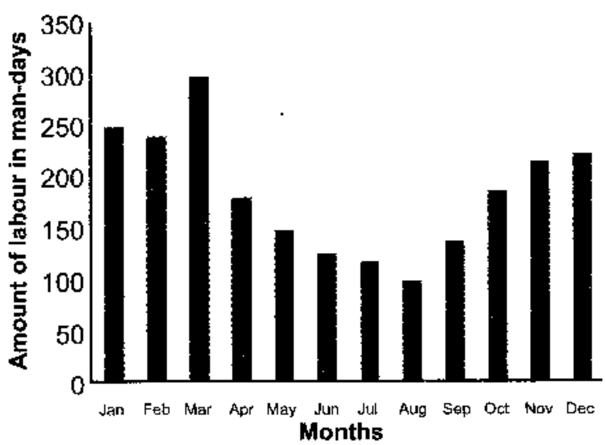
(g) i. Trained and experienced people are required to collect and administer Artificial Insemination (AI).

ii. Difficult to detect with surety the heat period of a cow so this can make Artificial Insemination (AI) be done at the wrong time.

iii. Female cattle in villages or far distant areas may be administered late or not at all because of distance and transport problems.

iv. Very expensive to maintain and begin Artificial Insemination (AI) programme in many areas.

6. (a)



(b) July and August

(c) January, February and March

(d) Planting, Fertiliser application, weeding and land preparation

(e) i. Increase labour supply by either using casual labour or family labour.

ii. Use contractors so that the work is finished within a short period of time.

iii. Extending the period when a particular activity can be done, e.g. start planting maize during the dry season.

iv. Adjusting enterprise combination. Reduce area of crops that have work load and grow more of those crops that have lighter activities, e.g. maize-more area and tobacco-less area.

(f) i. Peak and slack periods of labour demand become clear and can be allowed for in planning future production.

ii. As the relevant information is more detailed than in labour profile, ways of removing or reducing peaks are more easily seen.

iii. Planning enables farmers to organise their operations and adjust their methods to raise the efficiency of labour.

iv. There is little doubt that large savings can rise from well-planned labour (and contract) use.

v. It enables farmers to plan the recruitment and training of new staff. Training of new staff is sometimes a long and costly job, so adequate warning of staff needs is essential.

PRACTICAL 20

1. (a) **H** is humus.
C is cow dung.
S is sand.

(b) **S** (Sand) is a mineral constituent of the soil.

(c) **Sedimentation method**

Procedure:

Shake a sample of soil with water in a measuring cylinder and allow the particles to settle.

After the settling, read the depth of sand layer in the measuring cylinder.

Calculate the proportion of sand by volume

$$\% \text{ Sand} = \frac{\text{Volume of sand layer x 100}}{\text{Volume of the soil sample}}$$

Do likewise with other soil constituents.

Humus
Clay
Silt
Sand
Gravel

(d) i. Avoid burning the fields where **C** is present because some elements may get lost, e.g. **N**.
ii. When applying, bury it to avoid loss of some nutrients in form of gas or through soil erosion.
iii. Store under shade to avoid bleaching from the sun and leaching by rain.

(e) i. Improves microbial activities of the soil because the environment is favourable to microbes.
ii. Buffers soil pH hence providing a conducive environment for crop growth.
iii. Improves soil structure of **S** by binding the soil particles together.
iv. Improves water-holding capacity of **S** because soil porosity is increased.
v. On decay, **H** releases mineral nutrients thereby improving the nutrient status of **S**.
vi. Adds dark colour to **S,** thereby improving heat absorption and retention of **S**.

(f) i. Labour demanding.
ii. Does not show how much each nutrient is applied.
iii. Rate applied is not known.
iv. May bring weed seeds and pests in the fields.
v. Large quantities are needed per unit area (bulky).

(g) i. Releases nutrients in the soil.
ii. Releases nutrients slowly thereby supplying nutrients during the entire life of the crop.
iii. Increases microbial activity.
iv. It is locally found and therefore cheap.

2. (a) **P** is xylem.
Q is phloem.
R is called epidermis.

(b) **S** is a phloem.
T is vascular bundles.
U is called the cortex.

(c) i. Vascular bundles of a monocot have no regular arrangement (random) while those of a dicotyledonous plant have regular patterns.
ii. Vascular tissue is missing in monocots while vascular tissue is present in a dicot.

(d) Vascular cambium produces new xylem and phloem cells in a plant.

3. (a)

Fixed cost		
Land tax	=	K1,000.00
Wages of permanent labour	=	K20,000.00
Depreciation cost of irrigation equipment	=	K4,000.00
Variable cost		
2 bags of CAN fertiliser	=	K4,000.00
Insecticides	=	K1,200.00
Casual labour	=	K5,000.00
Packets of tomato seed	=	K500.00

(b) Total fixed cost
= K1,000 + K20,000 + K4,000
= **K25,000.00**

(c) Total variable cost
K4,000 + K1,200 + K5,000 + K500
= K10,700.00

(d) i. 200 x 90 x K100 = **K1,800,000.00**
ii. Profit/loss
= Total Income – (Total Fixed costs + Total Variable costs)
= K1,800,000 – K25,000 +K10,700
= K1,764,300.00

(e) It is easier than calculating profit.

4. (a) Flushing is the practice of conditioning or having thin animals (e.g. sows or ewes) gain weight just prior to breeding, or it is giving animals concentrates two weeks before they are mated to improve their health and fertility.
   (b) i. Ewes, sows and gilts are likely to have multiple ovulations and hence bear twins or triplets in case of the former and increase litter size in case of sows and gilts.
   ii. Flushing often increases the lambing by 10-20%, thereby increasing the number of lambs.
   iii. Flushed animals are more apt to come in heat more promptly and become pregnant than unflushed animals.
   (c) i. Challenge feeding is the practice of adjusting the feed according to production after reaching maximum production.
   ii. The ruminal microorganisms adapt to high concentrate levels before calving and provide abundant energy for the cow at precise time she needs it most, i.e. èarly in lactation.
   The cow is challenged to reach her maximum production early in lactation and it is not limited by lack of available energy for milk production.
   Challenge feeding may reduce incidences of Ketosis.
   iii. Cows with chronic mastitis; may flare up because of the extra strain on the udder, but feeding concentrates does not cause mastitis, it only accelerates mastitis, which was already in the udder.
   In average dairy herds, not all animals may respond to challenge feeding.
   (d) i. Steaming up is the practice of giving extra concentrates feed 6 to 8 weeks before calving.
   ii. To provide more food nutrient to the growing foetus in uterus.
   iii. It is globulin.
   iv. It is reddish in colour.
   Has strong odour (smell) compared to normal milk.
   Has bitter taste compared to normal milk.

5. (a) **A** is pulley.
   B is rope.
   C are treadles.
   (b) **D** (Treadle support) is used to support the treadles when people are pushing on to the pistons.
   E (Discharge pipe) is used to deliver water to the fields from the cylinder.
   F (Inlet pipe or suction pipe) is used to suck water from the water source into the cylinder.
   (c) It should be less than 4 m.
   (d) It varies between 0.4 to 1.2 litres/second depending upon the person operating and the depth from which you are pumping water.

6. (a) **PARTIAL BUDGET FOR INTRODUCTION OF COTTON - (1 HA)**

LOSSES			GAINS		
New costs	**K**	**t**	**New Income**	**K**	**t**
Fertiliser	3,000	00	Extra cotton sales	6,000	00
Boron	400	00			
Extra reaping labour	600	00			
Net gain	2,000	00			
	6,000	00		6,000	00

Conclusion: Fertilising her cotton is likely to raise this farmer's profit by K2,000.00 per hectare.

(b) (A) Stands for a change
(B) Stands for no change

i. **Income**:
50 bags @ K1,000.00 each = K50,000.00 (A)
50 bags @ K900.00 each = K45,000.00 (B)

ii. **Cost of labour:**
2 h a @ K700.00 each = K1,400.00 (A)
2 ha @ K500.00 each = K1,000.00 (B)

iii. **Cost of storing:**
50 sack @ K40.00 each = K2,000.00 (A)
Granary/*nkhokwe* @ K0.00 = K0.00 (B)

iv. **Cost of pesticides:**
Cost of pesticides for a change=K500.00 (A)
Cost of pesticides for no change= K300.00 (B)

v. **Cost of fertiliser:**
Cost of 5 bags CAN @ K2,500 each (2 ha) = K25,000.00 (A)
Cost of 7 bags CAN @ K2,500 each (2 ha) = K35,000.00 (B)

PARTIAL BUDGET TO ESTIMATE THE EFFECT OF CHANGES TO A MAIZE ENTERPRISE

LOSSES			GAINS		
New costs	**K**	**t**	**New Income**	**K**	**t**
10 bags @ K2,500.00	25,000	00	Sale of stored maize 50 bag @ K1000.00	50,000	00
50 sacks @ K40.00	2,000	00			
Labour @ K700.00	1,400	00			
Pesticides	500	00			
Income lost			**Cost saved**		
50 bags at K900.00	45,000	00	14 bags @ K2,500.00	35,000	00
			Pesticides	300	00
			Labour @ K500.	1,000	00
			Granary	0	00
Net gain	**12,400**	**00**	**Net loss**	**0**	**00**
	86,300	**00**		**86,300**	**00**

ii. Mr Tichasa should go ahead with his plan because he is making a net gain of K12,400.00 from his two hectares of land.

iii. Helps the farmer to expand the existing enterprise or make addition to the already existing enterprise.
Helps the farmer to come up with a change in method of production of her enterprise.

iv. A partial budget does not show all the costs, i.e. all the variable costs and fixed costs.

PRACTICAL 21

1. (a) Processing
   (b) i. Shelled nuts require less storage space, thereby reducing cost on storage.
   ii. Shelled nuts are less bulky hence requiring less transportation cost.
   (c) i. Sexual propagation
   ii. **Advantages**
   – It enables crop improvement through hybridisation.
   – It reduces transfer of pests and pathogens from parents to offspring.
   Disadvantages
   – It may result in serious variation and off-types.
   – It is a slow means of propagating fruit trees due to increased seed dormancy.

2. (a) Specimen **X** is the chicken gizzard.
   (b) Digests the food the chicken eats.
   (c) It accomplishes its task of digestion through the help of the grit.
   (d) i. Newcastle disease
   ii. Fowl pox
   iii. Fowl typhoid
   iv. Coccidiosis
   (e) i. Fowl flea
   ii. Fowl scaly leg mite
   iii. Roundworms
   iv. Tape worms
   (f) i. Birds become unthrifty.
   ii. Birds develop diarrhoea.
   iii. Egg production gets low.

3. (a) **T** is CAN.
   K is Lime.
   (b) Both have calcium (in common).
   (c) i. Used in protein synthesis in crops.
   ii. Lowers the soil acidity resulting in increase in phosphorus and potassium for crops as well as multiplication of nitrifying bacteria.

iii. Calcium is required for cell division in order for the apical tips of the shoot system and root system to increase in length.
iv. It forms part of the cell wall structure so that the stem of crops can be strong.

(d) Lime has calcium which strengthens the egg shell.

(e) i. Will raise the soil pH to increase the availability of phosphorus and potassium in the soil for crop use.
ii. Will raise the soil pH to increase the multiplication of nitrifying bacteria which will fix **N** for the crops.

(f) Nitrogen or **N**

(g) i. **Immobilisation:** **N** being used by microbes for their body use.
ii. **Soil erosion:** Soil erosion takes away soil together with **N**.
iii. **Leaching:** Nitrogen especially NO_3^- get washed vertically down the soil profile to levels beyond the reach of roots.
iv. **Volatisation:** **N** being lost into the atmosphere in form of a gas due to denitrifying bacteria.

(h) i. Zinc
ii. Iron
iii. Molybdnenum
iv. Boron

4. (a) It is a labour record.

(b)

5 men =1 man-day 5 x 2	= 10 man-days
3 women = 0.75 man-day 3 x 2	= 3 man-days
3 children = 0.3 man-day 3 x 2	= 1.8 man-days
	= 14.8 man-days

(c)

Labour supply for the 2 days in 1st weeding = 14.8
Labour supply for each day in weeding = 4.8/2
= 7.4

∴ labour surplus 9 – 7.4 = **1.6 man-days**

(d) i. It enables the farmer in allocating labour properly to operations and enterprises according to their needs.
ii. The farmer is able to predict the labour peaks ahead of time for easy planning.

(e) Capital and land.

(f) The labour supply is not regular and constant.

5. (a)

Days in January	= 22	Finish mass	=355 kg
Days in February	= 28	Start mass	=265 kg
Days in March	= 31	Gain in mass	= 90 kg
Days in April	= 30		
Days in May	= 10		
Total days in stall	= 121		

Average mass gain per day = 90 kg / 121 days
= **0.74 kg/day**

(b)

Total revenue (TR) = yield x price per unit yield
= 90 kg x K200.00/kg
= **K18,000.00**

(c)

Amount spent on Variable costs = K50.00 X 121 days
= K6,050.00

Net income = Total revenue – Total fixed costs – Total variable costs
= K18,000.00 – 0 – K6,050.00
= K18,000.00 – K6,050.00
= **K11,950.00**

(d) Requires a lot of labour to look for pasture and feed it to livestock.

(e) i. Avoids the danger of overgrazing.
ii. Needs less capital, for there is no need of fencing the pasture.
iii. Eliminates the problems of grass and soil trampling by livestock for animals are confined in one place without moving about.

(f) Standard grade

6. (a) i. Excavated earthen channels
ii. Lined or built-up channels

(b) i. Cement
ii. Concrete
iii. Bricks

iv. Masonry

(c) i. Division box

ii. Drops (grade control structures)

iii. Check

iv. Turn out, outlets

(d) i. Weirs, e.g. rectangular weir, trapezoidal weir and 90-degree V-notch weir

ii. Flumes, e.g. Parshall measuring flumes, Cutthroat measuring flume and trapezoidal measuring flume

(e) i. Surface drainage

ii. Sub-surface drainage

PRACTICAL 22

1. (a) Mixed cropping

(b) i. Saves lobour since some operations are done once for all the crops.

ii. The mixture of crops provides adequate soil cover to reduce soil erosion and weed growth.

iii. Reduces the risk of crop failure since the farmer can rely on the other crops if one crop fails.

(c) i. Bakhresa Grain and Milling company

ii. Chibuku Products Limited

(d) Carbohydrate

2. (a) **C** is cement.

D is the fertiliser.

E is the soil.

F is lime.

(b) i. **E** (soil) anchors the plant.

ii. **C** can be used in construction of farm structures such as bridges and other buildings.

(c) i. They are stratified.

ii. The particles are crystalline.

iii. The particles are shiny.

(d) i. They are crystalline.

ii. They are hard.

iii. They are glassy and angular.

(e) i. They are almost always in layers.

ii. The particles are loose.

iii. The presence of fossils or organic components may be visible.

(f) i. Mechanically formed sedimentary rocks, e.g. wind-deposited and river-deposited.

ii. Organically formed sedimentary rocks, e.g. from animals and plants.

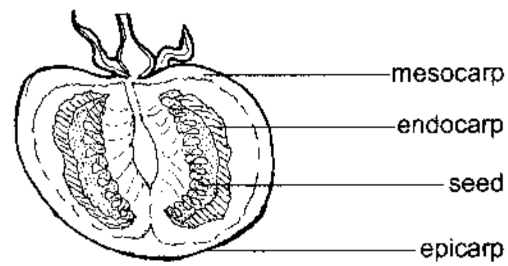
iii. Chemically formed sedimentary rocks, e.g. rock salt and gypsum.

(g) Sample **D**

3. (a) **K** is the sugarcane stem.

T is the tomato fruit.

(b)



(c) **K** is propagated mainly by means of a stem while **T** is propagated mainly by means of seed.

(d) By vegetative propagation through planting through planting a sugarcane stem.

(e) i. If some are attacked by pests and diseases they will perform poorly and look different from the healthy ones.

ii. If some lack the right and correct amount of nutrients they will look different from the plants that are receiving all the necessary nutrients.

(f) i. **Temperature:** Cool aerial temperatures accompanied by warm temperatures around the roots promote rooting.

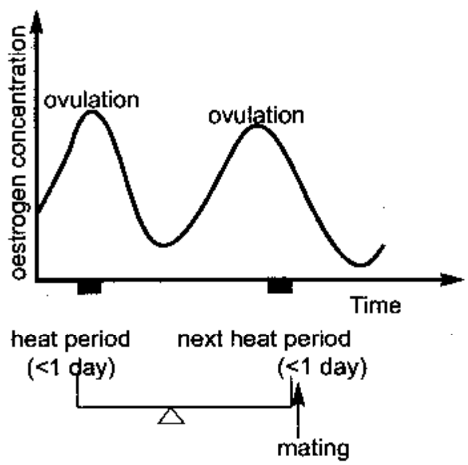
ii. **Relative humidity and light intensity:** High relative humidity inhibits desiccation by lowering transpiration rate. Under high relative humidity the turgidity of the leaf is maintained all the time.

iii. **Oxygen and moisture supply:** A rooting medium, which facilitates aeration as well as holding sufficient moisture, is desirable.

iv. **Chemical treatment:** There are rooting chemicals on the market called rooting hormones, which when applied to the basal end of the cuttings quickens the rooting process, e.g. Indoleacetic acid (IAA).

v. **Leaf area:** Some cuttings require to have some leaves in order to root while others do not.

4. (a)



Oestrous cycle: return of heat within about 19-21 days

The rise and fall in concentration of oestrogen follows a cycle called the oestrus cycle. When the oestrogen level reaches its maximum, an egg (ovum) is released from the ovary and enters the fallopian tube. The animal is on heat when there is high oestrogen levels. Oestrus cycle is the interval between one heat period and the next. The normal cycle in animals has four phases: Proestrus, oestrus, metoestrus and dioestrus.

(b) i. **Colibacilosis or Scours**

Symptoms are:

Profuse sharp smelling diarrhoea

Dullness and loss of appetite

Slight rise in temperature

ii. **Trypanosomiasis**

Symptoms are:

Fever, dullness and loss of appetite

Marked anaemia resulting in licking soil and emaciation

Swollen lymph node

iii. **Black quarter**

Symptoms are:

High fever

Shivering, no appetite and dullness

Lameness – usually a large limp. Muscle is swollen and very painful.

(c) Tick

5. (a) **M** is the ridger share.

A is the breast-plate.

N is the wing.

E is the handle.

B is the beam.

(b) i. Distance between ridges is controlled by the depth rod (clevis).

ii. The depth of ridging is controlled by the depth wheel.

(c) i. Sprayer

ii. Mouldboard plough

iii. Hand-hoe

iv. Ox-cart

(d) i. Efficiency of work: More work is done within a short period of time.

ii. Effectiveness of work: Thorough work is done mechanically than by human.

iii. Large scale farming is possible.

iv. High yields can be obtained because farming operations are done in good time.

v. Land fragmentation is avoided because machines are not fully utilised on fragmented land. So people will be forced to consolidate land.

(e) i. It is expensive to purchase machinery.

ii. Labourers can lose their jobs, for intensive use of mechanisation results in labour being laid off.

6. (a) i. Sulphate of Ammonia

Urea

CAN

ii. DAP
Potassium Nitrate

iii. Sulphate of Ammonia
CAN
Ammonium Nitrate

iv. Urea
DAP

v. Compound D
Compound B
Super C mixture
Super D mixture

(b) i. Area of a plot = Width x Length
$= 0.91\text{ m} \times 10\text{ m} \times 5\text{ ridges}$
$= \mathbf{45.5\ m^2}$

ii. If 1 ha = 300 kg of 23:21:0+4s
Therefore, = 45.5 m²

$$= \frac{300\text{ kg} \times 45.5\text{ m}^2}{1\text{ ha}}$$

$$= \frac{300\text{ kg} \times 45.5\text{ m}^2}{10\ 000\text{ m}^2}$$

= 1.365 kg /plot

iii. Area of each ridge = 0.91 m x 10 m
= 9.1 m²
If 1 ha = 300 kg
Therefore, $9.1 = \frac{300{,}000\text{ g} \times 91.1\text{ m}^2}{10{,}000\text{ m}^2}$

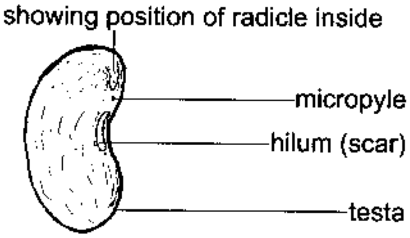
$$= \mathbf{\frac{273\text{ g of }23{:}21{:}0{+}4S}{ridge}}$$

iv. Area within each planting station = 0.91 m x 0.91 m = 0.8281 m²
If 1 ha = 300,000 g of 23:21:0+4S
Therefore, 0.8281 m²
$$= \frac{300{,}000\text{ g} \times 0.8281\text{ m}^2}{10{,}000\text{ m}^2}$$
= 24.843 g of 23:21:0+4S per station

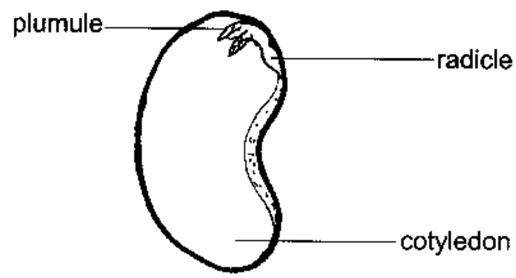
PRACTICAL 23

1. (a) i. Sample **X** is a bean seed.

ii.



(b)



(c) i. Testa protects the embryo against mechanical injury and entry of germs.
ii. Micropyle is a tiny hole that allows air to enter the seed for the respiration of the embryo.
iii. Hilum is black scar where the funicle was attached.

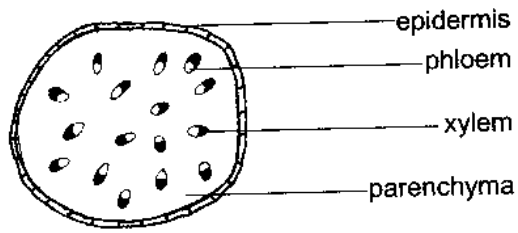
(d) i. Radicle – part of the embryo that forms the primary root.
ii. Plumule – part of the of the embryo that grows into a young shoot.
iii. Cotyledons – a pair of seed leaves that contain the food for the developing embryo.

(e) Source of proteins for body growth and development.

(f) i. Bulb, e.g. onion
ii. Corm, e.g. cocoyam
iii. Rhizome, e.g. ginger
iv. Stem tuber, e.g. Irish potato
v. Root tuber, e.g. sweet potatoes or cassava

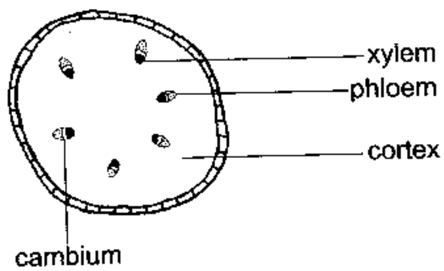
2. (a) **M** is a stem of maize plant.
B is a stem of bean plant.

(b)



Cross section of a monocotyledonous stem

(c)



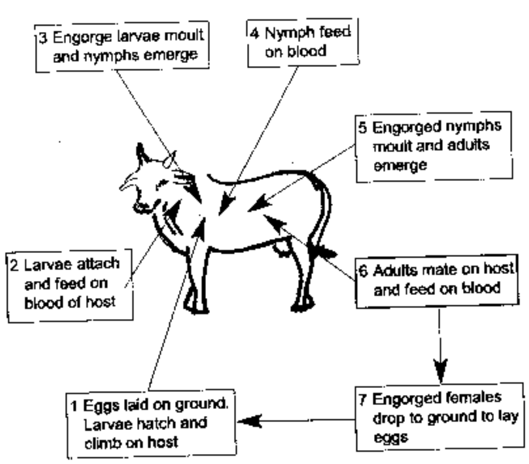
Cross section of a dicotyledonous stem

(d) i. They store food.
ii. They support the crops.
iii. They absorb water and mineral salts for the crops.

(e) It is a fertilised ovule.

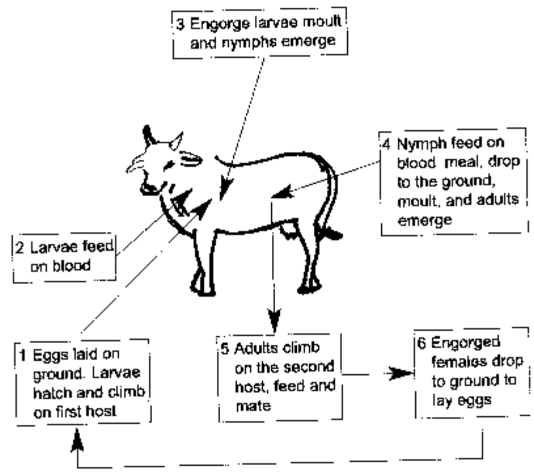
3. (a) **T**, which is a tick.

ONE-HOST CYCLE

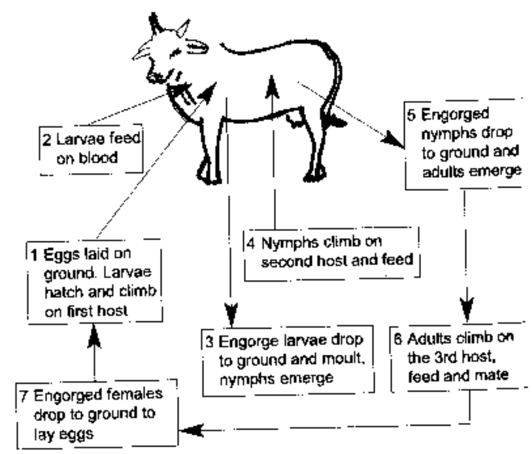


(b)

TWO-HOST CYCLE



THREE-HOST CYCLE

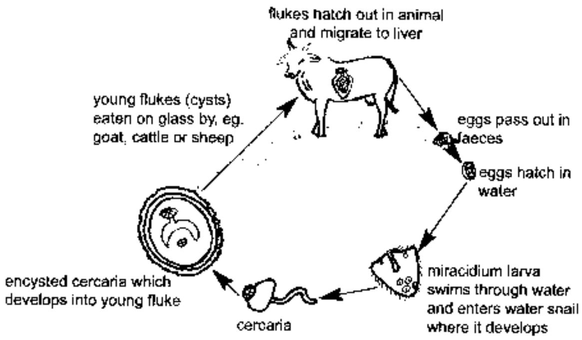


(c) Practising rotational grazing to control a 3-host tick.
ii. Hand dressing against ticks.
iii. Regular dipping in chemicals to control.

(d) Sucking animal blood and weakening them.

(e) i. Brucellosis caused by bacteria
ii. Heart water caused by protozoa
iii. Pneumonia caused by bacteria and virus

(f)



(g) i. Chickens
ii. Ducks

4. (a)

Produce	Farm gate price (MK/kg)	Retail price (MK/kg)	Marketing margins (MK)	% Share of product value
Onions	80.00	85.00	5.00	5.88%
Maize	20.00	30.00	10.00	33.33%
Groundnut	40.00	45.00	5.00	11.11%
Beans	35.00	40.00	5.00	12.5%
Millet	20.00	25.00	5.00	20%
Beef	100.00	120.00	20.00	16.67%

Total Marketing margin = Retail price - farm gate price
% Share of product value =

$$\frac{\text{Total marketing margin x 100}}{\text{Retail price (final selling price)}}$$

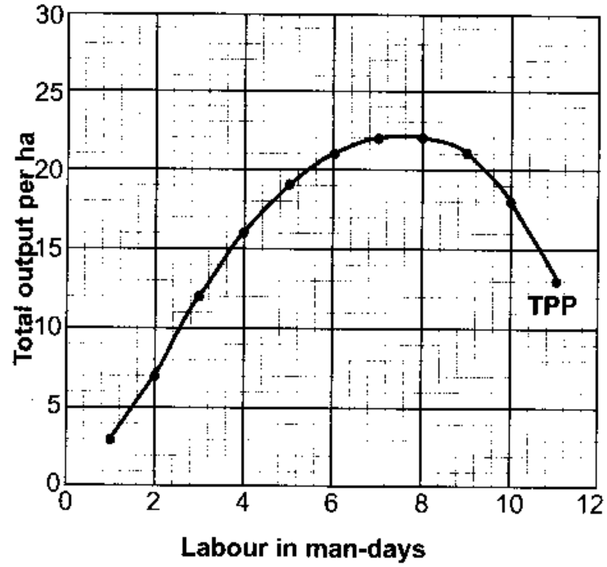
(b) i. Onions
ii. Groundnuts

(c) i. Maize
ii. Beef

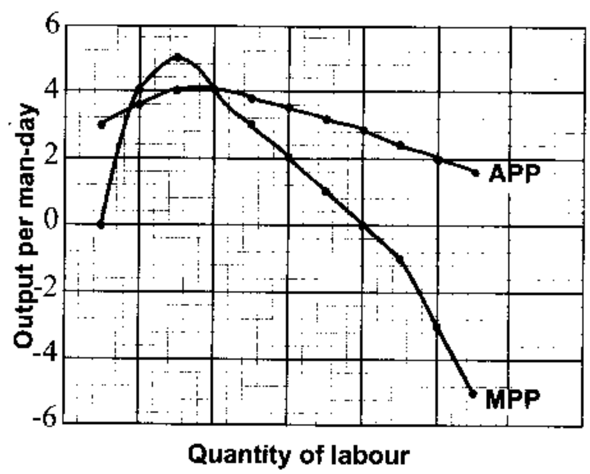
(d) i. Cost of storage
ii. Cost of packing
iii. Cost of transport
iv. Coat of grading

(e) i. Farmers
ii. Wholesalers
iii. Retailers
iv. Itinerant traders

5. (a) i. Graph of TPP:



ii. Graph of MPP and APP:



(b) The law of diminishing marginal returns

(c) 12 units

(d) 4 man days

(e) It is where MPP is equal to APP and again APP is maximum. The point where APP is maximum will produce high profits after sales.

(f) It is not good because the resources are underutilised. In other words, there is still room of increasing production if the resources are increased.

(g) i. The point where marginal physical product and average physical product are equal and it is also where Zone II starts.

ii. The point where marginal physical product is maximum and total physical product stops increasing at an increasing rate and starts increasing at a decreasing rate.

(h) 4 output per man day

(i) 22 total output

(j) i. 22 units

ii. Stage I is irrational stage because the resources are not fully utilised. Elasticity of production is more than 1.

Stage II is the rational stage, for the resources are fully utilised in this zone. The stage between APP maximum and MPP being zero. The stage where Elasticity of production is between zero and one. Elasticity of production is less than one.

Stage III is the irrational stage because with too many resources the output is reduced.

(k) i. He should produce within stage II, from where MPP = APP up to where MPP = zero or to where TPP = maximum.

ii. Output is 16 units and input is 4 man-days.

6. (a) It takes 21 days.

(b) It indicates the right time for mating in order that the female animal should conceive.

(c) i. There is mucus discharge from the vulva.

ii. The vulva becomes reddened and enlarged.

iii. The animal becomes restless.

iv. the animal mounts other animals.

(d) The corpus luteum keeps degenerating as the follicles develop for as long as the animal conceived.

(e) i. It influences the development of the mammary glands.

ii. It inhibits ova production.

PRACTICAL 24

1. (a) **P** is banana.
Q is mango fruit.

(b) i. **P** is propagated vegetatively by using suckers.
Q is propagated sexually from seeds.

(c) i. Carbohydrates

ii. Proteins

(d) i. It reduces the risk of transferring pests and diseases from parent plants to offspring.

ii. It helps in maintaining desirable traits in the offspring.

(e) i. It must be dwarf for easy harvesting.

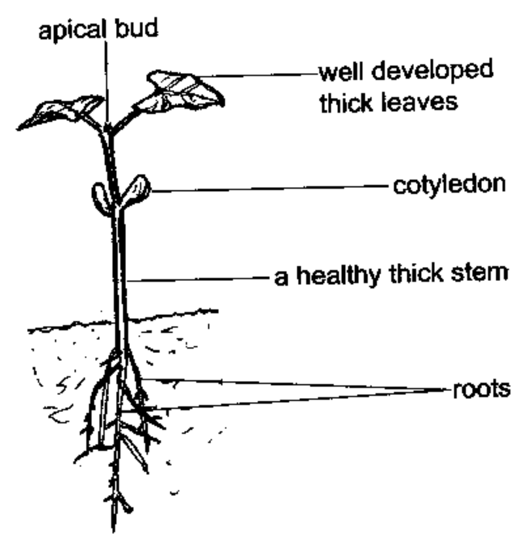
ii. It must be disease-resistant.

2. (a) i. Specimen **A** is short while specimen **B** is tall.

ii. Specimen **A** is yellowish in colour while specimen **B** is green in colour.

iii. Specimen **A** has thin stem while specimen **B** has strong stem with vigour.

(b)

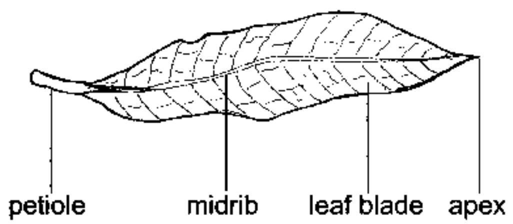


(c) i. The leaf of specimen **A** is very weak because it was not manufacturing food due to lack of sunlight energy. The leaf **B** is strong and turgid.

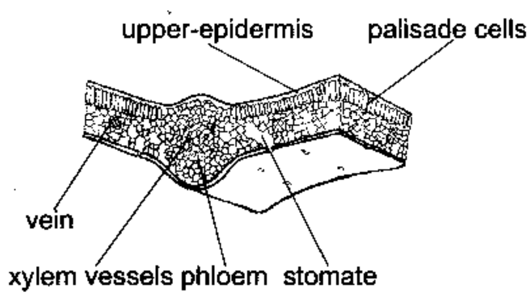
ii. Specimen **A**

iii. Because the leaf **A** is put in darkness and therefore is lacking sunlight energy to manufacture its food so that it can be strong and healthy.

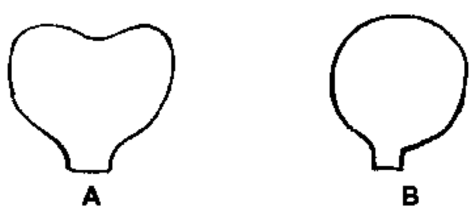
(d)



(e)

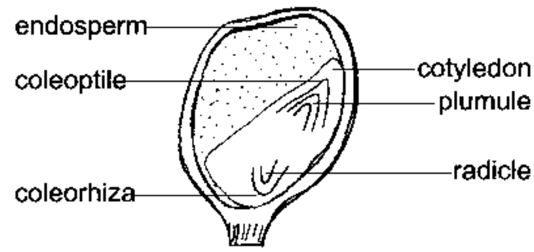


3. (a) i. Surface view:



ii. Edge-on view:

(b)



(c) It is **A**.

(d) Because it is soft and has wrinkles as you view it from the edge.

(e) i. The advantage is that high yields are obtained.

ii. The disadvantage is that it is difficult to pound.

(f) i. Choosing the parent maize varieties with superior characteristics that complement each other.

ii. Self-pollinating the parental lines for several generations (inbreeding) in order to develop pure lines. A pure line always produces itself exactly (it breeds true).

iii. Cross-pollinating the pure lines, i.e. pollen from an inbred maize (pure line) is transferred to stigma of the flower of another inbred maize. Cross-breeding results in increased plant vigour. This new vigour which the crop acquires through cross-breeding is called hybrid vigour.

(g) i. Plant with early rains.

ii. Weeding as soon as the weeds appear in the field of maize.

4. (a) **A** is seminal vesicles.
B is urethra.
C is vas deferens.
D is an ovary.

E is a fallopian tube (oviduct).
F is septum.
G is a vulva.
H is seminiferous tubules.

(b) i. **B** (urethra) is where urine and semen passes when coming out of the penis
ii. **C** (vas deferens) carries spermatozoa (sperms) from the testicles to the seminal vesicles.
iii. **D** (ovary) produces eggs or ova in the cow.
iv. **E** (oviduct) helps in the movement of eggs to the uterus.
v. **G** (vulva) is the external opening of the vagina through which a calf emerges at birth and through which urine normally passes.

(c) i. General animal management, e.g. feeding
ii. Type and breed of the animal in question
iii. Age when animal starts mating
iv. Environmental factors, e.g. climate

(d) i. Influences the development of mammary glands.
ii. Stimulates the pituitary gland to release the Luteinising hormone.
iii. Influences the oestrus cycle so that the animals go on heat.

5. (a) It is **rr**.
(b) i.

Gametes	R	r
R	RR	Rr
r	Rr	rr

ii. ¼ x 16 = 4 weevils (offspring)

(c) By mutation.

(d) i. By biological control, i.e. introduce a predator, e.g. chickens, which will feed on the weevils.

(e) i. **To increase resistance to pests and diseases:** The development of crop varieties that have resistance to pathogenic organisms and insects has provided the only feasible control for certain diseases and pests of some crop plants.
ii. **To increase yield:** The main purpose of plant breeding is to develop varieties that are increasingly efficient in their use of plant nutrients, thus increasing yields without loss of quality.
iii. **To meet the needs of consumers:** The demands of food processing and consumers create pressure for new qualities in plant, e.g. maize with less chaff and more protein.
iv. **To adapt to climatic conditions:** It is of great importance to develop varieties that are able to withstand extreme conditions of cold, drought and wind. Frequently this has been achieved through adjusting the growth cycle of the variety to suit the growing season.
v. **To meet particular needs of growers:** Improvements in farming methods may make particular characteristics in plants desirable. For instance, many growers prefer dwarf varieties of crops, which can be weeded, have fertiliser applied to them, with ease.

(f) i. **Introduction:** Some species or varieties of crops with desirable characteristics can be imported into areas where they have never grown before. .
ii. **Selection:** Choosing superior plants that have certain desirable qualities for breeding and propagation.
iii. **Hybridisation:** The development of plants by transferring heritable qualities from one plant to another through the fusion of male and female gametes.
iv. **Mutation:** Producing mutant varieties that are resistant to certain diseases through changing the gene number or arrangement of the variety e.g. using X-rays or colchicines.

6. **Solution**

(a) i. Processing marketing margin
= % Share x Retail price
= 25/100 x 1200
= K300.00

ii. Wholesaler marketing margin
= 30/100 x 1200
= K360.00

iii. Retailer marketing margin
= 10/100 x 1200
= K120.00

(b) Marketing price

Marketing margin + Cost price (buying price) (Selling price)

i. Processing marketing price
= K300.00 + K420.00
= K720.00

ii. Wholesaler marketing price
= K360.00 + K720.00
= K1,080.00

iii. Retailer marketing price
= K120.00 + K1,080.00
= K1,200.00

(c) The farm gate price (initial cost price) = K420.00 i.e. smallholder farmer's marketing price

(d) Total Marketing cost = Total charges at each marketing channel
= Total marketing margins at each channel
= Processing charge + Wholesaler charge + Retailer charge
= K300.00 + K360.00 + K120.00
= K780.00

(e) Total marketing margin
= Retail price – Farm gate price
= K1,200.00 – K420.00
= K780.00

NB. Total marketing cost should be equal to Total marketing margin and marketing margin = marketing cost.

PRACTICAL 25

1. (a) i. Sample **K** is CAN.
ii. Sample **C** is DAP.

(b) i. HPO_4^{2-} when pH is high.
ii. $H_2PO_4^-$ when pH is low.

(c) i. **N** for growth of crops.
ii. **P** encourages the formation, development and establishment of roots, especially secondary roots.

(d)

Mass of 4 bags of DAP = 4 bags x 50 kg
= 200 kg DAP

% N in DAP = 18%

∴ Mass of N = 18/100 x 200 kg of DAP
= 36 kg of Nitrogen

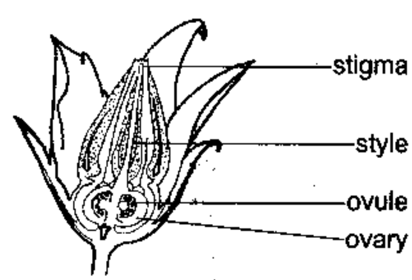
(e) i. Scorching of leaves.
ii. Delayed maturity.
iii. Excessive succulence. In grains crops, this condition leads to lodging, i.e. falling or leaning of crops due to excessive water in the stem.
iv. Weakening of stems and fruits, e.g. cotton stem and cotton fibre.

(f) Dollop or side dressing.

(g) i. **MOP:**
Does not leach easily.
It is very soluble in water.

ii. **Urea:**
Absorbs moisture from the air.
It readily dissolves in water.

2. (a) i.

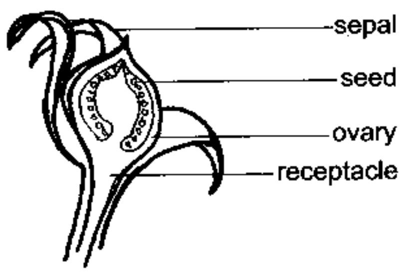


ii. Refer to the labelling in the **diagram** above.

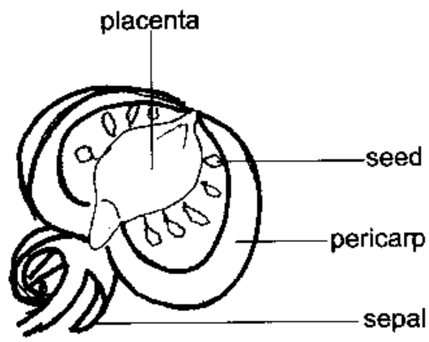
(b) i. It is insect.

ii. Petals have bright colours.
Anthers not large and firmly attached to the filament.
Sticky stigmas inside the flower.

(c)



(d)



3. (a) **A** is testes.
B is large intestine.
C is kidney.
D is Vas deferens (sperm duct).
E is Cowper's gland.
F is urethra.
G is penis.
H is epididymis.
I is scrotum.

(b) i. **A** (testis) produces the sperms in seminiferous tubules.

ii. **D** (sperm duct) carries sperms from the testicles to the seminal vesicles.

iii. **E** (Cowper's gland) one of the accessory glands that produce sticky fluid called semen in which sperms are carried.

iv. **H** (epididymis) is the part where sperms produced in testes mature and are stored.

(c) i. Corpus Luteum

ii. Placenta of pregnant animal

(d) i. Inhibits the production of ova in a pregnant animal.

ii. Influences mammary glands development.

iii. Influences ovary development.

iv. Stimulates the development of the follicle on the ovary.

v. Influences the development of uterine walls.

4. (a) i. It is a stylet or proboscis

ii. It is used to cut through plant tissue.

(b) i. They suck out plant cell sap which resulting in wilting of plants.

ii. They transmit diseases in plants by injecting germs into the plant tissue through their saliva

(c) i. They physically cut through plant leaves thereby reducing the surface area for photosynthesis.

(d) i. Early planting enables the crop to mature early before the multiplication of the pest.

ii. Practising crop rotation in order to disturb the life cycle of the pest.

5. (a)

Parents o↑ o↓
Parents red X red
Phenotype Rr Rr

Parents 1 ⟶ **Rr**

↓ **Rr**

Gametes	R	r
R	RR	Rr
r	Rr	Rr
Offspring	RR,Rr,Rr,rr	

Genotype RR Rr Rr rr
Phenotype Red: Brown: White
Ratio 1: 2: 1

Parents 2 ⟶ **rr**

↓ **RR**

Gametes	r	r
R	Rr	Rr
R	Rr	Rr
Offspring	Rr,Rr,Rr,Rr	

Genotype All Rr
Phenotype All Brown

Therefore, it can be said that it was possible to have brown calf after two generations.

(b) i. Performance tested bull means a bull that is known that the offspring from its sperms have inherited the desirable characteristics, e.g. of high beef.

ii. Continuous variation is the variation, which changes gradually throughout the population, e.g. the height of cattle, which is brought about by the action of several allelic pair of genes.

iii. Discontinuous variation is the variation, which occurs in two or more distinct groups in a population brought about by the action of a single gene, which occurs in two or more allelic forms.

iv. Gene is a sequence of chemicals in a chromosome, which controls the development of a particular characteristic in an organism.

v. Genotype is the composition of an individual or number of genes in an individual.

(c) i. Mass selection (natural selection)

ii. Single plant selection (pedigree or artificial selection)

(d) i. Cross-breeding is a method of upgrading species of plants through crossing plants of different varieties.

ii. Pure line is a plant, which has been self-fertilised or crossed continuously with closely related species (inbred) for many generations so that the desirable qualities it possesses do not change from generation to generation.

iii. Heterosis is the great vigour that hybrid possesses after a pure line species is crossed with another pure line whose dominant characteristics are markedly different.

(e)

Inbred (A) x inbred (B)	single cross
A x B hybrid x C hybrid	3-way cross
A x B hybrid x C x D hybrid	double cross
Inbred x variety	top cross
F1 hybrid selfed (F1 x F2)	F2 hybrid

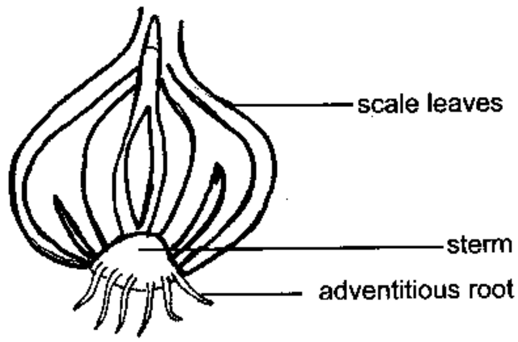
6. See table below.

Year	Value at start of the year	Depreciation (a)	Book value/value of machine at year end (b)
1	K10,000.00	20% of K10,000.00 = K2,000.00	K8,000.00
2	K8,000.00	20% of K8,000.00 = K1,600.00	K6,400.00
3	K6,400.00	20% of K6,400.00 = K1,280.00	K5,120.00
4	K5,120.00	20% of K5,120.00 = K1,024.00	K4,096.00
5	K4,096.00	20% of K4,096.00 = K8,19.20	K3,276.80
6	K3,276.80	20% of K3,276.80 = K655.36	K2,621.44
7	K2,621.44	20% of K2,621.44 = K524.29	K2,097.15
8	K2,097.15	20% of K2,097.15 = K419.43	K1,677.72
9	K1,677.72	20% of K1,677.72 = K335.54	K1,342.18
10	K1,342.18	20% of K1,342.18 = K268.44	K1,073.74

(c). Its scrape value would be **K1,073.74**

PRACTICAL 26

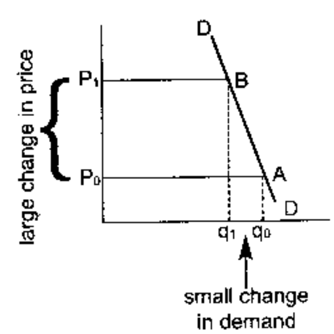
1. (a) Sample **O** is onion.
   (b)



   (c) It is a bulb
   (d) i. Pollination agents, which may fail to perform successfully, are not needed.
       ii. The offspring are true to type for there is no mixture of hereditary characteristics.
   (e) i. Whip or tongue grafting
       ii. Cleft grafting
       iii. Bark grafting
       iv. Approach grafting
       v. Notch grafting
       vi. Side grafting
   (f) i. Helps to propagate clones that cannot be propagated by other means.
       ii. Facilitates the changing of the top of the tree from being undesirable to desirable.
       iii. Grafting helps one to obtain special plant forms, e.g. tree roses.
       iv. Grafting maybe employed to repair damaged trees.
       v. Makes the growing of more than one type of flowers.or fruits on one tree or plant possible.

2. (a) i. Sample **M** is maize seed.
       ii. Sample **G** is groundnut seed.
   (b) It is **M** (maize seed).
   (c) i. Source of food.
       ii. Source of nitrogen fixation in the soil.
   (d) Nitrogen.
   (e) **G** (groundnut seed).
   (f) i. Direct marketing channel
       ii. Indirect marketing channel
   (g) i. Farmer
       ii. Retailers
       iii. Wholesalers
       iv. Itinerant traders
   (h) i. Selling
       ii. Product planning
       iii. Transportation
       iv. Market research
       v. Pricing
   (i) i. Increase the prices of sample **M** and **G**.
       ii. Skip some of the marketing agencies, e.g. wholesalers.
       iii. Reduce some of the marketing function, e.g. storage and market intelligence.
       iv. The farmer should perform some of the marketing functions himself, e.g. transportation.

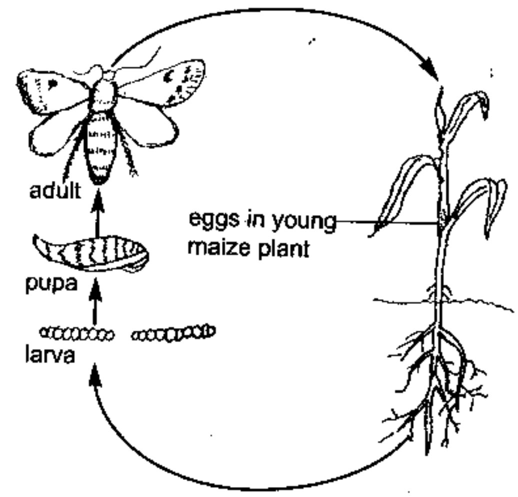
3. (a) **L** is maize flour.
       K is tomato fruit.
   (b) i – Tomato sauce
         – Jam
       ii. – It enables it be stored over a long period without going bad.
         – It ensures the availability of the product even when it is not in season.
   (c) i. By preserving it under very low temperature in the a cold room.
       ii. By processing it into tomato sauce and bottling it.
   (d) i. Because its supply on the market would not change much with a greater change in price since it is mainly produced for food.
       ii.



In this type of demand (inelastic), price changes do not affect demand. For example, a large change in the price causes only a very small change in the demand for the commodity as is shown in the sketch graph above.

4. (a) i. **A** is eosophagus.
   ii. **B** is stomach.
   iii. **C** are small intestines.
   iv. **D** is caecum.
   (b) i. Californian white
   ii. Campagne d' Argent
   iii. Flemish giant
   iv. Chinchilla
   (c) i. They do not require as much space as cattle, sheep, goat and pigs.
   ii. They have high fecundity and prolificacy.
   iii. The generation interval is short.
   iv. Rabbit skins are in demand for making hand bags, slippers, toys and glove linings.
   (d) i. Pneumonia
   ii. Coccidiosis
   iii. Bloat
   (e) i. Rabbit flea
   ii. Coccidia worm
   (f) **Coccidia worm:**
   i. Give the rabbit Amprol drug.
   ii. Sick rabbits should be isolated from healthy ones.
   iii. Damp and dirt (litter) should be removed from rabbit houses.

5. (a) **A** is stalk borer.
   B is an army worm.
   (b) Life cycle of **A** (Stalk borer)



   (c) Maize crop
   (d) i. Rats
   ii. Squirrel
   iii. Weevils
   iv. Termites
   (e) i. Stalk borer reduces the rate of photosynthesis through reduction of photosynthesising area of leaves.
   ii. Stalk borer makes holes through the stem, thereby making it susceptible to breakages and falling.
   iii. Stalk borer reduces the crop yield through feeding on the maize grains on the cob.
   (d) **B**, which is army worm can be controlled by applying carbaryl 85% wettable powder.

(g) i. The competition between weeds and plants for food is reduced because the early establishment of soil cover by plant leaves suppresses the growth of the weeds.

ii. Crops make full use of the rainwater falling during the growing season.

iii. Crop roots get established in good time, absorbing soil nutrients before they leach out.

iv. Crops are able to mature before some late pests and diseases attack them in the growing season to lower the yield.

6. (i) **Using straight-line method**

Year end	**Straight-line annual depreciation**	**Remaining value/ Book value of the machine at end of each year**
1	K1,000.00	K9,000.00 – K1,000 = K8,000.00
2	K1,000.00	K8,000.00 – K1,000 = K7,000.00
3	K1,000.00	K7,000.00 – K1,000 = K6,000.00
4	K1,000.00	K6,000.00 – K1,000 = K5,000.00
5	K1,000.00	K5,000.00 – K1,000 = K4,000.00
6	K1,000.00	K4,000.00 – K1,000 = K3,000.00
7	K1,000.00	K3,000.00 – K1,000 = K2,000.00
8	K1,000.00	K2,000.00 – K1,000 = K1,000.00
Total	K8,000.00	

Depreciation per annum

$$= \frac{\text{Cost of asset} - \text{estimated salvage value}}{\text{Estimated number of years of life of an asset}}$$

$$= \frac{\text{K}9{,}000.00 - \text{K}1{,}000.00}{8 \text{ years}} = \textbf{K1,000.00 per year}$$

(ii) **Using Reducing balance method**

Year end	**Reducing balance annual depreciation at 25%**	**Remaining value/ Book value of the machine at end of each year**
1	25% of K9,000.00 = K2,250.00	K9,000.00 – K2,250.00 = K6,750.00
2	25% of K6,750.00 = K1,688.00	K6,750.00 – K1,688.00 = K5,062.00
3	25% of K5,062.00 = K266.00	K5,062.00 – K1,266.00 = K3,796.00
4	25% of K3,796.00 = K949.00	K3,796.00 – K949.00 = K2,847.00
5	25% of K2,847.00 = K712.00	K2,847.00 – K711.00 = K2,135.00
6	25% of K2,135.00 = K534.00	K2,135.00 – K534.00 = K1,601.00
7	25% of K1,601.00 = K400.00	K1,601.00 – K400.00 = K1,201.00
8	K1,201.00 K1,000.00 = K201.00	K1,000.00
Total	= **K8,000.00**	

Depr. for the last year = last but one year book value – the scrape value

Depr. for the 8th year = 7th year book value – the scrape value
= K1,201.00 – K1,000.00 = **K201.00**

(iii) **Using Sum-of Digits method**

Year	Sum of digits annual depreciation	Remaining value/ Book value of the Machine at end of each year
1	8/36 of K8,000.00 = K1,778.00	K9,000.00 – K1,778.00 = K7,222.00
2	7/36 of K8,000.00 = K1,556.00	K7,222.00 – K1,556.00 = K5,666.00
3	6/36 of K8,000.00 = K1,333.00	K5,666.00 – K1,333.00 = K4,333.00
4	5/36 of K8,000.00 = K1,111.00	K4,333.00 – K1,111.00 = K3,222.00
5	4/36 of K8,000.00 = K889.00	K3,222.00 – K889.00 = K2,333.00
6	3/36 of K8,000.00 = K667.00	K2,333.00 – K667.00 = K1,666.00
7	2/36 of K8,000.00 = K444.00	K1,666.00 – K444.00 = K1,222.00
8	1/36 of K8,000.00 = K222.00	K1,222.00 – K222.00 = K1,000.00
$\sum$ =36	= **K 8,000.00**	

Note: Sum of digits method (K9,000.00 – K1,000) = K8,000.00 i.e. cost of asset – Scrape value or salvage value, is used for calculating depreciation.

PRACTICAL 27

1. (a) **M** is a monocotyledonous plant.
   D is a dicotyledonous plant.
   (b) It belongs to **D** (dicotyledonous plant).
   (c) It belongs to **M** (monocotyledonous plant).
   (d) i. Dicotyledonous root has small stele. Monocotyledonous root has large stele.
   ii. Dicotyledonous root has no central pith region. Monocotyledonous root has a clear central pith region.
   iii. Dicotyledonous root has cell walls uniformly thick. Monocotyledonous root has cell walls with U-shaped thickening.
   iv. In a dicotyledonous root it forms a single compact exarch. In a monocotyledonous root there are distinct groups encircling the central pith.
   (e) i. Respiration through the stomata.
   ii. Transpiration through the stomata.
   iii. Photosynthesis takes place in the chloroplast in leaves.
   (f) i. In dicotyledonous stems they are in a ring towards the outer part of the stem.
   In monocotyledonous stems they are scattered throughout the stem, but more numerous towards the outside.
   ii. Narrow, easily visible cortex in dicotyledonous stems.
   No obvious cortex in a monocotyledonous plant.
   iii. An expansive central zone of pith in dicotyledonous stems.
   No pith region visible in monocotyledonous stems.
   iv. Present in dicotyledonous stems.
   Absent in monocotyledonous stems.

2. (a) i. Maize plant affected by rust disease for maize plant leaves have formed red-brown and orange-red powders of spores appearing as spores on leaves.
   ii. Maize seed bored by maize weevil.
   (b) **X** is caused by fungi.
   Y (boring of maize) is caused by weevils.
   (c) **X** (maize rust) can be controlled by planting resistant hybrid and practising crop rotation.

Y (weevil attack) can be controlled by applying Super guard dust or Target actellic super dust.

(d) i. They leave a branching network of veins which provides a ready water supply to the photosynthesising cells.

ii. They have broad, flat shape that gives a large surface area for absorption of sunlight and carbon dioxide.

iii. They have the elongated palisade cells which contain more chloroplast than spongy cells on the upper surface to receive most sunlight so that it is available to the chloroplast without being absorbed by too many intervening cell walls.

iv. They have thin leaves so that the distance across which carbon dioxide will diffuse to reach the mesophyll cells from the stomata is very short.

v. They have many stomata on one or both surfaces to allow the exchange of carbon dioxide and oxygen with the atmosphere.

vi. They have a large intercellular spaces in the mesophyll to provide an easy passage through which carbon dioxide can diffuse.

3. (a) **A** is itch mite (pig mange).
B is tapeworm.
C are roundworms.

(b) i. Sheep
ii. Goats
iii. Chickens
iv. Pigs

(c) i. Sheep
ii. Goats
iii. Chickens
iv. Cattle
v. Pigs

(d) i. Sheep
ii. Goats
iii. Chickens
iv. Pigs

(e) i. Causes dry, scaly skin on the pig.
ii. Causes intensive itching.
iii. Causes sores on the skin as it feeds on it.

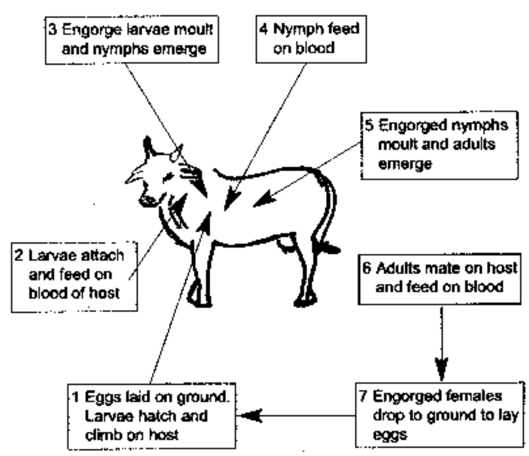
(f) i. Spraying the walls and floor with the insecticides.
ii. Removal of manure where itch mite like to stay.
iii. Cleaning all the khola (animal house) at all times.

4. (a) **A** is kidney worm.
B is itch mite (pig mange).

(b) A pig.

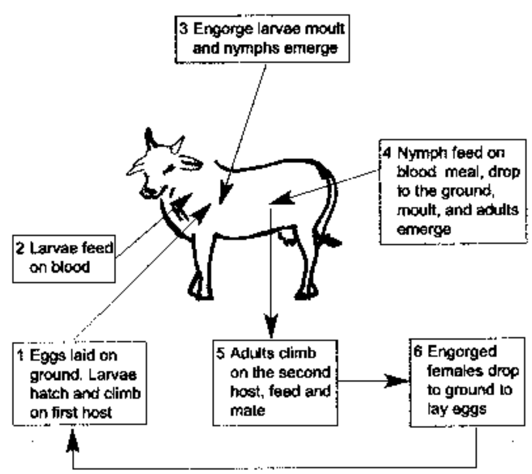
(c) i. **One-host tick**

ONE-HOST CYCLE



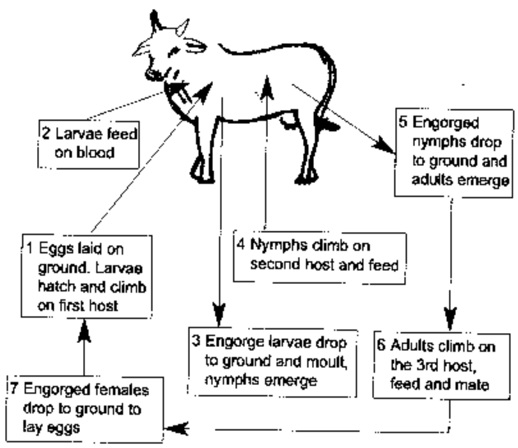
ii. **Two-host tick**

TWO-HOST CYCLE



iii. **Three-host tick**

THREE-HOST CYCLE



5. (a) i. **A** is a cattle tick.
B is a liver fluke.
C is a tapeworm.
D are round worms.

(b) **B**, **C** and **D**

(c) i. Avoid grazing cattle in wet dambos where liver flukes leave.
ii. Rotational grazing should be practised so that some stages of liver flukes do not find their hosts.
iii. The snail, which is the intermediate host, should be destroyed with copper sulphate.

(d) i. They transmit diseases such as gall sickness.
ii. Wounds from tick bite damage the animal hide.
iii. Cattle become anaemic through sucking of blood by ticks from the animal.
iv. The animal can get diseases through wounds created by ticks.
v. Animal production is lowered since ticks weaken the animal.

(e) i. Anthrax
Brucellosis
Heart water
Mastitis
Tuberculosis

6. (a) Estimated retuns and costs from chickens

ESTIMATED INCOME	K	t	ESTIMATED EXPENDITURE	K	t
Sale of chickens	10,000	00	Chicken feeds	7,500	00
Sale of eggs	12,000	00	Labour for chickens	2,000	00
Sale of chicken droppings	2,000	00	Medicine for chickens	500	00
Total returns	**24,000**	**00**	**Total costs**	**10,000**	**00**

(b) Estimated returns and costs from cattle

ESTIMATED INCOME	K	t	ESTIMATED EXPENDITURE	K	t
Sale of cattle	12,000	00	Cattle feeds	7,500	00
Sale of milk	9,000	00	Equipment for feeding cattle	600	00
Sale of cattle dung	1,000	00	Labour for cattle	1,500	00
			Medicine for cattle	600	00
Total returns	**22,000**	**00**	**Total costs**	**10,200**	**00**

(c) i. Total returns = Chicken returns + cattle returns
= K24,000.00 + K22,000.00
= **K46,000.00**

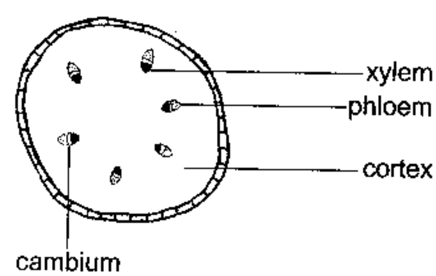
ii. Total costs = Chicken costs + cattle costs
= K10,000.00 + K10,200.00
= **K20,200.00**

(d) Estimated profit from
i. Chicken keeping
= K24,000.00 – K10,000.00
= **K14,000.00**
ii. Cattle keeping
= K22,000.00 + K10,200.00
= **K11,800.00**

PRACTICAL 28

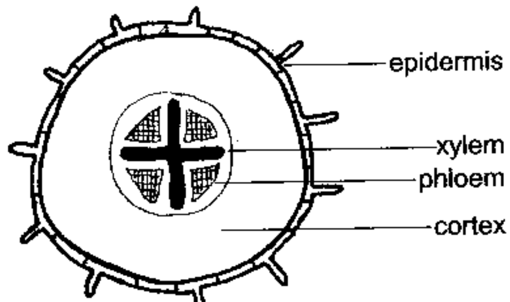
1. (a) **M** is a dicotyledonous root.
D is a dicotyledonous stem.

(b)



Cross section of a dicotyledonous stem

(c)



Cross section of a dicotyledonous root

(d) i. Petal
ii. Anther
ii. Stigma
iii. Pollen grain

2. (a) i. Sample **A** is clay.
ii. Sample **B** is sand.
iii. Sample **C** is silt.

(b) By feeling.

(c) It is soil sample **A** (clay soil).

(d) i. Because it has got small particles, which have small pores between them where air is trapped.
ii. By mechanical analysis with textural triangle.
By floatation or sedimentation method.

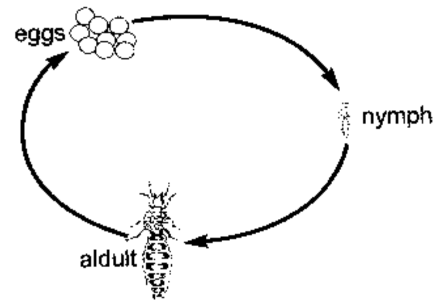
(e) i. It is sample **B** (sand soil).
ii. One of the reasons is that sand has big pore spaces so water easily drains away together with nutrients.
iii. It is **B** (sand soil) for making walls if combined with cement.

(f) Sample **B** does not anchor the roots properly to enable them to absorb plant nutrients.

(g) Because of large pore spaces and small pore surface area, which promotes drainage of water and bases in solution.

(h) i. Applying acidifying fertilisers.
ii. Apply too much irrigation water to soil to **leach** out the bases it contains.

3. (a)



i. The queen termite is the biggest of them all and her job is to lay the eggs for the colony. A king termite is present to fertilise the queen. Termites undergo incomplete metamorphosis.

ii. The eggs laid by the queen hatch into young nymphs, which resemble the adults.
These insects are the workers or white ants though they are not true insects. Their function is to build and maintain the nest and transport the eggs.
Two other castes of termites present in a colony are the soldiers, which have sharp jaws and protect the colony and winged termites or flying ants. These emerge from the nests during the rainy season and set new colonies.
In short queen lays eggs fertilised by the king, eggs hatch into nymphs and nymphs grow into adults.

(b) **A** is an antenna.
B is a compound eye.
C is biting mouthpart.
D are spiracles.

(c) i. Increases the cost of production through the control methods used.
ii. Transmitting diseases because they act like vectors.

iii. Reducing the quality of yield through contaminating the produce through their excreta or eggs laid.

iv. Reducing the quality of yield through eating leaves thereby reducing the area for photosynthesis.

(d) i. Diseases interfere with pollination of flowers.

ii. Diseases injure roots through root knots that affect roots ability to absorb water and mineral salts.

iii. Attacked leaves do not photosynthesise well so that plant food manufactured is affected.

iv. Lowers quality and quantity of fruits and seeds.

4. (a) **A** is an adult flea.
B is a chicken mite.
C is tampan.
D is a tick.

(b) Poultry, e.g. chickens.

(c) i. Cause skin itching.
ii. Blood sucking from the birds skin.
iii. Weakening the poultry.

(d) Using Gamatox

(e) i. Round worms
ii. Tapeworms

(f) i. Chicks become lestless.
ii. The cloaca is swollen.
iii. Chicks become sleepy.
iv. Death of 3-4 weeks old chicks

(g) i. Layers' mash
ii. Chick mash
iii. Growers' mash
iv. Broilers' starter mash
v. Broilers' finisher mash
vi. Maintenance mash

5.

	Maize	**Cassava**	**Tea**	**Rice**
Yield (kg/ha)	400	450	800	2,000
Price (MK/kg)	20	50	200	25
Gross income (GI) (MK)	80,000	22,500	160,000	50,000
Variable costs	**(MK)**			
Seed	1,000	500	800	500
Fertilizer and transport	8,000	-	10,000	20,000
Pesticides	5,000	150	1,000	-
Casual labour	100	150	200	80
Total variable) costs (TVC	14,100	800	12,000	20,580.00
Gross margin /ha = GI-TVC	65,900	21,700	148,000	29,420.00

Fixed cost for all the four enterprises (maize, cassava, tea and rice) (MK)	
Regular/permanent labour	20000
Rent and fuel	5000
Depreciation	250
Maintenance & repair	3000
Land tax	3000
Loan repayment	2000
Administration & office expenses	1000
General overheads like licenses and car expenses	8000
Total Fixed Costs (TFC)	**42,250**

NB: The costs of using fixed assets (e.g. Repairs & maintenance, Fuel and oil for a tractor) should be put under fixed costs.

The costs of owning fixed assets (e.g. rent, license etc) should be put under fixed costs.

(a) It is tea and maize.

(b) i. Tea
ii. The farmer should be advised to grow tea because it is the crop that has been found to have the highest gross margin.

(c) Cassava would be the worst crop because it has been found to have the lowest gross margin out of the four crops.

(d) Whole farm GM = Total sum of GM of all the enterprises
= K65,900 + K21,700 + K148,000 + K29,220
= **K265,020.00**

(e)
Whole farm profit = Whole farm GM – TFC
= K265,020.00 – K42,250
= **K222,700.00**

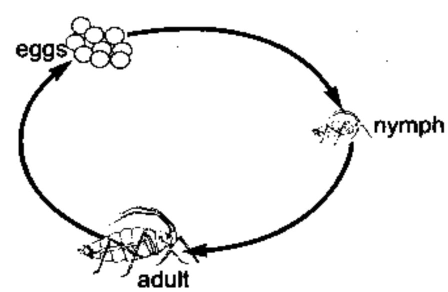
6. (a) 10,000 kg of maize.

(b) Because it is where most profitable produce is obtained.

(c) In the Zone I the resources are not fully utilised (underutilised), for the farmer has the chance to increase the resources and produce more profitable yield.

PRACTICAL 29

1. (a) i. **X** is the inorganic fertiliser (23:21:0+4S).
   Y is the organic manure or khola manure.
   ii. **X** which is the inorganic fertiliser (23:21:0+4S).
   (b) i. They do not need a lot of labour during application for it is not bulky.
   ii. They are easily soluble in the soil.
   iii. They contain many known nutrients, e.g. **N**, **P** and **S**.
   (c) i. They are expensive so farmers cannot afford to buy them.
   ii. They are manufactured far from farmers field therefore farmers have problems to transport them.
   (d) i. They improve the soil structure by supplying humus to the soil.
   ii. They improve the capacity of the soil to hold water.
   iii. They improve the soil drainage and aeration.
   (e) i. Depletion of water resources
   ii. Exposure of plant roots
   iii. Pollution of water reservoirs
   iv. Food insecurity
   v. Loss of fertile top soil
2. (a) Sample **C** (clay soil)
   (b) Sample S (sand soil)
   (c) i. Sample **C** (clay soil) has the highest water retention because it has small spaces that make water rise up from below easily by capillarity, and water from above is retained. So the spaces between the particles tend to be full of water with little room for any air.
   i. Sample **S** (sand) has very big particles and small surface area where water can be adhered to.
   (d) i. Sample **S** is the most permeable soil sample.
   ii. Sample **L** is the second most permeable soil sample.
   iii. Sample **C** is the least permeable soil sample.
   (e) It is sample **S** (sand soil).
   (f) i. Sample **S** (sand soil) is easily leached which means the soil will have less nutrient for rice use.
   ii. Sample **S** easily drains away water while rice needs a lot of water so rice will not do well.
   (g) i. Add sand.
   ii. Add lime.
   iii. Dig the soil to aerate it.
   iv. Add compost manure or humus.
   v. Add inorganic fertilisers.
3. (a) **A** is antenna.
   B is leg.
   C is cornicle.
   D is cauda.
   E is jaws.
   F is antenna.
   G is hard brown head.
   H is leg.
   (b) Piercing and sucking insect pest
   (c) Wingless aphid



Aphids undergo an incomplete metamorphosis.

The eggs develop into nymphs inside the body of the female and there are no larval or pupal stages.

The nymphs are very similar to the adults when they are born and have 6 legs, compound eyes and antennae.

The nymphs feed on juices extracted from the plant where they are born and undergo a series of moults when they shed their skins or cuticles.

After several days the aphids are ready to begin producing their own young.

Only wingless female aphids are produced at first, but as the host plant becomes overcrowded and begins to die, some of the females grow wings. These enable the aphids to fly to other plants, which they can set up a new colony by laying more nymphs.

This method of asexual reproduction, where the aphids are produced without fertilisation, is called **parthenogenesis**. The process of laying nymphs rather than eggs is called **viviparity**. In this way, the aphid population can increase rapidly.

However, shortly before the rains die out, some young males are born. These undergo a series of moults and soon become sexually mature. They then mate with the wingless females. This time eggs are laid instead of nymphs. These eggs have a protective shell, which enables them to survive the dry season. They hatch out the wingless females when the next rains appear.

(d) i. Mix the soil as they burrow down through it, helping drainage and aeration.

ii. Fertilise the soil as they feed on decaying plants and assist in making humus.

iii. Cause damage when they eat crops, living plants and even stored products.

(e) i. They weaken the plants by sucking juices.

ii. Transmit virus diseases.

iii. Have toxic (poisonous) saliva.

iv. Cause galls.

v. Their sweet excreta attracts ants and fungus.

4. (a) i. It is a knap sack sprayer.

ii. **X** is nozzle.
Y is tank.
Z is horse tube.

iii. It releases the liquid solution of pesticide as spray.

iv. Man power

(b) i. It is used to spray chemicals over the body of beef animal to eradicate external parasites.

ii. Cleaning it after use and keeping it under a leak-proof roof.

5. (a) i. **A** is a sign of a parasite.
B is sign of a disease.

ii. **A** is caused by a chicken mite.
B is caused by a viral chicken disease.

iii. Wash legs with paraffin to control **A**, which is chicken mite.

(b) i. Chickens have green diarrhoea.

ii. Chickens have difficult in breathing.

iii. Twisting of head and neck.

iv. Paralysis of one side of chicken and loss of balance.

(c) i. Fowl pox (caused by virus)

ii. Fowl typhoid (bacteria)

iii. Coccidiosis (bacteria)

iv. Gumboro (virus)

(d) i. Shaver

ii. Hyline

iii. Star cross

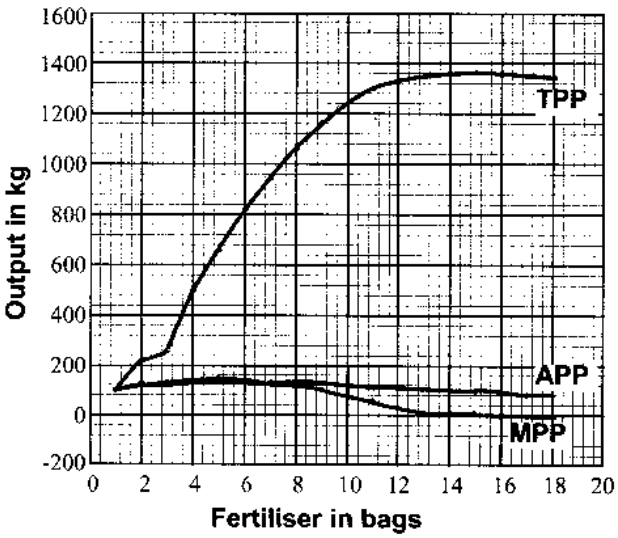
iv. White leghorn

v. Harco

(e) i. Indian River

ii. Starbro

6. (a) Graph of fertiliser against output:



(b) The law of diminishing marginal returns

(c) 665 kg

(d) 6.5 bags

(e) It is where APP is maximum and also APP = MPP.

(f) It is an irrational stage, for a lot of resources are used yet production is going down.

(g) It is 140.

(h) i. It is 1,361 kg.
ii. It is 1,361 kg.

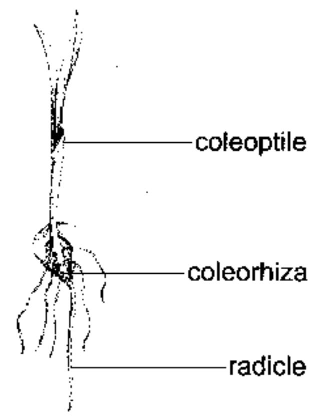
(i) 6.5 bags x K1,000.00
= **K6,500.00**

(j) 890 kg x K30.00
= **K26,700.00**

(k) i. 890 kg
ii. It is in stage between where APP is maximum and where TPP is maximum.
iii. It is 5 bags of fertiliser.
The point where marginal physical product and average physical product are equal and it is also where Zone II starts.
ii. The point where marginal physical product is maximum and total physical product stops increasing at an increasing rate and starts increasing at a decreasing rate.

PRACTICAL 30

1. (a)



(b) The seeds swell with water after being soaked in water. The radicle sheath splits, radicle grows out, testa and pericarp split.

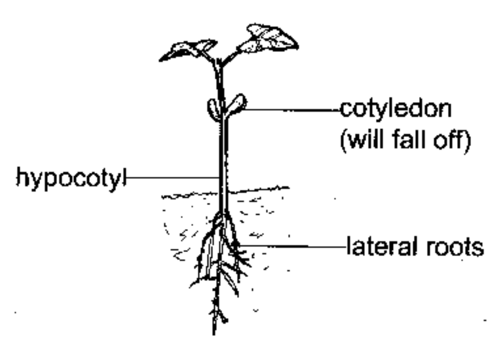
Plumule sheath (coleoptile) grows up through the soil, protecting the plumule, which is inside. Adventitious roots grow out from the stem.

Plumule sheath splits and leaves open out. Long narrow leaves photosynthesise. Small lateral branches appear.

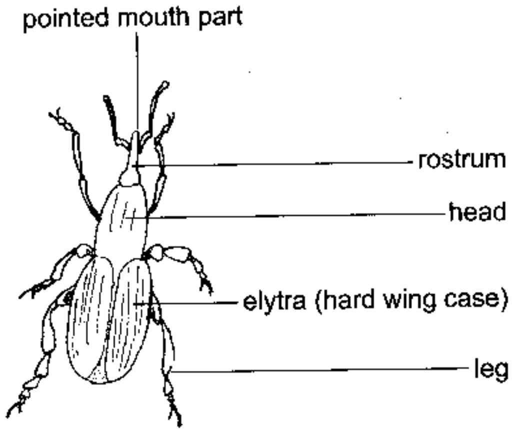
(c) i. Oxygen
ii. Suitable temperature

(d) i. Photosynthesis starts taking place in order to manufacture plant food.
ii. Nutrient absorption by root so that they can be used to make different plant parts and growth.

(e)



2. (a)



(b) The maize weevil feeds on the maize grain, boring the grains thereby reducing the quantity or mass.

(c) Use Target Actellic Super Dust.

(d) i. Dry maize grains thoroughly before storing.
ii. Cleaning *nkhokwe* and sacks before storing.
iii. Avoiding storing this season's maize with last season's maize.

(e) The attack starts in that field and continues in the stored grains (in storage).

(f) Maize weevil (*Sitophilus zeamais*) has a boring (biting) mouth part.

(g) The environment with high relative humidity especially if the maize grains are not fully dried.

3. (a) i. **A** is stargrass.
B is *madeya*.
C is leucaena.

ii.

Roughages	**Concentrates**
Star grass	*Madeya*
Leucaena	

(b) It supplies additional nitrogen which improves the pasture composition.

(c) It is planted together with the arable crops in agro forestry where it enriches the soil of nitrogen.

(d) i. Leucaena
ii. *Madeya*

4. (a) i. **WF** or **FW**

ii.

Parents ⟶ **WF**

WF ↓

Gametes	W	F
W	WW	WF
F	WF	FF
Offspring	WW,WF,WF,FF	

FF: red; WF: pink; WW: white

iii. The **W** gene and **F** gene are co-dominant and their combined effect produces pink flowers.

(b) i. Type of the animal
ii. Palatability of the feed
iii. The quality of feed
iv. Cost of the feed

(c) i. Good body shape
ii. Good body mass
iii. Good mothering ability of ewes
iv. Should be fast growing and maturing

(d) i. The vulva becomes red and thick.
ii. The doe or nanny often wags her tail.
iii. Mucous discharges from the vulva.
iv. The doe is excited.
v. The she goat mounts other doe.

5. (a) i. Soil sample **A**
ii. Soil sample **B**

(b) i. Soil sample **A** drained more water because it has large pore spaces.
ii. Soil sample **B** drained the least amount of water because it has a lot of narrow pore spaces.

(c) 100 m*l* – 20 m*l* = 80 m*l*

(d) i. Soil sample **A**
ii. Soil sample **C**

(e) i. Because sandy soil is characterised by a large percentage of large pore spaces.
ii. Because loam soil is moderately well drained due to almost equal proportions of large and small pore spaces.

(f) i. Soil **A**
ii. Soil **B**
iii. Soil **C**

(g) This is because cassava grows well with little soil water, rice grows well under water-logged soils and maize requires moderate amounts of water.

(h) i. Apply organic matter to the soil.
ii. Apply manure to the soil.

6. Farm calculations per hectare:

	Maize	Groundnut	Cotton	Vegetables
Yield	20 bags	10 bags	1,500 kg	2,000 kg
Price	K6.30	K21.00	K0.42	K0.28
Gross income (GI)(MK) (a)	**K126.00**	**K210.00**	**K630.00**	**K560.0**
Variable costs (MK)				
Seed	K10.50	K56.70	K6.60	K10.50
Fertiliser	K14.00	-	K7.00	K21.00
Chemicals	-	-	K14.00	K42.00
Casual labour (days)	K2.80	K44.80	K52.50	-
Mech. Unit hire	K17.50	K26.25	K17.50	K35.00
Transport	K2.25	-	K3.75	-
Total variable costs (TVC) (b)	**K47.05**	**K127.75**	**K101.35**	**K108.50**
Gross margin/ha = GI-TVC (c)	K78.95	K82.25	K528.65	K451.50
GM, Total for each enterprise	2.0 ha	0.4 ha	0.4 ha	0.2 ha
(GM/ha X Total ha) (d)	**K157.90**	**K32.90**	**K211.46**	**K90.30**
Whole farm GM (e) = K492.56	**(K157.90 +**	**K32.90 +**	**K211.46 +**	**K90.30)**

Total Fixed costs (common costs)

Loan repayment, e.g. mortgage	= K10.00
Managerial salary	= K20.00
Administrative and office expenses	= K20.00
Insurance	= K50.00
Depreciation	= K50.00
Total Fixed Cost (TFC)	= K150.00

Whole farm (3 ha) profit (f)= Whole farm GM – TFC
= K492.56 - K150.00
= **K342.56**

(a) i. Maize = K126.00
ii. Groundnut = K210.00
iii. Cotton = K630.00
iv. Vegetables = K560.00

(b) i. Maize = K47.05
ii. Groundnut = K127.75
iii. Cotton = K101.35
iv. Vegetables = K108.00

(c) Gross margin = Gross income – total variable costs.
i. Maize = K78.95
ii. Groundnut = K82.25
iii. Cotton = K528.65
iv. Vegetables = K451.50

(d) i. Maize = K157.90
ii. Groundnut = K32.90
iii. Cotton = K211.46
iv. Vegetables = K90.30

(e) Whole farm gross margin = K492.56

(f) Profit = Gross income – (Total fixed cost + Total variable cost)
Whole farm profit = K342.56

	COMMON NAME	SCIENTIFIC NAME
1. (a)	Cattle	*Bos indicus*
(b	Pig	*Sus scrofa*
2. (a)	Sheep	*Ovis aries*
(b)	Goat	*Capra hircus*
3. (a)	Rabbit	*Orytolagus aniculus*
(b)	Duck	*Anan platyrhncha*
4. (a)	Chicken	*Gallus gallus*
(b)	Termite	*Pseudocanthotermes Militaris*
5. (a)	Maize weevil	*Sitophilus Zea mais*
(b)	Bean weevil	*Acanthoscelides obtectus*
6. (a)	Maize	*Zea mays*
(b)	Army worm	*Spodoptera exempta*
7. (a)	Red locust	*Nomadacris septefasciata*
(b)	Stalk borer	*Busseola fusca*
8. (a)	Rice	*Oryza sativa*
(b)	Pear millet	*Pennisetum americanum*
9. (a)	Finger millet	*Elusine coracana*
(b)	Wheat	*Triticum aestivum*
10. (a)	Beans	*Phaseolus vulgaris*
(b)	Cow peas	*Vigna unguiculata*
11. (a)	Pigeon peas	*Cajanus cajan*
(b)	Pumpkin	*Cucurbita pepo*
12. (a)	Chick peas	*Cicer arietium*
(b)	Field peas	*Pisum sativum*
13. (a)	Soya beans	*Glycine max*
(b)	Guar beans	*Cyamopsis tretagonoloba*
14. (a)	Grams	*Vigna aureus*
(b)	Groundnuts	*Arachis hypogea*
15. (a)	Ground beans	*Voandzeia subterranean*
(b)	Sunflower	*Helianthus annuus*
16. (a)	Cassava	*Manihot esculenta*
(b)	Sweet potatoes	*Impomea batatas*
17. (a)	European potatoes	*Solanum tuberosum*
(b)	Tobacco	*Nicotiana tabacum*
18. (a)	Egg plant	*Solonum macrocarpon*
(b)	Cotton	*Gossypium hirsutum*
19. (a)	Banana	*Musa domestica*
(b)	Mangoes	*Mangifera indica*
20. (a)	Avocado pears	*Persica Americana*
(b)	Apples	*Malus domestica*

	COMMON NAME	SCIENTIFIC NAME
21.(a)	Peaches	*Prunus persica*
(b)	Pineapple	*Ananas comosus*
22.(a)	Cashew nut	*Anacardium occidentale*
(b)	Elephant grass	*Pennisetum purpureum*
23.(a)	Ginger	*Zingiber officinale*
(b)	Pepper	*piper nigrum*
24.(a)	Cabbage	*Brassica oleracea*
(b)	Tomatoes	*Lycopersicon esculentum*
25.(a)	Onions	*Allium cepa*
(b)	Garlic	*Allium sativum*
26.(a)	Coffee	*Coffea arabica*
(b)	Tea	*Camellia sinensis*
27.(a)	Sugarcane	*Saccharam officianarum*
(b)	Carrot	*Daucus carota*
28.(a)	Witch weed	*Striga asiatica*
(b)	Pawpaw	*Carica papaya*
29.(a)	Guava	*Psidium guajava*
(b)	Tangerine	*Citrus reticulata*
30.(a)	Lemon	*Citrus limon*
(b)	Sweet oranges	*Citrus sinensi*