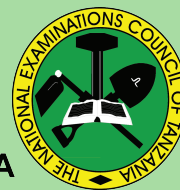**THE UNITED REPUBLIC OF TANZANIA**

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

CANDIDATES' ITEMS RESPONSE ANALYSIS REPORT ON THE ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION (ACSEE) 2023

AGRICULTURE

THE UNITED REPUBLIC OF TANZANIA

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134 AGRICULTURE

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FOREWORD

This report presents Candidates' Items Response Analysis (CIRA) on Advanced Certificate of Secondary Education Examination (ACSEE) conducted in May 2023. The report aims at providing feedback to education stakeholders on the performance of candidates by identifying the strengths and weaknesses shown by candidates in responding to the Agriculture examination questions.

The general performance of candidates in this examination was good. The topics and fields in which candidates had a good performance were Introduction to Animal Health, Pasture Agronomy, Introduction to Weed Science, Environmental and Technological Challenges in Agricultural Development, Introduction to Soil Chemistry, Workshop Technology and Farm Structures, Introduction to Animal Nutrition, Agricultural Production Economics, Introduction to Soil Science, Crop Science and Production, Crop Pests, Introduction to Agricultural Prices, Fundamental of International Trade and Farm Planning.

The candidates performed averagely in the topics of Livestock Reproduction, Breeding and Improvement, Plant Diseases, Farm Power, Plant Breeding and the field of Soil Science. However, they had a weak performance in the topics of Farm Mechanization and Machinery and Introduction to Irrigation.

The good performance is attributed to the candidates' adequate knowledge of the subject matter and practical skills. On the other hand, the weak performance is attributed to the candidates' inadequate knowledge of the subject matter and lack of practical skills. Some of the candidates also failed to comprehend the requirements of the questions.

The National Examinations Council of Tanzania (NECTA) expects that this feedback will shed light on the challenges which education stakeholders should address to improve the performance in Agriculture subject in future examinations administered by the council.

The Council appreciates the contribution of all who prepared this report.

Dr Said Ally Mohamed
EXECUTIVE SECRETARY

1.0   INTRODUCTION

This report presents an analysis of candidates' performance in ACSEE 2023 in Agriculture subject. The examination was set in accordance with the 2019 Agriculture format, which is based on the 2019 Agriculture Syllabus. The examination consisted of three papers: 134/1 Agriculture 1 and 134/2 Agriculture 2, being theory papers, and 134/3 Agriculture 3, a practical paper. Agriculture 1 and 2 consisted of ten short answer questions each. Each question carried 10 marks, making a total of 100 marks in each paper. Agriculture 3 consisted of two short answer questions and one structured question. Question one carried 20 marks, whereas the other two questions carried 15 marks each, making a total of 50 marks. Candidates were required to answer all questions in all examination papers.

The analysis indicates that 784 candidates sat for the 2023 ACSEE in Agriculture subject, of which, 783 (99.87%) passed and 1 (0.13%) failed, implying that the performance of the candidates was good. Nonetheless, the performance of candidates in 2023 decreased by 0.13 percent compared to the 2022 results. Table 1 compares the performance of candidates between 2022 and 2023 in ACSEE Agriculture subject by grade.

Table 1: Comparison of Candidates' Performance in ACSEE between 2022 and 2023 by Grade

Year	Grades							% Pass	% Fail	Sat	With held
	A	B	C	D	E	S	F				
2022	0	24	297	345	58	1	0	100	0	726	1
2023	0	17	289	370	105	2	1	99.87	0.13	784	0

Source: NECTA Statistics Book, pg. 6 ACSEE, 2023

The performance of candidates is categorized into seven grades (A, B, C, D, E, S and F). Each grade has a score interval and remarks as follows: A (80-100) Excellent, B (70-79) Very good, C (60-69) good, D (50-59) Average, E (40-49) Satisfactory, S (35-39) Subsidiary and F (0-34) Fail.

The next part of this report is organized into three sections: the analysis of the candidates' performance in each question, the analysis of the

candidates' performance in each topic/field, and conclusion and recommendations.

2.0 THE ANALYSIS OF THE CANDIDATES' PERFORMANCE IN EACH QUESTION

This section presents an analysis of candidates' performance in each question. The analysis highlights the requirements of each question, the general performance of candidates, their responses and possible reasons for the responses. In addition, extracts are presented as samples of the candidates' correct and incorrect responses in the question. Graphics have also been used to illustrate specific cases. In the analysis, the performance is considered as weak, average or good if the percentage of the candidates who scored an average of 35 and above ranges from 0-34, 35-59 and 60-100, respectively. Correspondingly, green, yellow, and red colours denote good, average, and weak performance, respectively.

2.1 THE ANALYSIS OF THE CANDIDATES' PERFORMANCE IN 134/1 AGRICULTURE 1

2.1.1 Question 1: Introduction to Soil Science

The question required the candidates to explain the five factors that cause variation of soil during its formation. The question assessed the candidates' understanding of the concept of soil formation.

The question was attempted by 784 (100%) candidates, out of which 101 (12.88%) scored from 0.0 to 3.0 marks, 343 (43.75%) candidates scored from 3.5 to 5.5 marks and 340 (43.37%) from 6.0 to 10 marks. Figure 1 indicates the candidates' scores in the question.
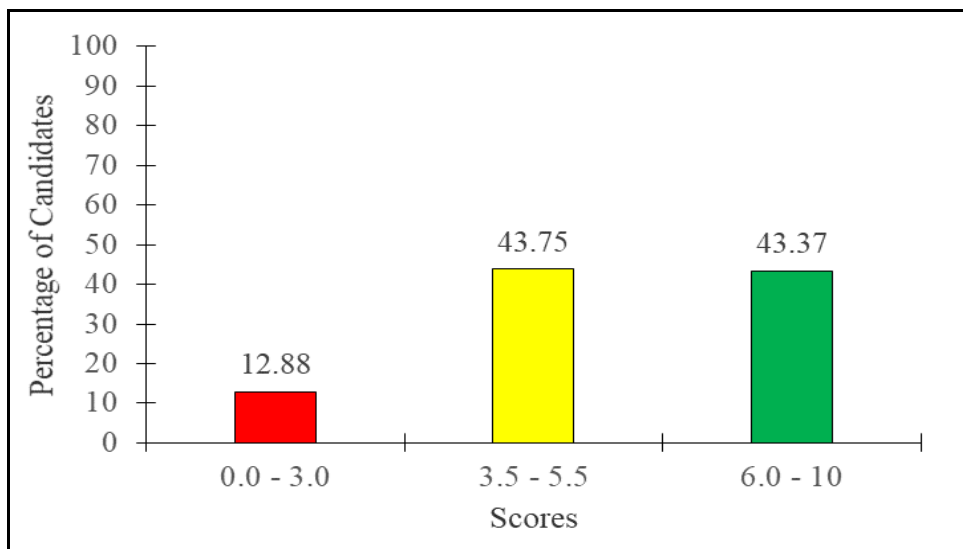
Figure 1: *Distribution of the Candidates' Scores in Question 1*

Figure 1 illustrates that 87.12 per cent of the candidates scored from 3.5 to 10 marks and 12.88 per cent scored from 0.0 to 3.0 marks. Generally, the performance in the question was good.

The data indicates that 43.37 per cent of the candidates had a good performance. Most of these managed to explain factors that cause variation of soil during its formation such as parent materials, climate, living organisms, topography/relief and time. This indicates the candidates' good understanding of the factors for soil formation. Extract 1.1 shows the sample of the correct responses from one of the candidates.

1. Soil refers to the uper most part of the earth crust in which plants and animals are active. Soil formation refers to the genesis of the soil. The following are the factors that cause variation of the soil during its formation.

(i) Nature of parent material (rock).
- Some rocks are resistant to weathering process while others are easily weathered
- There will be well developed soil if the nature of the parent rock is easily weathered by weathering agents such as water, temperature For example gabro
- But when the parent rock is resistant to weathering agents, the soil formed is poor

(ii) Climate,
- Temperature and rainfall are the major agents for both physical and chemical weathering

- Rainfall is the source of water which act as the chemical reagent during chemical weathening, but also water dissolve minerals
- Temperature affect the rate of chemical decomposition of rock. But also temperature is involved in physical weath-

ening during Contraction and expansion of rocks which result to exfoliation
- Areas with high rainfall and favourable temperature offer chemical weathening of rock hence well developed soil than in areas with little rainfall.

iii) Living organisms, including plants, burrowing animals, microorganisms influence biological weathening,
- Areas with vegetation contain large amount of organic matter as the dead leaves can be decomposed and become part of the soil
- Burrowing animals such as earth worms, rats help in mixing the soil
- Microorganism through their excretion help in chemical weathening
- Hence in areas with living organisms (more), the soil is better developed than in areas with small amount of organisms

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iv) Topography, The slope of the area also affect He soil form Ed, the soil can deffer in proper ties although it is formed

Extract 1.1: *A sample of the candidates' correct responses in question 1*

In Extract 1.1, the candidate demonstrated a good understanding of the concept of soil formation by providing correct responses to the whole question.

Furthermore, 43.75 per cent of the candidates had an average performance. These identified the factors that cause variation of soil during its formation but failed to explain them. This implies that the candidates had partial understanding of the factors.

On the other hand, 12.88 per cent of the candidates had a weak performance. Most of these did not explain the factors that cause variation of soil during its formation. Some of the candidates provided agronomic practices of maintaining soil fertility such as *crop rotation, manuring* and *liming.* Other candidates outlined the physical properties of soil such as *soil density, soil porosity, soil temperature* and *soil air*. A few tried to explain the process of weathering. The candidates' responses signify their failure to understand the requirement of the question. Extract 1.2 portrays a sample of the incorrect responses from one of the candidates.

01. The following are the factor that cause the variation of soil during its formation include :

Texture of the soil : The fairness, courness of the soil to feel slipery and silt is one of the one of cause that the soil can different during its formation.

Structure of the soil : The one of causes of soil to varriation during its formation is the structure due to the arrangement of the soil particles during its soil forming process the nature and structure can cause varioation of soil during its formation.

Soil profile : The vertical cross section of the soil is one of the one cause of the different soil during the formation of the soil process due to different climatical condition and the topographical uses.

01. Soil catena : The series of the soil change due to the climate, topography are the one of the cause of the soil variation during its soil forming process.

Soil colour : The prensence of the different colour of the soil like Black, Dark soil and grey soil are the one of the factor causing the soil variation during its formation.

Extract 1.2: *A sample of the candidates' incorrect responses in question*

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In Extract 1.2, the candidate provided physical properties of soil instead of the factors that cause variation of soil during its formation, hence failed to meet the requirement of the question.

2.1.2 Question 2: Introduction to Soil Science

This question had parts: (a) and (b). The candidates were required to: (a) distinguish the gravitational water from the field capacity and (b) argue for the statement, "soil air is inevitable" for proper growth of plants. The question examined candidates' knowledge of soil water and soil air.

The question was attempted by 784 (100%) candidates, of which 235 (30%) scored from 0.0 to 3.0 marks, 275 (35.08%) from 3.5 to 5.5 marks and 274 (34.92%) from 6.0 to 10 marks. Figure 2 presents the candidates' scores in the question.

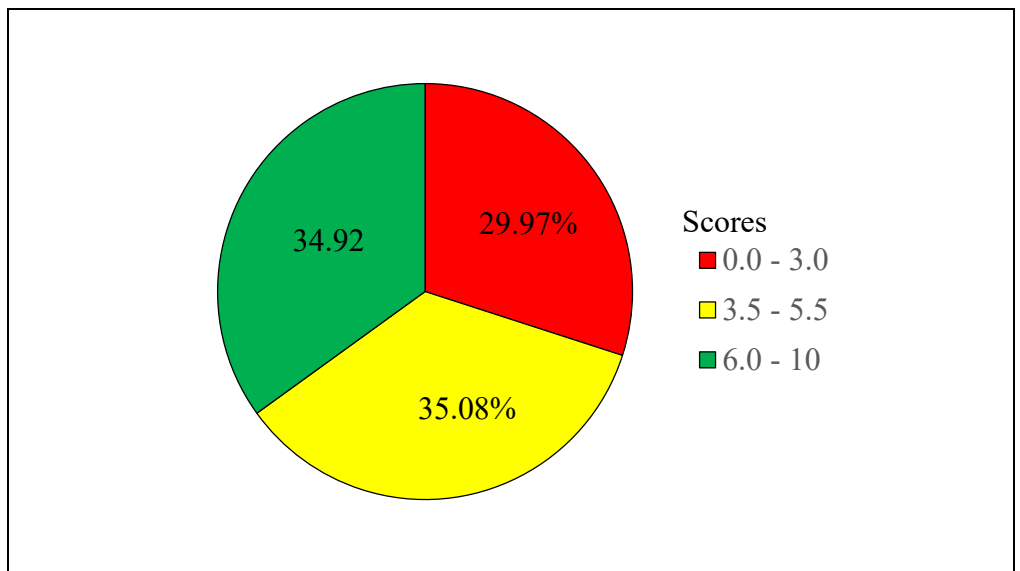**Figure 2:** *Distribution of the Candidates' Scores in Question 2*

In reference to Figure 2, the analysis shows that 70 per cent of the candidates scored from 3.5 to 10 marks and 30 per cent from 0.0 to 3.0 marks, indicating a good performance.

Data analysis shows that 34.92 per cent of the candidates performed well in the question. The majority correctly responded in both parts of the question. In part (a), they correctly distinguished the gravitational water from the field capacity such *as gravitational water is the water that enters into the soil and pass out through the soil by gravity while field capacity is the percentage of water remained in the soil after gravitational water have been removed*. In part (b), they made correct arguments for the statement, "soil air is inevitable for proper plant growth." Their responses were as follows; *growth and development of plants and its parts depends on the presence of air*, *microbial population and activities depends on the presence of air*, *soil air (CO_2) help to dissolve nutrients from rocks and minerals* and *nitrogen of the soil air can be fixed by symbiotic and non-symbiotic organisms and subsequently utilised by higher plants*. This is an indication that the candidates were knowledgeable of soil water and soil air as physical properties of soil. Extract 2.1 is a sample of the correct responses in the question.

7 a) Gravitational water, is the water held in gravitational pores and move down readly under force of gravity and this form of water not available for plant. "While" Field capacity is the amount of water held in the soil after all gravitational water is removed.

b) Its true for proper growth of plant soil "air is inevitable" this is because soil air has the following role in plants.
i) Affect root growth of the plant Abnormal size in roots crops especially carrots is caused by insufficient in to oxygen in soil. therefore for normal growth of
ii) plant roots oxgen air must be sufficient supplied.

iii) It affect microorganism population and activities in the soil, as microbes are important for decomposing organic matter in the soil they need enough oxygen for their activities inorder to ensure enough nutrients is released into the soil for plant use. little soil air reduce microbes activities.

Extract 2.1: *A sample of the candidates' correct responses in question 2*

In Extract 2.1, the candidate proved knowledgeable by providing correct responses in both parts of the question.

Further analysis reveals that 35.08 per cent of the candidates performed averagely. The majority of these managed to distinguish gravitational water from field capacity in part (a). In part (b), they did not present all points on the importance of air to the proper growth of plants.

Contrarily, 30 per cent of the candidates had a weak performance. These provided the incorrect responses in both parts of the question. In part (a), they failed to distinguish the gravitational water from the field capacity. Examples of the incorrect responses from some of the candidates were; *gravitational water is the amount of water that are in the underground caused by gravitational force in the roots while field capacity is the amount of water that drop into the soil through soil pores, gravitational water is the water formed from the ground while, field capacity is the ability of soil to absorb plant nutrients, gravitational water is the movement of water forcing from underground to the upper layer of the*

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soil while, field capacity is the available water held at point in the atmosphere and *gravitational water is the water that is found in the soil used to support plant growth while field capacity is the amount of water which is present in the soil solution.* This demonstrates their lack of knowledge of the subject matter.

Moreover, in part (b) the to understand the requirement of the question hence instead of giving the importance of air, provided a variety of the incorrect responses that were not related to the question. Such responses provided were *agronomic activities, physical properties, seasonal variations, increase water holding capacity, presence of light, help to dissociate water vapour to the plant roots.* Extract 2.2 presents a sample of the incorrect responses in the question.

02 a) To distinguish the following	
Gravitational water: This is the amount of water	
remained in the soil after WHILE field capacity	
This is the ability of easyness and liquid or	
gases water present in the soil.	
02 b: Reason for why soil air is inevitable	
i: Soil Air cause the air pollution	
- They can produce the air due to produces the air	
which distrud the atmosphere	
ii: Destruction of ozone layer	
The layer can be destructed as they produce smokes	
iii: It affects the microbial activities	
The microbial activities also affected by soil air	
iv: Destruction of ecosystem	
As they produces smokes they destruct the ecosystem	

In Extract 2.2, the candidate failed to provide correct responses in all parts of the question. He/she also conform with the action verbs used for asking the question.

2.1.3 Question 3: Introduction to Soil Chemistry

The question had parts: (a) and (b). Candidates were required to: (a) give four qualities of cowpea plant that make it a good cover crop and (b) (i) briefly explain two short term advantages of the practice of burning the vegetation and (ii) account for four the long-term disadvantages of the practice of burning the vegetation. The question examined candidates' knowledge of concepts related to cover crops and burning vegetations during the land preparation.

The question was attempted by 784 (100%) candidates, whereas 32 (4.08%) scored from 0.0 to 3.0 marks, 195 (24.87%) scored from 3.5 to 5.5 marks and 557 (71.05%) scored from 6.0 to 10 marks. Figure 3 indicates the candidates' scores in the question.
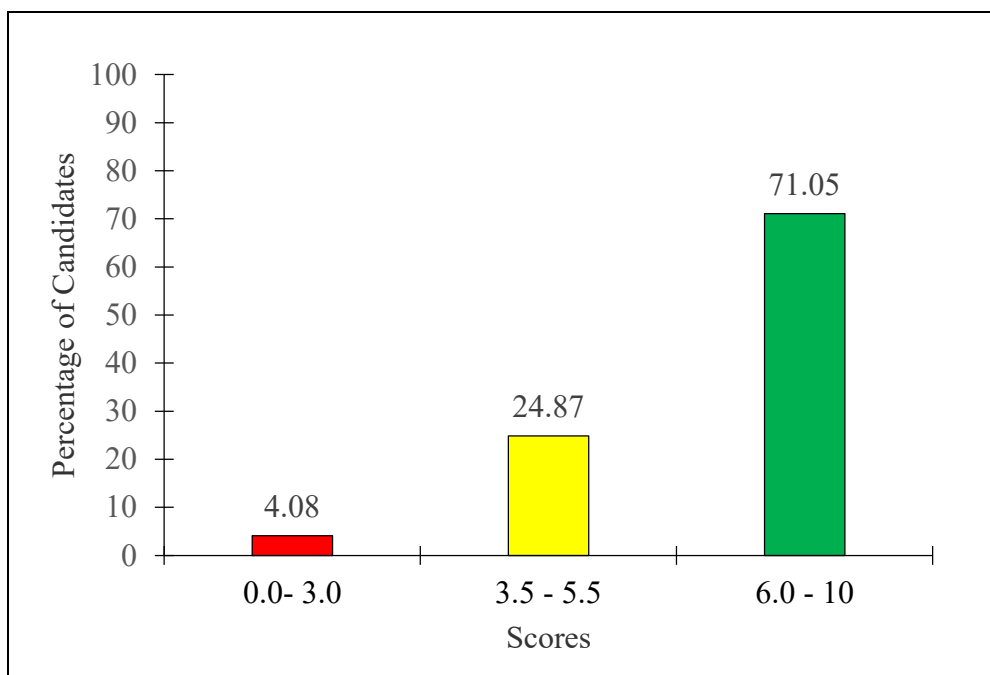

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Figure 3: *Distribution of the Candidates' Scores in Question 3*

As shown in Figure 3, 95.92, per cent of the candidates scored from 3.5 to 10 marks, while 4.08 per cent scored from 0.0 to 3.0 marks. The general performance in the question was good.

Data analysis shows that 71.05 per cent of the candidates correctly responded in almost all parts of the question. In part (a), they correctly gave the qualities that make the cowpea plant a good cover crop such as *does not compete with other crop plants for nutrients, water, rooting space and light*, *it grows well even in poor soil due to its ability to fix nitrogen* and *grow even under low soil moisture condition*. This indicates the mastery of the concept of cover crops. In part (b) (i), they managed to explain the short-term advantages of the practice of burning the vegetation. The correct responses include *ashes formed act as pH regulator*, *ashes contains basic cations like calcium, magnesium and potassium which become nutrients for crop grown*, *burning is a fast way of clearing weeds and thick vegetation during land preparation*. Likewise, the candidates were able to account for the long-term disadvantages of the practices of burning the vegetation in part (b) (ii). Examples of the responses provided were *burning destroys organic matter*, *volatile nutrient elements like nitrogen, sulphur, phosphorus stored in the soil are lost from the farm through evaporation*, *burning kills most of the beneficial soil organisms*, *burning expose the soil to the agents of soil erosion like running water and wind*, and *burning contributes to deforestation*. The correct responses provided by the candidates indicate their good understanding of the positive and negative effects of the practice. Extract 3.1 presents the correct responses from one of the candidates.

Q3 (a)

(1) It should not compete with the crop grown in the farm for rooting space, air and nutr~

(i) It do not compete with crops grown in the field for rooting space, air and nutrients.

(ii) It do not act as alternative host for pest and disease causing organism.

(iii) It grow effectively even in poor soil co

03 (a) Condition such as soil with low nutrient value.

(iv) It is drought resistance ie it grow well even when there is little water supply/rainfall in the particular area.

03 (b)

(i) Short term advantage.

⊛ It help to destroy the crop residues contaminated with a certain disease infections.

⊛ It help to destruct the insects, Pest that tend to attack the crop plant in the farm.

(ii) Long term disadvantages.

⊛ It affect the soil temperature condition hence make it unfavourable for the crops grown hence affect soil productivity.

⊛ It destroy the micro-organisms living in the soil hence makes unfavourable condition of efficiency micro organism to perform their activities in the soil hence affect soil productivity.

⊛ It ~~expose~~ influence the occurance of erosion in the particular as it create bare land with the poor vegetation cover hence affect soil productivity.

03 (b)(ii) ⊛ It affect the soil reactions as it influence destress in soil pH hence affect the soil productivity.

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In Extract 3.1, the candidate correctly attempted both parts of the question signifying the mastery of the subject matter.

Data analysis indicates that 24.87 per cent of the candidates performed averagely in the question. Most of these managed to explain the short-term advantages of the practice of burning the vegetation in part (b) (i). However, they provided partially correct responses in part (a) and (b) (ii) for the qualities of cowpea as a good cover crop and long-term disadvantages of burning the vegetation respectively.

Nevertheless, 4.08 per cent of the candidates had a weak performance. Most of them provided the incorrect responses in nearly all parts of the question. In part (a), they failed to give qualities of cowpea as a good cover crop. Some of them outlined general characteristics of cowpea as plant but not as a cover crop for example, *it has fibre roots, which make them difficult to control*, *it has large leaves for efficient photosynthesis*, *it has many root systems for proper absorption of water and minerals* and *it has well developed roots and vascular system for efficient transportation*. Other candidates provided responses that were not related to the question like *improve soil structure*, *control disease* and *increase soil pH*. The responses given demonstrate the lack of the subject matter knowledge and failure to meet the requirement of the question.

In part (b) (i), the candidates were unable to explain the short-term advantages of burning the vegetation. Contrarily, they provided a variety of the incorrect responses such as, *it increases organic matter, the practice doesn't disturb the soil structure, it increases microbial activities* and *burning make soil acidic in nature.* Likewise, in part (b) (ii), they failed to account for long term disadvantages of the practice of burning the vegetation by providing incorrect responses such as *cause leaching*, *help to increase yield in the farm, maintain soil texture, leads to the existence of resistant weeds, it rises the acidic medium of the* soil. The incorrect responses imply a low understanding of the candidates of

positive and negative impacts of the practice of burning the vegetation. Extract 3.2 exemplifies a sample of the incorrect responses in the question.

3 (a) (i). They have deep root system which penetration to the soil

(ii). They are very resistant to dry and harsh condition

(iii) They produce large number of seeds

(iv). They are very resistant to abnormal condition and diseases.

3 (b) (i). short term advantages of this practice
(i). Add organic matter to the soil which increases the productivity of the soil for short term
(ii). Decomposition of organic matter which facilitate the microbial activities to takes place for short period of time.

3 (b) (ii). Long term disadvantages of this practice on soil productivity.

(i). Increases acid salt concentration. Burning of vegetation increases the acidic salts concentration to the soil
(ii). Cause soil erosion. Burning of vegetation causes the soil erosion.
(iii). Affect microbial activities effectually microorganisms activity to takes place.

3 (b) (ii) (iv). It affect the soil aeration which reduce the water moisture in the soil.

In Extract.3.2, the candidate provided the incorrect responses in nearly all parts of the question except part (b) (ii) in response (ii) and (iii).

2.1.4 Question 4: Introduction to Soil Chemistry

The question required candidates to explain seven beneficial effects of using the correct amount of lime in the management of acid soil and three detrimental effects of excessive application of lime. The question tested candidates' understanding of the methods of correcting the soil reaction.

The question was attempted by 784 (100%) candidates, of which 76 (9.69%) scored from 0.0 to 3.0 marks, 351 (44.77%) scored from 3.5 to 5.5 marks and 357 (45.54%) scored from 6.0 to 9.5 marks. Figure 4 portrays the candidates' scores in the question.
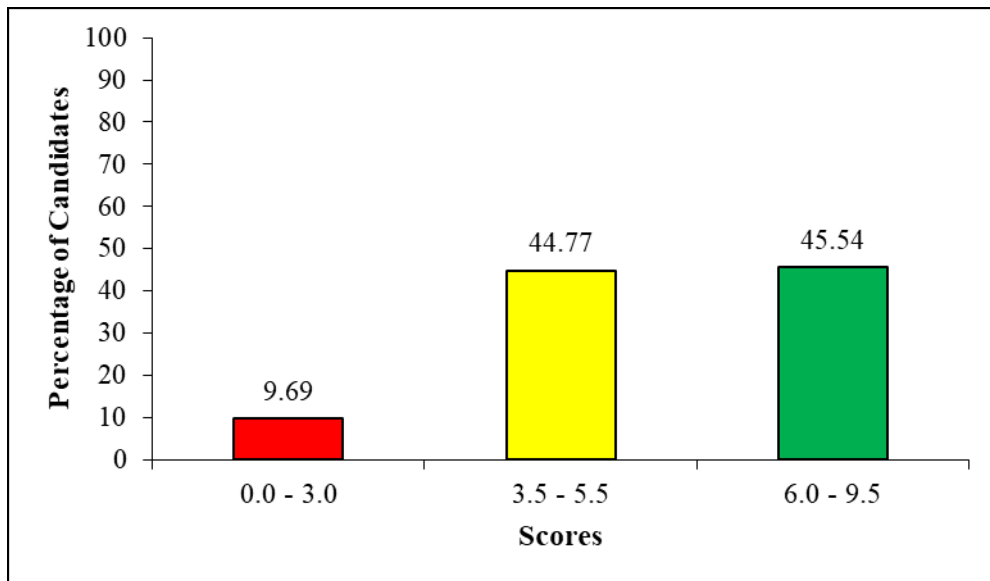
Figure 4: *Distribution of the Candidates' Scores in Question 4.*

In view of Figure 4, 90.31 per cent of the candidates scored from 3.5 to 9.5 marks and 9.69 per cent scored from 0.0 to 3.0 marks. The performance of the candidates was generally good.

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Candidates who performed well in the question were 45.54 per cent. Most of them correctly explained the beneficial effects of using the correct amount of lime in the management of acid soil such as; *it supplies calcium and /or magnesium as important nutrient elements for plant growth*, *it improve physical properties of soil, increase phosphorus and molybdenum availability in acid soil, it enhance microbial activities*, *it prevents the accumulation of iron, aluminium and manganese to toxic level*, *it increase plant density and water infiltration in the soil*, *and it reduce stem and root lodging.* They also provided correct detrimental effects of excessive application of lime such as *it decreases uptake of nutrients such as iron, manganese and zinc*, *it decrease phosphate availability and it is harmful to plant tissues as a result of sudden change in the reaction of the soil.* These responses given by the candidates signify a good understanding of the methods of correcting soil reactions. Extract 4.1 presents a sample of the correct responses in the question.

4. Beneficial effect of using Correct amount of lime in the management of acid soil.

i) It increase supply of Calcium and Magnessium which is need for proper growth of plant ; This means that addition of lime involve some addition basic metal such as $CaCO_3$ and $MgCO_3$ so due to this there is high supply Calcium and Magnessium

ii) It improve soil physical properties like soil structure which providing Conducive environment for Microorganism to decompose organic matter and humus

iii) It increase availability of phosphorus in the soil This Means that addition of liming material increase uptake of some nutrients such as phosphorus

iv) It stimulate symbiotic and non-symbiotic fixing bacteria by providing favourable environment or Conditions for their activities

v) It prevent accumulation of toxic iron, aluminium and Manganese. This Means that addition of that lime may prevent this element from acculation to toxic level.

4.	vi) It improve water infiltration capacity : This means that the down movement of water is improved due to addition of liming materials	
	vii) It Control soil erosion ; This means that addition of liming material in the soil prevent run off of the soil either through rain or wind or other erosive agents	
	Detrimental effect of excessive application of lime i) It lead to accumulation of Alumium, iron and Manganese to toxic level . This means that when liming material are applied in excess it make these element to accumulate in the soil	
	ii) Decrease availability of phosphate due to excess amount of CaCO₃ . So the excessive accumulation of some liming material such as lime CaCO₃ decrease the availability of essential plant nutrient	
	iii) It decrease the solubility of some nutrient ; This means that the application of excess lime in the soil Making some of the plant nutrient insoluble .	

Extract 4.1: *A sample of the candidates' correct responses in question 4*

In Extract 4.1, the candidate provided the correct responses to almost the whole question except in the detrimental effects of excessive application of lime where in response (iii) he/she provided partial explanations.

Data show that, 44.77 per cent of the candidates performed averagely in the question. Most of them provided partially correct responses in explaining the beneficial effects of using the correct amount of lime and detrimental effects of excessive application of lime.

However, 9.59 per cent of the candidates had a weak performance. Most of them failed to explain the beneficial effects of using the correct amount of lime in the acid soils. Most of their responses given such as *reduce hunger, improve standard of the soil, ensure palatability of forage and pastures, increase the income* and *it help to reduce cost of production* were not related to the question asked.

Likewise, the candidates provided a variety of the incorrect responses for detrimental effects of over liming such as *it can cause leaching in the soil, it helps to encourage the nutrient of the soil, it helps to neutralise the acidity of the soil, it controls soil erosion, may lead to temperature change of the crop and reduce workability of the soil*. This signifies lack of the subject matter knowledge. Extract 4.2 indicates a sample of the incorrect responses from one of the candidates.

4. **Beneficial effects of using correct amount of lime.**

i) It increases the soil productivity by maintaining the pH of the soil at required level.

ii) It keeps the good condition for the production of crops in the soil.

iii) It maintains the soil reaction. This is because the level of OH^- and H^+ balances.

iv) It reduces the cost of production. This is because there will be no loss of lime (excess lime) which is costful.

v) It increases the crop yield or product. This is due to the presence of required condition for the crops to grow.

vi) It control and prevent the deficient of some nutrient needed by plant from the soil such as Aluminium and Hydrogen ion.

vii) It ensure the nutrient circulation in the soil which is beneficial to plant growth.

4. **II: Effects of excess lime.**

i) It reduces the amount of exchangeable acids in the soil such as Aluminium and Hydrogen ion which are important to plants.

| | ii) It also reduces the production yield or products due to absence of norm soil pH for the production . | |
| | iii) It also increases the cost of production. This is because excess lime are bought and applied but there is no any beneficial . | |

Extract 4.2: *A sample of the candidates' incorrect responses in question 4*

In Extract 4.2, the candidate provided the incorrect responses to the question. He/she focused on the general conditions for the plant growth, signifying an inadequate knowledge of the subject matter.

2.1.5 Question 5: Farm Power

The question consisted of parts: (a) and (b). Candidates were required to: (a) give six conditions in which the use of the tractor will be more successful than the animal power and (b) give four points on how the ignition system of the tractor engine can be maintained. The question tested candidates' understanding of the engine systems and sources of farm power.

The question was attempted by 784 (100%) candidates, where 329 (41.96%) scored from 0.0 to 3.0 marks, 227 (28.95%) scored from 3.5 to 5.5 marks and 228 (29.09%) scored from 6.0 to 10 marks. Figure 5 summarizes the candidates' scores in the question.
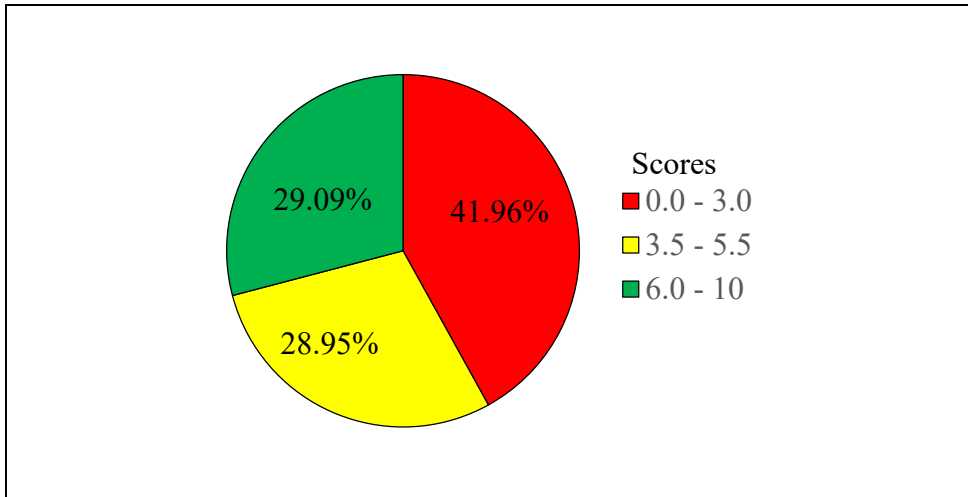
Figure 5: *Distribution of the Candidates' Scores in Question 5*

As shown in Figure 5, data analysis exhibits that 58.04 per cent of the candidates scored from 3.5 to 10 marks where 41.96 percent from 0.0 to 3.0 marks. The candidates' performance in the question was average.

Candidates who had a good performance in the question were 29.09 percent. Most of them correctly attempted both parts of the question. In part (a), they correctly gave conditions in which the use of the tractor is more successful than the animal power such as; *the farm must be large with plenty of work to be done throughout the year*, *there should be enough capital to buy and operate the tractor*, *there must be skilled people to operate, repair and maintain the tractor*, *spares and services must be available at reasonable price*, *the return from the farm should justify the cost of running the tractor* and *the land must be flat for the tractor to work better*. Moreover, they correctly provided the maintenance of the ignition system of the tractor engine in part (b), such as, *the carbon deposit on the spark plug electrodes should be removed*, *spark plugs whose electrodes are worn out should be replaced*. The responses provided demonstrate the possession of adequate knowledge of the conditions for the successful use of the tractor and the tractor ignition system. Extract 5.1 presents a sample of the correct responses in the question.

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5   (a)   (i) The farm should be large with plenty of work
to be done throughout the year.

(ii) There should be a skilled personnel to operate
and maintain or repair the tractor in case of
any damage.

(iii) There should be enough capital required
to purchase and hence operate the
machine or tractor.

(iv) The spare parts should be easily available
at a reasonable cost.

(v) The cost of running the tractor should be
justified and should be lower than the
returns obtained from using tractor.

(vi) The topography of the soil should be reasonab
le for the proper working of the tractor, that is
it should not be too slope but reasonably
gentle sloping.

5	(b) (i) The terminal connections in the battery should be ensured in order to ensure power for ignition of the fuel.
	(ii) Any carbon deposits or dirty particles in the spark plug should be removed using a sandpaper for appropriate working of a spark plug.
	(iii) The defective ignition coil should be repaired or replaced with another so as to ensure efficient ignition of the fuel as a result of amplification of voltage passing through the distributor.
	(iv) The distributor cap should be regularly cleaned and replaced to ensure proper functioning of the distributor

Extract 5.1: *A sample of the candidates' correct responses in question 5*

In Extract 5.1, the candidate showed the mastery of the subject matter by providing the correct responses in both parts of the question.

Further data analysis denotes that 28.95 per cent of the candidates performed averagely. Most of these correctly gave the maintenance of the ignition system in part (b). In part (a), the candidates differentiated the tractor power from the animal power instead of presenting the conditions for the successful use of the tractor power over the animal power. This indicates the failure to meet the requirements of the question.

On the other hand, candidates who had a weak performance constituted 41.96 per cent of the candidates. Most of them responded incorrectly in nearly all parts of the question. In part (a), they failed to give conditions

for the successful use of the tractor over the animal power. Most of them provided the differences between the use of the tractor and the animal as sources of power for doing farm operations. Examples of the responses are, *tractor save time while animal power use limited time, tractor do not depend on health and age while animals depends on health and age, tractor is faster than animal, tractor save cost than animal and tractor does not require a lot of energy*. Similarly, in part (b), they were unable to give the maintenance of the ignition system of the tractor engine. Some of them provided preliminary inspections before starting the tractor. Such responses were *check the level of fuel*, *grease or oil the moving parts*, *ensure the valves are smoothly working*, *check the tyre pressure and check the battery terminals if they are tight*. Other candidates provided the maintenance of other engine systems like *fen belt must be intact* and *radiator is full of water* which are for the cooling system. Examples of the provided maintenance of the fuel system were, *the fuel path is not clogged*, *the tank is not damaged* and *fuel filter is working properly*. All responses given imply that the candidates failed to meet the requirement of the question. Extract 5.2 illustrates a sample of the incorrect responses in the question.

5(a). The condition jahich the use of tractor will be mor successful than animal power.

(i). It less affected by weather condition the use of tractor cannot be affected by the weather condition compared to the animal

(ii) It is more effiziens in manipifating is the farm as compared to animal are less efficiens.

(iii) Short time can be taken to perform farm operation. as compared to animal take long time to perform the Same activities

(iv) The machine can perform Varieties of work is the farm as compared to animal which are limited to some work.

(v). large area can be covered within the Short period . compared to the animal which take long time to cover large area in farm operations .

5(a) (vi) The tractor does not require full maintinance as some parties only can be need ed to be maintaned compared to animal It need full maintainance.

b. The way ignition System of the tractor engine be maintaned.

(i) Regular testing of the engine oil before before Starting the tractor

(ii) lubricate the moving parties of the engine.

In Extract 5.2, the candidate incorrectly responded in both parts of the question. In part (a), he/she tried to compare the tractor and the animal power contrary to the demand of the question. Likewise, in part (b), the candidate provided the inspections needed before starting the tractor instead of the maintenance of the ignition system of the engine.

2.1.6 Question 6: Farm Structures and Workshop Technology

The question consisted of parts: (a) and (b). Candidates were required to: (a) propose five factors to be considered to construct an efficient, durable and low-cost electric wire fence to control the movement of farm animals and (b) propose five maintenance requirements of planes as a workshop tool. The question tested candidates' knowledge of the farm fences and workshop tools.

The question was attempted by 784 (100%) candidates, out of which 75 (9.57 %) scored from 0.0 to 3.0 marks, 380 (48.47 %) scored from 3.5 to 5.5 marks and 329 (41.96%) scored from 6.0 to 10 marks. Figure 6 shows the candidates' scores in the question.
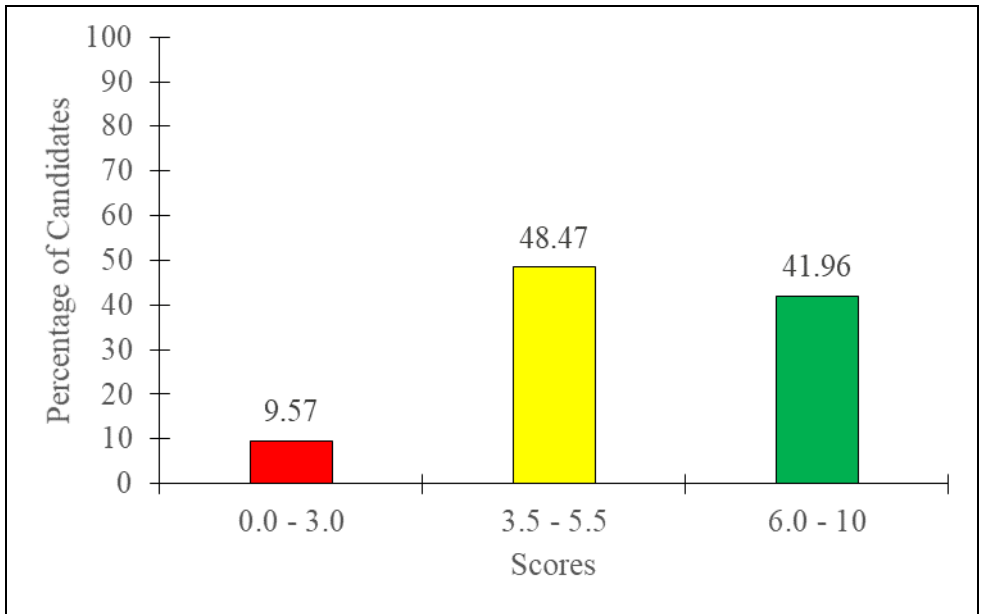
Figure 6: *Distribution of the Candidates' Scores in Question 6*

Figure 6 indicates that 90.43 per cent of the candidates scored from 3.5 to 10 marks, whereas 9.57 per cent scored from 0.0 to 3.0 marks. The general performance in the question was good.

It was noted in the analysis that 41.96 per cent of the candidates performed well; with most of them providing the correct responses in both parts of the question. In part (a), they managed to propose factors to be considered to construct an efficient, durable and low-cost electrical wire fence to control the movement of farm animals. Examples of the correct responses were; *follow an appropriate design for fencing as per different type of farm animals*, *it must be installed properly with no shorts*, *use high tension wire*, *do not use poor quality or small insulators*, *avoid mixing galvanised materials with others*, *use bolts*, *galvanised nuts* or *joint clamps to bolt all wire connectors together*, *the pulse in wire should be maintained all the time*, *ensure that earthing is properly done to avoid shorts and use thinner post and wire which are easily electrified and less expensive*. This proves that the candidates were knowledgeable of the factors to be considered in the construction of the electric wire fence. In part (b), they correctly proposed the maintenance of planes such

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as; *adjustments to plane must be properly be done before using it, lubricate the sole of metal plane with candle wax to promote easy working, dress wooden planes with linseed, keep them on their sides, oil the metal planes to prevent rust, check for damage including cracks then repair, replace or re-sharpen accordingly, keep it clean, retracting the iron and storing your plane.* This signifies a good understanding of planes as workshop tools. Extract 6.1 is an example of the correct responses in the question.

6 a) Factors to consider inorder to construct efficient, durable and low cost electric wire fence:

(i) Follow an appropriate design for the fence: Inorder to make fence durable and effective at a low cost It is necessary the appropriate design of such a particular fence required in the farm for crop or livestock Production

(ii) Use recommended H-I wire to avoid sagging: Also the farmer must use the wire which is recommend by the fence which he like want to establish so that to avoid sagging of the wire.

(iii) Avoid mixing galvanized materials and other materials: Also for the farmer construct an electric fence which is durable and efficient at a low cost it is better to avoid the mixing of galvanized materials and other materials:

iv) Use galvanized bolt, nut and joint clamp to clamp all wire connectors together: Inorder to make the electric fence durable the farmer must clamp all wire connectors together by using galvanized bolt, nut or joint clamp to make the plain wire tight and function well.

(v) The Pulse in a wire should be maintained at all time: Also in the wire there must be maintel a Pulse every time So that to ensure the existence of electric fence.

6 b) Planes: are tools used for plan shaping used to give a plane surface:

The following are the proper maintainance of planes

(i) Damaged cutting edge should be reground at an angle of about 25°: Inorder to function well the work using plane it is advised to put the cutting edge at angle-

(ii) The blade should be sharpened and fine on't stone to improve performance.

- Also the blade of the plane must be sharpened so that to make plane to function high.

(iii) All adjustment to plane should be made before using the tool.

- Before using the tool it is advised to make sure all adjustment are done well.

(iv) Lab the soles of metal with candle wax to enhance easily running.

- This facilitate the running easily of plane during working.

v. The broken handle should be replaced with new one. This will enable to ensure continuous working in the workshop

Extract 6.1: *A sample of the candidates' correct responses in* question 6

In Extract 6.1, the candidate demonstrated the mastery of the subject matter as he/she provided the correct responses in both parts of the question.

Further analysis showed that, 48.47 per cent of the candidates had an average performance. Their responses in both parts of the question indicates a partial understanding of the subject matter.

On the other hand, 9.57 per cent of the candidates did poorly in the question. Most of them incorrectly responded in both parts. In part (a), they failed to propose factors to be considered in the construction of the electrical wire fence. Most their responses focused on the qualities of a good fence, for example, *must be durable, should have low cost,*

efficient, *size of the fence should be equal to the number of animals present* and *secured*. This demonstrates that the candidates had misconceptions of the concept. In part (b), they were also unable to propose the maintenance of the planes. They did not meet the requirement of the question. Some of them mentioned the personal protective measures against injuries in the workshop while others mentioned the storage of the workshop tools. Examples of such incorrect responses include *tools should be maintained to avoid rain, tools should be maintained to avoid light, do not talk to anyone when using the tool because may cause injury, during working wear protective gears, tools should be maintained to control theft and do not oil the plane to reduce contamination of oil with teeth of plane.* This indicates that the candidates were unfamiliar with the planes and lacked exposure to practical work in the workshop. Extract 6.2 illustrates a sample of the incorrect responses in the question.

6 (b)(i) They should be placed in the app right places
⇒ This means the tools place in the correct position
(b).

(ii) They should be used in right job
⇒ This means that when the tools or equipment
are used for the right, job also it maintain its
efficient

(iii) Care must be taken when using the tools or
equipment like jack plane.
⇒ This inorder to prevent injuries that appeared
suddenly during working.

(iv) Donot applying oil on the surface of plane
(tools or equipment), This if require the efficient
of equipment & inorder to maintain should required
for to avoid or prevent applying of oil on the
surface of tools like plane.

v) Do not test its sharpness by using the fingers
⇒ Inorder

v) It should be cleaned off before and after
use of equipment or tools like plane and others.

6 (a)(i) Accessibility
⟹ Through considering the accessibility of materials during the construction of fence

(ii) Topography.
⟹ This means in the slop areas the construction of fence are not now efficient, but in flat areas of land it does

(iii) Size of building/structure
⟹ By mans of considering the size of after structural construction

(v) Skill of builder
⟹ This mean the nature/skill of that required to construct the structure

v) Economic of the farmer

Extract 6.2: *A sample of the candidates' incorrect responses in question 6*

In Extract 6.2, the candidate failed to score in all parts of the question, indicating an inadequate knowledge of the subject matter.

2.1.7 Question 7: Introduction to Irrigation and Farm Mechanization and Machinery

The question comprised parts: (a) and (b). Candidates were required to: (a) elaborate the four necessary adjustments to be done on the tractor mounted mouldboard plough because of not creating suitable tilth during the cultivation and (b) justify the statement that the "drip irrigation system is said to minimise certain crop diseases outbreak and weed growth than the sprinkler irrigation system". The question

examined candidates' understanding of the methods of irrigation and farm implements.

The question was attempted by 784 (100%) candidates, of which 565 (72.02%) scored from 0.0 to 3.0 marks, 188 (23.98%) scored from 3.5 to 5.5 marks and 31 (4%) scored from 6.0 to 8.5 marks. Figure 7 summarizes the candidates' scores in the question.
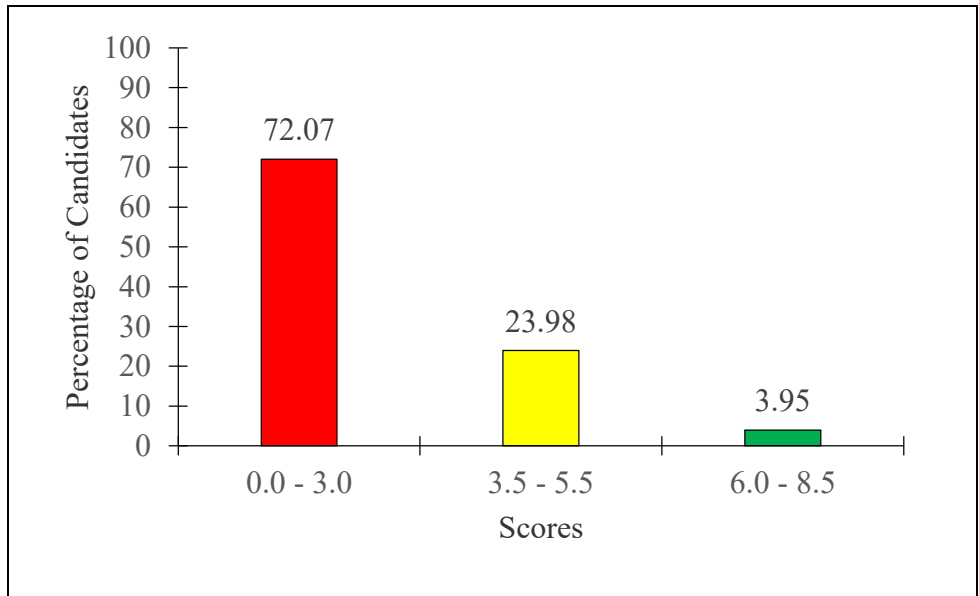
Figure 7: *Distributions of the Candidates Scores in Question 7*

Figure 7 indicates that 72.05 per cent of the candidates scored from 0 to 3 marks and 27.98 per cent scored from 3.5 to 8.5 marks. The general performance in the question was weak.

Data analysis shows that 72.02 per cent of the candidates did poorly in the question. Most of them provided the incorrect responses in almost all parts of the question. In part (a), they failed to elaborate the adjustments to be done on the tractor mounted mouldboard plough. Some of the responses provided were the role of the plough such as *breaking and loosening the soil*, *burry vegetation*, *improve aeration and drainage* and *control soil borne disease*. Other incorrect responses provided were the

conditions that favour the plough to work properly like light soil, short vegetation, and absence of obstacles. In some cases, the candidates provided different incorrect responses for example *the mouldboard should be adjusted for efficient work output*, *consider nature of the soil*, *consider the topography of the area*, *consider the climate*, *apply tightening bolts and nuts and cleaning the land first before working*.

Furthermore, in part (b), they failed to justify the statement given. Most of their responses focused on how the drip irrigation and sprinkler irrigation work instead of justifying that the drip irrigation minimizes the outbreak of diseases and the weed growth than the sprinkler irrigation. These responses show that some candidate did not understand the requirement of the question and had a low understanding of the subject matter. Extract 7.1 indicates a sample of the incorrect responses in the question.

07	(a) The adjustment to be done on a tractor mounted mouldboard plough.		
	(i) The mould should be adjusted down ward for efficient work output.		
	(ii) The mould should be used on the light work.		
	(iii) Mouldboard plough should be well shape and to ensure good cultivation in the farm.		

17	(b) Advantages of Drip irrigation over sprinkler irrigation:		
	(i) Drip irrigation supplies water to the each stem of the plant more efficiently.		
	(ii) The irrigation does not cause disease since water is uniformly distributed to each plant.		
	(iii) Water from drips irrigate the specific plant and does not contact with another plant hence disease are controlled.		
	(iv) Fumigation can be done more effectively by drip irrigation since the rate of evapouration is low compared to sprinkler irrigation where water is distributed on the leaves of plant hence evaporation is higher.		

Extract 7.1: *A sample of the candidates' incorrect responses in question 7*

In Extract 7.1, the candidate incorrectly attempted both parts of the question by giving responses that do not meet the requirement of the question.

Candidates who attained an average performance were 23.98 per cent. Most of these correctly justified that the drip irrigation minimizes the outbreak diseases and weeds growth than the sprinkler irrigation in part (b). In part (a), they were unable to elaborate the adjustments needed in the mouldboard plough so that it works properly. They named the parts of the plough as the ones that needed adjustments. For example, the

adjustment of the mouldboard, beam, landside, share and skim coulter. This indicates that they were unfamiliar with the adjustments needed on the mouldboard plough.

However, 4 per cent of the candidates provided the correct responses in almost all parts of the question. In part (a), they well elaborated the adjustments to be done on the tractor mounted mouldboard plough. Such correct responses include, *adjustment of ploughing depth*, *adjustment of front furrow depth*, *lowering/raising ploughing pitch* and *adjustment of front furrow width*. In part (b), they correctly justified the statement that the "drip irrigation system is said to minimize certain crop diseases outbreak and weed growth than the sprinkler irrigation". The correct responses given were, *drip irrigation involve application of water in small droplets within the plants*, *therefore it minimizes outbreak of crop diseases such as blight, coffee berry disease etc as water is applied to the root zone hence it does not come into contact with plant leaves. In addition, it minimizes weed growth as little water get in between crop rows*. *However, sprinkler irrigation is the application of water to the crops in form of small droplet like rain direct onto the leaves. This encourage outbreak of certain crop diseases. Also, because water get in between crop rows*, *it encourages flourishment of weeds*. The responses given by the candidates in both parts signify a good understanding of the adjustments needed on the mouldboard plough and the working of the stated irrigation method. Extract 7.2 presents an example of the correct responses from one of the candidates.

7 (a) Necessary adjustments to be done on a tractor mounted mouldboard plough.
(i) Adding of weight on the mouldboard to plough. This will help to make the mouldboard plough to be able easy immersed into the soil as it required.
(ii) Use a well sharpped mouldboard or cuting part. This also help because if a person use unsharped mouldboard nothing will be cut on the soil surface.
(iii) To lower the hitch point. This due to lowering of the hitch point result into increase or immersion a mouldboard into the soil

(iv) To increase disc angle. This is where by increase in disc angle provide good condition for mouldboard to inter into the soil as it is required.

7 (b) Drip irrigation it is true that is said to minimize certain crop diseases outbreak and weeds growth than sprinkler irrigation system. Because
Drip irig irrigation is the kind of irrigation which involve drop of water on the site where plant or crop roots are found drop by drop hence no kind of disease can occur like fungus which occur on the leaves of plant also weeds are difficult to occur because they will not contain water to support their growth, But
Sprinkler irrigation is the kind of irrigation in which water are supplied on the surface of plant hence if is easy for disease to occur on the surface of plants and weeds can grow because are supplied with enough water.

Extract 7.2: *A sample of the candidates' correct responses in question 7*

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In Extract 7.2, the candidate attempted both parts of the question correctly, showing the possession of adequate knowledge of the subject matter.

2.1.8 Question 8: Agricultural Production Economics

The question had parts: (a) and (b). Candidates were required to: (a) summarize the seven roles of an entrepreneur as a farm manager and (b) elaborate three types of the labour used in the production process. The question tested candidates' understanding of the role of the farm manager and types of labour in the production process.

The question was attempted by 784 (100%) candidates, where by 123 (15.69%) scored from 0.0 to 3.0 marks, 283 (36.10%) scored from 3.5 to 5.5 marks and 378 (48.21%) scored from 6.0 to 10 marks. Figure 8 illustrates the candidates' scores in the question.
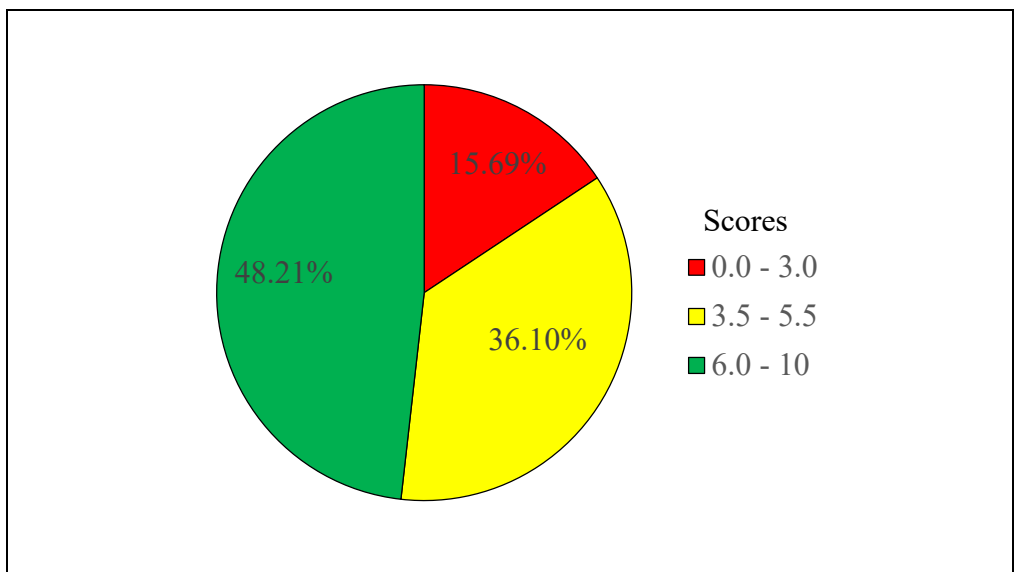

Figure 8: *Distribution of the Candidates' Scores in Question 8*

As shown in Figure 8, 84.31 per cent of the candidates scored from 3.5 to 10 marks, whereas 15.69 per cent scored from 0.0 to 3.0 marks, showing a good performance in the question.

Data analysis indicates that 48.21 per cent of the candidates provided the correct responses in almost all parts of the question. In part (a), they correctly summarize the role of the farm manager as an entrepreneur. The roles include; *make short term plans which involve making quick decisions*, *make long term plans which involve making decisions relating to future operations on a farm*, *gather and analyse information on farm enterprises*, *detect constrains and weakness in the farm and find appropriate solutions*, *keep farm records and accounts*, *bear the responsibility for plans and decisions made in the farm*, implement the farm management decisions and plans*, hire the other factors of production*, *organize and manage the land*, *labour and capital so as to produce good s and services*. Likewise, in part (b), they correctly elaborated the types of labour used in the production process. Examples of the correct responses include *family labour- is labour which is provided by the members of the family*, *casual labour – labour hired to supplement family labour and*, *permanent labour- labour hired on monthly bases*. The responses indicate that the candidates were conversant with the subject matter. Extract 8.1 portrays a sample of the correct responses in the question.

8 (a) Roles of an interprenuar as a manager of his own farm.
i/ Short term planning
Interprenuar has to make quick decision sometimes about his or her enterprises.
ii/ Long term planning
The interprenuar h interprenuar has to plan the long term planning concerning his or her enterprises so as to maximise its profit
iii/ Detecting weakness and strength of his or her enterprise
Tho interprenuar should be able to detect the weakness and strength of his or her enterprises, so as to make the decision depending on the strength and weakness of those enterprises
iv/ Bearing responsibilities and risk resulting from his or her decision
The interprenuar should be able to bear the responsibilities of risk which resulted from

8 (a) or her own decision.
v/ Information gathering.
Among the role of an interprenuar is to collect the information of his or her enterprises something which will enable him or her to know the changes that occur in his or her enterprises
vi/ Should be able to bear a guidlines question
An interprenuar is actual a manager, therefore should be able to bear a guidline question of what to produce, who How to produce, whon to produce, How much to produce, whom to produce and what price to charge.
vii/ Allocation of the scarce resource,
The interprenuar, should be able to allocate the scarce resources so as to avoid the scarcity of different good in the farm.

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8 (a) or her own decision.

y Information gathering.

Among the role of an interpreneur is to collect the information of his or her enterprises something which will enable him or her to know the changes that occur in his or her enterprises

vi Should be able to bear a guidlines question

An interpreneur is actual a manager, therefore should be able to bear a guidline question of what to produce, seba How to produce, when to produce, How much to produce, whom to produce and what price to charge.

vii Allocation of the scarce resource.

The interpreneur, should be able to allocate the scarce resources so as to avoid the scarcity of different good in the farm.

8 (b) Types of labour.

i, skilled labour.

These are labours which are trained for a particular job. For example teachers.

ii, un semi-skilled labour.

Rejer to the labour which are partially trained for a particular job

iii, Unskilled labour.

These are labours which are not trained for any particular job. But they can be used in simple work such as carrying the loads.

Extract 8.1: *A sample of the candidates' correct responses in question 8*

In Extract 8.1, the candidate gave the correct responses in all parts of the question. This indicates the possession of adequate knowledge of the subject matter.

Candidates who performed averagely in the question were 36.10 per cent. The analysis of their responses shows that they did well in part (b) on the types of labour used in the production process. In part (a), they did not provide all points required for the role of the farm manager. Rather, they summarized the three main role of the farm manager, namely planning, organizing and implementing. This suggests that they had partial understanding of the role of the farm manager.

On the other hand, 48.21 per cent of the candidates had a weak performance in the question. Most of them incorrectly attempted both parts of the question. In part (a), these failed to summarize the role of the farm manager. They provided the marketing functions such as *storage of agricultural goods, processing, merchandising, buying goods and transportation of goods* instead of the role of the farm manager. In this case, the candidates failed to understand the requirements of the question. Furthermore, some provided a variety of the incorrect responses such as *provide employment to the people, provide foreign currency, reduce poverty and encourage growth of city and towns* thus indicating possession of inadequate knowledge of the subject matter.

Similarly, in part (b), the candidates were unable to elaborate the types of labour used in the production process. The candidates provided a variety of the incorrect responses such as *forced labour, immigrant labour, low labour, moderate labour, high labour, fixed labour, variable labour and worked labour*. Others mentioned the factors of production such as *capital*, *land* and *entrepreneurship*. This signifies that the candidates had a low understanding of the types of labour used in the production process. Extract 8.2 is an example of the incorrect responses from one of the candidates.

8a) i) Entrepreneur enable to manage the time of starting work and finalize work
ii) Entrepreneur arrange well materials which distributed by labour in different area.
iii) Entrepeneur has intelligent to plan budget and analyze work effectively.
iv) It enable to pay salary to the labours
v) It take attendance when all labour are attending well in their jobs
vi) It enable to producing high production or high capital for their plapping process
vii) It enable to operate well their jobs for employ other labour inorder to improve productivity.

8.b i) Training improved skilled labour since labour must be given education inorder to improve skill

b) ii) Provision of motivation Due to done inorder to improve productivity forexample manager provide more of drinking alcohol for labour that rault presence of motivation
iii) Provision of piece of worker per work inorder to avoid laziness between labour because every one providing their piece of work efficiently.

Extract 8.2: *A sample of the candidates' incorrect responses in*
question 8

In Extract 8.2, the responses provided by the candidates indicate the possession of an inadequate knowledge of the subject matter. He/she responded incorrectly in all parts of the question.

2.1.9 Question 9: Introduction to Agricultural Prices

This question consisted of parts: (a) and (b). Candidates were required to: (a) account for eight situations in the market indicating the existence of the perfect competition and (b) state two conditions that favour the development of the black market. The question assessed candidates' knowledge of the types of agricultural markets.

The question was attempted by 784 (100%) candidates, of which 277 (35.33%) scored from 0.0 to 3.0 marks, 221 (28.19%) scored from 3.5 to 5.5 marks and 286 (36.48%) scored from 6.0 to 10 marks. Figure 9 shows the candidates' scores in the question.
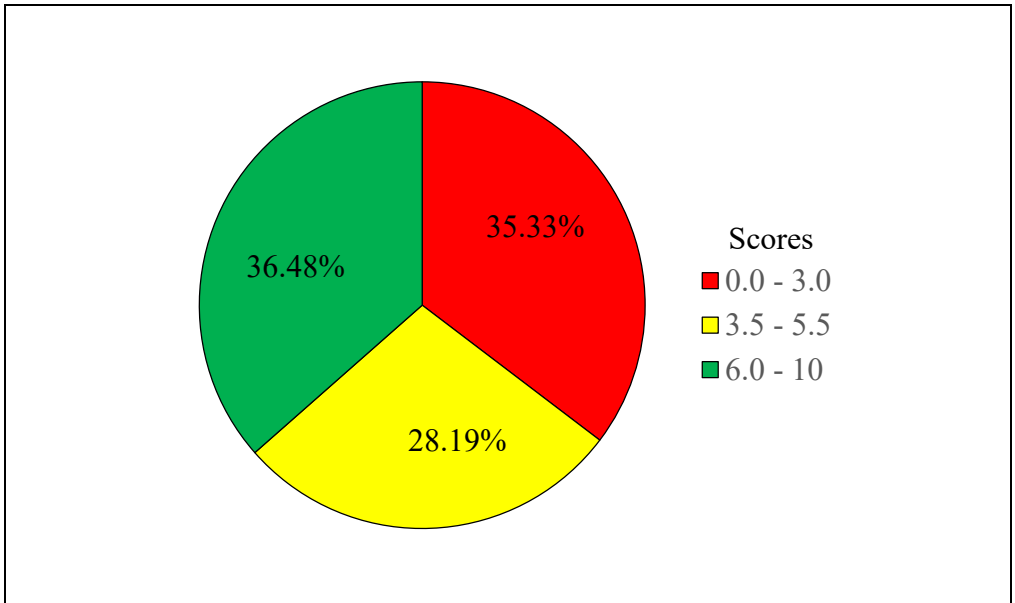

Figure 9: *Distribution of the Candidates' Scores in Question 9*

Figure 9 shows that 64.67, per cent of the candidates scored from 3.5 to 10 marks, whereas 35.33 per cent scored from 0.0 to 3.0 marks. Generally, the performance of the candidates in the question was good.

The analysis shows that 36.48 per cent of the candidates had a good performance in the question. In part (a), most of them managed to account for the situations in the market indicating the existence of the perfect competition.

They provided the correct responses such *as presence of many sellers and buyers of particular products*, *the sellers and buyers sell or buy a similar product which is not differentiated*, *all sellers and buyers have equal knowledge of market conditions as regards supply, demand, price, and other factors*, *no one seller or buyer can influence the market price of the product on the market*, *each seller makes only a very few profit due to strong competition among sellers*, *there is freedom of entry and exit into the business so that the buyer or sellers may enter or leave the market at will* and *the force of supply* and *demand determine the price of product sold under perfect competition*.

In part (b), the candidates correctly stated the conditions that favour the development of the black market. They provided responses such as, *scarcity of the product in question*, *price control by the government*, *rationing or hoarding of the product*. The responses indicate a good understanding of the types of agricultural markets. Extract 9.1 presents a sample of the correct responses in the question.

9a) (i) There are many sellers and buyers at the market.
- under pure and perfect competition the number of sellers and buyers in the market is very large.

(ii) Sellers sales the product of the same kind to the buyers. Each sellers at the market place or market sales the products of the same type to / as the other sellers sam. Also buyers buy products of one kind.

(iii) Each sellers and buyers have equal knowledge on the market conditions
- Under the perfect competition all sellers and buyers having the same and sufficient knowledge as regards on supply, demand and other factors.

(iv) Demand curve of each individuals sellers and buyers are perfectly elastic
- This means that the curve is downward sloping. So there is low price in the market.

9a) (v) Each seller at the market makes a very minimum profit for their products. This means that each sellers sales their products at very low cost due to the presence of strong competition

(vi) There is free entry and exit in the market,
- So, for this reason each buyers and sellers can enter or leave the market at will when they want.

(vii) The price of a given product is determined by the force of supply and demand
- If the demand is low and the supply is high the price totally will be low and if the demand is high and supply is very low the price will be high.

Extract 9.1: *A sample of the candidates' correct responses in* question 9

In Extract 9.1, the candidate provided the correct responses in both parts of the question. This indicates the mastery of the subject matter.

Moreover, the analysis indicates that 28.19 percent of the candidates have performed averagely. In part (a), most of them failed to exhaust all the points demanded by the question. Likewise, in part (b) they provided partially correct responses on the conditions that favour the development of the black market. Their responses show partial understanding of agricultural markets.

However, 36.48 per cent of the candidates did poorly in the question. The majority were unable to account for situations in the market, which indicate the existence of the perfect competition in part (a). They provided the types of marketing middlemen contrary to the demand of the question. Examples of such responses are *wholesalers*, *retailers*, *jobbers*, *brokers*, *commission agent*, *authorities* and *cooperatives*. Some candidates provided the classification of markets for agricultural products such as *oligopoly, monopsony, monopoly and black market*. These

responses signify the lack of understanding of the question requirements. Others provided a variety of the incorrect responses such as *high initial cost of product production, type of soil where the product is produced, kind of the fertilizer used, the climatic condition of the area, less or no toxic on the products and the quantity of the product produced* showing the lack of knowledge on agricultural markets.

In part (b), the candidates failed to state the conditions that favour the development of the black market. Some provided the methods of reducing risks and uncertainties in the agricultural production such as *insurance, use of subsidies, use of buffer stock funds, diversification,* and *use of international commodity agreement.* The candidates' responses show a low understanding of the subject matter. In addition, they provided different incorrect responses such as *poor government regulations, poor labelling and grading of products, free price of commodities.* The responses exemplify a low understanding of the black market. Extract 9.2 presents a sample of the incorrect responses in the question.

09(a)	– situations on the market which indicate the existence of perfect competition.	
	(i). Price Fluctuation of commodities.	
	– Fall and rise of price of commodities indicate that there is highly competition in the market.	
	(ii). Influx of commodities in the market. The presence of many goods in the market indicate that there is highly competition.	
	(iii). Absence of certain commodities in the market.	
	– this may cause competition due to its scarcity in the market.	

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09(a)	(iv). Highly demand of certain goods.	
	- Highly demand of commodities in the market increase it's price and competition for selling it.	
	(v). presence of only one type of commodity in the market.	
	- this cause competition for market.	
09(b)	condition that favour the development of black market.	
	(i). over supply of commodities.	
	- this cause decrease in price of commodities and may cause loss to farmers.	
	(ii). Low demand of commodities.	
	- This cause influx of commodities in the market since it's demand is too low at that time.	

Extract 9.2: *A sample of the candidates' incorrect responses in question 9*

In Extract 9.2, the candidate provided the incorrect responses in all parts of the question. This demonstrates that he/she lacked knowledge of the subject matter.

2.1.10 Question 10: Farm Planning and Fundamentals of International Trade

The question comprised parts: (a) and (b). Candidates were required to: (a) explain the four negative effects of the government's involvement in controlling the price of agricultural commodities and (b) explain the four measures to be taken in case a country trading with another country faces a problem of a prolonged deficit in the balance of payments. The question tested candidates' knowledge of concepts related to price stabilization and international trade.

The question was attempted by 784 (100%) candidates, of which 289 (36.86%) scored from 0.0 to 3.0 marks, 246 (31.38%) scored from 3.5 to 5.5 marks and 249 (31.76%) scored from 6.0 to 10 marks. Figure 10 depicts the candidates' scores in the question.
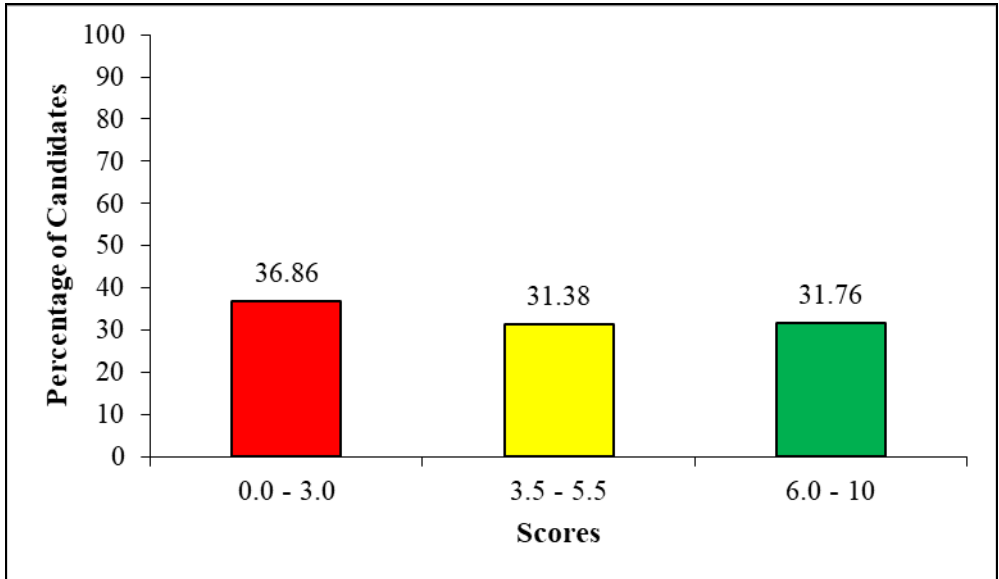
Figure 10: *Distribution of the Candidates' Scores in Question 10*

In Figure 10, the analysis shows that 63.14 per cent of the candidates scored from 3.5 to 10 marks, whereas 36.86 scored from 0.0 to 3.0 marks. The general performance in the question was good.

Candidates who performed well in the question were 31.76. Most of them managed to explain the negative effects of the government's involvement in controlling the price of agricultural commodities in part (a). Examples of responses given were; *may be bad to consumers especially if price of goods tend to rise while wages remain at the same level*, *if the fixed price for a certain commodity is lower than the equilibrium price of the commodity, price control may encourage development of black market*, *where input prices are controlled and set at a high level they may lead to high production cost*, *controlled prices may lead to wastage and dumping of agricultural commodities*.

In part (b), they were able to explain measures to be taken in case one country trading with another country faces a problem of a prolonged deficit in the balance of payments. Examples of the correct responses provided were *devaluation of local currency*, *introduction of floating*

exchange rate, *review of country's fiscal policies such as taxation and subsidies*, and *total ban on some imports and introduction of strict foreign exchange regulations*. This is a justification that the candidates had sufficient knowledge of the price control and the balance of payments. Extract 10.1 is an example of responses from candidates who did well in the question.

10(a)	Negative effects of government involvement in Controlling the price of agricultural commodies.	
	• It may be bad to Consumers when price of food Setting at high level but the wages remain Constant. The Consumer get the pressure of increase wages in order to afford the food	
	• Result to increase cost of production when the inputs such as fertilizers setting at higher price. when farmer buy the inputs at high price actual the the return will be low hence reduce the productivity	
	• Result to the black market when government setting the fixed price at low level than equilibrium price result to the scarcity of products due to the low price and also price rise in price than the equilibrium price.	

	• Result to the damping of products because when products such as food selling at high price the consumer failed to afford those product which result to the ~~exerce~~ ~~exces~~ damping of excessive product also farmer getting loss when consumer failed to buying goods.	
(b)	Four measures to be taken in case one country trading with another country faces a problem of prolonged deficit • Devaluation of local currency. The country should reduce the value of currency in term of gold and other country inorder to maintain its economic during defit • Review of country fiscal policy. The country should establish or review the paying of tax as source of government revenue to increase income	
10(b)	• Total ban of some imports and introduction of law and regulation on importing of goods but also country should exports their goods in order to obtain money to reduce the defit of the country • Establishment of floating exchange rate. The government should establish the system of exchange rate inorder to control long defit in the country	-

Extract 10.1: *A sample of the candidates' correct responses in* question 10

In Extract 10.1, the candidate demonstrated a good understanding of the concept of price stabilization and balance of payments.

Moreover, candidates who had an average performance constituted 31.38 per cent. These candidates managed to explain the negative effects of the price control by the government in part (a). In part (b), most of them provided measures for controlling normal deficit in the balance of payments. Some of their answers were, *borrowing from abroad* and

financial institutions, *withdrawal from foreign reserves*, *selling investment abroad* and *asking debtors to pay back loan instead of the measures for prolonged deficit in the balance of payments*. The candidates appear to have misunderstood the question.

Conversely, 31.76 per cent of the candidates had a weak performance. In part (a), most of them failed to explain the negative effects of the government's involvement in controlling the price of agricultural commodities. The candidates provided different incorrect responses such as *it reduces the diversification in production, it reduces amount of subsidies, increase price fluctuation, it causes decline of international trade, occurrence of risks and uncertainties, it consumes time, and it lowers the price of agricultural commodities*. These responses prove the fact that, they lacked knowledge of the effects of the price stabilization.

Likewise, in part (b) they provided the incorrect responses for measures to be taken in case one country trading with other country faces problem of prolonged deficit in the balance of payments. Examples of such incorrect responses include *devaluation of agricultural prices, control of price fluctuation, increase of foreign loans, increasing production and controlling price by the government*. Such responses indicate the lack of knowledge of balance of payments. Extract 10.2 portrays a sample of the incorrect responses from a candidate who had a weak performance in the question.

10 b) Four measures to be taken in case one country trading with another country faces a problem of prolonged defizit in the balance of payments.

i) The use of subsidies; It means that the country must pay direct payments in order to control the problem faced the country

ii) The use of international agreements; It means that the country should cooperate in the production of goods and services so as to produce good quality of products

iii) The use of buffer stock funds; It means that the one country and another should able to exchange the value of currency in production when it is transported to the another country

iv) Diversification of production; It means that during

g production the farmer is able to produce more than one types g product in the field and then transported to the other country	
10ⓐ Negative effect g the government involved in controlling the price g agricultural commodities	
i/ flunduation g the currency	
ii/ Poor infrastructure	
iii/ Poor government policy.	
iv) Poor quality g products.	

Extract 10.2: *A sample of the candidates' incorrect responses in question*

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In Extract 10.2, the candidate responded incorrectly in both parts. For example, in part (b) he/she provided methods of price control instead of measures for correcting prolonged deficit in the balance of payments.

2.2 THE ANALYSIS OF THE CANDIDATES' PERFORMANCE IN 134/2 AGRICULTURE 2

2.2.1 Question 1: Plant Diseases

The question required candidates to analyse five ways of controlling the plant diseases. The question tested candidates' understanding of the plant diseases control.

The question was attempted by 784 (100%) candidates, whereas 332 (42.35%) scored from 0.0 to 3.0 marks, 195 (24.87%) scored from 3.5 to 5.5 marks and 257 (32.78%) scored from 6.0 to 10 marks. Figure 11 depicts the candidates' scores in the question.
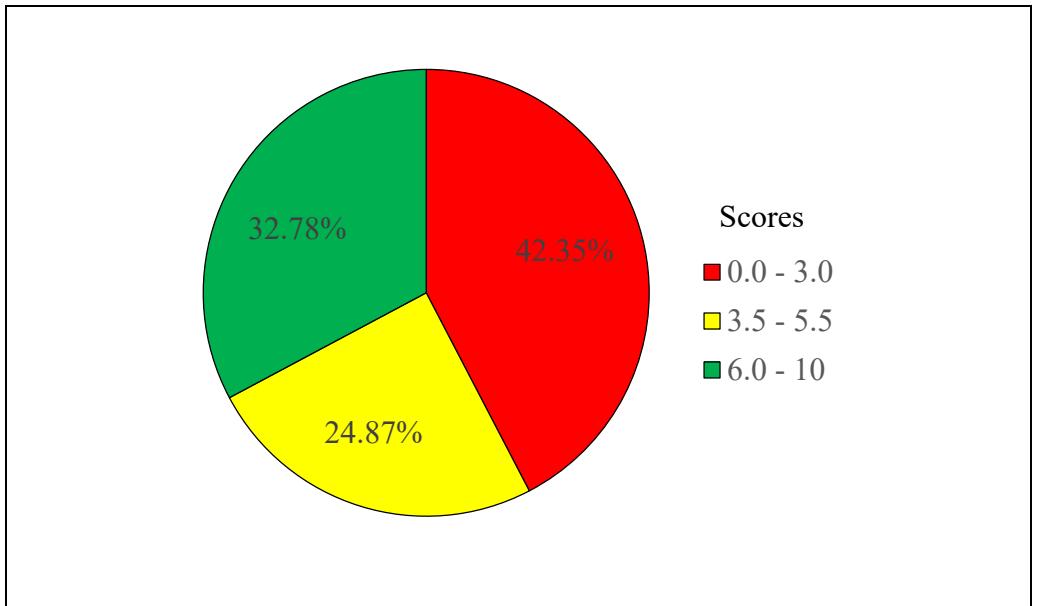
Figure 11: *Distribution of the Candidates' Scores in Question 1*

As shown in Figure 11, the analysis indicates that 57.65 per cent of the candidates scored from 3.5 to 10 marks and 42.35 per cent scored from 0.0 to 3.0 marks. The performance in the question was average.

Candidates who had a good performance in the question were 32.78 per cent. The majority of the candidates managed to analyse the ways of controlling the diseases. They provided the correct responses such as *use of disease resistance varieties*, *maintain field hygiene*, *use crop rotation*, *soil balancing*, *keeping plant healthy*, *use of fungicides*, *early planting*, *selecting time of planting* and *choosing the right plant for the site*. These responses demonstrate the possession of adequate knowledge of the ways of controlling plant diseases. Extract 11.1 presents a sample of the correct responses in the question.

1. Plant diseases: Are the abnormality caused by both pathogens and non-pathogens to the plant but many of them can caused by pathogen. The following are the ways of controlling diseases:

(i) Crop rotation; This is the system of agriculture which sometimes used to control the plant disease for those annual crops it is useable because pathogens can disappeared.

(ii) Burning of the Crops; During the preparation of the farm. the remains of the crops can be burned so as to remove some species in the field that wait for crop to be planted.

(iii) Early planting: For some of the plant disease like fungal disease, early planting can help to prevent or controlling the plant to be diseased or to be attacked by pathogens.

(iv) Use of the clean planting materials; So as to prevent the plant disease like viral disease which can mainly transmitted through this way and hence we can control it eg. In sugarcane viral disease.

(v) Mulching: This method is especially for the non pathogenic disease for example Blossom. endrot of tomato which can be caused by the high or excessive temprature, hence mulching be done to reduce the evaporation of the water applied to tomato plants in the soil.

Extract 11.1: *A sample of the candidates' correct responses in question 1*

In Extract 11.1, the candidate showed a good understanding of the preventive measures of the plant diseases.

Moreover, candidates who attained an average performance were 24.87 per cent. These mentioned points without explaining them in detail. Others failed to exhaust all points required by the question. The avarage performance in the question is attributed to an inadequate knowledge and skills in the ways of controlling the plant diseases.

Conversily, candidates who had a weak performance were 42.35 per cent. Most of these failed to analyse the ways of controlling the plant diseases. They r provided general methods of controlling plant disease such as *chemical*, *mechanical*, *cultural* and *biological control methods*. Some of them focused their responses on the livestock diseases instead of the plant diseases such as *introducing vaccine to the sick animal so that it can regain, slaughtering the affected animals so that the disease cannot spread, providing drugs to the sick animals so as to reduce the sickness, isolating sick animals from the healthy animals to reduce contaminating other animals, use of prophylactic measures to control the disease*. The candidates' responses indicate the lack of knowledge of preventing the plant diseases. Extract 11.2 presents the incorrect responses in the question.

(iv) Protection. This is another way of controlling the plant disease where it involves crop rotation mulching or all cultural practices which can prevent the emergy of new plant disease to a such area of land. (v) Immunization/Resistance. This is done through selection of resistant plant species which can be not be easily affected by plant disease and hence controll of orstopping disease to occur.	

Extract 11.2: *A sample of the candidates' incorrect responses in question*

1

In Extract 11.2, the candidate incorrectly provided the principles of controlling plant diseases instead of the ways.

2.2.2 Question 2: Plant Diseases

Candidates were required to account for blossom end rot diseases in tomato using the following guidelines: (a) cause of the disease (b) major symptoms of the diseases and (c) control measures of the diseases. The question tested candidates' knowledge and skills in plant diseases.

The question was attempted by 784 (100%) candidates, of which 319 (40.69%) scored from 0.0 to 3.0 marks, 301 (38.39%) scored from 3.5 to 5.5 marks and 164 (20.92%) scored from 6.0 to 10 marks. Figure 12 summarizes the candidates' scores in the question.
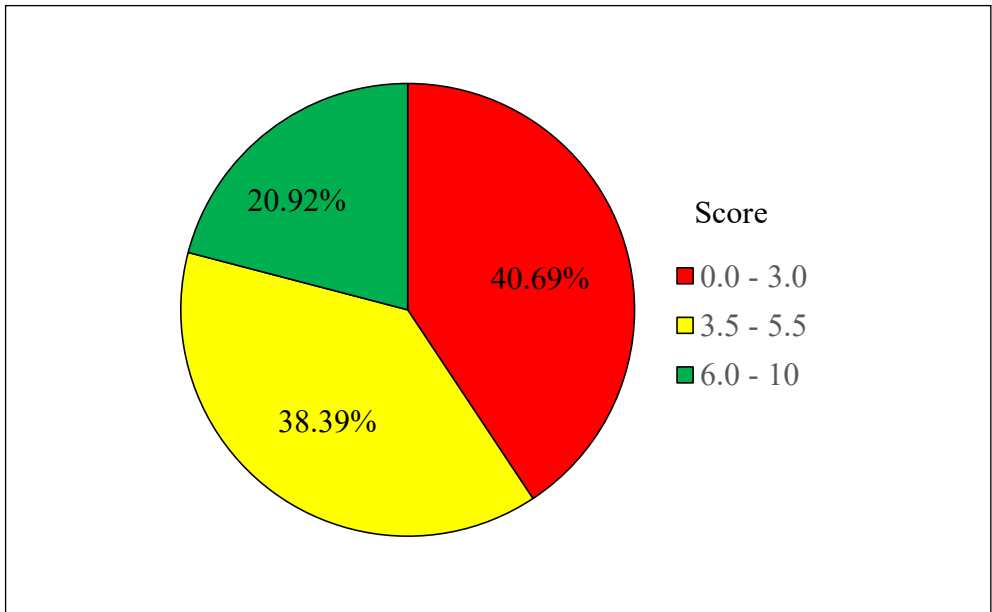
Figure 12: *Distribution of the Candidates' Scores in Question 2*

Figure 12 shows that 59.31 per cent of the candidates scored from 3.5 to 10 marks, whereas 40.69 per cent scored from 0.0 to 3.0 marks, signifying an average performance.

Data analysis reveals that 38.39 per cent of the candidates performed well in the question. Most of these provided the correct cause, symptoms and the control measures of the diseases. In part (a), they were able to identify the lack of calcium in plant as the cause of the diseases. In part (b), they correctly provided the major symptoms of the plant diseases such as *small depressed*, *water-soaked area on the blossom end of the fruit* and *dark bruise spots which when enlarges become sunken and turn black or dark leathery brown in colour*. In part (c), they provided the correct control measures such as; *choose cultivars that are tolerant of calcium deficiencies and less likely to show blossom in colour*, *avaoid watering your plants too much or too little*, *use mulches to retain soil moisture during dry periods*, *have your soil tested periodically*, *check the soil ph on a regular basis particularly if you use lime as a calcium source*, *fertilize plants to add calcium in the soil and avoid cultivating near the roots of plants*. The correct responses given by the candidates signify a

good understanding of the diseases. Extract 12.1 presents a sample of the correct responses from one of the candidates.

2	(a) Causes of the disease (Blossom end rot in tomatoes)
	i) Defficiency of calcium (Ca^{2+}).
	—Calcium is a mineral element which play a vital role in formation of the fruit tissue. Therefore its defficiency cause poor formation of fruit tissue.
	    ii) Irregular watering of the tomato plants.
	— Irregular watering cause un-efficient absorption of the calcium ion (Ca^{2+}) by the plant from the soil, hence poor formation of the fruit tissue.
	    iii) Excessive nitrogen in the soil.
	— If there is excess nitrogen in the soil, large amount of nitrogen will be absorbed by the tomato plant; but nitrogen interfere with absorption of calcium ion by the plant.
	    iv) Inadequate amount of moisture in the soil
	— If there is limited moisture content in the soil, calcium will not be absorbed by the plants because is in solid state, hence unavailable in plants.	

2	(b) Two major symptoms of the disease. i) Rotting of the tomato fruit at the blossom end which appear as water. ii) Development of hard skin on the surface of the tomato fruit at the bottom end.	

2 (a) Causes g the disease (Blossom end rot in tomatoes)
   i) Defficiency g calcium (Ca^{2+}).
- Calcium is a mineral element which play a vital role in formation g the fruit tissue. Therefore its defficiency cause poor formation g fruit tissue.
   ii) Irregular watering g the tomato plants.
- Irregular watering cause un-efficient absorption g the calcium ion (Ca^{2+}) by the plant from the soil, hence poor formation g the fruit tissue.
   iii) Excessive nitrogen in the soil.
- If there is excess nitrogen in the soil, large amount g nitrogen will be absorbed by the tomato plant; but nitrogen interfere with absorption g calcium ion by the plant.
   iv) Inadequate amount g moisture in the soil
- If there is limited moisture content in the soil, calcium will not be absorbed by the plants because is in solid state, hence unavailable in plants.

2 (b) Two major symptoms g the disease.
   i) Rotting g the tomato fruit at the blossom end which appear as water.
   ii) Development g hard skin on the surface g the tomato fruit at the bottom end.

2 (c) Control measures g the disease.
   i) To ensure a regular watering g the tomato plants for efficient absorption g calcium from the soil.
   ii) To add calcium to the soil through addition g fertilizer containing calcium example Calcium Ammonia Nitrate

2	(c)

(iii) To reduce the application q nitrogeneous fertilizer to the soil.

(iv) To reduce the addition q organic matter to the soil because organic matter contain large amount q nitrogen.

(v) To maintain the soil pH at a neutral level because high or low pH enterfere with absorption q calcium by the tomato plants.

(vi) To conserve the soil moisture through mulching, example use q polythene sheets.

(vii) To plant a resistance varieties.

Extract 12.1: *A sample of the candidates' correct responses in question 2*

In Extract 12.1, the candidate provided the correct responses in all parts of the question, signifying a good understanding of the disease.

Further analysis indicates that 38.39 per cent of the candidates had an average performance in the question. Most of them managed to identify the cause of the disease in part (a) and its major symptoms in part (b). In part (c), they provided partially correct responses on the control measures of the diseases. The candidates seemed to be unfamiliar with the control measure of the diseases.

However, 40.69 per cent of the candidates had a weak performance. The majority of these failed to account for the cause, symptoms and control measures of the disease. In part (a), they incorrectly named biotic agents such as *fungi*, *virus* and *bacteria* as the cause of the disease. In part (b), the incorrect responses for the symptoms of the disease given were; *dropping of leaves, yellowing of leaves, total death in tomato fruit, poor fruits developments, sudden fall of the tomato fruits.* In part (c), they incorrectly provided control measures of other diseases rather than the targeted one. Examples of such incorrect responses were *use of fungicide, field hygiene, use proper spacing, ragueing, use crop rotation, use resistant varieties and use insecticides.* Such responses indicate the lack

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of knowledge of the disease. Example of the incorrect responses in the question is shown in Extract 12.2.

Extract 12.2: *A sample of the candidates' incorrect responses in question 2*

In Extract 12.2, the candidate incorrectly responded in both parts of the question. This indicates lack of knowledge of the subject matter.

2.2.3 Question 3: Introduction to Weed Science

The question comprised parts, (a) and (b). Candidates were required to: (a) suggest four ways that can be employed by a farmer to control weeds that grow aggressively and multiply quickly and (b) examine six disadvantages of the chemical weed control. The question assessed candidates' knowledge and skills in the weed control.

The question was attempted by 784 (100%) candidates, whereas 24 (3.06%) scored from 0.0 to 3.0 marks, 229 (29.21%) scored from 3.5 to

5.5 marks and 531 (67.73%) scored from 6.0 to 10 marks. Figure 13 denotes the candidates' scores in the question.
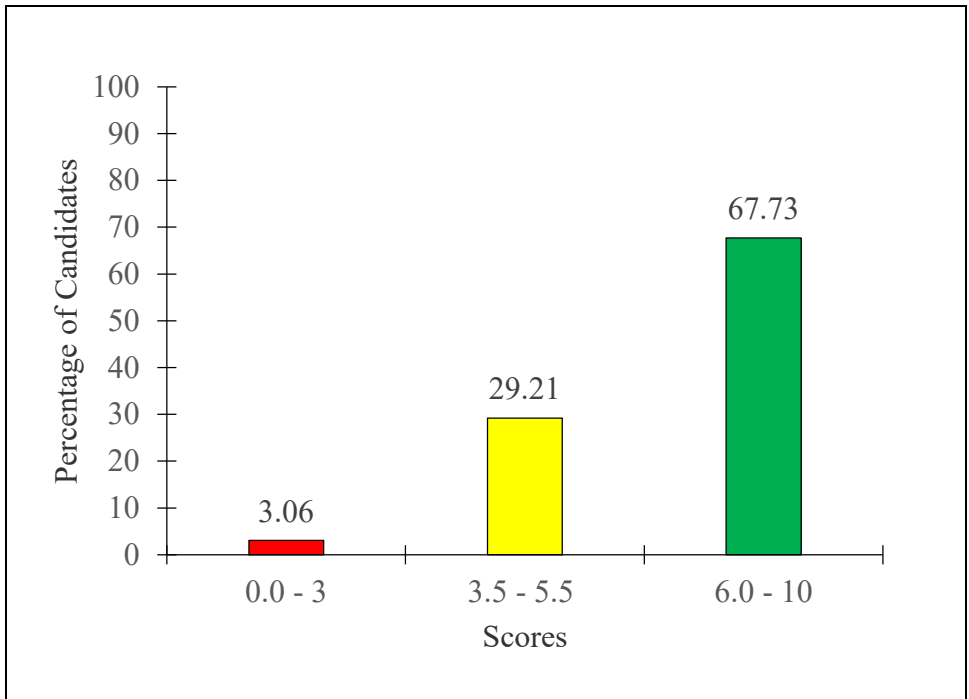
Figure 13: *Distribution of the Candidates' Scores in Question 3*

Figure 13, dipicts that 96.94 per cent of the candidates scored from 3.5 to 10 marks and 3.06 per cent scored from 0.0 to 3.0 marks. This indicates general good performance.

Candidates who performed well in the question were 67.73 per cent. In part (a), most of them manged to suggest the ways that can be employed by the farmer to control weeds which grow aggressively and multiply quickly. Examples of the correct responses given by the candidates include *use of appropriate herbicides such as 2,4-D*, *application of heavy manure*, *use of trap crops*, *uproot the weeds and destroy them*, *cultivating to turn the soil*, and *mulching to deprive weeds of light*.

Likewise, in part (b), they were able to examine thedisadvantages of the chemical weed control. The responses given were *cause health risk to human beings especially when breathed or ingested*, *they can destroy even the vegatations which were not targeted*, *regular application of weeds may develop weed resistant to herbicides*, *chemicals may drift and cause harm to other wildlife and plants*, *chemicals can leak away into nearby water ways*, *it requires skills in mixing and application of herbicides*, *the sprayers and herbicides are expensive*. The responses in both parts of the question signify a good understanding of the weed control methods. Extract 13.1 portrays one of the correct responses in the question.

3(a) The following are the ways of controlling

    i) uprooting: This is the natural controll method it
helps to control weeds eg striga spp

    ii) Flooding: This also is the cultural control method
wer the water is largely applied forexample the Black-
jack. Bidens pilosa. is controlled by this method.

    iii) Use of chemical / Herbicide: This are chemicals
their involves the killing of the weed forexample 2,4-D
herbicide that work on broadleaved weed.

    iv) Tillaging / mechanical control: This helps to expose
the weed, with its roots on the soil surface and they become
dry.

(b) Chemical control method: This is the use of chemical
to prevent the weeds attacks.
   This include herbicides.
The following are the disadvantages.
  i) The use of chemicals requires more skills when
    applied.

  ii) The use of chemicals lead to the pollution or
    cause harm to the water bodies when the farm
    is near to that area.
  iii) The use of chemicals have long residual.
effects in the soil forexample Atrazine

  iv) chemicals are poisonous to man especially
    when inhaled during application.

3 2 b	v) chemical control method is more expensive, because need to buy herbicides and to employ the sprayer	
	vi) chemical control method lead to the killing of the microorganisms within the soil.	
	vii) chemical control method, is highly affected by environmental factors such as wind, temperature, humidity and rainfall. eg During the rainfall -the solution of the applied herbicides are washed away.	

Extract 13.1: *A sample of the candidates' correct responses in question 3*

In Extract 13.1, the candidate provided the correct responses in all parts of the question, implying a good understanding of the subject matter.

Moreover, 29.21 per cent of the candidates had an average performance. The majority of them correctly examined the disadvantages of chemical weed control in part (b). In part (a), they failed to understand the requirement of the question. That is, they provided general methods of weed control such as the chemical, biological and cultural methods instead of the specific ways for controlling noxious weeds that grow agressively and multiply quickly.

On the contrary, 3.06 per cent of the candidates did poorly in the question. These failed to supply the correct responses in almost all parts of the question. In part (a), the candidates did not understand that weeds that grow aggressively and multiply quickly are noxious weeds. Their failure to understand the question made them provide the incorrect responses such as *weeds can be controlled by adding fertilizer, it can be controlled through burning, it can be controlled through planting resistant varieties, can be controlled through avoidance* and *can be controlled through quarantine*. The candates' responses signify a failure to understand the requirement of the question.

Similarly, in part (b), the candidates failed to examine the disadvantages of the chemical weed control. They provided a variety of the incorrect responses such as *it stimulate some weeds to grow, when herbicides are applied in areas with temperature it lead to evaporation, it reduce the plant ability in resistance against pest and disease and can be affected by climatic change.* This indicates the lack of knowledge of the subject matter. Extract 13.2 shows an example of the incorrect responses in the question.

Extract 13.2: *A sample of the candidates' incorrect responses on question 3.*

In Extract 13.2, the candidate responded incorrectly in all parts of the question. For example, in part (b) he/she provided responses that focus on the advantages instead of the disadvantages as the question demanded.

2.2.4 Question 4: Crop Pests

The question required candidates to suggest the damages that might be caused by each of the following pests to the crop they attack based on their mode of feeding (a) maize stalk borer (b) cotton stainer and (c) leaf hopper. The question examined the candidates' knowledge of the damages caused by pests.

The question was attempted by 784 (100%) candidates, whereas 256 (32.65%) scored from 0.0 to 3.0 marks, 303 (38.65%) scored from 3.5 to 5.5 marks and 225 (28.70%) scored from 6.0 to 9.5 marks. Figure 14 illustrates the candidates' scores in the question.
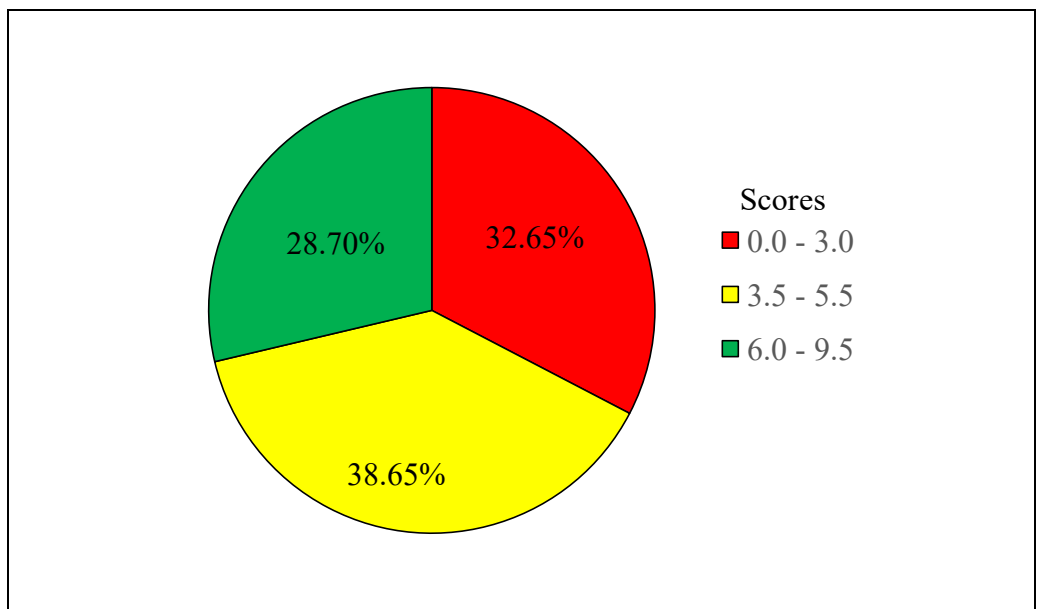
Figure 14: *Distribution of the Candidates' Scores in Question 4*

As shown in Figure 14, 67.35 per cent of the candidates scored from 3.5 to 9.5 marks, whereas 32.65 per cent fom 0.0 to 3.0 marks. The general performance in the question was good.

Data analysis shows that 28.70 per cent of the candidates performed well in the question. Most of them managed to suggest the damages caused by the named pests. In part (a), the damages caused by the maize stalk borer were; *damage water and nutrient transporting tissues*, *characteristics 'window panes* and *cause holes where tissues has been eaten away*. In part (b), the damages caused by cotton stainers were; *yellowing of plants*, *wilting of plants*, *stunted growth* and *disease transmission*. In part (c), the damagesdamages caused by the leaf hopper were; *holes in the leaves and stems*, *semicircular holes along the edges the leaves*, *discolouration on the surface or edges of the foliage and flower petals*, and *plant wilting*. The responses provided show a good understanding of the damages caused by the pests based on their mode of feeding. Extract 14.1 is a sample of the correct responses in the question.

4(a) Maize stalk borer

Damages:

1) Leaf Boring into stem.
- they tend to bore the stem of the
crop of the plant so as to suck the
juice present in the stem.

11) Destruction of Vascular tissues, this may cause
the blockage of transportation systems of
The crop plant. So that can fail to transport
materials

111) Wilting
- The plant tend to dry because there is not
transportation of food water and minerals in
other plant plant.

1v) Blockage of the plant (distraction of plant)
Because the plant can loose stability to
resist against wind because the middle part
of the stem is bored.

(5) Cotton stainer.

   Damage caused.

i) Fruit rosseting.
- Cotton stainer tend to feed on the fruits of the cotton so as to obtain food that may cause the fruit to spoit.

ii) Boring the fruit part.
They tend to bore the fruit and left It which may cause how quality of cotton

iv) Transmission of some diseases from other infected plant which may hinder the growth of the cotton.

v)

(c) Leaf hopper
Damage they cause.
i) Destruction of vascular tissue,
ii) Destruction of respiratory tissues, this is because the system of stomata can be destroyed so as gaseous exchange can not take place.

ii) Destruction of photosynthetic tissues, the leaf miner tend to feed on leaves of the crop plant so as chlorophyl can be destroyed so as plant can not produce its own food.

iii) Mining into the leaf, the because they are feeding on the leaves of the plant so that they can cause damage in the leaves'

Extract 14.1: *A sample of the candidates' correct responses in question 4*

In Extract 14.1, the candidate correctly responded in all parts of the question, showing the mastery of the subject matter.

Furthermore, 38.65 per cent of the candidates performed averagely. Most of these provided the correct responses in part (a) and partially correct responses in part (b) and (c). This is attributed to their inadequate knowledge of the damages caused by pests based on their mode of feeding.

On the other hand, 32.65 per cent of the candidates had a weak performance in the question. Most of them failed to suggest the damages caused by pests based on their mode of feeding. The candidates did not understand the modes of feeding of the named pests; hence their responses were not related to the demand of the question. For example, the incorrect damages caused by the maize stalk borer provided were; *maize become powdered, they have sucking mouth part*, *they cause direct damage* and *they cause seed domance*. The incorrect damages caused by cotton stainer provided were; *affect sorghum lead, affect the whole body of cotton, they eat cotton into small parts* and *they cause infertility*. The incorrect damages caused by the leaf hoper provided were; *cause tomato end rot*, *boring the plant parts*, *cause dwarfism to crops, it cause molttling and it cause late maturity to crops*. Extract 14.2 is an example of the candidates' incorrect responses in the question.

Extract 14.2: *A sample of the candidates' incorrect responses in question 4*

In Extract 14.2, the candidate provided the incorrect responses in all parts of the question because of not knowing the modes of feeding of pests.

2.2.5 Question 5: Plant Breeding

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The question had parts: (a) and (b). Candidates were required to: (a) briefly explain the breeding method to be employed to perform the resistance breeding and (b) give seven steps to be involved in performing the selected method. The question assessed candidates' understanding of the breeding methods.

The question was attempted by 784 (100%) candidates, whereas 344 (43.88%) scored from 0.0 to 3.0 marks, 178 (22.70%) scored from 3.5 to 5.5 marks and 262 (33.42%) scored from 6.0 to 10 marks. Figure 15 indicates the candidates' scores in the question.
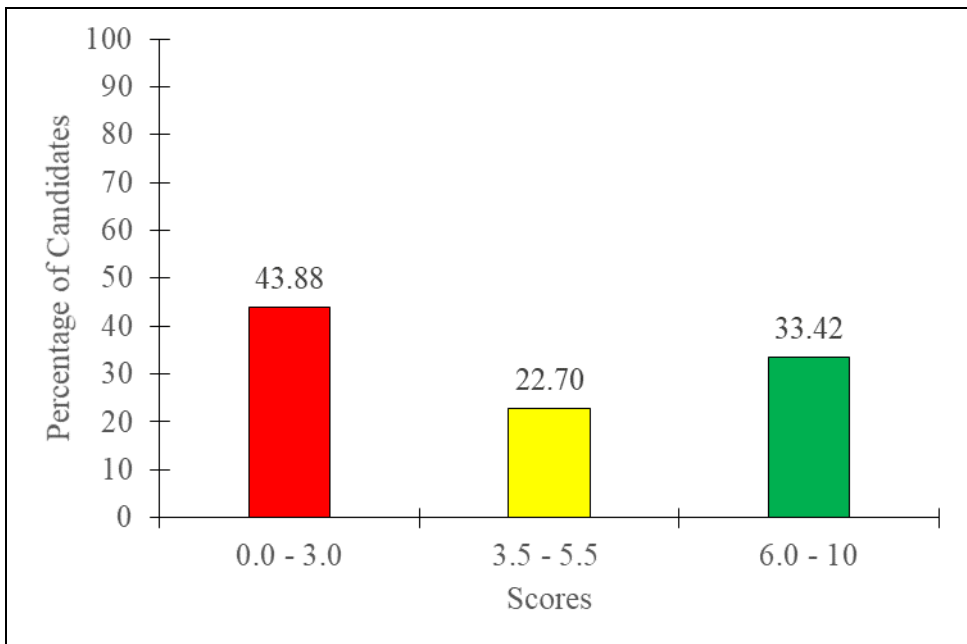
Figure 15: *Distribution of the Candidates' Scores in Question 5*

Figure 15 indicates that 56.12 per cent of the candidates scored from 3.5 to 10 marks whereas 43.88 per cent scored from 0.0 to 3.0 marks. The general performance in the question was average.

Candidates who had a good performance constituted 33.42 per cent. Most of them correctly attempted the question. In part (a), they managed to explain the breeding method which can be employed to develop the resistant varieties. Examples of such breeding methods were;

hybridization, *mutation breeding*, *introduction breeding*, *selection breeding*, *mass selection*, *pure line selection*, *pedigree selection*, *recurrent selection* and *genetic engineering*. Consequently, in part (b), they gave the steps involved in the selected breeding method. This indicates that the candidates were knowledgeable and skilled in the breeding methods of the resistance breeding. Extract 15.1 is an example of the correct responses in the question from one of the candidates.

B @ Plant introduction
This is the establishment of a new variety of crop into a new area of which it was not previously grownd this establishment (introduction) enable to make acclimatization, because the plant it self would first adapt to local environment hence make it durable and growing availability hence start to produce.

Procedures /steps to follow

B (i) Germplasm collection
This involves the use main parent material which would be used in production so as to improve before them for production it can be seeds / vegetative plants

(ii) Quarantine
this is the method imposed by the government so as to increase ranking of disease to crop by measuring and controlling a certain disease that are present in our crops this is done so as to prevent spread of diseases

(iv) Certification
This analyses the procedures proge is suitable for planting /not suitable for planting a seeds or even if its vegetative plt

(v) Cartaulcoging
this is the method imposed to understand the status of crops, growed and conducting a field trial so as to cause the preliminary test and get the production

(vi) Evaluation this is the method required to farmer to practice where he/she looks on the preliminary test and look for the crop which has grown well and being adistribution suitable management

store at farmer produce more and more seeds so as to be & planted in different parts

(vii) Distribution
This involves the supply of goods and services to the people at different place

Extract 15.1: *A sample of the candidates' correct responses in question 5*

In Extract 15.1, the candidate demonstrated the mastery of the subject matter.

Candidates who attained an average performance were 22.70 per cent. Most of them correctly explained the breeding method for resistance in part (a) but provided partially correct responses of the steps involved in the method. This signifies a partial understanding of the breeding methods for resistance.

However, the analysis indicates that 43.88 per cent of the candidates had a weak performance. Most of them failed to explain the breeding method for resistance and the steps involved in part (a) and (b), respectively. They mentioned the breeding techniques, which were not for resistance breeding such as *line breeding, apomixes, progeny testing, and natural breeding*. This implies that the candidates had a low understanding of the breeding methods for resistance. Example of the incorrect responses in the question is illustrated in Extract 15.2.

5b)Nii) Harvest the crops obtain which is						
a pure breed which is resistance to disease						
and harsh environment.						

Extract 15.2: *A sample of the candidates' incorrect responses in* question 5

In Extract 15.2, the candidate explained the breeding method, which is not for developing resistance, signifying the lack of knowledge and skills in the breeding methods for resistance.

2.2.6 Question 6: Introduction to Animal Nutrition

The question comprised parts: (a) and (b). Candidates were required to: (a) give a reason why the chicken do not need teeth during the digestion and (b) describe the digestive system of the chicken. The question examined candidates' knowledge of the chicken digestive system.

The question was attempted by 784 (100%) candidates, whereas 75 (9.57%) scored from 0.0 to 3.0 marks, 251 (32.02%) scored from 3.5 to 5.5 marks and 458 (58.41%) scored from 6.0 to 10 marks. Figure 16 shows the candidates' scores in the question.
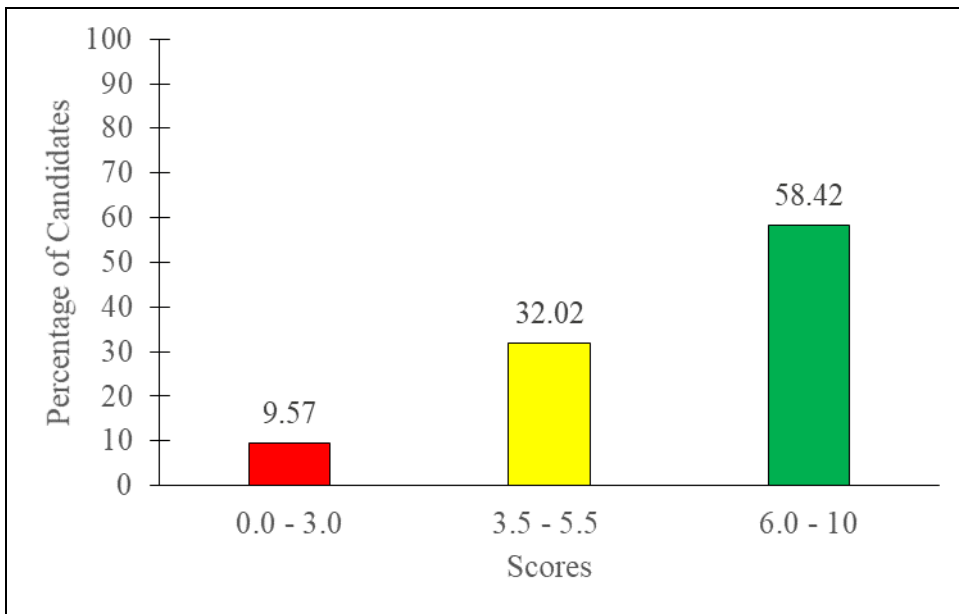
Figure 16: *Distribution of the Candidates' Scores in Question 6*
Figure 16, shows that 90.43 per cent of the candidates scored fom 3.5 to 10 marks, while 9.57 per cent scored from 0.0 to 3.0 marks. This indicates a good performance in the question.

Data analysis reveals that 58.41 per cent of the candidates performed well in the question. In part (a), they correctly gave a reason why the chicken does not need teeth during the digestion. Their response was *that chicken has a gizzard, which carry out the mechanical breakdown of food. In the gizzard, digestive enzymes are added to the mix and physical grinding of the food occurs by insoluble grit through strong muscular action.*

Likewise, in part (b), the candidates managed to describe the digestive system of the chicken. The correct responses provided were: *mouth - for picking up food and swallows it with the help of tongue, crop - for temporary storage of food before it move into the stomach for digestion, stomach - from the crop the food enters the true stomach (proventiculus) where food is mixed with addition of hydrochloric acid and digestive enzymes, gizzard - in it the grit are accumulated which grind down food by strong muscular action, small intestine- the nutrients are absorbed and*

the residues then passes through the caeca, caeca - this is a blind suck along the lower intestinal tract where bacteria help break down undigested food, cloaca (vent) - for removing out faeces. The responses clearly indicate a good understanding of the digestive system in chicken. Extract 16.1 presents a sample of the correct responses in the question.

6 b) + Crop; is one of the digestive system or part in chicken which aid in temporary storage of food before taken it into another part. The crop is important in temporary storage of food particles in the body of chicken.

- Proventriculus; is one of the digestive parts in the body of chicken which is very important during digestion of food and transporting it to other be parts.

- Gizzard; is the stone like structure which aid in digesting or grinding of large food particles into smaller particles such that May be easily absorbed by small Intestine in the body of chicken, Gizzard is adapted to have two layers such that it may complete its activity effectively.

→Small Intestine; Is one of the important part in digestion of chicken where where it absorbs the digested food by the gizzard hence to be used in different metabolic activities in the body.

6a) Chicken do not need teeth during digestion due to the presence of gizzard.

-It posses teeth or stone Like structure which aid in grinding of food from large particles into smaller particles hence simplifying the absorption of food. Due to the presence of such stones the chickens are adapted to lack teeth because food substance are grinded by such stones hence making it into smaller particles that simplify its absorption by small intestine.

-This May also contains muscles which aid in stimulating the stones Like structure to grind large food particles into smaller particles hence digestion

6b) -Digestions system in chicken is as follows;

-Beaks; The chickine May takes the food particles by using because beaks hence taken it towards the oesophagus in the body of chicken. example Maize grains.

-Oesophagus; Is one of the digestive system in chicken where it receives the food particles from the beaks and create the wave like for movement of food towards the crop in the body of chicken.

6(b) - Digestive caeca; It's also used or important part in digestive system of the chicken where it accomplish the different activity in the body of chicken.

- Rectum; Is the last organ in digestion of the food in body of chicken where it aid in temporary storage of the waste product such as feaces.

- Anus; Used to remove out the end product of digestion from the body of chicken after the digestion to be completed.

DIAGRAM SHOWING DIGESTIVE SYSTEM IN CHICKEN.

Extract 16.1: *A sample of the candidates' correct responses in question 6*

In Extract 16.1, the candidate attempted both parts of the question correctly. He/she exhibited a good understanding of the chicken digestive system.

Further analysis shows that 32.02 per cent of the candidates performed averagely. In part (a), they managed to give a reason why the chicken does not need teeth during the digestion. However, they only partially provided the descriptions of the chicken digestive system but in part (b). This shows the possession of satisfactory knowledge of the subject matter.

On the contrary, 9.57 per cent of the candidates had a weak performance in the question. In part (a), these failed to give a reason why the chicken

does not need teeth during the digestion. Some of the incorrect resposes provided were; *chicken do not need teeth due to possessing gut called crop which contain stone like structure, the nature of feed eaten by chicken are very small particles which have no need to be digested physically in the mouth, the chicken have a mouth which is needle like structure which help to grind feeds, because have the crop which help to moisten the food and presence of crop which contain sand particles that enable digestion.* Moreover, in part (b), they failed to describe the chicken digestive system. Some of them described the ruminant stomach such as *rumen - help in digestion of cellulose, reticulum - help to filter coarse particles, omasum - for reabsorption of water in chicken and abomasum- produce digestive juices.* Others described parts of the reproductive system instead of the digestive system. This demonstrates a failure to meet the demands of the question. Extract 16.2 presents a sample of the incorrect responses from one of the candidates.

In Extract 16.2, the candidate's responses indicate the lack of knowledge of the chicken digestive system. He/she responded incorrectly in both parts of the question.

2.2.7 Question 7: Introduction to Animal Health

The question had parts: (a) and (b). Candidates were required to: (a) suggest six observable signs that help to identify unhealthy animals and (b) analyse four effects of parasites on animals. The question examined the candidates' knowledge and skills in livestock diseases and parasites.

The question was attempted by 784 (100%) candidates, of which 4 (0.51%) scored from 2.0 to 2.5 marks, 137 (17.47%) scored from 3.5 to 5.5 marks and 643 (82.02%) scored from 6.0 to 10 marks. Figure 17 portrays candidates' scores in the question.
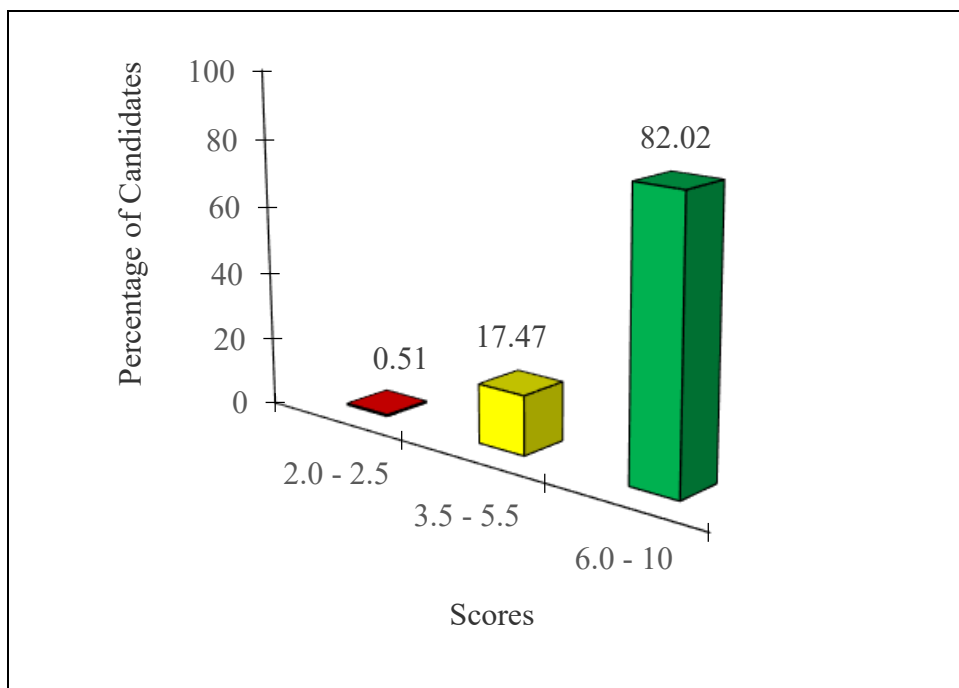
Figure 17: *Distribution of the Candidates' Scores in Question 7*

As shown in Figure 17, the analysis shows that 99.49 per cent of the candiadates scored from 3.5 to 10 while 0.51 per cent scored from 2.0 to 2.5 marks. The general performance in the question was good.

Candidates who performed well were 82.02 per cent. In part (a), most of them correctly suggested the observable signs that help the farmer to identify the unhealthy animals. They provided the correct responses such as *appearance of the animal*, *feeding*, *animal behaviour*, *coughing*, urine *and excreta*, *mucous membranes*, *changes in temperature* and *pulse rate*. This implies that the candidates were knowledgeable and skilled in the parameters that can be used to identify a sick animal.

In part (b), they were able to analyse the effects of parasites on animals by providing responses such as *worms deprive the host animal of food leading to loss of weight, emaciation and low production*, *biting parasites such as tsetseflies break the skin exposing the animal to secondary infection*, *some external parasites irritate the animals through their biting effects causing the animal to rub itself against solid objects*, *some parasites such as ticks and tsetse flies spread diseases from sick animals to healthy ones*, and *they cause anaemia due to action of sucking large volume of blood from the host animals*. These responses show the mastery of the subject matter. Extract 17.1 is a sample of the correct responses in the question.

07. a) Factor of identify the Unhealthy animals.

i) Physical appearance of the animal.
- The unhealthy animals look docite and the sleep any time. So this is the one of the methods of determine unhealthy animals.

ii) Urination
- The urine of the unhealthy animals become able normal colour. example. red colour urine this indica te unhelthy or disease to the animals.

iii) Defrication.
- Unhealthy animals remove the hard or watery feaces this indicate that the animals have a diseases.

iv) Body temperature.
- The healthy animals have normal temperature. so the lower or hight temperature indicate the diseas s. to the animals.

v) Body Pulse rate.
- The healthy animals have normal pulse rate. but the low or high pulse rate indicate the disease to the animals

vi) Skin coat.
- The skin of the healthy animals look bright and return fast when pulled - but the dirty or when the feather or hair of the animal pulled and not retu rn fast It indicate that the animal is unhealthy

```
07. B) EFFECT OF PARASITES TO ANIMALS.
    i) Cause emaciation. to the animals.
      — The animals lose their weight due to sucking of
      blood by the parasites.

    ii) Spread of the diseases.
      — The internal and external parasites cause spreading
      of the livestock diseases. example tick can lead to the
      spread of diseases to the animals.

    iii) Cause low productivity
      — Forexample production of milk and skin can be
      lowered due to parasites that feed on the animals.

    iv) Can lead to anaemia to the animals.
      — The parasites cause anaemia to the animals due to
      the loss of blood. So the parasites are harmful to
      the animals should be controlled.
```

Extract 17.1: *A sample of' the candidates' correct responses in question 7*

In Extract 17.1, the candidate performed well in all parts of the question, demonstrating a good understanding of the subject matter.

Candidates who performed averagely in the question were 17.47 per cent. In part (b), most of them managed to analyse the effects of parasites on animals. In part (a), they failed to exhaust the observable signs for the unhealthy animals. In addition, some of them were unable to give sufficient explanation of the signs. Their partial correct responses indicate insufficient knowledge and skills in detecting the unhealthy animals.

Nevertheless, 0.51 per cent of the candidates had a weak performance. Most of their responses in both parts of the question were not correct. In part (a), they failed to suggest the observable signs that can be used to identify the unhealthy animals. They provided the incorrect responses such as *animal isolate itself*, *the animal eat more food*, *the animal mount others*, *mucus discharge from the vulva*, *vulva become red*, *the animal make noise*, and *animal urinate much*. Most of these are the signs of heat in animals and not the signs of the unhealthy animals.

Likewise, in part (b) the candidates failed to analyse the effects of parasites on animals by providing different incorrect responses such as *increase cost of treatment to the farmer*, *the animal tend to shake the head frequently*, *it may cause severe infection to human beings*, *parasites cause the animal to look dirty*, and *parasites cause salivation to animals*. This signifies the lack of knowledge of the effects of parasites on animals. An example of the incorrect responses in the question is portrayed in Extract 17.2.

7	Signs of healthy animal.	
	i) High rate of production	
	— The helthy animal to reproduce the animals with high and large amount of product such as Milk production is high, egg production become high.	
	ii) High reproduction rate. The reproduction rate for the healthy animal is increases and become highor.	

7	a) iii) ~~Proper~~ Increase of appitite of feeding — Health animal has high rate of feeding Compcured unhelthy animal.	
	iv) A helth animal has large and big body. — The helth animal is large and its body sno is large.	
	v) A health animal become	
	vi) Animal seen to have rough skin	
7	b) Effect of parasite to animals. i) It cause loss of appitite to animal — The animal lose the appitite to the feed.	
	ii) It cause stress to animal. — Animal, affected by parasite become stressed.	

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iii). The animal tend to Shake the head Frequently.							
iv). The parasite cause disease to the animals.							

In Extract 17.2, most of the responses provided by the candidates were incorrect. In part (a), he/she focused his/her responses on the signs of the healthy animal instead of the unhealthy one. In part (b) the candidate scored two points which are (b) (i) and (ii).

2.2.8 Question 8: Pasture Agronomy

The question had parts: (a) and (b). Candidates were required to: (a) give three limitations of natural pastures and (b) give seven reasons for establishing a mixture of grass-legume pastures. The question assessed the candidates' understanding of the pastures.

The question was attempted by 784 (100%) candidates where 4 (0.51%) scored from 0.0 to 3.0 marks, 56 (7.14%) scored from 3.5 to 5.5 marks and 724 (92.35%) scored from 6.0 to 10 marks. Figure 18 illustrates the candidates' scores in the question.
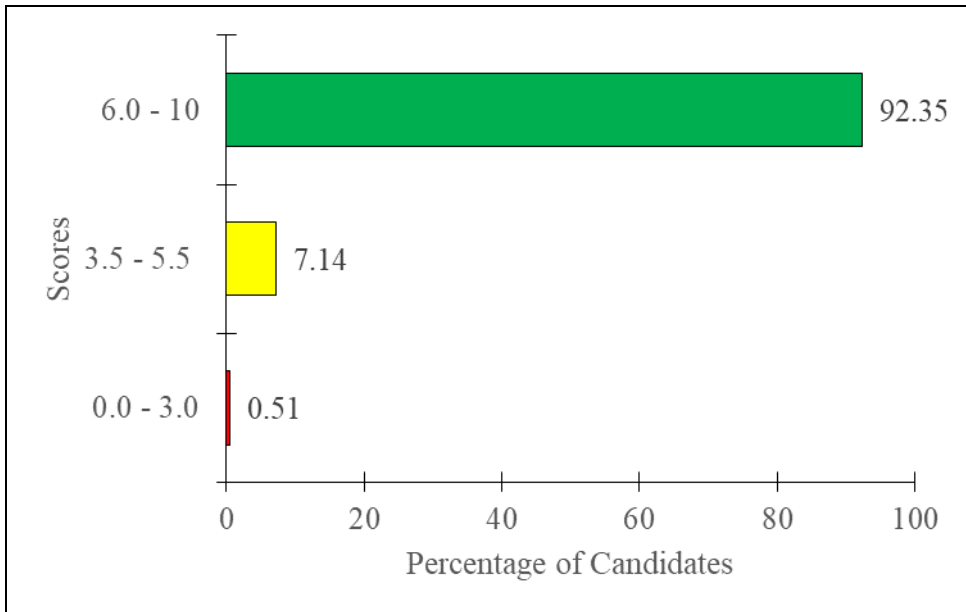
Figure 18: *Distribution of the Candidates' Scores in Question 8*
Figure 18 shows that 99.49 per cent of the candidates scored from 3.5 to 10 marks whereas 0.51 per cent scored from 0.0 to 3.0 marks. Generally, the candidates' performance was good.

Further analysis indicates that 92.35 percent of the candidates had a good performance. In part (a), majority of them were able to give the limitations of the natural pastures as *grow on poor fertile soils and hence affecting their productivity*, *natural pastures have poor quality grass and legumes as a result of poor nutrition*, *not all grasses or legumes are eaten by animals in natural pastures*. Likewise, in part (b) they managed to give the reasons for establishing a mixture of grass-legume pastures. They provided responses such as *provide an economical source of livestock feeds*, *build soil tilth and fertility*, *reduce invasion of noxious and poisonous weeds*, *reduce erosion*, *animals are less prone to bloat when grazed to mixed pastures*, *increase yield and quality of pastures by providing nitrogen through atmospheric fixation*, *crops to be grown in the area can benefit from a larger amount of soil available nitrogen*, *offers rich amount of digestible protein, calcium and minerals*, *grass-legumes mixtures is more palatable to livestock*. This suggests that the candidates

had sufficient knowledge of pastures. Extract 18.1 presents a sample of the correct responses from one of the candidates.

8	a) Limitation of natural pasture are i) Natural pasture are more affected by pests and diseases, therefore can transmit pest to animal.	
	ii) Natural pasture contain many weeds which are unparatable by animal and same are poisenous to animal	
	iii) Natural pasture cannot be supplied through out the year this is becau se they depend on rainfall hence during dry reason they are not available	

8 b) i) ~~Mixture of grasses~~

It's advised to establish a mixture of grass-legume pasture because of the following reason (importance).

i) It help to reduce the problem of bloat in animal, this is because animal could not take more legumes which cause bloat insted take a mixture of grass-legume.

ii) It help to provide nutritious feed to animal hence provide all most nutrien t required by animal, as the grass and legume contain different nutrient

iii) It help to protect pasture from total loss due to disease and pest attack, this is because pest or disease s can attack only grass or legume.

iv) It help to maintain soil fertity, this is because legumes can fix nitrogen from the atmosphere into the soil hence ensure ~~ene ens~~ enough nitrogen is present in soil.

v) It help to control weeds, this is because of grass-legume mixture would provide good coverage in soil hence no chance for weeds to grow.

8 (b) vi) It help to control soil erosion
this because mixture of grass-legu
me would offer a good land cover
age hence prevent the effect of
erosive agent such as rainfalls.

vii) Ensure sufficient pasture is supplie
d through out the year this because
of high productivity therefore
increase production to of farm
animal.

Extract 18.1: *A sample of the candidates' correct responses in* question 8

In Extract 18.1, the candidate performed well in the whole question. This demonstrates the possession of sufficient knowledge of pastures.

Furthermore, Candidates who had an average performance where 7.14 per cent. Most of the candidates were able to give the limitations of the natural pasture in part (a) and in part (b) provided a few correct responses. The incorrect responses in this part mainly focused on the steps of establishing the artificial pasture instead of the reasons for establishing the pastures.

However, 0.51 per cent of the candidates had a weak performance. The candidates provided the incorrect responses in almost both parts of the question. In part (a), they failed to give the limitations of natural pastures instead provided a variety of the incorrect responses like *natural pastures push nutrients away far from the soil, natural legumes have ability to supress legumes, natural pasture is not digestible, natural pastures lead to development of people, natural pastures are easily affected by diseases.* Similarly, in part (b), they were unable to give the reasons for establishing a mixture of grass-legume pastures. Examples of the incorrect responses provided were the *mixture cause bloat to animals, it enhances environmental temperature, it provides foreign exchange, legume-grass cause exploitation of different crops in the crop field and it help to break*

life cycle of pest and diseases. Their responses indicate the lack of knowledge of pastures. Extract 18.2 shows an example of the incorrect responses in the question.

8 a) i) Natural pastures have low nutritional value.

ii) Natural pastures have low proportion of protein ratio.

iii) Natural pastures have low proportion of legumes in the feed.

8 b) i) In order to increase protein ration in the feed of an animal.

ii) To increase nutritional value of the feed.

iii) To increase a feed adaptability

iv) In order to balance the feed ration of the animals.

v) To increase the availability of pasture inorder to supply feed to the animal.

vi) To improve animal productivity.

vii) To improve the quality of animals products.

Extract 18.2: *A sample of the candidates' incorrect responses in question 8*

In Extract 18.2, the candidate responded incorrectly in almost all parts of the question except response (a) (i) and (b) (ii).

2.2.9 Question 9: Livestock Reproduction, Breeding and Improvement

The question required candidates to explain five major causes of the failure of the artificial insemination in cows. The question tested candidates' knowledge and skills in the practice of the artificial insemination.

The question was attempted by 784 (100%) candidates, of which 320 (40.82%) scored from 0.0 to 3.0 marks, 301 (38.39%) scored from 3.5 to 5.5 marks and 163 (20.79%) scored from 6.0 to 10 marks. Figure 19 summarizes the candidates' scores in the question.
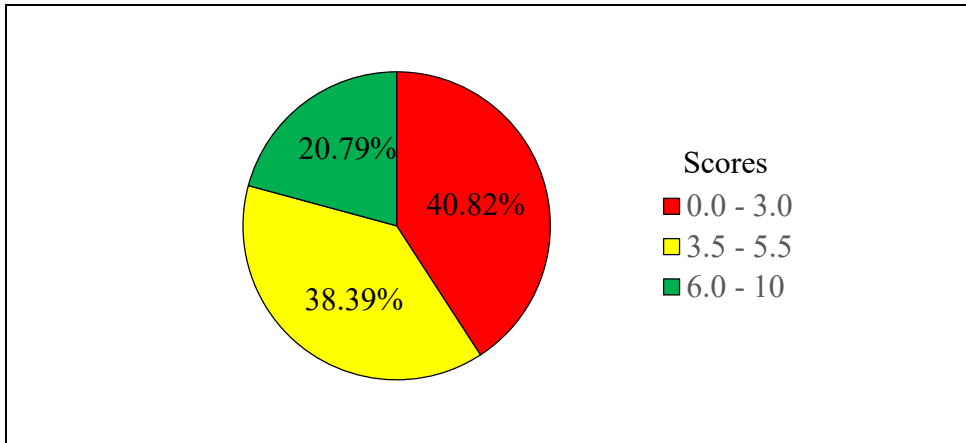
Figure 19: *Distribution of the Candidates' Scores in Question 9*

Figure 19 shows that, 59.18 per cent of the candidates scored from 3.5 to 10 marks and 40.82 per cent scored from 0.0 to 3.0 marks. Data indicate general average performance of the candidates.

Candidates who had a good performance in the question were 20.79 per cent. Most of them correctly explained major causes of failure of the artificial insemination in cows. They provided the correct responses like *failure of the farmer to detect heat on time*, *an incompetent inseminator cotribute to the failure through improper semen handling and incorrect insemination technology*, *loss of weight of an animal before or after insemination may negatively affect the critical stages of early embryonic development*, *poor nutrition cause failure to show clear signs of heat in cows*, *abnormal injured or infected reproductive tract*, *poor quality semen*, *dirty or unsterilised equipment may kill the spermatozoa in the semen*. Their responses show a good understanding of the practice of the artificial insemination. Extract 19.1 exemplifies the correct responses in the question.

9. Causes of failure of artificial insemination
   (i) Failure of the farmer to detect the heat period. If the farmer do not detect properly the heat period of the farm animal, the insemination can not be successful to such animal hence lead to failure.

   (ii) Collection of semen from the infertile bull; If the male animal from which semen are taken was infertile, the fertilization fails hence the insemination done is not successfull or failure occurs.

9. (iii) Hormonal imbalance in the female animal; Usually the oestrus cycle is the hormonal controlled processes hence the irregular oestrus cycle can make artificial insemination to be less effective or to cause failure.

   (iv) Technical failure of the inseminator; If the inseminator is not well trained, the practice of artificial insemination can bring failure of the mode.

   (v) Health status of the cow; The disease can lead to inefficient artificial insemination. For example the disease called contagious abortus can lead to miscarriage hence failure of insemination.

Extract 19.1: *A sample of the candidates' correct responses in* question 9

In Extract 19.1, the candidate correctly attempted the question showing the mastery of the artificial insemination practice.

Furthermore, 38.39 per cent of the candidates performed averagely. Some of them provided partially correct responses to the question while others failed to exhaust all the points demanded. This indicates partial knowledge and skills in the practice of the artificial insemination.

On the other hand, Candidates who had a weak performance in the question were 40.82 per cent. Most of them attempted the question incorrectly. They failed to explain the major causes of the failure of the artificial insemination in cow. They mainly provided the disadvantages of the artificial insemination instead of the causes for its failure. Some of the responses provided were *spread of undesirable gene, may lead to spread of disease especially if the semen are collected from the diseased bull, it is expensive, it is a tedious work to detect the heat periods of cows, it needs technical skills to inseminate.* This indicates a failure to meet the requirement of the question due to the misconception. Extract 19.2 is a sample of the incorrect responses in the question.

Extract 19.2: *A sample of the candidates' incorrect responses in question 9*

In Extract 19.2, the candidate provided the disadvantages of the artificial insemination instead of the causes for its failure as the question required.

2.2.10 Question 10: Environmental and Technological Challenges in Agricultural Development

The question required candidates to evaluate five benefits of genetic engineering in animal production. The question examined the candidates' knowledge of genetic engineering.

The question was attempted by 784 (100%) candidates out of which 49 (6.25%) scored from 0.0 to 3.0 marks, 168 (21.43%) scored from 3.5 to 5.5 marks and 567 (93.75%) scored from 6.0 to 10 marks. Figure 20 depicts the candidates' scores in the question.
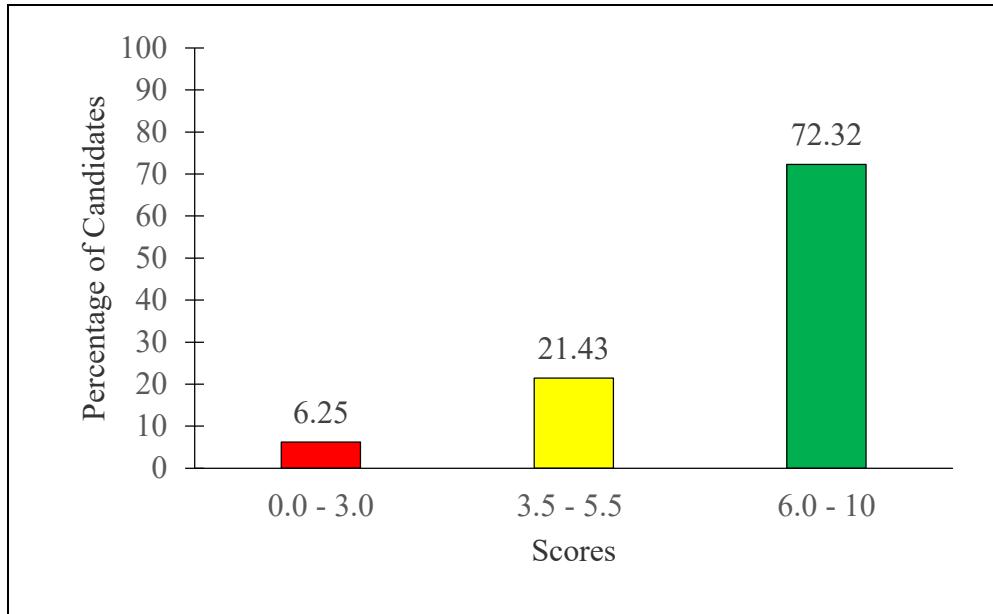
Figure 20: *Distribution of the Candidates' Scores in Question 10*

Figure 20 indicates 93.75 per cent of the candidates scored from 3.5 to 10 marks, whereas 6.25 per cent fom 0.0 to 3.0 marks. The general performance in the question was good.

The statistics show that, 72.32 per cent of the candidates performed well. The majority of them managed to evaluate the benefits of genetic ingineering in animal production. The correct responses were; *Improve diseases and parasite resistance and stress withstand*, *create extended life*, *develop specific traits*, *animals can be modified to produce more milk, grow more muscle tissue or produce different coats so that a wider range of fabrics can be created*, *greater yield can be produced*, and *predict outcome*. Such responses indicates a good understanding of the subject matter. Extract 20.1 is a sample of the correct responses fom one of the candidates.

10. Benefit of genetic engineering in animal production

i) It make the animal to be resistance against disease the genetic engineering proces help to develop the immune system of the animal to be able to resist against disease and develop its health status.

ii) Genetic engineering help to increase animal production such as milk; this is because the animal have good health so can be able to give high amount of production such as milk.

iii) If the animal is for selling help to reach the market weight early; the animal can reach the market weight early due to high and rapidly growth which is stimulated by genetic engineering.

iv) Genetic engineering help to increase quality of production; due to genetic modified organism help to increase better quality of the product, and suitable use to the people and reach the market weight early.

v) It help to reduce cost of production and develop the economy; genetic engineering held to reduce cost of production due to production of good quality and quantity product and develop of our economic status because the product use to reach the market weight early.

Extract 20.1: *A sample of the candidates' correct responses in question*

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In Extract 20.1, the candidates exhausted all the correct points showing possession of adequate knowledge of the subject matter.

Candidates who had an average performance in the question were 21.43 per cent. They seemed to understand the benefits of genetic engineering in animal production but could not explain them fully. Their partial correct responses signify possession of inadequate knowledge of the subject matter.

Nevertheless, 6.25 per cent of the candidates performed poorly. Most of them failed to evaluate the benefits of genetic engineering in animal

production. They provided a variety of the incorrect responses such as *it help to know the genotype of the animal, it helps to identify the behaviour of the animal, it helps to know breeding of the animal, it helps to know the genes and species of the animal and it help to know the condition of the animal during birth*. This implies that, they lacked knowledge of genetic engineering in animal production. Extract 20.2 is a sample of the incorrect responses in the question.

10,	Genetic engineering Is the process of modifying the genes of an organisms in order to ensure the efficient production of more developed organisms such as resistant to both biotic and abiotic conditions
	The following are the benefits of genetic engineering :
	Production of resistant varieties : Through genet

to is engineering the organisms which are highly resistants to both abiotic factors such as drought, low rainfall, high temperature and biotic factors such as bacteria viruses and fungis are available or produced.

It enhance wide adaptability: The crop made from genetic engineering can be highly adaptable in different environmental conditions because the genes are very stable.

It enhance the increase in the yield: The genetic engineering increase the production of high yield because the crop produced have high ability to overcome some problems causing the decrease in production such as diseases.

It ensure the earlier production: This means that through genetic engineering there was maintainance of earlness production. The plant can grow over a short period of time.

It reduce the cost of production: The genetic engineering reduce the cost of production such as cost of controlling pest and disease or irrigation cost due to low rainfall. The cost can be reduced due to the production of resistant varieties.

Therefore the modification of genes of the plant has a benefit in agricultural activities because there was no risk in production.

Extract 20.2: *A sample of the candidates' incorrect responses in question 10*

In Extract 20.2, the candidate focused his/her responses on the benefits of genetic engineering in crop production contrary to the demand of the question.

2.3 THE ANALYSIS OF CANDIDATES' PERFORMANCE IN 134/3 AGRICULTURE 3

2.3.1 Question 1: Soil Science

In this question, candidates were provided with the following specimen, apparatuses and materials: X (wood ash), 100 cm^3 beaker, 100 cm^3 measuring cylinder, spatula, stirring rod, blue and red litmus paper and distilled water. They were required to carry out procedures hereafter and answer questions that follow.

Procedures
(i)   Measure 50 cm^3 of distilled water and pour it into a beaker.
(ii)   Put five spatulaful of specimen X into a beaker containing distilled water.
(iii)   Stir the mixture well.
(iv)   Deep each of the red and blue litmus paper into the mixture and make observation.

The question comprised parts (a), (b), (c), (d), (e), (f) and (g). Candidates were required to:

(a)   record the observations in the following table:

Experiment with litmus papers	Observations
Red litmus paper	
Blue litmus paper	

(b)   state the pH of the specimen from the result of the experiment.
(c)   briefly explain, in two points, the intension of farmers to use specimen X in the soil when growing cabbage in Kilimanjaro, Mbeya, Bukoba and Rungwe.
(d)   why farmers living in semi desert areas are not advised to use specimen X when growing coffee crop?
(e)   suggest by giving a reason, in reference to part (d), the suitable management practices to be adopted by farmers.

(f)   give three precautions to be observed when using specimen X in the soil.

(g)   write down three functions of each of the important nutrient elements that are contained in specimen X. The question assessed candidates' knowledge and skills in the soil reaction concept.

The question was attempted by 784 (100%) candidates, whereas 449 (57.27%) scored from 1.0 to 6.5 marks, 328 (41.84%) scored from 7.0 to 11.5 marks and 7 (0.89%) scored from 12 to 15 marks. Figure 21 shows the candidates' scores in the question.
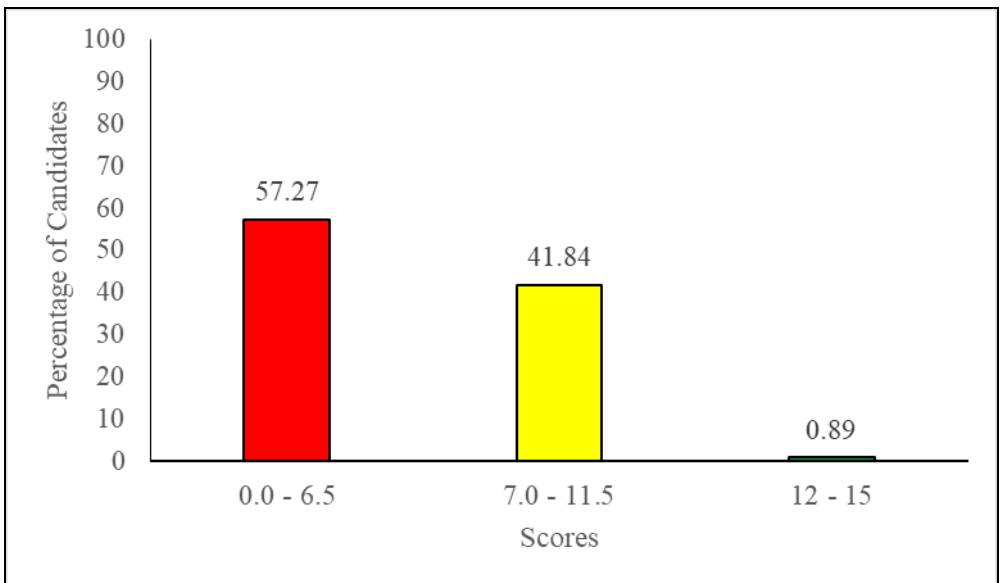
Figure 21: *Distribution of the Candidates' Scores in Question 1*

As shown in Figure 21, the analysis indicates that 42.73 per cent of the candidates scored from 7.0 to 15 marks and 57.27 per cent scored from 1.0 to 6.5 marks. Generally, the candidates' performance was average.

Candidates who performed well in the question were 0.89 per cent. They correctly responded to almost all parts of the question. In part (a), they correctly recorded the observation in the table as follows:

Experiment with litmus papers	Observations

Red litmus paper	It changed from red to blue
Blue litmus paper	It remained unchanged

In part (b), they were able to give the pH of the specimen as *alkaline* or *basic in reaction*. In part (c), the candidates managed to explain the intention of farmers to use specimen X (wood ash) when growing cabbages in Kilimanjaro, Mbeya, Bukoba and Rungwe. The candidates provided the correct responses such as *the soil in the stated regions are acidic in nature because these area receive maximum amount of rainfall thus basic ions such as sodium, potassium, magnesium and calcium are removed by leaching due to heavy rainfall making the soil acidic. Therefore, addition of specimen x in the soil create favourable alkaline condition which favour the growth of cabbage by supplying basic nutrients such as phosphorus, calcium, potassium and magnesium*. In addition, and *due to acidic nature of these regions, specimen X help to neutralise the acidity of the soil since it contains significant amount of calcium which act as a substitute for lime*.

Likewise, in part (d), they provided the correct reason for not using specimen X in semi-desert area when growing coffee as *the soil in semi-desert area is alkaline due to the little amount of rainfall in that area thus having higher amount of alkaline earth carbonates and exchangeable sodium percentage. Coffee is the crop favoured by acidic soil condition therefore it is not advised to apply specimen X in the soil*. In part (e), they managed to suggest the suitable management practices to be adopted by farmers, in reference to part (d). These were as *acidification of the soil which involve build-up of hydrogen cations to lower the soil pH. Reason; acidification is important since coffee is an acidic loving crop and the soil in semi desert is alkaline in nature*. In part (f), they managed to give precautions to be observed when using specimen X in the soil. Examples of such correct responses include *do not spread specimen X around acidic loving plants, always mix specimen X in the soil if left in piles, avoid specimen X coming into contact with seedlings because it contains salt which may cause scorching*.

In part (g), the candidates provided the correct responses on the functions of the important nutrient element contained in specimen X. They provided the correct responses such as, calcium *strengthen cell wall of plants*, *it neutralises organic acids*, *it promotes seed production*, *it regulates uptake of potassium by plants*, *it is essential for normal cell division and promotes early root development*. Potassium *is essential in the formation of the carbohydrate and translocation of starch to various parts of the plant*, *it strengthen straws and stalk of cereal plants*, *is an activator of number of enzymes involved in amino acid synthesis and encourage normal cell division to young plants*. Phosphorus *promotes formation of seeds and roots*, *promotes formation of tillers in cereals crops*, *makes straws stronger and more resistance to lodging*, *improves disease resistance in plants and it is essential constituent of many vital compounds such as nucleotides and phospholipids*. Magnesium *is involved in phosphorus metabolism in plants and help in translocation of carbohydrates in the form of sugars in plants and it is a part and parcel of the chlorophyll molecules without which photosynthesis cannot occur*. These responses demonstrate the possession of adequate practical skills and knowledge of soil reaction. Extract 21.1 exemplifies the correct responses in the question.

01. (a)   Table of results.

s/n	Experiment with litmus papers	observations
i	Red litmus paper	The litmus paper changed from red to blue colour.
ii	Blue litmus paper	The litmus paper retained its blue colour.

(b) From the results, The pH of the specimen is Basic /Alkaline

(c) The farmers intend to use or apply specimen X in the soil so as;

(i) To maintain the soil pH, since specimen X is alkaline in nature can be applied to the soil as lime material to neutralize the acidity in the soil, which it can also help to control some pests and disease pathogens in the soil for cabbage productivity.

(ii) The farmers also intend to use specimen X in the soil so as to increase the soil nutrients and fertility status since in specimen X, there is mineral composition like calcium, magnesium, potassium and phosphorus which is suitable for

01. (d) The farmers living in semi-desert areas are not advised to use specimen X in the soil when growing coffee because,

In semi-desert area there is high content of basic /alkalinity, thus the pH value of the soil is high, so it is not advised to use specimen X in such areas since it can increase more alkalinity to the soil which is not sufficient for the productivity and growing of the coffee plants

(e) The farmer should practice audification of the soil so as to ensure the suitable pH for the productivity of the coffee, audification is the application of the acidic nature materials to the soil so as to lower the pH of the soil example by addition of the inorganic fertilizers such as sulphate of ammonia (SA) and di-ammonium phosphate (DAP), The addition of these fertilizers will increase the soil acidity / lower the soil pH.

01. (f) The precautions to be observed when using specimen X in the soil,

(i) The pH of the soil; when applying specimen X to the soil the farmer should ~~error~~ determine the soil pH, when acidic or basic and the required management practice to be done.

(ii) Type of crop to be grown; when applying specimen X to the soil, the type of crop grown should be observed if it grow well in acidic soil or basic conditions.

(iii) Fertility status of the soil; The mineral composition of the soil should be observed before the application of specimen X, The availability of the essential elements like Calcium, potassium and phosphorus which are present in specimen X,

(g) The mineral elements that are contained in the specimen X are

(i) calcium
    Functions of calcium
    ① It help in the formation of cell wall since increase the mechanical strength of the plant
    ② Calcium is important in the formation of seeds and fruits
    ③ Calcium element is important in the formation of various plant tissues such as Xylem and phloem for transportation purpose in plants.

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01. (f) (ii) Phosphorus

Functions.

① Help in the formation of cell membrane in the plant cell hence mechanical strength.
② Help to increase plant resistance to diseases and pathogens.
③ Help in the formation of seeds and fruits as well as plant leaves.

(iii) Magnesium

Functions.

① Help in the formation of chlorophyll pigment for photosynthesis.
② It aid during cell division of plant leading to growth
③ Magnesium also helps to maintain the green colour of the plants.

(iv) Potassium

Functions.

① It aid cell division in plants hence growth and increase mechanical strength
② It increase plant resistance to diseases / immunization.
③ It help in controlling opening and closing of stomata for gaseous exchange in plant.

Extract 21.1: *A sample of the candidates' correct responses in question 1*

In Extract 21.1, the candidate provided the correct responses in most parts of the question, except part (f) and (g) where he/she missed 1 function of phosphorus, 2 of magnesium and 3 of potassium.

Furthermore, 41.84 per cent of the candidates had an average performance. Most of such candidates provided the correct responses in part (a) and (b) and partially correct responses in the remaining parts of the question. This indicates partial understanding of the subject matter.

On the contrary, 57.3 per cent of the candidates had a weak performance. They responded incorrectly in almost all parts of the question. In part (a) and (b), they failed to record correct observations and state the Ph of the specimen respectively. In part (c), the candidates failed to explain the intension of the farmers to use specimen X in the soil. Some candidates provided the importance of the organic matter contrary to the requirement of the question. Examples of such responses were *it help to improve soil structure, it helps to improve porosity of the soil and improve aeration of the soil*. Other candidates provided a variety of the incorrect responses such as *ensure nitrogen fixation to the plant*, *help in reduction of toxicity to the soil and it activates enzymes*. In part (d), they were unable to give a reason for not using specimen X when growing coffee in semi desert area. The candidates did not understand that the semi-desert area is alkaline in nature. Contrarily, most of their responses treated the areas as acidic in nature. For example, *semi desert areas are acidic in nature so the specimen will neutralise the acid, coffee grows in basic or alkaline soil, specimen X increase acidity in the soil and specimen X increase the growth of coffee.*

Moreover, in part (e), they failed to suggest, with a reason, the suitable management practice to be adopted by farmers in reference to part (d). Most of them incorrectly provided agronomic practices of maintaining soil fertility. Example of responses were *crop rotation*, *mulching*, *use of cover crops*, *liming*, and *application of organic manure*. Other candidates provided a variety of the incorrect responses such as *proper cultivation*, *proper pruning and proper land preparation*. In part (f), they were unable to give precautions to be observed when using specimen X in the soil. Most of their responses focused on the precautions to be taken when applying agrochemicals in the farm such as *wear a mask to avoid direct contact with the nose*, *wear glasses to protect the eyes, apply following the direction of wind*, *read and follow the manufacturer's instructions when applying*, *wash hands with plenty of clean water after applying specimen X and wear gloves to avoid direct contact with the skin*. In part (g), the candidates were unable to give the functions of each of the important nutrient elements contained in specimen X. Some candidates provided wrong elements like *oxygen, nitrogen, sulphur and carbon* while others provided compounds like

calcium carbonate and magnesium carbonate hence failed to give the correct functions. This demonstrates that the candidates lacked practical skills and knowledge of the subject matter. Extract 21.2 is an example of the incorrect responses in the question.

1 (a) Experiment with Litmus paper	Observation
Red litmus paper	The red litmus paper changed to blue
Blue litmus paper	No any changes in blue litmus paper.

b). The PH of the specimen is

c). The Intension of farmers to use specimen X is

i) To Maintain the soil PH
ii) To Enhances ba microbial activities in the soil.

iii) To Improve physical and chemical properties of the soil.

D. This is because in semi-desert areas the soil is too alkalinity thus why are not advised to use it.

E. The suitable management practice to be adopted by farmer is Mulching This is because it

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F.i. Do not apply too much on the farm because it can burn the crops when applied too much.

ii) Apply them during early is the morning and late in the evining.

iii) Do not apply near the crop steam and roots. Because it can cause reduction.

9. The important nutrient element that contain is specimen X is

i) Nitrogen.
- It help to prevent the pre-mature fall of leave and encourage development of leaves, Flowers and fruits.

ii) Magnesium.
- It encourages growth of leaves, fruits and Flowers is the plant.

iii) Calcium.
- It help in Development of fruits and flowers in the plant.

Extract 21.2: *A sample of the candidates' incorrect responses in* *question 1*

In Extract 21.2, the candidate provided the incorrect responses to nearly all parts of the question except in part (a) where he/she made correct observation.

2.3.2 Question 2: Crop Science and Production

In this question, candidates were provided with experimental set up 1 and 2 with plants planted in two rows and 30 cm ruler. They were then required to perform procedures and answer questions that followed:

Procedure
Use the ruler to measure the plant spacing between and within rows in the experimental set up 1 and 2.

The question had parts (a), (b), (c) and (d). Candidates were required to:

(a)   record the results obtained in the stated procedure in the table provided:

Experimental set up	Between rows spacing (cm)	Within rows spacing (cm)
1		
2		

(b)   calculate, by referring to the experimental set up 1, the number of plants which will be available if the farmer has established 1 ha of pastureland.

(c)   Calculate, by referring to the experimental set up 2, the amount of viable seeds in kg that will be required to plant 1 ha of pastureland if each seed that germinates into the plant seedling weighs 0.5g.

(d)   briefly explain the five factors that guide farmers in deciding the spacing to be used for a certain crop. The question assessed candidates' ability to determine the plant population in a given area.

The question was attempted by 784 (100%) candidates, of which 374 (47.70%) scored from 0.0 to 5.0 marks, 276 (35.21%) scored from 5.5 to 8.5 marks and 134 (17.09%) scored from 9.0 to 14.5 marks. Figure 22 portrays the candidates' scores in the question.
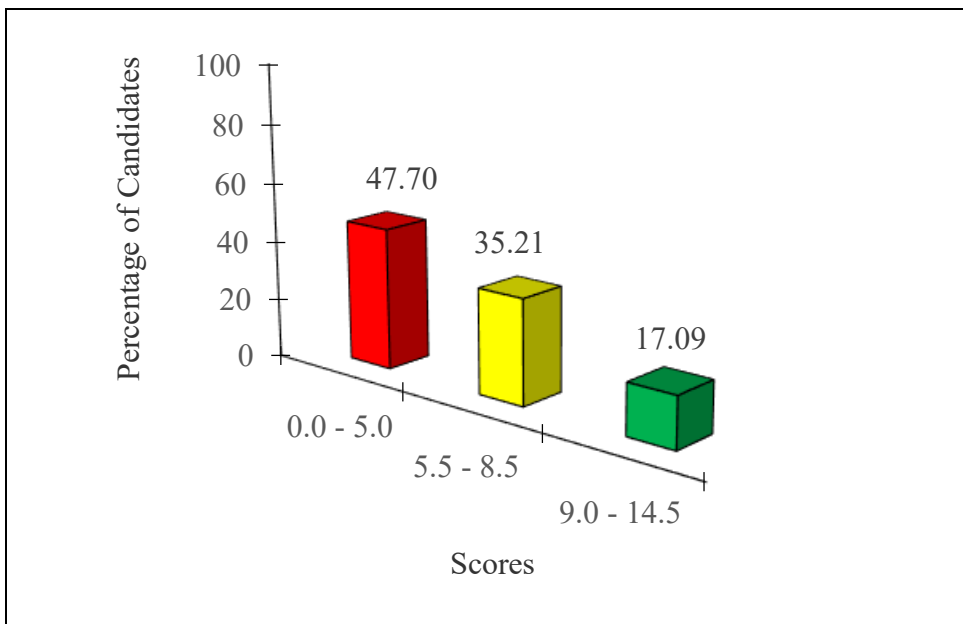
Figure 22: *Distribution of the Candidates' Scores in Question 2*

As shown in Figure 22, 52.30 per cent of the candidates scored from 5.5 to 14.5 marks and 47.70 percent scored from 0.0 to 5.0 marks. The general performance in the question was average.

Data show 17.09 per cent of the candidates had a good performance. Most of them correctly attempted almost all parts of the question. In part (a), they managed to record the results obtained from the experiments as follows:

Experimental set up	Between rows spacing (cm)	Within rows spacing (cm)
1	75	30
2	75	60

In part (b), they correctly calculated the number of plants available in 1 ha of pasture land in experimental set up 1. The correct responses provided by the candidates were:

Plant population = $\dfrac{\text{farm area (m}^2\text{) x plants per hole}}{\text{Plant spacing in meters}}$

Data
Farm area= 1 ha= 10000 m²
Plants per hole = 1
Plant spacing in meters = 0.75 m x 0.3 m
Plant population = $\frac{10000 \text{ m}^2 \text{ x } 1}{0.75\text{m x } 0.3 \text{ m}}$
= 44, 444 plants per ha.

Furthermore, in part (c), they were able to calculate the amount of viable seeds required to plant 1 ha of pasture land as follows:

Plant population = $\frac{\text{farm area (m}^2) \text{ x plants per hole}}{\text{Plant spacing in meters}}$

Data
Farm area = 1 ha = 10000 m²
Plant per hole = 2
Plant spacing in meters = 0.75 m x 0.6 m
Plant populatio = $\frac{10000 \text{ m2 x } 2}{0.75 \text{ m x } 0.6 \text{ m}}$
= 44,444 plants per ha
Amount of seeds in kg
1seed that germinate = 0.5g
44,444 seeds will be = x g

$\frac{44,444 \text{ x } 0.5}{1}$

= 22,222g of seeds
1kg = 1000g
Xkg = 22,222g
$\frac{22,222 \text{ x1}}{1000}$ = 22. 2 kg
Amount of seeds = 22.2 kg.

In part (d), they correctly explained the factors that guide farmers in deciding on the spacing to be used for a certain crop. Such responses were; *the type of machinery to be used*, *soil fertility*, *moisture availability*, *use of crop*, *pest and disease control*, *the size of plants*, *growth habit of crops and seed rate*. The candidates demonstrated good mathemathical skills. They also had a good understanding of the concept of crop spacing. Extract 22.1 is a sample of the correct responses from one of the candidates.

2. **(a)** TABLE OF RESULTS.

Experimental set up	Between Rows spacing (cm)	Within Rows spacing (cm)
1	75	30
2	75	~~B~~ 60

(b) solution

Data given

Farm area 1ha $= 10000\,m^2$

spacing $= 0.75m \times 0.3m = 0.225\,m^2$

Plant per hole $= 1$ plant

Number of plants available $= ?$

Then

2. (b) Plant population $= \dfrac{\text{Farm area } (m^2) \times \text{plant per hole}}{\text{Spacing } (m^2)}$

Plant population $= \dfrac{10000 \, m^2 \times 1 \, plant}{0.225 \, m^2}$

Plant population $= 44,444 \, plants$

∴ The number of plants which will be available to 1ha of pt pasture land are 44,444 plants.

(c)   <u>solution</u>
Data given
Weight of 1 seed ~~bag~~ $= 0.5g$.
Farm area $= 1ha = 10000 \, m^2$

Spacing = 0.75m x 0.6m = 0.45m²

Plant per hole = 2 plants

Number of plants available in 1ha = ?

Amount of viable seeds in kg = ?

From

Plant population = $\dfrac{\text{Farm area} \times \text{plants per hole}}{\text{Spacing (m}^2\text{)}}$

$= \dfrac{10\,000\text{m}^2 \times 2\text{ plants}}{0.45\text{m}^2}$

plant population = 44 444 plants / viable seeds

The viable seeds in 1ha = 44,444 seeds

2.	(c) But	

2. (c) But

$$1 \text{ viable seed weighs } 0.5g$$
$$44\,444 \text{ viable seeds weigh } ?\ x$$

Then

$$\frac{X \times 1\,\text{viable seed}}{1\,\text{viable seed}} = \frac{44,444\,\text{viable seed} \times 0.5g}{1\,\text{viable seed}}$$

$$x = 22,222g$$

Then, 44 444 viable seeds weighs 22,222g.

But in kilograms,

$$1kg = 1000\,g.$$
$$x\ ? = 22\,222\,g$$

$$\frac{1000g\ x}{1000g} = \frac{1kg \times 22,222\,g}{1000\,g}$$

$$x = 22.222kg$$

∴ The amount of viable seeds that will be required to plant 1ha of pasture land will be 22.222kg.

(d) The factors that guide farmers when deciding on spacing to be used to a certain crop are;-

i/ The fertility status of the soil.
   - The more fertile soil, the spacing of crops can be closely while the soil with less fertility the spacing between crops should be large enough for proper growth of the plant.

2. (c) ii. Type of machines used on the farm.
- The farmers should observe and consider the type of machines used on the farm when deciding on spacing to be used to a certain crops *
- ~~That~~ If the machines used are larger in size then the spacing should be large enough while if the machines to be used are smaller in size then the spacing to be used should also be closely.

iii. The moisture content of the soil.
- The soil with high moisture content the spacing of crops should be closely ~~void~~ while the soil with low moisture content the spacing should be large ~~or~~ widely.

iv. Dispersion extent of the crop to be grown.
- The ~~q~~ crops with high dispersions such as ~~tom pot~~ sweet potatoes, pumpkin plants and other crops which expand widely on the farm their spacing should be large than those with low extent to disperse within the farm.

v. Proneness of the soil to erosion.
- The soil which is more vulnerable to erosion should be planted ~~the~~ with the crops with closely spacing to control the rate of soil erosion while the soil which

2. is less prone to soil erosion should be planted with crops of large widely spacing between and within the plants.

Extract 22.1: *A sample of the candidates' correct responses in*
question 2

In Extract 22.1, the candidate provided the correct responses in all parts of the question except part (d) (v) where the response was partial correct.

Candidates who had an average performance were 35.21 per cent. Most of them provided the correct responses in part (a), (b) and (c). However,they were unable to explain the factors to consider when deciding crop spacing in part (d), implying a low understanding of the subject matter.

However, 47.70 per cent of the candidates had a weak performance. In part (a), most of these interchanged the values of *within the row spacing* and *between the row spacing*. This is probably because of not knowing the concepts. Others provided incorrect values due to poor measurement skills. In part (b) and (c), they did not understand the formula for calculating plant population, hence arrived at the incorrect values.

In part (d), the candidates were unable to explain the factors guiding farmers in deciding the spacing for a certain crop. Most of them provided the responses, which were not related to the question asked. For example, *it reduce competition for nutrients and space between plants*, *to ensure environmental condition of the area*, *to ensure soil type*, *and improve size of the farm*, *consider climate of the area*, *consider area given and resistance of crop varieties.* These responses exemplify the lack of knowledge and skills in the subject matter. Extract 22.2 presents a sample of the incorrect responses from one of the candidates.

2. (a) Experimental set up	Between Rows spacing (cm)	Within Rows spacing (cm)
1	30	74 cm
2	60	75

b)   soln.

Data. for experimental set up 1.

Spacing $= 30cm \times 74cm$

$= 2220 cm^2$

from $1 m^2 = 10000 cm^2$

$x \ m^2 = 2220 cm^2$

$$\frac{x \ 10000cm^2}{10,000cm^2} = \frac{1m^2 \times 2220cm^2}{10,000cm^2}$$

$x = 0.222 m^2$

Spacing $= 0.222 m^2$.

from

Area $= 2 (LW + Wh + hL)$

$= 2((100 \times 50) + (50 \times 10) + (10 \times 100))$

$= 2(6500)$

Area $= 13,000 cm^2$

from

Plant population $= \dfrac{Area \ of \ a \ farm}{spacing}$

But $= 1 m^2 = 10000 cm^2$

$x m^2 = 13000 cm^2$

$$\frac{10000cm^2 \ x}{10,00 \ cm^2} = \frac{1m^2 \times 13000cm^2}{13,000 \ cm^2}$$

$x = 1.3 m^2$

Area $= 1.3 m^2$.

$P.P = \dfrac{1.3 m^2}{0.222 m^2} = \underline{6 \ plants / ha}$

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2. b) Then x =

$$6 = 1.3 m^2$$

$$x = 10,000 m^2$$

$$\frac{1.3 m^2 x}{1.3 m^2} = \frac{6hx 10,000 m^2}{1.3 m^2}$$

$$x = 46,154 \text{ plant / ha}$$

∴ The number of plant with will be available to establish in 1ha of a pasture land is 46,154 plant / ha.

c)   Data given In experimental set Up 2.

Spacing = 60 cm × 75 cm

$$= 4500 cm^2$$

$$1m^2 = 10,000 cm^2$$

$$x m^2 = 4500 cm^2$$

$$\frac{x m^2 \, 10,000 cm^2}{10,000 cm^2} = \frac{1m^2 \times 4500 cm^2}{10,000 cm^2}$$

$$x = 0.45 m^2$$

Spacing = 0.45 m²

Area = 2 (Lw + Wh + Lh)

Area = 2 ((100×80) + (80×10) + (100×10))

Area = 2 (9800)

Area = 19600 cm²

Area = 19,600 cm²

$$1m^2 = 10,000 cm^2$$

$$x m^2 = 19,600 cm^2$$

$$\frac{x m^2 \, 10,000 cm^2}{10,000 cm^2} = \frac{1m^2 \times 19600 cm^2}{10,000 cm^2}$$

$$x = 1.96 m^2$$

∴ Area = 1.96 m²

2. c)   From

Plant population $=\dfrac{\text{Farm Area}}{\text{Spacing}}$

$P \cdot p = \dfrac{1 \cdot 96 m^2}{0 \cdot 45 m^2}$

$P \cdot p = 4 \cdot 355$ plants. or 5

From.

4.355 plant.

$5 = 1 \cdot 96 m^2$

$x = 10,000 m^2$

$\dfrac{x \, 1 \cdot 96 m^2}{1 \cdot 96 m^2} = \dfrac{5 \times 10,000 m^2}{1 \cdot 96 m^2}$

$x = 25,511$ plants / ha.

25511 plants $= x g$

$1 ha / $ plant $= 0 \cdot 5 g$.

$x = \dfrac{0 \cdot 5 g \times 25511 \text{ plants} / ha.}{1 \text{ Plants} / ha}$

$x = 12,755 g$

$1 kg = 1000 g$

$x kg = 12,755 g$

$\dfrac{1 kg \times 12755 g}{1000 g} = \dfrac{x \times 1000 g}{1000 g}$

$x = 13 kg$

∴ The amount of viable seeds in kilograms that will be required to plant in 1ha of pasture land is 13 kg.

2.	d) i) Climate of the soil ; This means that for the space to be available and enough the climate like temperature is considered.	
	ii) Nature of the soil. The soil with low water holding capacity require the little space for the plant to maintain moisture	
	iii) Type of crops grown ; There crops can be those with strong stem and therefore are not needed to crowd together.	
	iv) Resistance of the crop variety. Involves those plant / crops that are resistance to any environmental condition.	
	v) Size of the farm area and number of plants.	

Extract 22.2: *A sample of the candidates' incorrect responses in question 2.*

In Extract 22.2, the candidate responded incorrectly in all parts of the question. He/she lacked knowledge and skills in the subject matter.

2.3.3 Question 3: Crop Science and Production

In this question, candidates were provided with specimen C (tomato plant affected with bacterial wilt disease) with the following scenario: When fruits of specimen C began to mature, a farmer observed abnormalities in the field. Careful examination of the sample specimen by the plant pathologist indicated injuries to the roots and upon cutting the stem base and soaking it into water, a sticky, milk-white substance oozed into water. Assuming you are a plant pathologist:

(a) outline three observable signs of the disease in specimen C.

(b) identify the problem facing specimen C based on the signs and diagnostic examination observed.

(c) give the scientific name of the causative agent facing specimen C.

(d) briefly explain to the farmer how the specimen became infected with the agent.

(e) educate the farmer on the four conditions that encourage the spread of the problem facing the specimen C.

(f) provide advice to the farmer on the six measures that can be taken to rescue the specimen. The question tested candidates' knowledge and skills in plant diseases.

The question was attempted by 784 (100) candidates, whereas 16 (2.04%) scored from 2.5 to 5.0 marks, 176 (22.45%) scored from 5.5 to 8.5 marks and 592 (75.51%) scored from 9.0 to 14 marks. Figure 23 presents the candidates' scores in the question.
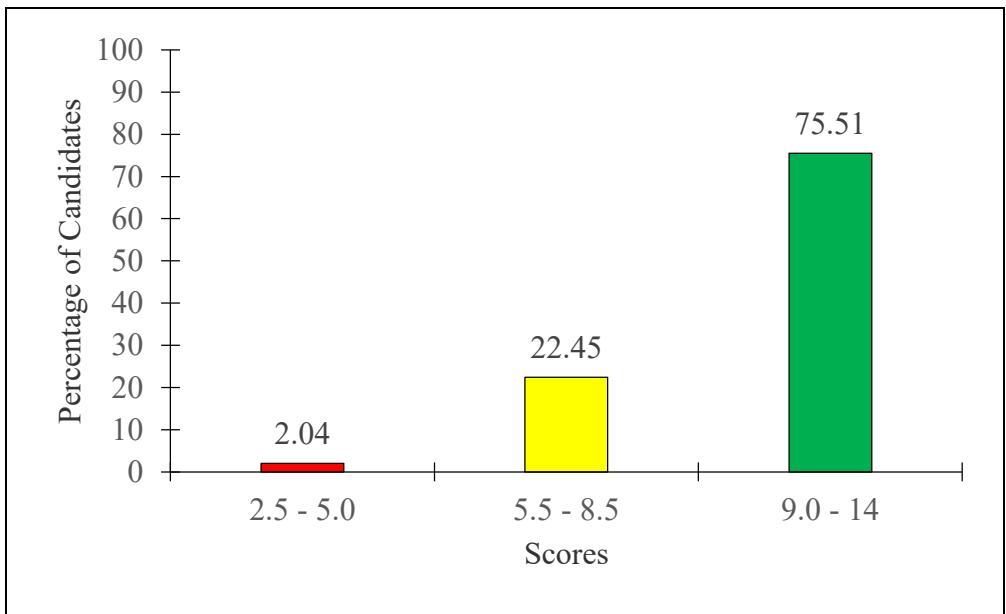
Figure 23: *Distribution of the Candidates' Scores in Question 3*

Figure 23 denotes that 97.96 per cent of the candidates scored from 5.5 to 14 marks and 2.04 per cent scored from 2.5 to 5.0 marks. The general candidates' performance in the question was good.

Candidates who performed well in the question were 75.51 per cent. Most of them provided the correct responses in almost all parts of the question. In part (a), they managed to outline the observable signs of the disease in specimen C (tomato plant affected with bacterial wilt). In regard to this,

they demonstrating good observational skills. The responses provided were *stunted leave growth*, *yellowing and browning of leaves*, *wilting of the plant*. In part (b), they were able to identify the problem facing specimen C as *specimen is infected with bacteria causing bactrial wilt disease*. In part (c), they managed to give the scientific name of the causative agent facing specimen C as *Ralstonia pseudomonas solanacearum*.

Likewise, in part (d), the candidates managed to give the explanations on how the specimen became infected with the agent. The correct response given was such as *the bacteria enter the plant through injuries caused by nematodes and physical damage by working tools in the roots and clog themselves into the stem particularly in xylem vessels*. In part (e), they were able to educate the farmer on the four conditions that encourage the spread of the problem facing specimen C. The correct responses given were such as *poor plant spacing*, *presence of root feeding insects such as nematodes that damage the roots and leave the gaping holes*, *poor soil such as infertile*, *acidic*, *heavy clay* and *poor drained soil*, *hot and humid conditions*, *presence of water run off that carry* and *spread bacteria causing wilt*, *presence of weeds that act as hosts without showing any symptoms*. *Many weeds harbour the bacteria in the roots and use of infected grafts and contaminated tools*. In part (f), they managed to provide the candid advice to the farmer on the six measures that can be taken to rescue the specimen. The candid advice provided were such as; *try high beds to improve drainage*, *control root knots nematodes that weaken plants and make them more prone to disease*, *choose resistant varieties*, *space the plants further apart to ensure good air circulation*, *use crop rotation*, *wash hands after handling infected plants and pay attention to farm hygiene*, *flood the field 1-3 weeks before planting the specimen*, *remove and destroy infected plants*, *reduce irrigation frequencies*, *drain the field quickly after rain and maintain the soil pH at 6.2-6.5 which is ideal for tomato*. The responses indicate competence in the subject matter. Extract 23.1 presents a sample of the correct responses from one of the candidates.

3. (a) Observable signs of the disease in specimen C.

    i) The wilting of the foliage.

    ii) The foliage remained green.

    iii) The loss of rigidity of the foliage

(b) The problem facing the specimen C is BACTERIAL WILT.

(c) The scientific name of the ~~substance~~ causative agent is *Pseudomonas solanacearum.*

(d) "The specimen become infected with the agent in a way that May be during cultivation or tillage the roots of the plant were damaged so bacteria (specifically Pseudomonas solanacearum) passes through the damaged roots up the stem blocking the movement of water, In this way the specimen become infected with the plant."

(e) Conditions that encourage the spread of the problem facing specimen C.

    1. Root damage.
The damage of the root either during cultivation or in any other way, the bacteria May eacily passed through damaged root and cause the spread of the problem.

    2. High pH in moisturedsoiL.
The high pH on the soil May support the growth and survival of the bacteria (p Pseudomonas solanacearum) thus encourage the spread of the problem facing specimen C.

3. (e) 3. The temperature above 75°F.
The bacteria causing the disease is made active and favoured by the temperature above 75°F, so this increase their survival and hence the spread of the problem facing specimen C.

4. The presence of root knot ~~nemado~~ nematode.
Root knot nematode usually cause damage of the roots of the plants so presence of root knot nematode damaging roots ensure the spread of bacteria and hence spread of the problem facing specimen c.

(F) Measures that can be taken to rescue the specimen.
1. Avoiding the root damage.
Inorder to rescue the specimen from the problem, damage of the roots should be avoided during cultivation or other activities inorder to limit the movement of bacteria.

2. Controlling the root knot nematode
Inorder to rescue the specimen from the problem, root knot nematode should be controlled inorder to avoid conditions that cause damage of the roots.

3. Rotation of the crops.
The rotation of crops should be practised inorder to discourage the continuity of the bacterial life. Rotation of crops such as pepper, eggplant should be avoided as they are succeptible to bacteria but crops that can be used in rotating season should be Maize, beans.

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3. (F) 4. Planting resistant varieties
The varieties which are resistant to bacterial attack (attack by *Pseudomonas solanacearum*) should be planted inorder to withstand the condition.

5. Avoiding high pH in moistured soil.
Since high pH supports the survival of the bacteria, it should then be avoided so that the condition for survival of bacteria are discouraged hence plant is rescued.

6. Avoiding temperature above 75°F and Removal of affected plant
The temperature above 75°F supports the survival of the bacteria causing the problem so, It should be avoided inorder to rescue the plant also the affected plant should also be removed from the field.

Extract 23.1: *A sample of the candidates' correct responses in question 3*

In Extract 23.1, the candidate provided the correct responses in almost all parts of the question except in part (a), where he/she failed to outline the observable signs of the disease.

Data analysis demonstrates that 22.45 per cent of the candidates performed averagely. Most of them correctly responded in part (f). The candidates provided partially correct responses in parts (a), (b) and (e). Furthermore, they incorrectly attempted parts (c) and (d). This implies that the candidates had partial understanding of the disease.

On the other hand, 2.04 per cent of the candidates had a weak performance. Most of them responded incorrectly in nearly all parts the question. In part (a), they failed to outline the observable signs of the disease in specimen C. Some of the candidates provided the signs of fusarium disease such as *bacterial ooze, fruit spot and necrosis*. Others gave a variety of the signs of other diseases such as *water soaking lesion, dropping of fruits, leaf spot, and lesion on the stem and scorching*. In part (b), they were unable to identify the problem-facing specimen C. They provided names of different diseases such as *mosaic disease, leaf spot, cankers, gummosis and streak disease*. In part (c), they failed to give the scientific name of the causative agent. They wrote names of different organisms such as *Meloidogyne javanica, Xanthomonas capentris, Lycoperscon esculentum* and *Anthromonas compestris*.

Similarly, in part (d), the candidates failed to explain how the specimen became infected. Rather, they provided a variety of the incorrect responses such as *through irrigation*, *through mono cropping*, *through affected plants*, *due to poor field practice*, *due to poor space between crops*. In part (e), they provided the incorrect responses on the conditions that encourage the spread of the disease, such as the *use of certified seeds*, *use of legislative/ plant quarantine, crop rotation*, *destroying crop residues, use of closed season and deep ploughing* – which are the ways of preventing plant diseases. In part (f), they failed to provide the candid advice to the farmer on measures that can be taken to rescue the

specimen. Some of them provided the cultural methods of controlling crop diseases and other incorrect responses such as *early planting and harvesting, use of cover crop, high organic matter content, observing dead season and early sowing and applying hot water in the soil.* This indicates that the candidates were not knowledgeable about the disease. Extract 23.2 presents a sample of the incorrect responses from one of the candidates.

3.	a. - leaf curling.	
	- falling of premature leaf	
	- Stunted growth.	
	b. - The problem facing specimen X is shortage of water to that plant so make it to fail to grow.	
	c. (Pseudomones solanacearum)	

d. The problem can rive when the farmer fail to provide water for growth of that plant and made the causative agent to attract that plant and viart to absorb that remain to that plant and made the plant to be get that problem because of shortage of water to that plant.

e. - Eraption of weed. This can cause the plant to compete with weed inorder to get water.
- Mulching- Sometime mulching material can handle the pest hest so they can spre ad from one plant to another.
-

3. f .- Controlling of weed. Because the weed can compete with plant by taking the nutrient, space, water which can cause that plant to be attracted by disease

- Application of water. This can be used to control the problem because the source of problem is shortage of water.

- Planting of resistant varieties. This can help for the plant to adopt in any environmental condition without being affected by any diseases.

- Mulching. This can be used to rescue the specimen because can be used to increase the moisture content in the soil.

- Spraying of chemical. This can be used to kill the causative agent of the specimen and make the plant to continue growing.

- Early planting. This can be done early in rain season inorder to overcome the shortage of water to the plant.

Extract 23.2: *A sample of the candidates' incorrect responses in question 3.*

In Extract 23.2, the candidate provided the incorrect responses in almost all parts of the question except in part (a) where he/she scored one point and two points in part (f).

3.0 ANALYSIS OF THE CANDIDATES' PERFORMANCE IN EACH TOPIC AND FIELD

This section presents an analysis of the candidates' performance in different topics and fields examined in the year 2023. All 20 topics in the Agriculture Syllabus were examined in theory papers and 2 fields in a practical paper.

Data analysis on the performance of the candidates indicates that 14 topics and 1 field had a good performance, 4 topics and one field average performance and 2 topics had a weak performance. The candidates had a

good performance in the topics and field of *Introduction to Animal Health* (99.49%), *Pasture Agronomy* (99.49%), *Introduction to Weed Science* (96.94%), *Environmental and Technological Challenges in Agricultural Development* (93.75%), *Introduction to Soil Chemistry* (93.12%), *Workshop Technology* and *Farm Structures* (90.43%), *Introduction to Animal Nutrition* (90.43%), *Agricultural Production Economics* (84.31%), *Introduction to Soil Science* (78.56%), *Crop Science and Production* (75.13%), *Crop Pests* (67.35%), *Introduction to Agricultural Prices* (64.67%), *Fundamental of International Trade* and *Farm Planning* (63.14%). Such a performance has been contributed by the candidates' possession of adequate knowledge and skills in the subject matter.

The candidates had an average performance in the topics of *Livestock Reproduction*, *Breeding and Improvement* (59.18%), *Plant Diseases* (58.48%), *Farm Power* (58.04%), *Plant Breeding* (56.12%) and field of Soil *Science* (42.73%). The performance was caused by the possession of partial knowledge and skills in the subject matter.

On the other hand, a weak performance was demonstrated in the topics of *Farm Mechanization and Machinery* and *Introduction to Irrigation* (27.98%). This performance is attributed to the lack of knowledge of the subject matter and misconceptions. The analysis of the candidates' performance in each topic and field is summarized in appendix 1.

4.0 CONCLUSION AND RECOMMENDATIONS

This section gives an overview of the analysis and proposes measures to improve candidates' performance in future examinations.

4.1 Conclusion

In this examination 99.87 per cent of the candidates passed, which is a good performance. Data analysis indicates that 2.17 per cent of the candidates scored grade B, 36.86 per cent scored grade C, 47.19 per cent grade D, 13.39 per cent grade E, 0.26 per cent grade S and 0.13 per cent grade F.

Furthermore, the analysis of the responses indicates that the candidates who scored high marks had a good understanding of the subject matter and fulfilled the requirements of examination questions. These made them provide correct responses.

Further analysis shows that the candidates who scored lower marks had a low understanding of the subject matter. This limited them from providing correct responses or attempting examination questions. They also failed to follow the instructions of questions. Their failure to follow instruction is attributed to either misconceptions of concepts or inability to perceive action verbs used for asking questions.

4.2 Recommendations
The following are recommended to improve the performance of candidates in future examinations:

(a) use of better and learner centred teaching methods to enhance students' engament in the teaching - learning process. The method (s) to be adopted should focus on the needs of the topic and stages of the lesson development. For example;

(i) students can better understand the adjustments needed on the tractor mounted mouldboard plough on the topic of *Farm Mechanization and Machinery* through demonstration than lecture. Hence, demonstration is recommended for building up new knowledge and enabling students to learn by seeing and doing.

(ii) the effectiveness of the drip irrigation in minimizing disease outbreak and weed growth compared to the sprinkler irrigation and the strengths of the tractor over the animal power can be more appreciated by conducting study visits. That is, study visits should be carried out to reinforce and consolidate knowlege and broaden students' knowlege through interaction with proffessionals.

(iii) The dermination of soil Ph can be better done through laboratory work. The technique builds the new

knowledge, encourages creativity, improves memory and develop critical analytical skills.

(iv) students can best learn the breeding methods for resistance in the topic of *Plant Breeding* by watching videos showing the practices. That is, video learning can be used to reinforce and consolidate knowledge due to its positive ability in increasing motivatio and interest among learners.

(v) Students can learn different plant diseases such as blossom end rot in the topic of *Plant Diseases through* teaching aids in the classroom and the fieldwork. Real plants affected by blossom end rot can be used as teaching aid to build up the new knowledge. The strategy helps students to remember concepts and improve their cognition. Field work in an area affected by diseases can for instance reinforce the knowledge. This is because the technique gives students a chance to develop skills in a real world situation, which supplements the classroom teaching.

(vi) Group discussions can be used to reinforce and consolidate knowledge and clear confusions in some concepts such as the reasons for the failure and disadvantages of the artificial inseminatio in the topic of *Livestock Reproduction*, *Breeding and Improvement can be cleared through group discussions*. Group discussion helps to explore and interpret the topic and provides opportunity for sharing experiences.

(vii) Brainstorming is more suitable in introducing lessons for they help the instructor to determine what students know about the subject matter. It is also useful in doing reflection. Questions and answers diagnose students' understanding of materials and can be used to review, restate and summarize important points. The strategy is a way of engaging with students to keep attention and

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reinforce their participation. It develops interest, promotes inquisitive mind and enable students to think critically.

(b) Students should be emphasised to carefully read examination questions before attempting them to clearly understand the requirements in terms of content and scope. For example, the action verb "analyse" used for preventive measures of plant diseases on the topic of *Plant Diseases* requires candidates to examine the measures in detail to interpret how they prevent diseases. It is observed that some candidates tend to outline preventive measures instead of analysing them as required.

(c) Regular assessment and evaluation should be part of the teaching and learning process. That is, teachers should regularly provide assignments, activities and tests to evaluate the degree of understanding of students. Remedial classes can also be introduced when the need arises to promote learning.

The Candidates' Performance in the Topics and Fields in ACSEE 2023

S/N	Topic/Fields	Question No.	Percentage of the candidates who scored the average of 35% or above	Comments
1.	Introduction to Animal Health	7 (P2)	99.49	Good
2.	Pasture Agronomy	8 (P2)	99.49	Good
3.	Introduction to Weed Science	3 (P2)	96.94	Good
4.	Environmental and Technological Challenges in Agricultural Development	10 (P2)	93.75	Good
5.	Introduction to Soil Chemistry	3,4 (P1)	93.12	Good
6.	Workshop Technology and Farm Structures	6 (P1)	90.43	Good
7.	Introduction to Animal Nutrition	6 (P2)	90.43	Good
8.	Agricultural Production Economics	8 (P1)	84.31	Good
9.	Introduction to Soil Science	1,2 (P1)	78.56	Good
10.	Crop Science and Production	2,3 (P3)	75.13	Good
11.	Crop Pests	4 (P2)	67.35	Good
12.	Introduction to Agricultural Prices	9 (P1)	64.67	Good
13.	Fundamental of International Trade and Farm Planning	10 (P1)	63.14	Good
14.	Livestock Reproduction, Breeding and Improvement	9 (P2)	59.18	Average
15.	Plant Diseases	1,2 (P2)	58.48	Average
16.	Farm Power	5 (P1)	58.04	Average
17.	Plant Breeding	5 (P2)	56.12	Average
18.	Soil Science	1 (P3)	42.73	Average
19.	Farm Mechanization and Machinery and Introduction to Irrigation	7 (P1)	27.98	Weak

KEY:

P 1 – PAPER 1
P 2 – PAPER 2
P 3 – PAPER 3