INTRODUCTION TO AGRICULTURE

1. Name **three** branches of agriculture.

- **Crop production/ crop husbandry**
- **Animal production/ animal husbandry**
- **Agricultural economics**
- **Agricultural engineering**
- **Soil science**

1. Give **two** features which characterize intensive farming.

- **Land is maximally utilized**
- **Permanent labour is maximally used.**
- **Yields are high per unit area**
- **Much/ Huge capital is used**
- **Produce for sale**
- **Mechanization done**
- **High quality products**
- **High level skill is required**

2. State **two** characteristics of extensive farming system.

- **Carried on large tracts of land.**
- **Low capital investment per unit area.**
- **Low labour input per Unit area.**
- **Low level of management**
- **Low yields per unit area**

3. Name **five** activities that may be undertaken in organic farming.

- **Use of organic manures**
- **Crop rotation**
- **Practice early planting.**
- **Planting resistant varieties.**
- **Practice minimum tillage.**
- **Use extracts from pepper, use of ash to control pests**
- **Use medicinal plants to control parasites and diseases**
- **Maintain field hygiene.**
- **Cover cropping,**
- **Mulching within crops**
- **Rear livestock on natural organically grown pasture**

4. Give **four** benefits of organic farming.

- **Provides food for soil microbes;**
- **Reduces pollution of environment by inorganic chemical residue / Environmental friendly**
- **Improves soil structure.**
- **Replenish soil nutrients.**
- **Enhances soil water infiltration and retention.**
- **It buffers soil pH / reduce rapid pH changes**

5. State **two** ways in which agriculture contributes to industrial development

- **Provide raw materials for industries.**
- **Provide market for industrial goods.**
- **Source of capital for starting industries.**

6. Differentiate between the following terms as used in Agriculture:-

(a) Olericulture and floriculture

- **Olericulture is the production of vegetables while Floriculture is the production of flowers**

(b) Apiculture and aquaculture

- **Aquaculture is the rearing of fish in fish ponds while Apiculture is the keeping of bees for honey**

7. Name **two** systems of farming practiced in Kenya

- **Intensive**
- **Large scale**
- **Small scale**
- **Extensive**

8. a) Give any **two** farming methods.

- **Organic farming**
- **Nomadic Pastoralism**
- **Mixed farming**
- **Shifting cultivation**
- **Agroforestry**

b) State **two** roles of Agriculture in the economy of Kenya
- **Supplies food**
- **Provides employment**
- **Source of foreign exchange earnings**
- **provide market for industrial goods**
- **Source of capital**
- **Source of raw materials for industries.**
- **Leads to improvement of infrastructure in agricultural areas**
- **Fosters international relationship**

c) Name **two** areas of scientific study which show that Agriculture is a science
- **Pathology**
- **Entomology**
- **Parasitology**
- **Genetics**
- **Soil science**
- **Ecology**
- **Agricultural Engineering**
- **Agronomy**

9. List any **Four** advantages of mixed farming
- **Mutual benefit between livestock and crops (manure is used to improve soil fertility and crop residues are used to feed livestock)**
- **Income is earned throughout the year**
- **Draught animals such as oxen provide power for various farm operation**
- **Enables good distribution and use of farm power.**
- **It ensures maximum utilization of land, labour and management**
- **A way of diversification of production against total crops failure / livestock losses by either pests ,parasites or diseases**
- **Farmer gets a more balanced diet from both crop and livestock products.**

10. State **three** disadvantages of mixed farming.
- **Labour for both crops and livestock is difficult to manage**
- **Technical advise for both crops and livestock is difficult to obtain**
- **The farmer's interest may be divided.**
- **It is expensive to run the two enterprises.**

11. What is Arable farming?
This is the production of crops on cultivated land in pure or mixed stands.

12. List any **Four** advantages of mixed farming.
- **Arable farming – growing of crops.**
- **Livestock farming –rearing /keeping farm animals.**

13. **Distinguish** between pastoralism and nomadism as used in livestock production
- **Pastoralism is the rearing of livestock on Natural pastures whereas Nomadism is moving from one place to another with livestock**

14. State **two** factors that determine the scale of production.
- **Level of technology**
- **Availability of land**
- **Availability of capital**
- **Availability of skilled labour**

15. Define organic farming
- **It is a method of farming in which crop growing and livestock rearing is done without using agricultural chemicals.**

16. Give **two** advantages of organic farming in relation to environmental conservation.
- **Production of healthy products which do not have any chemical residue**
- **It prevents chemical pollution of water sources**
- **It enhances conducive environment for the multiplication of useful soil organisms**

- **Organic matter acts as food for soil organisms**

17. a) Why is agriculture regarded as a science?
- **It entails application of intellectual and practical activities through observation, experimentation and analysis**

b) State **four** areas used in agriculture that make it be regarded as a science
- **Scientific study of crop diseases (pathology)**
- **Scientific study of insects and their control (entomology)**
- **Agricultural engineering (soil water conservation and machines)**
- **Scientific study of soils /soil science/Pedology**
- **Genetics in plant and animal breeding**
- **Ecology**

18. Give **two** reasons why ranching is important in the arid and semi arid areas of Kenya.
- **Animals can survive and do well in areas where crop production is not possible**
- **Pasture improvement in these areas help to increase the land carrying capacity**
- **Animals can be moved with ease inside an enclosed area in search of food and water**
- **Helps relieve population pressure in high potential areas**
- **It is an important way of earning a livelihood in dry areas**

19. **What** is floriculture?
- **It is the growing of flowers e.g. roses and carnations.**

20. Define the following terms as used in Agriculture
(i) Olericulture
- **Growing of vegetables such as French beans, cabbages and tomatoes**

(ii) Pomoculture
- **Growing of fruits such as avocado, mangoes, and citrus**

21. Give **three** branches of horticultural farming.
- **Pomoculture / fruit farming**
- **Floriculture / flower farming**
- **Olericulture / vegetable farming**

22. Agriculture is said to be a source of market for some industrial products **name four** products
- **Pesticides e.g. insecticides, acaricides, molluscides, rodenticides**
- **Livestock feeds**
- **Fertilizers**
- **Drugs for livestock**
- **Herbicides to control weeds**
- **Farm tools, equipment and machinery**

23. Define the term agriculture
- **The art and science of growing crops and rearing livestock.**

24. Give **two** factors that discourage the practice of shifting cultivation in modern agricultural practice.
- **Individual land ownership.**
- **Dense population**
- **Modern farming practices e.g. use of fertilizers**

25. State **four** conditions under which shifting cultivation is favourable.
- **Abundant land**
- **Where population is sparse/low**
- **Where number of livestock per unit area is low**
- **Where land is communally owned/not individualized**

26. **State two** advantages of shifting cultivation
- **Restores soil structure**
- **Reduces chances of pests and disease build – up by breaking their life cycles**
- **Allows land to rest resulting in nutrient build- up / Soil regain fertility**

- **Has low capital requirement.**
- **No land disputes as land ownership is not individualized.**

27. State **two** disadvantages of shifting cultivation.
- **low total yield per unit area**
- **Time is wasted in shifting and building structures**
- **There are no incentives to develop land and conserve soil and water**
- **Not applicable in densely populated areas**
- **Perennial crops cannot be grown**

28. Give four environmental benefits of agro-forestry trees.
- **Improves the hydrological cycle.**
- **Improve /moderates the micro climate around the crops.**
- **When trees are cut leaves decompose leading to recycling of nutrients**
- **Acts as wind breaks and reduce soil erosion**
- **Canopy of leaves intercepts rain drops preventing splash erosion**

29. Give four factors that should be considered when choosing the type of farming system to be practiced.
- **Resources available**
- **Environmental factors**
- **Government policy and regulations**
- **Skills and knowledge of the farmers on the enterprise in question.**
- **Type of enterprise to adopt.**
- **Cultural factors / traditions and taboos / religious beliefs.**
- **Aims / objectives of the farmers / enterprise.**
- **The size of the farm.**
- **Type of soil in the area.**
- **Method of land ownership**
- **Market available**
- **Climate**

30. State **four** factors to consider when identifying a farming system.
- **Size of the farm.**
- **Type of soil in the area.**
- **Environmental factors.**
- **Availability of resources/capital**
- **Cultural factors.**
- **Farmer's knowledge and skills.**

31. List **two** disadvantages of plantation farming.
- **High initial capital.**
- **Pest and disease may spread easily and fast.**
- **Encourages over dependence of one enterprise.**
- **Requires large tracts of land which may not be available.**
-

32. State **two** characteristics of a large scale farming system.
- **Requires large tracts of land**
- **Requires high capital investment**
- **Mechanization is common**
- **Skilled labour is required**
- **High level of management**
- **Processing of the product in the farm**
- **Provides more employment**
- **Low operational costs / low cost of production /economies of scale**

33. State any **two** conditions that lead to small scale farming.
- **Population pressure on land**
- **Limited capital for large scale farming**
- **Lack of incentives / market**
- **Government policy**
- **High costs of inputs.**

34. Give **four** reasons why farmers are encouraged to practice organic farming.
- **Reduced or no pollution**

- **Conserve the soil e.g. soil structure, pH e.t.c**
- **Easily carried out**
- **Produce/fetch higher prices in the international market.**
- **Materials used are easily / locally available/cheap**
- **No chemical residues in produce**

35. Give **three** importance of horticultural crops in the economy of Kenya.
- **Provide foreign exchange**
- **Earn income to farmers.**
- **Provide employment.**
- **Provide raw materials for industries**

36. a) What is plantation farming in agriculture?
- **System of farming in which one crop is grown on large scale.**

b) Give **four** characteristics of plantation farming.
- **One type of crop on a large scale.**
- **It is highly commercialized.**
- **There is economic use of machinery and labour.**
- **Good economic results where management is good.**
- **Possible to carry out research to improve soils and crops.**
- **There is labour specialization**

37. **State** the factors to consider when selecting farm enterprise.
- **The period the enterprise will take to mature.**
- **Availability of market for the produce.**
- **The prevailing climate.**
- **The size of land available for the enterprise.**
- **The current government policy relating to the enterprise.**
- **The common pests and diseases that may hinder the enterprise implementation.**
- **Technical skills required.**
- **Profit margin in relation to the price fluctuation at different times of the season.**
- **Availability of labour according to the requirement of the enterprise in question.**
- **Availability of infrastructure to allow good communication.**
- **Availability of proper security for the enterprise.**
- **Availability of enough capital/money.**
- **Availability of inputs/Raw materials.**
- **Suitability of soil to the enterprise.**
- **Social cultural factors.**
- **Topography of the land.**
- **Tastes and preferences of the farmer.**

FACTORS INFLUENCING AGRICULTURE

1. State **two** roles of humus in the soil that is beneficial to crops
- **Provide nutrients**
- **Increase soil water holding capacity**
- **Increase soil temperature**
- **Buffers soil pH**

2. State **four** general effects of temperature on crop growth and development.
- **Increase pest and disease incidences**
- **Low temperatures encourages crop diseases such as leaf rust**
- **Low temperatures may increase or lower the quality of farm produce**
- **High temperatures hastens maturity**
- **High temperature Increases the rate of evapotranspiration which may result to loss of plant moisture leading to wilting of crops**
- **Influence crop distribution**

3. Give **two** effects of low temperature on crop production.
- **Slow growth rate of crops as metabolic process is slowed e.g. Photosynthesis.**
- **High incidences of disease infection to crops such as Elgon die back, CBD etc**
- **Improves quality of crops such as tea, coffee and pyrethrum.**
- **Discourages flowering**

4. State **three** benefits of **optimum temperature** in crop production.
- **Enhances seed germination.**
- **Promotes soil microbial activities.**
- **Improves quality of crop products.**
- **Enhances high yields.**
- **Enhances vigorous growth and development.**

5. State **four** ways by which wind affects the growth of crops
- **Causes physical damage to crops.**
- **Cause rapid spread of diseases/ pests/ weeds.**
- **Can cause water stress as a result of evaporation.**
- **Causes cold stress of crops due to chilling caused by cold winds.**
- **Encourage transpiration hence water and mineral uptake.**

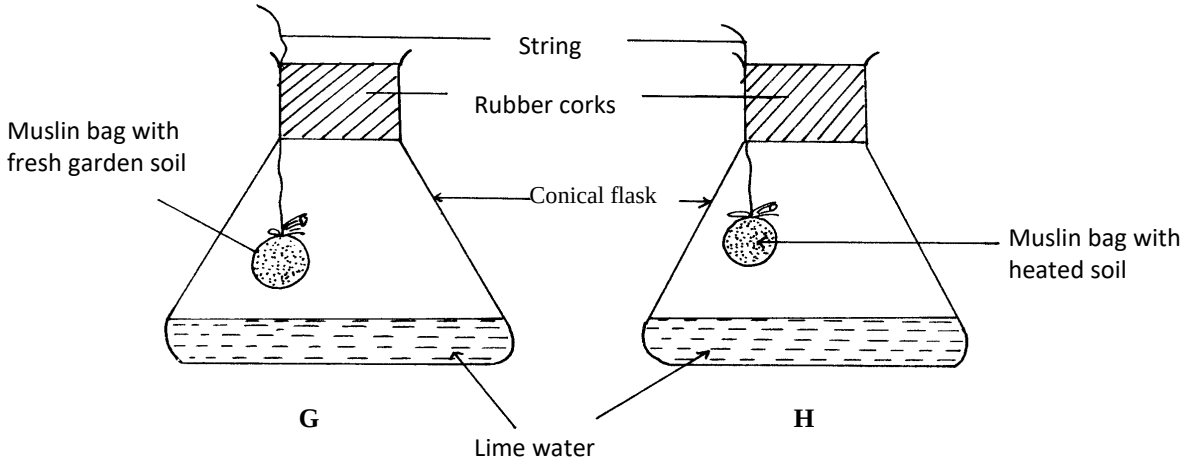
6. State **three** aspects of light that affect crop growth.
- **Light intensity**
- **Light Wavelength/quality**
- **Light duration(photoperiod)**

7. List **three** environmental factors that affect crop distribution in Kenya
- **Rainfall**
- **Soil**
- **Topography**
- **Light**
- **Wind**
- **Temperature**

8. a) State **one** physical characteristic used in classifying soil
- **Colour**
- **Texture**
- **Structure**

b) Outline the influence of physical characteristics of soil on its properties
- **Colour- affects soil temperature and hence micro- organisms in the soil**
- **Texture – affects drainage, aeration and capillarity**
- **Structure – affects aeration and root penetration**

9. Study the diagrams labeled **G** and **H**



(a) What was the aim of the experiment?
- **To test for the presence of living organisms in the soil**

(b) Give **two** reasons why the garden soil in experiment **H** is heated.
- **To kill any living organisms present in the soil**
- **To remove carbon (IV) oxide**

(c) Briefly explain what happens to the lime water in both experiments **G** and **H**
Experiment **G**
- **The lime water forms a white precipitate/ turns milky/ turns whitish**

Experiment **H**

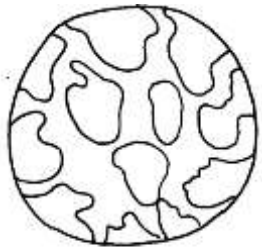
- **The lime water remains clear**

d) Give **one** reason for your answer in Question **9 (c)** above.
- **Carbon (IV) oxide which turns lime water milky in flask G would have been produced only during the respiration of living organisms present in fresh soil**

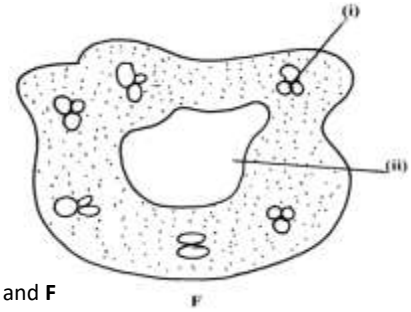
10. List **two** processes of weathering
- **Physical/ mechanical weathering**
- **Biological weathering**
- **Chemical weathering**

11. Give **four** factors that influence soil formation
- **Parents rock material**
- **Climate**
- **Time**
- **Topography**
- **Biotic/living organism**

12. The diagrams labeled **E** and **F** below illustrate some types of soil structure. Study the diagrams carefully and answer the questions that follow:



E

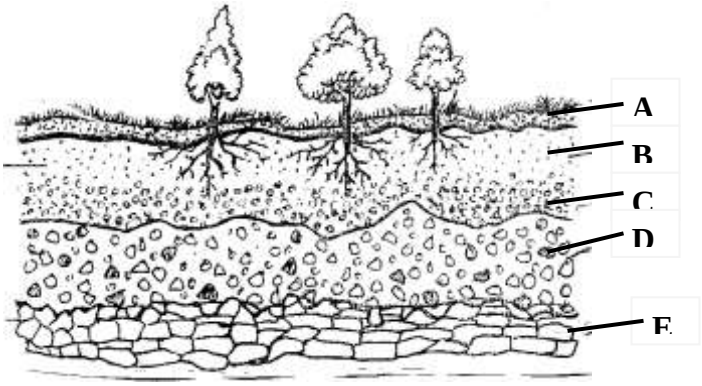


F

a) Identify the types of soil structures illustrated in diagrams **E** and **F**
- **E – Single grained structure**
- **F – Granular structure**

b) Identify the parts labeled **(i)** and **(ii)** in diagram **F**
(i) Humus with clay
(ii) Air space

13. The diagram below illustrates the earth's surface downward. Study it and answer the questions that follow.



a) Identify the structure illustrated.
- **Soil profile.**

b) Name the parts labelled **A** – **E**.
A-Superficial layer
B – Top soil / Horizon A
C – Sub soil / horizon B
D – Weathered rock / substratum / horizon C
E – Parent rock / Horizon D.

c) State merits of horizon **B**
- **Source of plant nutrients**
- **Support/anchor the crops**

- **Store of water for the crops**
- **Sources of soil micro organisms**
- **Provides air/ oxygen necessary for respiration**

d) State distinct features of horizon **C**
- **Deficient of humus**
- **Contain leached nutrients**
- **Contains more compact soil particles**
- **Presence of hard pans in some soils**

e) State the importance of horizon **D**
- **Give rise to sub soil**
- **Source of minerals**
- **Determine mineral content of soil and type of soil**

f) Give **two** reasons why knowledge of the feature illustrated on the diagram is important.
- **Shows depth of soil.**
- **Determines types of crops to grow.**
- **Influences soil fertility / amount of nutrients**
- **Influences water retention / water holding capacity**
- **Determine root penetration and expansion**
- **Determine the level of aeration**

15. (a) Define the term soil profile
- **The vertical arrangement of soil horizons / layers**

b) What does the term **transition zone** refer to in soil profile?
- **This is a zone bordering two adjacent layer of soil profile**

(c) State **four** benefits of a deep soil profile to crop production.
- **Is well drained/has better percolation/infiltration**
- **Allows better root penetration/plant anchorage.**
- **Hold more moisture for crop.**
- **Has better aeration.**
- **Allows better root development and tuber expansion.**

16. Briefly explain how sub-soil as a horizon in a soil profile can affect soil productivity
- **It may have hard pan which interfere with water infiltration**

17. List **four** ways by which biological agents can enhance the process of soil formation
- **Movement of animals in large numbers exert pressure on rocks thus breaking them**
- **Decomposition of plant and animal remains by soil micro- organisms**
- **Physical breaking of rocks by roots of higher plants**
- **Man's activities e.g. cultivation, mining and road construction**
- **Mixing up of soil by animals e.g. earth worms and termites**

18. State **four** roles played by living organisms in the process of soil formation.
- **Large animals exert pressure on rocks causing small fragments to disintegrate.**
- **Man's activities e.g. mining reduce the size of the rocks into smaller particles.**
- **Bacteria and fungi initiate breakdown of organic matter on the surface of the soil to humus**
- **Termites bring to the surface large quantities of leached nutrients from subsoil to top soil.**
- **Earthworms feed on plant tissues and their waste cements soil particles.**
- **Roots exert pressure on rocks causing splitting of rocks.**
- **Roots produce acids in the soil which dissolves minerals from rocks.**
- **Nitrogen fixing bacteria Fix nitrogen in the soil**
- **Provide nutrients in the soil when they die**
- **Their waste matter adds nutrients to the soil**
- **Their burrowing activities increase the breakdown of rock particles and improve water infiltration**
- **Plant leaves decay to form organic matter**
- **Plant roots hold the soil firmly preventing soil erosion**

19. Explain the role played by topography in soil formation
- **It influences the movement of the weathered materials hence affecting the depth of soil development;**

20. State three importance of parent material in the soil profile.
- **Determines soil texture**
- **Determines soil colour**
- **Determines type of soil**
- **Determines soil mineral composition/ Determine soil nutrients**
- **Determines soil depth.**

21. Mention **four** ways of modifying soil temperature in crop production
- **Mulching**
- **Pruning**
- **Shading of crops**
- **Irrigation**
- **Manuring**

22. State **three** properties of soil that are influenced by soil texture
- **Drainage**
- **Aeration**
- **Water-holding capacity**
- **Capillarity**

23. Name any t**hree** agents of biological weathering
- **large animals e.g. Buffaloes**
- **Man activities e.g. farming**
- **Root pressure of plants**
- **Burrowing animals e.g. moles, termites**

24. List **two** farming practices that can be carried out to increase the amount of light harnessed by crops.
- **Pruning**
- **Thinning**
- **Weeding**
- **Wider spacing**
- **Growing upright growing crops**

25. How can the following soil characteristics be determined?
i) Structure type = **General shape of aggregates**
ii) Structure class. = **Size of the aggregates**
iii) Structure grade= **Stability /cohesiveness of the aggregates**

26. Give **two** effects of HIV/Aids on agricultural production and development.
- **The infected die hence shortage of farm labour and skilled manpower**
- **Cost of living is raised / A lot of money spent on drugs at the expense of farm inputs**
- **Loss of hope / lack of motivation leads to low agricultural developments /reduced agricultural production**
- **The infected lack strength to work adequately on the farm**
- **A lot of time is spent caring for the sick at the expense of farm work**
- **A lot of funds are directed to seminars/ control the pandemic by the government instead of using the resources in agricultural department**
- **Increases the cost of labour**
- **Cost of living is raised hence Low demand of agricultural goods.**

27. a) State **four** achievements that can be made with high level of education and technology in agriculture.
- **Provides knowledge / skills on proper method & time of carrying out agricultural activities e.g. planting, spacing.**
- **Use of right type and amount of inputs**
- **Applying inputs at the right place.**
- **Making right decisions based on proper observations.**
- **Leads to positive change in attitude involving practices and consumer preference.**

b) Give **two** economic activities in Kenya that have affected Agriculture.
- **Collapse of co-operative movements and factories have affected sale of farm produce.**
- **Liberalization of the economy and world trade has led to dumping of cheaply imported goods**

28. a) State **three** farming practices that help in reducing the effects of water shortage in crop production
- **Mulching**
- **Early planting**
- **Planting early maturing crops**
- **Practising land fallowing**

- **Contour cropping/ contour farming**

b) **Give four** farming practices that help to reduce water stress in crops.
- **Mulching**
- **Irrigation**
- **Pruning**
- **Shading.**

29. In what ways can wind positively influence arable farming?
- **Has a cooling effect on crops on a hot day**
- **Bring rain bearing clouds to cause rainfall on arable land**
- **It facilitates cross pollination**
- **Facilitates dispersal of tiny seeds to increase crop population where there was poor germination percentage**

30. Differentiate between the soil structure and soil texture
- **Soil structure- Is the physical appearance of soil according to the way individual particles are arranged.**
- **Soil texture- Is the relative proportions of the various sizes of soil mineral particles.**

31. State **two** ways in which soil structure influence crop production.
- **It influence activity of microorganism in the soil**
- **Determine the type of crop to be grown**
- **Influence soil water holding capacity or retention**
- **Determine the soil fertility**
- **Influence drainage of a given soil**
- **Improves root penetration and proliferation**
- **Facilitates proper soil aeration /air circulation leading to better root development and microbial activities.**

32. List four climatic factors that influence crop production.
- **Temperature**
- **Light**
- **Rainfall**
- **Wind**
- **Humidity**

33. State **four** farming practices that improve soil structure.
- **Application of organic manure.**
- **Application of lime to the soil**
- **Organic mulching**
- **Minimum tillage**
- **Crop rotation**
- **Mixed cropping**
- **Cover cropping.**
- **Avoid over cultivation.**
- **Draining excess water / Planting eucalyptus trees**
- **Fallowing /planting grass**
- **Cultivating at the right moisture content**
- **Afforestation and reafforestation**

34. Mention four characteristics of clay soil
- **High water retention capacity**
- **Cracks when dry**
- **Hard when dry**
- **Sticks when wet/ difficult to work**
- **Poorly drained/ easily water logged**
- **Fine particles**
- **High capillarity**
- **Most have high soil pH**
- **Swells when wet**
- **High fertility/high cation exchange capacity**

35. State four ways that a farmer may use to improve the structure of a water-logged clay soil.
- **Apply organic matter.**
- **Drain excess water/ plant trees which absorb a lot of water e.g. eucalyptus.**
- **Apply lime**

- **Plant some crops like grasses**
- **Avoid over cultivation.**

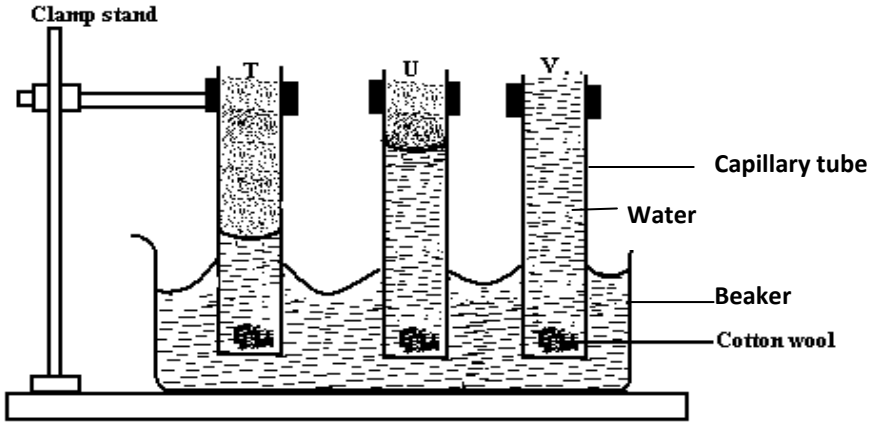
36. State **four** properties of a loamy soil
- **Well drained**
- **Fertile**
- **Have good water holding capacity**
- **Easy to dig/ cultivate**
- **Moderate texture**

37. State **four** effects of adding organic manures to sandy soils.
- **Bind soil improving structure**
- **Improve drainage/water holdings capacity**
- **Add fertility to sandy soils**
- **Impart dark colour thereby influencing soil temperature.**
- **Buffers soil pH**

38. Give any **two** methods of lowering soil pH.
- **Use of acidic fertilizers e.g. Sulphate of Ammonia**
- **Use of Sulphur**

39. State three effects of soil pH on crop production.
- **Promote microbial activities in the soil**
- **Influence crop damage by pest e.g. nematodes common in acidic soil**
- **Affects availability of certain nutrients in the soil**
- **Different crops require different pH ranges e.g. tea does well at low PH while wheat requires high pH.**
- **Affects microbial activity (most beneficial microorganisms are available at neutral pH, extreme pH lead to diseases and pests e.g. low pH favours fungi and nematodes)**
- **Determines the presence or absence of certain nutrients e.g. Sulphur**

40. The diagram below shows an experiment set up using soil types T, U and V and the observations made after 24 hours. Study the observations made after 24 hours. **Study** the diagram and answer the questions that follow



(a) **What is** the experiment set up above to study?
- **Soil water capillarity**

(b) **Name the three** types of soil **T, U**, and **V**
T- sandy soil,
U- loam soil,
V- Clay soil

(c) **What is** the characteristic texture of the soil type **T** and **V**.?
T- Coarse-textured
V- Fine-textured

(d) **State how** a farmer would improve the structure of soil type **T**.
- **Application of organic manures**

41. State four effects of high temperature on crop production.

- **Increase incidence of diseases and pests.**
- **Increase rate of growth.**
- **Increase evaporation**
- **Improve quality of crops. e.g. oranges and pineapples**
- **Reduce quality of some crops e.g. pyrethrum and tea**

42. State the effects of temperature on the quality of the following crops.
(i) Oranges
- **High temperature.-Increases the quality /sweetness / reduces the acidity of the fruits and vice versa.**

(ii) Pyrethrum
- **Low temperature - Increases the quality / increases the pyrethrin content of the flowers and vice versa.**

43. Give three **negative** impact of high temperature in crop production
- **Increase evaporation leading to wilting of crops**
- **Increase incidence of disease infection and pest infestation in crops e.g. leaf rust in coffee and aphids in vegetables.**
- **Reduces the quality of some crops e.g. pyrethrum and tea.**

44. a) Define the term chemical weathering
- **Break down a rock by chemical action resulting in a change in composition of the rock.**

b) State two agents of chemical weathering
- **Water**
- **Carbon (IV) oxide**
- **Oxygen**
- **Acid rain**
- **Weak acids from living organisms or decaying organic matter**
- **Minerals in the rock**

45. State **three** roles of soil Air in crop production
- **Necessary for root respiration**
- **Needed by aerobic soil micro organisms which are useful nitrogen fixing.**
- **Make some mineral ions available due to oxidation of organic materials.**
- **Necessary for germinations of seeds.**

46. Give three effects of soil micro-organisms which are beneficial to growth of crop plants.
- **Decompose organic matter**
- **Source of organic matter upon death and decay**
- **Help to aerate soil.**
- **Some fix plant nutrients i.e. nitrogen fixing bacteria.**

47. Name any **two** factors which influence soil colour.
- **Chemical properties of parent rock material**
- **Amount of humus / organic matter in soil.**

48. State **three** biotic factors that influence agriculture **positively**.
- **Pollinators**
- **Decomposers**
- **Nitrogen fixing bacteria**
- **Predators in crops kill pests e.g. praying mantis that feeds aphids and egret feeding on ticks in livestock**

49. Outline **three** negative effects of wind on farming
- **Causes lodging / damage / break crops.**
- **Increases the rate of evapotranspiration hence causes wilting.**
- **Blow away rain bearing clouds**
- **An agent of soil erosion**
- **Increases the spread of diseases and pests**
- **Destroys farm structures.**

50. List **three** biotic factors influencing agriculture **negatively**.
- **Pests**
- **weeds**
- **Disease causing micro-organisms /pathogens**
- **Parasites**

- **Denitrifying bacteria**
- **Predators kill livestock lowering production**

51. Explain the aspects of rainfall which influence agriculture.

(i) Rainfall reliability/ predictability/ certainty of rainfall
- **Prediction of the start of rain determines the start of land preparation and time of planting.**

(ii) Amount of rainfall
- **Different crops require their own specific amount of rainfall during their growing period.**

(iii) Rainfall intensity/ heaviness of rainfall/ strength
- **Rainfall of high intensity damages crops and cause soil erosion.**

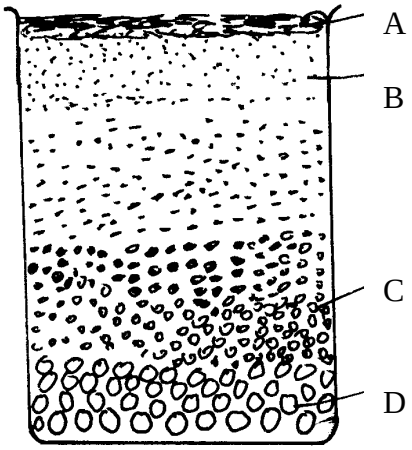
(iv) Rainfall distribution/rainfall pattern
- **Well distributed rainfall ensures a better growth and performance of the crop.**

52. Give four reasons why soil is important to crops.
- **Provides water to crops**
- **Provides minerals / nutrients to crops**
- **Gives physical anchorage to crops / physical support**
- **Gives crops/plant roots the necessary gas (oxygen) for their respiration in order to grow**

53. List two advantages of proper soil aeration in crop growth.
- **Enhances microbial / micro- organisms activities.**
- **Promotes root respiration and development of a good root system.**
- **Reduces accumulation of toxic substances in the soil e.g. iron and manganese elements.**
- **Facilitates absorption of nutrients and water by crops**

54. Define the term soil capping.
- **Development or formation of an impervious layer on the soil surface which impedes water infiltration and root penetration**

55. Form One students in Cardinal Otunga High School put some soil sample in a measuring cylinder. They added some water and sodium carbonate, then covered the cylinder with the hand and shook the cylinder for about two minutes. They left the cylinder on the bench for one hour. The result was as shown below.



i) What was the aim of this experiment?
- **To show that soil is made up of different sized particles**

ii) What was the function of the sodium carbonate in this experiment?
- **It aids in the dispersion of soil particles**

iii) Name the layers marked a, b, c and d.

A- Humus/ floating organic matter
B- Water +fine clay particles and dissolved mineral salts
C- Sand
D- Gravel

56. Give four apparatus which would be used to perform an experiment to determine the water holding capacity of a soil.
- **Measuring cylinders**
- **Beakers / containers**

- **Weighing balance**
- **Funnel**
- **Stand.**

57. List **three** physical weathering agents in the soil formation process.
- **Rainfall /moving water**
- **Wind**
- **Moving ice**
- **Temperature**

58. Mention **three** ways through which relative humidity affect crop production
- **High humidity results in less evapotranspiration.**
- **High humidity affects rates of water intake.**
- **High humidity promotes disease incidence.**
- **High humidity promotes condensation therefore making moisture available for crops growth.**

59. Name **four** human factors that influence the efficiency of agricultural production
- **Cultural practices and religious beliefs**
- **Government policy**
- **Transport and communication**
- **Levels of education and technology.**
- **Health especially HIV/AIDS scourge.**
- **Liberalization of economy.**
- **Local and/international market forces.**

60. Give **three** factors that influence soil productivity
- **Good supply of plants nutrients**
- **Good aeration**
- **Good soil depth**
- **Good drainage**
- **Abundance of useful soil organisms**
- **Adequate water retention**
- **Free from plant pests and disease causal agents.**

61. Two garden soil samples **A** and **B** weighing 100gms each were set aside in a room for some hours. 50gms of water was added to sample **A** and then weighed. The weight was 148gms. Sample **B** (100gms) was heated in an oven to 100^0C until a constant weight of 95gms was achieved. When it was further heated to 400^0C, a constant weight of 92gms was achieved

Soil sample	Weight after collection	Weight after addition of water	Weight after heating to 100^0C	Weight after further heating to 400^0C
A	100gms	148gms		
B	100gms		95gms	92gms

(a) From the above information

(i) What was responsible for the loss of weight when 50gms of water was added to 100gms of soil?

- Air was lost from the soil

(ii) What was the percentage loss?

150 – 148 = 2

$^2/_{150}$ x 100 = 1.33 %

(b) What was responsible for the loss of weight when 100gms of soil was heated to 100^0C.

- Water was lost from the soil sample.

(c)(i) What caused the change in weight when the soil was continuously heated to 400^0C from 100^0C?

- Organic matter (humus) was burnt / lost

(ii) Calculate the percentage loss in c (i) above.

95-92 = 3

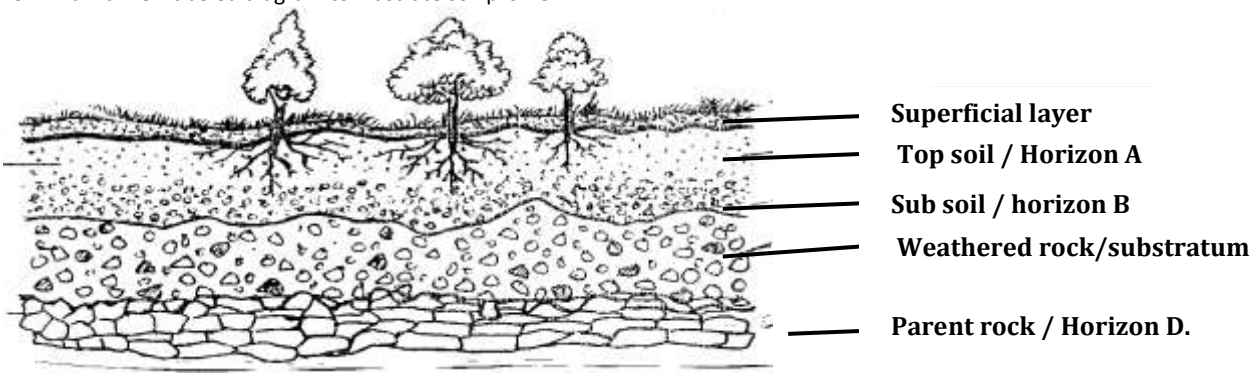
$^3/_{95}$ x 100 = <u>3.16 %</u>

(d) State **five** useful effects of the substance that was lost in sample **B** when it was heated at 400^0C.

–**Improves soil structure**
–**Adds soil nutrients**
–**Improves soil aeration and drainage**
–**Modifies soil temperature due to dark colour**
–**Improves water holding capacity of soil**

–**Buffers soil pH**
–**Provides shelter and feed for the soil micro – organisms.**

62. Draw a well labeled diagram to illustrate soil profile.



63. State four characteristics of sub – soil.
- **Poorly aerated**
- **Light coloured**
- **Rich in leached nutrients**
- **Low in organic matter.**
- **Contains less micro- organisms.**
- **Compact**

64. Name **two** categories of crops on the basis of photosynthetic light requirement.
- **Long day plants.**
- **Short day plants.**
- **Day neutral plants.**

65. State influences of soil depth to crop production.
- **Crop type to be cultivated**
- **The method of land cultivation.**
- **Moisture holding capacity / retention capacity.**
- **Root penetration.**
- **Drainage / aeration of the soil.**
- **Quantity of nutrients in the soil.**

66. State **two** ways of lowering acidity in the soil.
- **Application of lime.**
- **Application of a basic fertilizer.**
- **Soil drainage.**

67. List **four** constituents of soil.
- **Mineral matter.**
- **Organic matter (humus)**
- **Soil Air.**
- **Soil water.**
- **Living organisms.**

68. A student carried out an experiment using two soil samples, labeled F and G. The samples were put in different Petri-dishes and some drops of water added to each sample until they were moist. The student rubbed the moist soil samples between the fingers one at a time noting the feel. The results were recorded as shown in the table below.

Soil sample	Description of feel
F	Smooth and sticky
G	Rough and coarse

(a)From the results, identify the types of soil represented by sample **F**.

F – Clayey soil/ clay soil;

(b)Which of the two soil samples would be best suited for growing rice? Give a reason for your answer.
- **F / Clayey soil**
- **Reason-It holds water for a long time needed for rice growing/poorly drained**

69. a) Outline **two** ways the level of education and technology influence the efficiency of agricultural production
- **Understanding the technical language used in agriculture**
- **Application of the right amounts of inputs**
- **Correct/ appropriate measurements in farming**
- **Uses of appropriate technology**

b) List **four** benefits that Kenyan farmers can get from liberalisation of the economy.
- **Produce high quality goods**
- **Produce goods cheaply**
- **Sell goods competitively**
- **Diversification**

70. Explain how each of the following climatic factors affect crop production: Rainfall, Wind, Temperature, Light

Effects of rainfall on agriculture
- **Rainfall distribution throughout the year determines what crops to grow and when to plant**
- **Rainfall reliability-the greater the chances of receiving a given amount of rainfall that is adequate for crop growth over a given period then the greater the certainty of growing crops successfully/rainfall reliability is better in higher altitudes**
- **Rainfall amount determines the crops to grow in an area e.g. Coffee requires rainfall amount of 1500-2250mm p.a. / areas of high rainfall amounts support many crops**
- **Rainfall of high intensity damages crops**
- **Lack of rainfall results in plant wilting and low productivity / failure of rainfall results in crop failure;**
- **Rainfall of high intensity causes soil erosion / loss of soil nutrients through leaching.**

Effects of wind on crop production
- **It causes physical damage to crops / break crops hence crops grown on sheltered sides**
- **It causes water stress as a result of increased evapotranspiration**
- **It causes rapid spread of diseases, pests and weed seeds**
- **It causes stress to crops due to chilling caused by cold winds / frost**
- **It causes erosion which reduces soil fertility hence poor growth of crops / silting of water ponds;**
- **It encourages transpiration hence water and mineral uptake**
- **It increases the rate of evaporation of moisture from the soil**
- **Strong winds destroy farm structures e.g. Crop stores, flower green houses etc.**

Effects of temperature on crop production
- **Crops grow and thrive well at optimum range of temperature / most crops thrive well at temperature range of between 12.5^{o}c and 36^{o}c e.g. tea does well at temperature range of 21^{o}c – 28^{o}c**
- **High temperatures increase plant's physiological processes like photosynthesis, transpiration and germination rates**
- **It influences the quality of plant products e.g. pyrethrum, pineapples and citrus fruits**
- **High temperature hasten crop maturity**
- **It influences incidences of crop diseases / Elgon dieback, coffee berry disease, late blight diseases thrive well at low temperature**
- **High temperatures increase evaporation and transpiration rates leading to wilting of crops**
- **Altitude influences temperature and crops do well in high altitudes with low temperature.**

Effects of light on crop production
- **Light provides energy required for photosynthesis**
- **Light intensity influence rate of photosynthesis and transpiration / optimum light intensity result in high rate of photosynthesis and better crop yields**
- **Light duration / photoperiodism influences flowering of crops thus crops are classified as long –day plants, short-day plants and day-neutral plants**
- **Light wavelength / light quality influences crop growth**
- **Chlorophyll absorbs infra-red light wavelength for photosynthesis**
- **Visible light is not important to crops.**

Humidity
- **High humidity results in less evapotranspiration.**
- **High humidity affects rates of water intake.**
- **High humidity promotes disease incidence.**

- **High humidity promotes condensation therefore making moisture available for crops growth.**

71. a) **Stat**e and **explain five** factors that influence soil formation.
- **Parent rock – influence physical and chemical properties of soil**
- **Climate – influence the speed of soil formation**
- **Topography – influence the speed of soil formation also determine the maturity and profile of the soil**
- **Time – the length of time over which the soil formation process has been in action affect the depth and maturity of the soil i.e. where soil formation process has taken long, the soil is deep and mature and vice versa**
- **Living organisms – micro –organisms decompose plant and animal remains into humus**
- **large animals break rock fragments to small particles as they trample on them**
- **In vertebrates such as earthworms, termites rodents burrow into the soil mixing mineral elements with humus**

b) Describe the various edaphic factors which influence crop performance.
- **Soil forms the basis for agriculture as it's a medium from which plants get nourishment (nutrient and water).**
- **Soil textures determine water holding capacity leading to drainage, aeration, permeability and hence root growth.**
- **Soil type determines the method of irrigation to be used. It also affects waterlogging and leaching.**
- **Soil pH influences the crop to be grown presence of certain nutrients in the soil microbial activities and hence decomposition process.**
- **Soil texture accelerates the extent and the rate of soil erosion, leaching, drainage, aeration and water retention.**
- **Soil colour affects soil temperature /warmth which consequently affect rate of soil formation, decomposition of organic matter, seed germination and mineral uptake.**
- **Soil type affect crop distribution and consequently system of livestock farming e.g. ranching is suitable in poor soils.**
- **Poor soil fertility leads to low yields.**

c) **State and explain** the **three** forms in which soil water exists.
- **Superfluous water – occupies the macro–pores and is held by gravitational force, readily available to plants and easily lost because it is loosely held by soil particles not important to plants as too much water limits aeration.**
- **Capillary water – occupy the micro-pores held with greater force by soil particles. Available to plants and acts as a solvent for plant nutrients, leaves macro pores unoccupied thus allowing for aeration.**
- **Hygroscopic – forms a thin film around the soil particles. Held with greater force hence it's not available to plants, mostly available in clay soil and a little in sandy soils**

72. State **two** problems farmers face in Agricultural production.
- **Poor transport and communication**
- **Poor health (HIV/AIDS -lack of labour)**
- **Lack of technical know-how / Lack of knowledge and skills in agricultural production**
- **Poor planting materials**
- **Lack of tools and equipment**
- **Climatic changes/ Aridity**
- **Poor marketing facilities**
- **Poor storage facilities**
- **Diseases, pests and parasites**
- **Government policy**
- **Lack of capital**
- **Social factors**
- **Fluctuation of commodity prices**
- **Poor land tenure systems**

73. Describe the effects of the various biotic factors to Agricultural production

i) Pests
- **Feed on the whole or parts of the plant.**
- **Transmit crop diseases.**
- **Injure and cause secondary infection.**
- **Increase cost of production.**

ii) Parasites:
Infest livestock; suck blood, Transmit diseases, irritate the animals etc.
Parasitic weeds e.g. Striga suck nutrients from crops lowering growth of Crops

iii) Decomposers:
- **Rotting of dead plants and animals to form manure.**

iv) Pathogens
- **Causes disease in crops and animals; reduce quality and quantity of agricultural products.**

v) Predators:
- **Reduce pest population.**

vi) Pollinator
- **Cross pollination that helps in production of new and improved varieties in crops.**

vii) Nitrogen fixing bacteria
- **Increases nitrates in the soil.**

74. Explain various environmental conditions that may lead to poor crops yields
- **Poor soil type resulting into leaching or water logging**
- **Extreme relative humidity**
- **Extreme of light intensity**
- **Topography / some altitude i.e. very high may limit crop growth**
- **Infertile soil /poor soil leads to low yield due to lack of essential nutrients**
- **Inappropriate pH leading to fixation of nutrient/in availability of nutrients i.e. phosphorous not available at very low pH.**
- **Less/unreliable /too much rainfall not suitable for good growth of crops.**
- **Excessive wind causes damage of branches /lodging /excessive loss of water.**
- **Excessive /extreme light damage photosynthetic cells hence reduce rate of photosynthesis**
- **Hailstones damage leaves, flower and fruits of crops.**
- **Extreme temperatures(too low or high) affect process of photosynthesis hence affect the yield of crops**

75. Discuss **five** negative effects of liberalization of agricultural market to farming in Kenya.
- **Dumping of cheap products in the local market reducing demand for local products**
- **Drop in prices of local agriculture products discouraging farmers**
- **Close down of local industries due to lack of raw materials**
- **Loss of employment/jobs**
- **Low farmers income/lack of motivation**
- **Health risk to people if proper check is not followed**

CROP PRODUCTION I (LAND PREPARATION)

1. Give **three** factors that determine depth of ploughing during land preparation
- **Presence of certain types of weeds e.g. Couch grass**
- **Source of power.**
- **The implement available.**
- **Type of crop to be planted/rooting system**
- **Type of soil**
- **Climatic conditions**
- **Soil moisture content during ploughing time.**

2. State **three** methods for land clearing
- **Slashing**
- **Burning**
- **Tree felling**
- **Use of herbicides / weed killers**
- **Chaining**
- **Destumping**

3. List **four** reasons for cultivating land before planting
- **To improve soil aeration.**
- **To Increase water infiltration and assist in the conservation of moisture in the soil**
- **To incorporate organic matter into the soil and encourage decomposition**
- **It brings nutrients present in the subsoil to the top soil**
- **To destroy pests and disease causing organisms**
- **It loosens the soil for easy germination and root development**
- **It loosens the soil for easy planting/operation**

4. a) What is minimum tillage?
- **It is the least number of cultivation operations either during preparation of the seed bed or during the management of the crops.**

(b) Give **four** farming practices that help in achieving minimum tillage.
- **Timing cultivation e.g. early/late weeding leads to a clean seedbed**

- **Uprooting/slashing/grazing to control weeds**
- **Application of herbicides in controlling weeds**
- **Use of mulch on the soil surface**
- **Restricting cultivation to the area where seeds are to be planted**
- **Establishing a cover crop on the field**

5. Give reasons for practicing minimum tillage in land preparation.
- **To reduce the cost of cultivation or ploughing by reducing the number of operations.**
- **To control soil erosion; mulching and cover cropping greatly reduce chances of soil erosion,**
- **To maintain soil structure; continuous cultivation destroys soil structure hence is avoided.**
- **To prevent the disturbance of roots and underground structures e.g. tubers, bulbs etc.**
- **To prevent exposure of humus to adverse conditions e.g. the sun's heat that causes volatilisation of nitrogen.**
- **To conserve moisture, Continuous cultivation exposes the soil to the sun's heat thus enhancing evaporation of moisture.**

6. State **four** disadvantages of minimum tillage
- **The less porous surface increased soil erosion especially in heavy soils**
- **Difficulty in weed control**
- **Speed of planting is reduce due to large amount of residues in the soil and big clods**
- **Leads to accumulating of soil borne pests and diseases**

7. **Why** is it undesirable to carry out minimum soil tillage operation before planting? **Give four** reasons.
- **Development of hard pan**
- **Partial control of weeds**
- **Build up of pests and diseases in the soil**
- **Unfavourable rough tilth for planting**
- **Incomplete mixing of trash with soil for rotting**
- **Partial recycling of leached nutrients.**

8. List **five** factors that determine the number of cultivations when preparing a seedbed
- **Soil moisture content.**
- **Type of soil.**
- **Cost of operation.**
- **Size of seed/ type of planting material/ type of crop.**
- **Type of machinery available / use of tractors.**
- **Topography / gradient of the land/ liability of soil erosion.**
- **Skills of the operator.**
- **Initial conditions of the land/ the cropping history of the land.**
- **Time available to carry out the operation before planting.**

9. Give **four** factors that determine the number of secondary cultivation operations
- **Type and size of planting material;**
- **Topography/slope f land;**
- **Soil moisture content;**
- **(Initial) condition of land/amount of vegetation on the land;**
- **Capital available**
- **Type of implement used;**

10. List **three** factors that determine the choice of correct implements for primary tillage.
- **Condition of the land**
- **Type of tilth required/type of crop to be grown.**
- **Depth of cultivation**
- **Land topography**
- **Skills of the operator/Available skills**
- **-Soil type**
- **-Capital available**

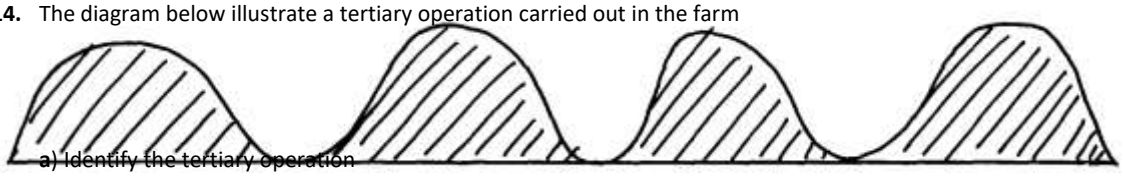
11. State **four** physical conditions of the seedbed that need to be changed to facilitate germination
- **Size of soil clods (made small or medium size)**
- **Appropriate soil depth**
- **Soil looseness**
- **Should be weed free**
- **Soil moisture content improved**

12. State **four** importance of sub soiling as a tertiary operation

- **Brings leached nutrients to the surface**
- **Breaks hard pans**
- **Promotes aeration of the soil**
- **Promotes water infiltration**
- **Ensures better root penetration**
- **Mixing top soil with the subsoil**

13. Outline **four** advantages of rolling in seedbed preparation
- **Press the seeds against the soil moisture**
- **Ensure uniform germination**
- **Controls removal of small seeds by wind**
- **To compact loose soil**
- **To compact soil of fine tilth/ Breaks large soil clods**
- **To prevent small seeds from being carried by wind.**
- **To prevent soil erosion**
- **To increase seed soil contact**

14. The diagram below illustrate a tertiary operation carried out in the farm



a) Identify the tertiary operation
- **Ridging**

b) (i) State the importance of the tertiary operation identified in **(a)** above
- **Allow easy harvesting of root crop s**
- **Planting of root crops**
- **Opening furrow e.g. for irrigation or planting crops like sugar cane**
- **It encourages root development and expansion**
- **It helps to conserve soil and water on sloppy land**

(**ii)** Give **two** other tertiary operations carried out in the field besides the one identified above
- **Rolling**
- **Leveling**
- **Sub-soiling**

15. Give **two** reasons why it is advisable to cultivate the field during the dry season
- **Leads to timely planting**
- **Weeds are appropriately controlled especially the perennial ones such as couch grass**
- **Farmers take advantage of availability of labour reducing the cost of labour**
- **Control of soil borne pests**
- **Gives time for better organic decomposition / vegetation gets time to dry and decompose faster**
- **Allows enough time for other operations**
- **Promotes air circulation in the soil**

16. Give **four** reasons for carrying out secondary cultivation
- **To remove any weeds that might have germinated after primary cultivation**
- **To break the soil into small pieces for easy planting /To refine the seed bed**
- **To level the field in order to achieve uniform depth of planting**
- **To incorporate organic matter into the soil in order to encourage decomposition.**

17. For each of the following tertiary operations, Give **one** reason why it is carried out

i) Ridging
- **Allow easy harvesting of crop roots**
- **Planting of root crops**
- **Opening furrow e.g. for irrigation or planting crops like sugar cane**
- **It encourages root development and expansion**
- **It helps to conserve soil and water on sloppy land**

ii) Rolling
- **Press the seeds against the soil moisture**
- **Ensure uniform germination**
- **To compact loose soil**

- **To compact soil of fine tilth/ Breaks large soil clods**
- **To prevent small seeds from being carried by wind.**
- **To prevent soil erosion**
- **To increase seed soil contact**

iii) Levelling
- **Facilities uniform germination of seeds/ allows uniform depths at planting**

18. List **two** factors that determine the number of times a farmer would harrow his land.
- **The crop to be grown/ size of the seed**
- **Slope of the land**
- **Condition of the land after primary cultivation**
- **Moisture content of the soil**
- **Type of implement used**
- **Type of soil**

19. What is the importance of Land preparation?
- **Kills weeds**
- **Incorporate manure and other organic matter into the soil**
- **Destroy crop pests**
- **Aerate the soil**
- **Encourages root penetration**
- **Makes subsequent operations easy**
- **To encourage water infiltration.**

20. Give **three** reasons why burning of land as a method of land clearing should be discouraged.
- **Destroys organic matter**
- **Loss of soil nutrients/loss of soil fertility**
- **Destroys soil organisms**
- **Accumulation of nutrients to toxic levels**
- **Leads to moisture loss**
- **Fire can spread to unintended area hence destroying property /forest**
- **Useful plant species are destroyed**

21. a) What do you understand by the term " **hard Pan**" as used in crop production
- **A compact sub-soil layer which restrict / impedes aeration, drainage and root penetration.**

b) Give one cause of a hard pan in a crop field.
- **Ploughing at the same depth season after season**
- **Deposition of insoluble precipitate of same mineral salts**
- **Rolling of land with heavy machines e.g. rollers**
- **Lack of crop rotation with shallow rooted crops versus deep rooted crops**

c) Give **four** dangers of having a hard-pan layer within a soil profile.
- **Prevent the absorption or infiltration of water into the soil**
- **Prevent the action of soil micro organisms**
- **Lead to water logging of a given soil**
- **Lack of air / no air spaces**
- **Prevent exchange of mineral nutrients**
- **Lead to accumulation of salts on top.**

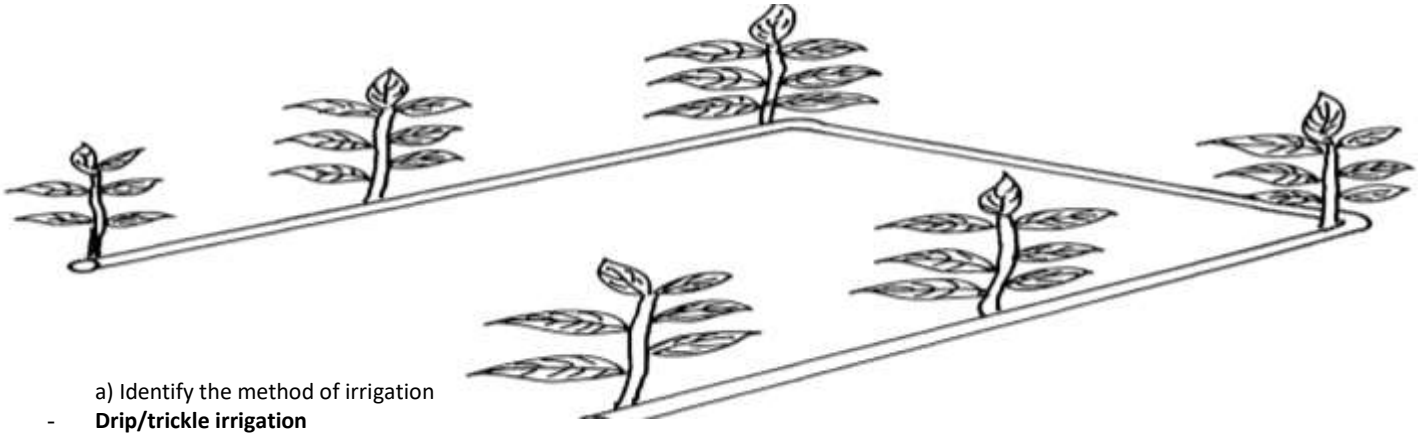
22. Give **four** reasons why the use of herbicides is discouraged during land clearing.
- **Requires skills to apply**
- **Poisonous**
- **Pollutes air, soil and water**
- **Have undesirable residual effect**

WATER SUPPLY, IRRIGATION AND DRAINAGE

1. State **two** reasons for treating water for use on the farm
- **To kill disease causing micro-organisms e.g. bacteria, protozoa / pathogens**
- **To remove chemical impurities e.g. fluoride**
- **To remove smell and bad taste**
- **To remove sediments of solid particles /Remove foreign material / make water clear**

2. State **three** reasons for draining swampy land before growing crops
- **Increase soil volume**
- **Improve aeration**
- **Increases activities of micro organisms**
- **Control erosion**
- **Reduce toxic substances in soil**
- **Increase sol temperature**

3. Use the diagram below of irrigation method to answer the questions that follow.



a) Identify the method of irrigation
- **Drip/trickle irrigation**

b) State **four** advantages of the above irrigation system
- **Little water required**
- **Done on any topography / field levelling not necessary**
- **Weed growth between rows minimized**
- **Soil erosion is minimized**
- **Water flows under low pressure**
- **Low labour costs**
- **Prevent fungal diseases as foliage remain dry**
- **Fertilizer and pesticides can be applied with irrigation water with minimal waste of fertilizer**

d) State **two** disadvantages o f the above system of irrigation
- **Difficult to carry field mechanization**
- **Require high initial capital**
- **Require clean water**
- **Regular repair of broken pipes and blocked pipes**
- **Applicable where few plants are grown**

4. State **four** factors that determine the type of irrigation that can be used in a given area
- **Capital available**
- **Topography of the land/Slope of land**
- **Water availability (amount)**
- **Type of soil**
- **Type of crop to be irrigated**
- **Availability of skilled labour**
- **Size of land to be irrigated**
- **Profitability of irrigation / viability of soil**

5. Describe **five** factors considered before choosing the type of irrigation system to use on the farm.
- **Capital availability- this determines the type of irrigation systems to be used. Drip and overhead irrigation systems require high capital for installation and maintenance**
- **Topography- Surface irrigation requires flat areas**
- **Water availability- Surface irrigation requires a lot of water. Drip and overhead irrigation requires less water**

- **The type of soil- Surface irrigation is best suited for clay soils because they retain water for a long time.**
- **The type of crop / value of the crop / benefit analysis. Crop to be irrigated should be of high value to justify the irrigation cost**
- **The availability of clean water – drip and overhead irrigation requires clean water to prevent blockage of the systems**

6. **List four** factors considered in choosing any irrigation system
- **Suitable topography/ slope**
- **Adequate water**
- **High water holding capacity soil/ clayey soil**
- **Water requirement of the crop**
- **Financial requirement of the irrigation system**
- **Fresh water**

7. a) What is **irrigation?**
- **Artificial application of water to the soil surface for purpose of supplying enough moisture for plants growth**

b) Outline **three** methods of irrigation
- **Surface**
- **Overhead/ sprinkler**
- **Subsurface**
- **Drip/trickle**

8. List any **four** uses of water in the farm
- **For diluting chemicals used to control pests, diseases and weeds**
- **For watering livestock.**
- **For watering plants e.g. irrigation.**
- **For washing farm structures e.g. calf pen, milking sheds zero grazing units.**
- **For domestic use e.g. drinking, cooking and sewage disposal.**
- **For rearing fish.**
- **Used in the processing of farm products e.g. coffee, carrots, hides and skins e.t.c.**
- **For mixing concrete in the construction /In construction of buildings.**
- **For cooling and running machine engines**
- **Washing farm tools/equipments**
- **Recreational purposes**

9. Give **four** methods of harvesting water on the farm
- **Roof catchment**
- **Weirs/ Dams**
- **Rock catchment**
- **Retention ditches/level terraces**
- **Ponds**

10. Outline the stages involved in water treatment process
- **Filtration at water intake**
- **Softening**
- **Coagulation and sedimentation**
- **Filtration (filtration in tank)**
- **Chlorination**
- **Storage**

11. State the advantages of drip irrigation
- **Water under low pressure can be used**
- **Does not encourage weed growth between rows**
- **Uses less water compared to other types of irrigation**
- **Reduces incidences of diseases like blight and Coffee Berry Disease**
- **Fertilizer and pesticides can be applied with water**
- **Done on any topography**

12. Outline **four** disadvantages of cambered beds
- **High cost of maintenance**
- **Provides breeding ground for vectors of malaria**
- **Prevents proper mechanization of the farm**
- **Labour intensive**

13. State **four** methods of drainage

- **Open ditches**
- **Under ground drain pipes**
- **French drains**
- **Cambered beds**
- **Pumping**
- **Planting of trees/planting of trees such as Eucalyptus**

14. Give the importance of **drainage** as a land reclamation method.
    - **Facilitates activity of soil living organisms**
    - **It moderates / increases soil temperature/regulates/controls soil temperature**
    - **Improves soil structure**
    - **Improves effectiveness of phosphorous fertilizers and conserve soil nitrogen**
    - **Increase soil volume**
    - **Improve aeration in the soil**
    - **A way of land reclamation for agricultural use**
    - **Regulates different crop cycles i.e. in rice paddies, it is done after two weeks**
    - **To check or reduce leaching**
    - **To reduce salinisation/accumulation of salts**
    - **To reduce erosion rate of top soil**

15. Name **four** types of water pumps which can be used on a farm.
- **Piston / Reciprocating pumps**
- **Centrifugal / Rotor dynamic pumps**
- **Hydram**
- **Semi-rotary / Rotary pump**

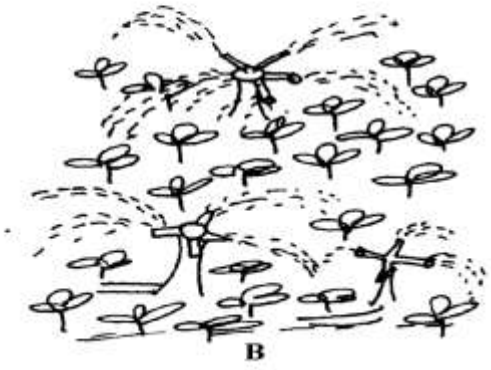
16. Distinguish between **a dam** and **a weir**
- **A dam is a barrier constructed a cross a river or a dry valley to hold water and raise its level to form a reservoir or lake**
- **A weir is a barrier constructed across a river to raise the level of water and still allow water to flow over it**

17. What is the difference between **pumping** and **piping** of water in the farm?
- **Piping is the conveyance of water through pipes from one place to the other while pumping is the lifting of water from one point to another by use of mechanical force;**

18. (a) Define the term **pollution**.
- **Any process which leads to harmful increase in the amount of chemical substances or form of energy released into the environment by human activities**

(b) Give **two** agricultural practices, which will lead to water pollution.
- **Use of inorganic fertilizers**
- **Use of pesticides**
- **Poor cultivation practices e.g. over cultivation, over grazing, cultivation along river banks**
- **Allowing livestock to graze near water sources often results in organic waste products being washed into the water ways.**
- **Improper disposal of farm chemical**
- **Dumping of farm waste/slurry/polythene.**
- **Soil erosion/Over stocking.**
- **Use of farm machinery**

19. The diagrams below illustrate some methods of irrigating crops. Study the diagrams and answer the questions that follow:



(a) Identify the methods used

A – Drip/ trickle irrigation

B – Sprinkler/ overhead irrigation

(b) State **two** advantages of method **A** over method **B**

- **Conserves water**
- **Does not damage flowers, leaves**
- **Does not cause splash/ splatter irrigation**
- **Does not encourage spread of fungal diseases from crop to crop**
- **Does not encourage the growth of weeds all over the field**

20. Give **four** reasons for practicing irrigation

- **Increase crop production by applying adequate moisture**
- **To reclaim dry areas**
- **To meet moisture requirement of crops**
- **To produce and benefit from off season crops**
- **Growing of paddy rice**

21. State the role of each of the following chemicals used in the process of convectional water treatment;

i) Soda ash.-**Softens the water**

ii) Chlorine.-**Kills pathogens / micro – organisms in water**

iii) Aluminium Sulphate (Alum) -**For sedimentation**

22. Describe the process involved in water treatment using chemical treatment system

<u>Stage 1</u>: Filtration at intake water

- **At the point of intake water is made to pass through a series of sieves.**
- **Sieves trap large solid impurities/ particles**

<u>Stage II:</u> Softening of water

- **Water is made to circulate in a small tank where it is mixed with soda ash (sodium bicarbonate)**
- **-Soda ash softens water**

<u>Stage III:</u> Coagulation and sedimentation

- **-Alum (Aluminium Sulphate) is added to water to facilitate coagulation and sedimentation. Water stays here for 36hrs to kill bilharzia.**
- **Tanks left open for aeration/remove bad smell.**

Stage IV: Filtration

- **Water is passed through a filtration tank that removes all solid impurities**

<u>Stage V:</u> Chlorination

- **Filtered water enters the chlorination tank where small amount of Chlorine solution is added**
- **Chlorine kills pathogens/diseases causing organisms**

<u>Stage VI</u> Storage

- **Treated water stored in clean tanks before use/distribution**

23. State **two** surface irrigation methods

- **Basin**
- **Flood**

24. Mention the various sources of water used in the farm.

(i) Surface sources

- **Rivers**
- **Streams**
- **Dams**
- **Lakes**

(ii) Underground sources

- **Springs**
- **Wells**
- **Boreholes**

(iii) Rain water

25. Name **four** structures that can be used to store water in a farm

- **Dam**

- **Weir**
- **Plastic tank**
- **Concrete tank**
- **Pond**
- **Well**

26. a) What is water conveyance?
- **Moving water from one point to where it will be used or stored**

(b) Name **two** types of pipes used in the farm.
- **Metal pipes**
- **Plastic pipes**
- **Hose pipes**

27. State **three** ways of conveying water into the farm.
- **Piping**
- **Use of containers (e.g. drums, jerry cans, pots, gourds, tanks and buckets**
- **Use of canals**

28. a) Outline **three** effects of water pollution.
- **Kills water organisms.**
- **Causes siltation of waterways/ reduces water level.**
- **Causes water – borne diseases.**

b) List **two** methods used to prevent water pollution.
- **Soil conservation measures to minimize lose of soil through erosion.**
- **Fencing of water sources to minimize possible pollution by livestock or humans.**
- **River banks should be vegetated by planting grass/ sugarcane e.t.c. to minimize siltation in rivers.**
- **Employing adequate storm water control methods and disposal systems especially in areas with heavy rains.**
- **Enforcing by–laws on the use of integrated methods of controlling pests and weeds (non – chemical methods / organic farming)**

29. List **two** features of **plastic pipes** a farmer should consider before buying the pipes
- **Durability**
- **Size (diameter)**

30. a) **State two** factors which influence the types of **plastic pipes** to be used.
- **Amount of water available.**
- **Slope of the land.**
- **Type of soil.**
- **Capital available.**
- **Durability**

b) Give any **three** disadvantages of plastic pipes when conveying water on the farm
- **Can burst under high pressure**
- **Become brittle if exposed to the sun**
- **Can be gnawed by rodents**

31. Mention and describe **five** factors considered when choosing water pipes for irrigation
- **Durability- Shown by the quality of the materials the pipes are made of**
- **Length of the pipes- This is determined by the size of the farm and the source of water / water supply point.**
- **Diameter of the pipe- Determines the volume of water to be converged in the pipes**
- **Water pressure- High water pressure requires strong pipes to prevent bursting**
- **Resistance to heat from the sun- Pipes crack and become brittles if exposed to the sun**
- **Resistance to pest damage- Plastic pipes are easily damaged / gnawed by rodents**
- **Cost of the pipes- Aluminium pipes may be expensive when used for irrigation**

32. Which substance is used to soften water during the process of chemical water treatment
- **Sodium bicarbonate/ sodium hydrogen carbonate / soda Ash.**

33. State **two** factors one should consider when choosing a method to use in surface irrigation.
- **Topography / steepness of land**
- **Water supply**
- **Type of soil**

- **Crop to be grown**
- **Cost of production**

34. **State two** means of applying water to field of beans by overhead irrigation.
- **Use of sprinklers**
- **Use of hose pipe.**
- **Use of watering cans**

35. **Discuss** the methods that can be used to improve the drainage of waterlogged soils.
- **Open ditches: are dug and water flow by gravity to a waterway lowering the water table or removes excess water.**
- **Underground drain pipes: perforated pipes one laid underground and water seeps into the pipes. The water is led to a waterway.**
- **French drains: ditches are dug and filled with stones and gravel and then covered with soil. Water from the surrounding area is drained into these drains.**
- **Cambered bed are constructed on poorly drained soils like black cotton soils**
- **Ridges are made and water is taken away through farrows and crops are planted on ridges**
- **Planting trees: trees with high water demand are planted in waterlogged areas**
- **Pumping water: excess water is pumped from the field.**

36. Mention **two** methods of storing water on a farm
- **Use of water tank/container**
- **Use of dams/ponds.**

37. **Name two** methods of land reclamation.
- **Draining swampy land**
- **Irrigating dry land**
- **Terracing steep land.**
- **Planting trees in waste land /forestation**
- **Clearing forests.**
- **Controlling tsetse flies**

38. Give the advantages of sprinkler irrigation
- **There is even distribution of water over the area required**
- **Less water is required / less water wastage**
- **Can be practiced on sloppy land**
- **It is possible to apply foliar fertilizers with irrigation water / fertigation**
- **Irrigation pipes / sprinklers can easily be moved from one area to another**
- **Irrigation water cleans off dust from plant leaves for better functioning**
- **Helps to control aphids.**

39. Besides providing water to plants, give any **three** other uses of flood irrigation to rice.
- **Control of weeds**
- **Control of pests**
- **Application of fertilizers.**

40. State **two** disadvantages of using the hydram pump during irrigation.
- **Cannot pump stationary water.**
- **Pumps little quantity of water.**
- **Not suitable in flat areas**

41. List **four** different problems brought by water in the farm.
- **Leaching of nutrients /mineral elements**
- **Soil erosion/ Landslides**
- **Water borne diseases**
- **Breeding sites for mosquitoes**
- **Floods**
- **Corrosion of farm machinery**
- **Carrying away of farm structures**

42. Give **two** factors that influences the quantity of water used in the farm.
- **Purpose of water is required for / type of irrigation.**

- **Size and type of storage facilities.**
- **Source of water/catchment area**
- **Type of enterprise/size of enterprises/no of enterprises.**
- **Methods of conveyance.**

43. Outline the properties of clean water.
- **Free from disease causing micro-organisms**
- **Colourless**
- **Odourless**
- **Tasteless**
- **Soft**
- **Free of foreign contaminants**
- **Neutral PH**

44. List down **four** disadvantages of plastic water tank for water storage on the farm.
- **Weaken with increase in temperature**
- **Delicate, can be poked with a sharp object and leak all the water**
- **Their size is limited to a certain thickness**
- **Very expensive for very small sizes**

45. The diagrams below illustrate some methods of draining water fields.

Diagram **1**

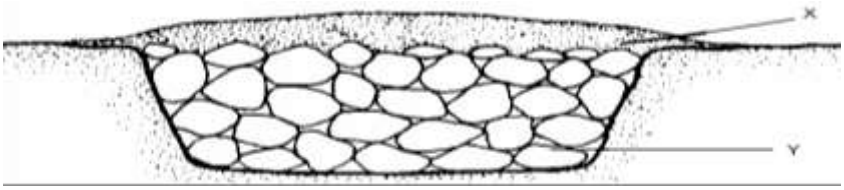
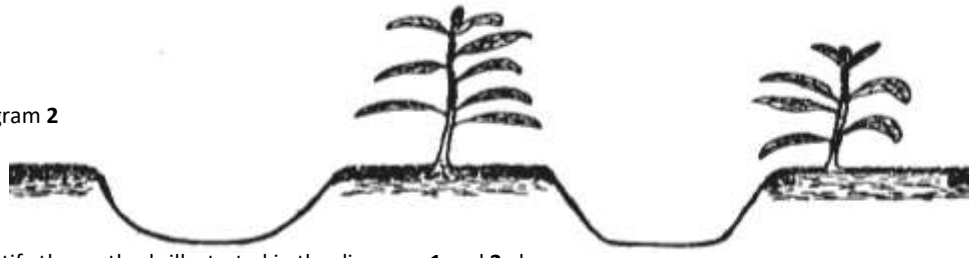


Diagram **2**

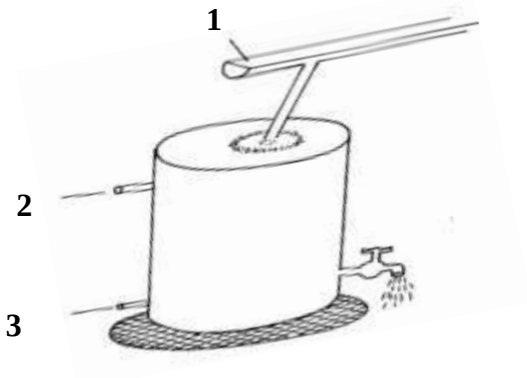


(a) Identify the methods illustrated in the diagrams **1** and **2** above.
- **French drain**
- **Cambered bed**

(b) Name the materials used in **diagram 1** labeled **x** and **y.**
X – Soil **Y – stone/pebbles**

(c) Outline **four** methods used in draining water logged soils
- **Uses open ditches**
- **Use of underground drain pipes**
- **Use of French drains**
- **Use of cambered beds**
- **Planting trees with high transpiration rate.**

46. Below is a diagram of a domestic tank. Study it and answer the questions that follow.



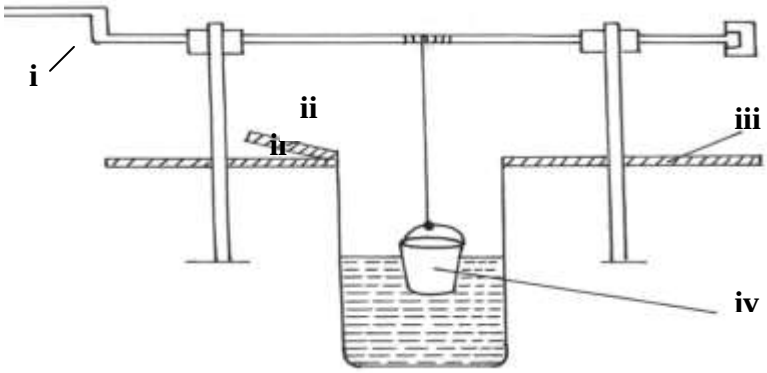
a) Name the parts labeled **1, 2, and 3.**

1. Gutter
2. Overflow pipe
3. Drain pipe

b) Give **three** factors that influence the quality of rain water.

- **Cleanliness of the storage structure/tank.**
- **Cleanliness of the roof/gutter/Rock.**
- **Incidence of air pollution in the air.**
- **Type of roofing material from which water is collected.**

47. Below is an illustration of underground water source.



(a) Identify the method.

- **Simple lift hand pump/bucket**

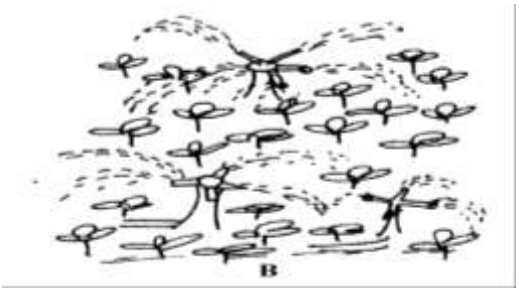
(b) Identify the parts labeled.

i) Winch or pulley.
ii) Lockable lid.
iii) Reinforced concrete slab.
iv) Bucket.

48. Name **four** diseases caused to man by drinking untreated water.

- **Typhoid**
- **Cholera**
- **Amoebic dysentery**
- **Amoebiasis**

49. Below is an illustration of a sprinkler.



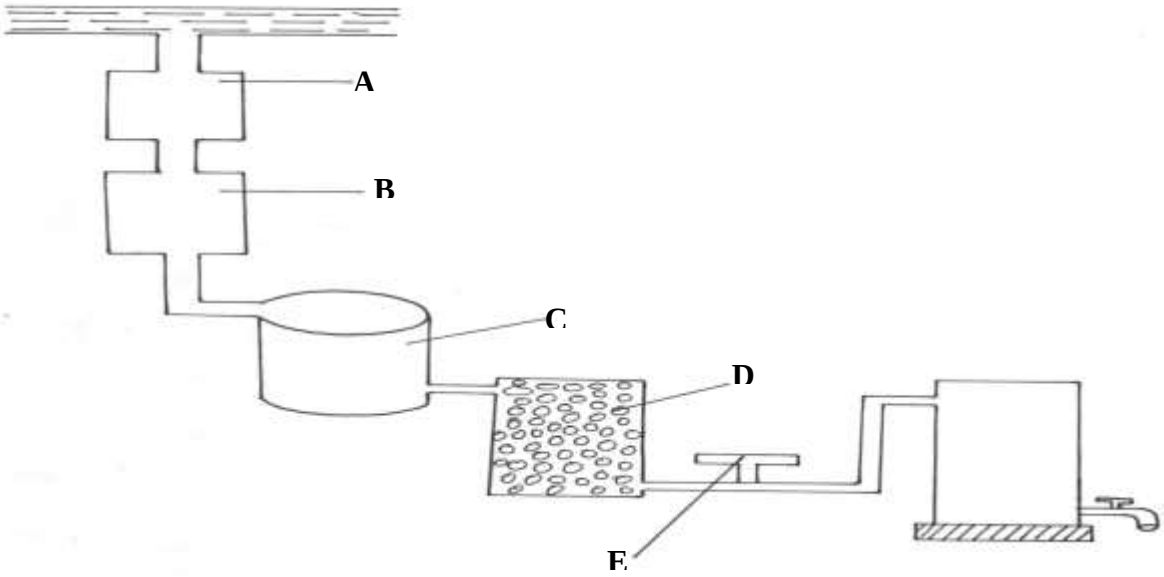
(a) Identify the type of sprinkler.

- **Continuous rotating sprinkler.**

(b) Name another type of sprinkler used in irrigation

- **Spring loaded sprinkler.**

50. Below is a diagram of a water treatment system.



(a) Identify parts labeled

A – Screens /sieves
B – Mixing chamber /mixing tank
C – Sedimentation/coagulation tank
D – Filtration tank

(b) Name the chemicals added in part **B**.

- **Soda ash/Sodium bicarbonate;**
- **Alum/Aluminium Sulphate**

(c) State **one** use of each chemical named in **(b)** above.

- **Soda ash – softens water/ removes Calcium from hard water and replaces it with Sodium**
- **Alum/$Al_2(SO_4)_3$/Aluminium Sulphate-Coagulates solid particles/causes silicate particles to become denser than water, so as to settle at the base;**

(d) State **one** role of the part labeled **E**.

- **Chlorine is added, to kill bacteria /pathogens;**

SOIL FERTILITY 1 (ORGANIC MANURES)

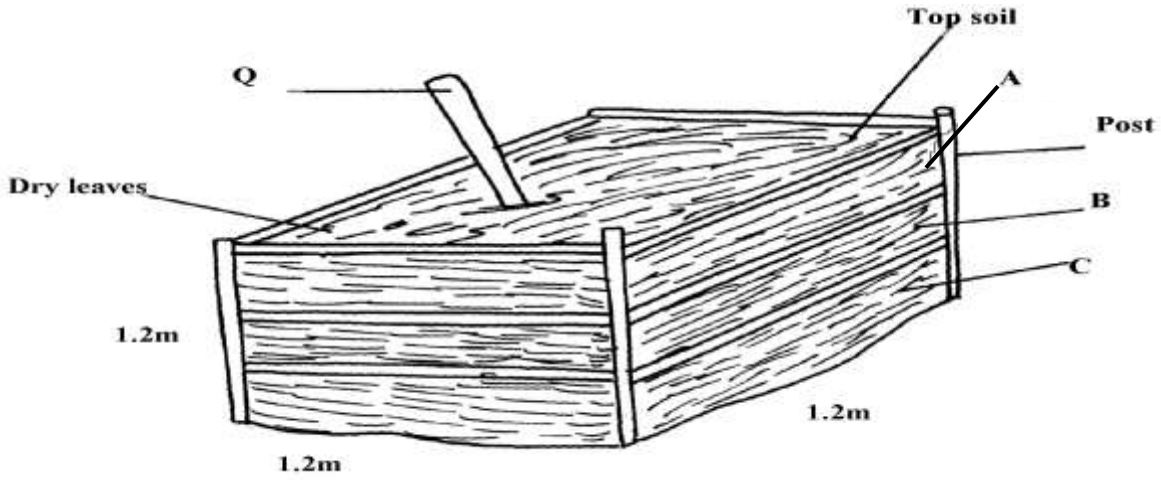
1. **Outline four** features of a fertile soil

- **Has all the nutrients in right proportions and available to crops / High cation - exchange capacity.**
- **Deep enough for root penetration**
- **Right pH range**
- **Free from excessive infestation of pests and infection by diseases**
- **Well aerated**
- **Good water holding capacity**
- **Well drained/Good infiltration rate.**
- **Right colour to absorb heat and be warm**

2. Explain characteristics of fertile soil

- **Good depth – deep soils give plant roots greater volume and strong anchorage**
- **Proper drainage – well drained soil is properly aerated to promote root development and reduce the build up of carbon (IV) oxide to toxic levels**
- **Good water holding capacity – ensures enough water for plant use**
- **Adequate nutrient supply – should supply nutrients needed by plants in correct amount and in available forms**
- **Correct soil pH – different crops have different soil pH and certain plant nutrients only available at specific soil pH**
- **Free from excessive infestation of soil borne pests and infection by diseases.**

3. The diagram below illustrates a compost heap. Study it and answer the questions that follow

- 

It is for checking temperature and other conditions within the heap

b) What is the function of each of the following components in preparation of compost manure?

i) Top soil

- **Introduces microorganisms to effect decomposition**

ii) Wood ash

- **Increases the level of phosphorus and potassium**
- **Neutralize acidic soil.**

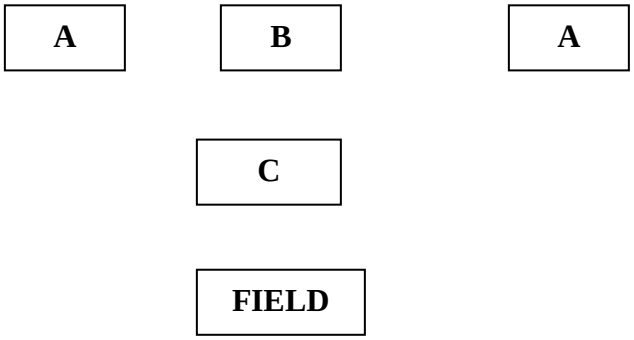
iii) Rotten manure

- **Provides food for micro-organism**

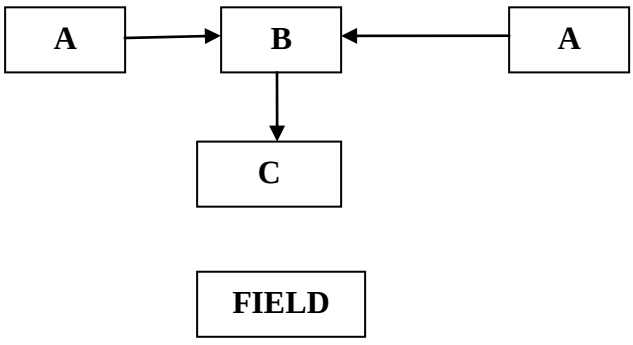
4. Describe ways in which soil loses fertility.

- **Monocropping. This is cultivating one type of crop for a long period of time. The crop exhausts particular minerals making the soil infertile to that particular crop.**
- **Continuous cropping this leads to continuous removal of crop materials from the soil. This removes minerals from the soil**
- **Soil erosion-Carries away top fertile soil leading to loss of minerals**
- **Accumulation of salts. This is due to high evaporation rate and low amounts of rainfall. Soils become saline hence cannot support crop growth properly.**
- **Excessive soil disturbance /over cultivation-This destroys soil structure.**

5. The illustration below shows a four heap system of making compost manure. Study it and answer the questions that follow.



(a) By use of arrows indicate on the diagram above how the following material should be transferred from one heap to another till the manure is applied in the field



(b) How long does the material take to be ready for application in the field as manure?

- **3 - 6 wks**

(c) Give a reason for **turning** the material in the heap regularly

- **Proper / uniform decomposition.**
- **Facilitate air circulation.**
- **Facilitate microbial activities.**

(d) Give **two** reasons why it is necessary to sprinkle water on the heap

- **To regulate the internal temperatures in the heap.**
- **Create moist environment for microbial activity.**

6. Name **four** indicators of well-decomposed manure

- **Absence of bad odour and instead the smell of forest soil**
- **Light weight**
- **Brown colour**
- **Moist but not wet**
- **Original nature of material not noticeable**

7. State **five** characteristics of plants used as Green Manure.

- **Should be leafy/highly vegetative.**
- **High nitrogen content/preferably legumes**
- **Rapid/quick / faster growth**
- **Be capable of rapid rotting / decomposition**
- **Should be hardy/ capable of growing in poor conditions**

8. State **four** advantages of adding organic matter to a sandy soil

- **Releases plant nutrients on decomposition thus increasing fertility**
- **Improves soil structure**
- **Improves soil water holding capacity**
- **Regulates / moderates soil temperature**
- **Increases microbial activities in the soil**
- **Reduces the built up of toxic substances**
- **Moderates soil pH / Buffers soil pH**
- **Reduces leaching**

9. State **two** problems associated with the use of manures by small-scale farmers.

- **Bulkiness**
- **low nutritive value per unit volume**
- **Laborious in application and transport**
- **They may spread diseases, pests and weeds**
- **If used when not fully decomposed, the crop does not benefit from them**
- **Can lead to scorching of crops if not properly decomposed**
- **Easily lose nutrients if not properly stored**

10. Describe the preparation of farm yard manure

- **Collect animal waste/refuse/dung and urine;**
- **Collect animal bedding/litter and other rotten plant residues;**
- **Store collected materials under roof/shed to prevent leaching and oxidization of nutrients;**
- **Turnover the materials regularly;**
- **Sprinkle water if dry;**
- **leave the material to rote completely before use**

11. State **four** farming practices that maintain soil fertility.

- **Crop rotation**
- **Control soil PH**
- **Control soil erosion**
- **Proper drainage**
- **Control weeds**

- **Apply fertilizer/ manure**
- **Minimum tillage**
- **Use organic mulches**

12. Define the term soil fertility.
- **It is the ability of soil to provide mineral ions in correct and adequate amount to sustain high crop yields indefinitely.**

13. State **two** roles of humus in the soil that is beneficial to crops
- **Provide nutrients**
- **Increase water holding capacity**
- **Increase soil temperature**
- **Neutralize soil PH**

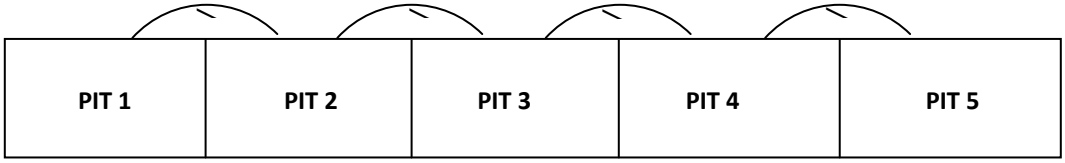
14. What is **leaching**?
- **It is movement of dissolved nutrients from top soil to lower horizons of soil becoming unavailable to crops**

15. **State four** factors that should be considered when siting a compost manure heap/ pit.
- **Drainage / topography**
- **Size of the farm**
- **Accessibility to the site**
- **Nearness to where it has to be used/ proximity**
- **Direction of prevailing winds in relation to the farm house.**

16. State ways by which soil loses fertility.
- **Leaching of soluble nutrients**
- **Soil erosion**
- **Burning of vegetation and plant residues**
- **By continuous plant uptake/ Continuous cropping**
- **Change of soil PH**
- **Accumulation of salts**
- **Infestation by diseases**
- **Monocropping**
- **Development of hardpans**
- **Infestation by weeds**

17. State **four** factors that determine quality of farm yard manure.
- **Type of animals used**
- **Type of food eaten**
- **Type of litter used.**
- **Method of storage**
- **Age of farm yard manure**

18. Study the illustration of compost given and use it to answer the questions that follows



i) Identify the method of compost illustrated
- **Indore method**

ii) Describe the process of filling the first pit
- **Put fresh material to be composted/ grass/ kitchen refuse/ maize stalk**
- **Cover with cow dung/old compost/FYM**
- **Add artificial fertilizer /SSP/MAP to increase nutrient activity**
- **Add top soil layer to increase microbial activity, level;**
- **Repeat the above process until the pit is full**

iii) Explain how compost is made in the pits illustrated
- **Lay the materials like banana leaves, maize stalks, vegetable leaves, ash in layers in pit I to IV simultaneously;**
- **After 3-4 weeks the material in pit IV is transferred to pit V, the material in pit III to pit IV, in pit II to pit III and pit I to pit II**

- **After another 3-4 weeks the materials which are well rotten are taken to the field as compost.**

iv) State **two** factors that determine the quality of compost manure

- **The nutrients content of the materials used, i.e. the type of the material used / age of the materials used;**
- **Duration of the decomposition / age of the manure**
- **Method of storage**
- **Preparation management of the compost e.g. temperature and water control**
- **The type of fertilizers or manure used in the process**
- **The compaction, layering e t c**

19. Explain farm management practices that can be carried out by a farmer to maintain the soil fertility on his farm.

- **Control of soil erosion to enhance water infiltration into the soil and reduce surface runoff hence preventing crop nutrients from being washed away.**
- **Carryout crop rotation which helps to control accumulation of crop pests, diseases and weeds on the farm. It also helps to ensure maximum utilization of soil nutrients preventing exhaustion of particular nutrients from the soil. Inclusion of leguminous plants in the crop rotation helps to increase the nitrogen content in the soil.**
- **Control of pH to almost neutral, to facilitate proper function in of useful soil micro-organisms which help in decomposition of organic mater. Liming helps to increase the pH.**
- **Proper drainage by breaking the hardpan or creation of water channels and cambered beds to ensure that there is proper aeration in the soil and also enough moisture availability to crops.**
- **Weed control to prevent competition for nutrients, moisture, space and light with crops. It also helps to reduce crop pests and diseases since some weeds act as alternate hosts of pests.**
- **Intercropping / mixed cropping of non legumes and legumes to help fix nitrates in the soil hence improving on the soil fertility.**
- **Minimum tillage which helps to maintain the soil structure and prevent soil erosion.**
- **Use of organic manure which helps to supply organic matter to the soil. On decomposition, the organic matter release nutrients to the soil and help to improve the soil structure.**
- **Use of inorganic fertilizers helps to add nutrients to the soil some like CAN help to flocculate soil particles together.**

20. Describe the procedure followed by a farmer when making compost manure using the Indore method.

- **Dig 5 holes measuring 1.2m long, 1.2m wide and 1.2m deep.**
- **Assemble all the required materials near the pits.**
- **Start filling pit one- four with fibrous materials such as maize stalks which form the foundation of the compost layers.**
- **Followed with a layer of grass, leaves to form the second layer.**
- **Add a layer of well rotten manure to provide nutrients to the micro- organisms used to decompose the organic materials.**
- **Add a thin layer of ash to improve the level of phosphorus and potassium in the resulting manure.**
- **Add a layer of top soil to introduce the micro- organisms required to decompose the organic matter.**
- **Repeat the above sequence until the whole pit is to full. /1.2m high.**
- **Add a layer of soil to cover the pits.**
- **After 3-4 weeks transfer the materials in pit IV to V, III to IV, II to III and I to II.**
- **Finally cover with grass or leaf layer to prevent loss of moisture**
- **Put a stick into the compost to check for the temperature to asses full decomposition**
- **Heap should be sprinkled with water after three days to control the temperature**
- **Manure will be ready for use in about 6 weeks time**

21. Describe the process of making compost manure using the heap/stack method.

- **Select well drained and sheltered site**
- **Clear the selected site**
- **Mark out areas measuring 1.2m x 2.0m**
- **Fix posts at the corners of the measured area**
- **Fixed posts should be 1.2 to 2.0m high**
- **Collect materials to be used for composting is smaller pieces.**
- **Dig a trench around the composting area to facilitate drainage**
- **Chop materials to be used for composting into smaller pieces.**
- **Lay down fibrous or hard materials first**
- **Place a layer of well rotten compost manure or farm yard manure or top soil to introduce micro-organisms**
- **Add a layer of wood ash or lime to reduce acidity and improve phosphorus and potassium levels.**
- **Repeat the same until desired height is obtained**
- **Cover the heap with dry leaves or soil**
- **Pass through the heap a number of sticks right across as the pile is being made to facilitate aeration.**
- **Remove the sticks after completing piling**
- **Provide protection of materials by building the sides with planks of wood.**
- **Sprinkle some water on the heap after every three days to control temperature**
- **Heap should be turned after 3-4 weeks**
- **Put a stick into the compost to check temperature that confirms completion of decomposition**

- **Manure is ready for use in six weeks time**

AGRICULTURE ECONOMICS (BASIC CONCEPTS AND FARM RECORDS)

1. Define the term **farm record**.
- **Documents kept in the farm showing various farm activities over a given period of time**

2. State **two** qualities of a good farm record
- **Titled**
- **Neat**
- **Concise**
- **Complete**
- **Showing actual amounts**
- **Dated**

3. State **four** advantages of keeping up-to date labour records.
- **To lay off unproductive labour**
- **Helps in budgeting**
- **To determine peak demand**
- **Helps to determine labour allocation**

4. Mention any **three** types of farm records that a farmer should keep
- **Field operation records**
- **Production records**
- **Inventory records**
- **Marketing records**
- **Labour records**
- **Breeding records**
- **Feeding records**
- **Health records**

5. a) Give **four** types of records that can be kept by a crop farmer.
- **Field operation records**
- **Labour records**
- **Production record/ yield records.**
- **Account record.**

b) **Name two** types of records a coffee farmer should keep.
- **Labour records**
- **Production records**
- **Marketing records**
- **Field operation records**
- **Inventory records.**

6. Name the type of farm record from which each of the following information could be obtained

i) Common livestock diseases occurring on a given farm
- **Health records**

ii) Best fertilizer to use top dressing
- **Field operation records**

iii) The number of Jembes a farm owns
- **Inventory**

iv) The sire used to obtain the calves on the farm
- **Breeding records**

7. What is the importance of taking a farm inventory?
- **In order to show what there is and what is not there in the farm / assist in detecting stolen items**

8. What are the uses of farm records to a farmer?

- **Show the farmers assets and liabilities which help the farmer to know his net worth**
- **Provide history of the farm.**
- **Assist in planning and budgeting of various activities.**
- **Helps to detect losses or theft in the farm.**
- **Assists when sharing losses or profits (dividends / bonuses) for communal owned farms/ partnership.**
- **Help in settling disputes between heirs where there is no written will during succession**
- **Help to support insurance claim e.g. against fire and theft.**
- **Provide labour information like terminal benefits, NSSF due, Sacco dues for all employees.**
- **Help to compare the performance of different enterprises within a farm or other farms or between seasons**
- **Help in the assessment of income tax to avoid over or under taxation.**
- **Records, helps to show whether the farm business is making profit or losses.**
- **Used to obtain loan or credit facilities**

9. Identify the farm record below and the questions that follow:

Date	Disease symptoms	Animals affected	Drug used	Cost of treatment	Remarks

(a)Identity of the record
- **Health record**

(b) State **two** different pieces of information that should be entered in the remarks column
- **Next date of treatment /vaccination**
- **Response to treatment**
- **Death of animal.**
- **Frequency of disease.**
- **Effect of treatment.**

(c) Give **two** importance of keeping the farm record illustrated above
- **Select and cull animals on health ground**
- **Know the course of action to be taken in the event of a disease and maintenance of good health**
- **Know the prevalent disease**
- **Calculate cost of treatment**
-

10. Study the illustration below of farm records:- Use it to answer the questions that follow:

Enterprise ____ **Month**_____

Name of cow	**DAYS IN MONTH**											
	1		2		3		4		5		6	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM

(a) Name the type of the farm record illustrated above
- **Milk production record**

b) Give **three** reasons for keeping health records in a livestock production
- **Determine prevalent diseases**
- **Establish treatment of diseases**
- **Establish disease control method**
- **Determine cost of medication/health care**
- **Determine the health status of different animals**

11. List down **four** pieces of information recorded in a field operation record.
- **Field**
- **Area of the land /plot.**
- **Plot field no.**
- **Season**
- **Crop planted**
- **Crop grown/ variety**
- **Land preparation / Ploughing date**
- **Planting date**

- **Inputs used.**
- **Type of fertilizer at planting**
- **Type of fertilizer at top dressing**
- **Seed rate used**
- **Type of weed and date of weed control**
- **Diseases controlled/ method**
- **Type of pest and date of pest control**
- **Date of harvesting**
- **Yield**
- **Remarks**

12. a) Give **two** importance of keeping health records.

- **Help in culling sickly animals (reject culling sick animals)**
- **Help in selection of animals for breeding**
- **Help in calculation of veterinary/ treatment cost**
- **Assist the farmer in knowing the prevalent diseases**

b) List **four** important entries in a health record.

- **Disease (type, name)**
- **Symptom (s)**
- **Drug used and the doctor, treating the animal**
- **Cost of treatment**
- **Remarks on response to treatment**
- **Animals identity affected**

13. Explain the following economic concepts:

(i) Scarcity

- **Resource are limited in relation to the demand/where production resources are limited in relative to demand therefore a choice has to be made on which enterprises to allocate limited resources.**

(ii) Preference

- **One makes a choice according to his/her tastes/liking.**

(iii) Opportunity cost

- **The returns from the best alternative forgone.**

14. Under what conditions is opportunity cost zero?

- **When the item is free.**
- **When the item is in plenty/ unlimited**
- **When there is no alternative**

15. Define the term Economics.

- **Applied science aimed at maximizing output at minimum costs through combining the limited supplies of land, capital, labour and management to produce goods and services for use in a given period of time**

16. What is opportunity cost in agricultural economics?

- **Is the value of best alternative foregone**

b) A farmer has a piece of land on which he can produce maize and barley. The yield and selling prices of the crops are as shown below.

Enterprise	Yield (90kgs bags)	Selling price (KShs/90kg bag)
Maize	2500	800
Barley	2000	1500

The farmer decides to produce maize. Assuming the cost of producing any of the crops is the same.

(i) Calculate the farmer's opportunity cost. Show your working.

Barley = 2000x1500

= 3,000,000

(ii) Which crop should the farmer grow?

For maize - 2500x800 = 2, 000,000

For barley- 2000x1500 = 3, 000,000

∴Farmers should grow barley

17. **State two** types of Labour records.
- **Labour utilization analysis.**
- **Muster roll**

18. A farmer has a piece of land on which he can produce wheat, maize, and barley.
The yields and selling prices of the three crops as shown below:

Crop	Yield 90 kg bag	Selling price Kshs. Per bag
Tea	2000	750
Coffee	1400	900
Pyrethrum	1500	1200

The farmer decides to produce pyrethrum. Assuming the cost of producing any of the crops is the same.
(i) Calculate the farmer's opportunity cost. Show your working

Tea **2000 bags x 750** **= 1,500,000**
Coffee **1400 bags x 900** **=1,260,000**
Pyrethrum **1500bags x 1200** **=1,800,000**

- **Opportunity cost = KShs. 1,500,000**

(ii) Give reasons for your answer in (i) above
- **Tea is the returns from the next best alternative forgone.**

19. Give **four** types of records that can be kept by a poultry farmer
- **Labour records**
- **Egg Production records**
- **Marketing records**
- **Inventory records.**
- **Feeding records**
- **Health records**

20. Name **four** important entries in a muster roll.
- **Name of the worker**
- **Pay roll number**
- **Days worked**
- **Rate of payment**
- **Amount of salary or wage**
- **Signature of the worker.**

21. The table below is extracted from the farmer's books. Study it and answer the questions that follow.

Name of person	Personal number	Days				Days worked	Rate	Total
		1	2	3	….			

i) Identify the type of record represented by the table.
- **Muster roll**

ii) Give **one** importance of the record above.
- **Determine the total cost of the labour**
- **Determine the amount of money each worker is to be paid**
- **Determine the members of the labour force to be retrenched or promoted on basis of work output**

SOIL FERTILITY II (INORGANIC FERTILIZERS)

1. Name **two** macronutrients that can be used as liming elements.
- **Calcium**
- **Magnesium**

2. Name any **two** micronutrients involved in the synthesis of proteins in the chloroplasts.
- **Iron**
- **Copper**

3. State **three** sources of nutrients to soils
- **Bacterial fixation**
- **Atmospheric fixation by lightning**
- **Decomposition of organic matter**
- **Fertilizer application**
- **Parent rock**

4. Differentiate between Macronutrient and micronutrient.
- **Macronutrient is element needed by plants in relatively large quantities while Micronutrient is an element needed by plants in relatively small quantities**

5. Give the form in which the following elements are absorbed by crops
i) Sulphur - **SO_4^{2-},SO_2**
ii) Nitrogen **-NO_3^-,NH_4^+**
iii) Carbon **-CO_2**
iv) Magnesium **-Mg^{2+}**

6. Give **two** functions of Nitrogen in crops
- **Forms part of chlorophyll molecule**
- **Encourages vegetative growth**
- **Regulate availability of phosphorus and potassium in plant**
- **Increase the size of grains and protein content in cereals**
- **Protein formation/ components of proteins and protoplasm of all living cells.**

7. a) Mention **two** properties of nitrogenous fertilizers.
- **Are highly soluble in water**
- **Are easily leached**
- **Have short residual effect**
- **Have a scorching/ burning effect**
- **Are highly volatile**
- **Are hygroscopic**
- **Are highly corrosive**

b) State **four** effects of over application of nitrogenous fertilizer in tomatoes
- **Occurrences of blossom end rot disease.**
- **Delayed maturity of plants**
- **Fruits crack when young**
- **Grow more vegetative parts and produce less fruits**
- **Scorching effects on leaves**
- **Excessive succulence /Lodging/ Weak stems**

8. State **two** ways by which nitrogen is lost from the soil.
- **Volatilization**
- **Leaching**
- **Soil erosion**
- **Crop removal**
- **Combustion**
- **Denitrification**

9. What is nitrification?
- **Process by which ammonium compounds are converted into nitrites and then nitrates.**

10. **a) What is** nitrogen fixation?
- **The series of chemical processes that convert the unavailable forms of nitrogen to available form for the plants.**

b) Give two sources of nitrogen in soil for plants.
- **Applying nitrogen containing fertilizer.**
- **Using organic manure**
- **Fixation of nitrogen by lightning /nitrogen fixing bacteria.**

c) Name four bacteria involved in nitrogen cycle
- **Rhizobia**
- **Nitrobacter**
- **Nitrosomonas**

- **Azotobacter and clostridium.**

11. Give **three** ways in which nitrogen is removed from the atmosphere.
- **Nitrogen fixation by lightning.**
- **Nitrogen fixation by nitrogen fixing bacteria**
- **Nitrification**
- **The harber – Borsch process.**

12. Why is it advisable to apply straight nitrogenous fertilizer to a crop of maize at a height of 30-45 cm?
- **At 30-45cm maize has well developed roots to absorb dissolved nitrogenous fertilizer**
- **Maize is growing faster and requires a lot of nitrogen.**

13. **State any four** things that would happen to the element nitrogen when Sulphate of ammonia fertilizer is applied to a field of maize.
- **Nitrogen evaporates/volatilizes**
- **May be used up by micro-organisms**
- **May be leached.**
- **It may be eroded/ water erosion.**
- **May be take up by maize plant / other plants**
- **May be released into the atmosphere by denitrifying bacteria.**

14. Give **five** practices a farmer can carry out to ensure maximum use of Nitrogenous fertilizer in a crop of maize.
- **Control soil erosion**
- **Application fertilizer at appropriate stage of growth/ when the crops are ready to use it/has developed vegetable parts**
- **Top dress when just about to rain/when soil in moist**
- **Apply the optimum rate of fertilizer**
- **Top dressing as a ring round the roots of the base / or band along the plant rows**
- **Clean weeding to avoid loss of Nitrogen to weeds / Control weeds/ pests /diseases**
- **Mulching after application to avoid volatilization and access leaching**
- **Away from the plant to avoid scorching**
- **Be applied frequently as they have short residual effect / Apply fertilizer in splits**
- **Apply the optimum rate of fertilizers**

15. a) State **two** reasons why Sulphate of Ammonia is preferred in top dressing a rice field.
- **Provide the required acidic medium for optimum rice growth.**
- **It has a low solubility compared to fertilizer such as C.A.N**

b) Why is nitrogenous fertilizer used as top dress and not during planting?
- **Easily leached**

16. Name the deficient nutrient element in plants showing the following symptoms

i. Stunted growth, die back of plant tips, leaves roll up and chlorosis along margins of younger leaves
- **Calcium**

ii. Yellowing of leaves appears first on lower leaves turn brown and fall prematurely, stunted growth.
- **Nitrogen**

iii. Leaf curling, yellowing of leaves tips and edges of leaves scorched and has small mottles.
- **Potassium**

iv. Purpling of leaves, stunted growth, slender stalks and lateral buds remain dormant.
- **Phosphorous**

17. What is an inorganic fertilizer?
- **An artificially prepared chemical compound, with known value of plant nutrients that are added to the soil to improve its fertility.**

18. Give **two** types of fertilizer in accordance to the nutrient contained.
- **Nitrogenous fertilizers**
- **Phosphatic fertilizers**
- **Potassic fertilizers**

19. What is a complete fertilizer
- **A fertilizer containing all the three primary macro nutrients i.e. nitrogen , phosphorous and potassium**

20. What is an incomplete compound fertilizer?

- **Fertilizer which Lacks one of the major fertilizer NPK elements**

21. Distinguish between fertilizer grade and fertilizer ratio
- Fertilizer ratio **is the proportion of various nutrients in a fertilizer while** fertilizer grade **is the percentage of nutrients in a fertilizer**

22. State four advantages of using inorganic fertilizers over organic fertilizers.
- **Not bulky/easy to apply.**
- **Has high amount of nutrients per given volume.**
- **Does not spread diseases**
- **Nutrients are released very fast.**
- **Do not spread weeds or harbour pests.**

23. a) Give **three** methods used to apply fertilizer to crops.
- **Broadcasting**
- **Hole / Row placement**
- **Top dressing / Side dressing/ band placement /ring placement**
- **Foliar spraying**
- **Drip irrigation (fertigation)**

(b) Name and explain methods of fertilizer application.
- **Broadcasting – Random scattering of fertilizers on the ground for plant use**
- **Placement method – Application of the fertilizer in the planting holes or drills.**
- **Side dressing – Placement of nitrogenous fertilizer at the side of the crop being top dressed.**
- **Foliar spraying – Application of specially formulated fertilizer solution onto the foliage of the crop**
- **Drip – Fertilizer is dissolved and applied to individual plants through perforated pipes or bottles.**

24. Name the method of applying fertilizer to crop using irrigation water.
- **Fertigation**

25. State **two** factors that determine the amount of fertilizer to be used as a top dress in forage crops.
- **Soil nutrient status**
- **Stage of growth of crop**
- **Expected yield**
- **Type of crop/Nutrient requirement/rate of nutrient uptake by the crop.**
- **Type of fertilizer/Fertilizer characters**
- **Type of soil**
- **Environmental condition**

26. State **four** importance of top dressing forage crops
- **Add / replenish soil nutrients and ensure proper nutrients balance**
- **Increase the herbage yield**
- **Improve the nutritive value of the crop**
- **Correct / amend both physical and chemical properties of soil e.g. Soil structure, moisture holding capacity e.t.c**
- **Enable the micro-organism to break down organic matter into available nutrients.**

27. Mr. Arogo of Mosocho village prepared to top dress 10 hectares of Napier grass using Sulphate of ammonia (21%N). Sulphate of ammonia is applied at rate of 150kg per hectare. Calculate

a) The quantity of Sulphate ammonia fertilizer the farmer will need for 10 hectares

1ha requires 150kg SA

10ha requires (150x10) kg SA

= 1500kg SA in 10ha

b) The number of 50kg bags of fertilizer he will purchase

50kg fill 1 bag

1500 kg =?

$$\frac{30 \cancel{1500}}{\cancel{50}\ 1} = 30\text{bags}$$

28. Calculate the amount of P_2O_5 in 300kg of a compound fertilizer 25:10:5

N: P: K

25:10:5

∴P = 10 %

100 kg (of compound fertilizer) = 10 kg of P_20_5

300 kg (of compound fertilizer) =?

($\frac{\cancel{300}^{3}}{\cancel{100}^{1}}$ x 10)

= 30 kg of $P_2 0_5$

29. A form four student was given a sample of a fertilizer with the following characteristics:

(i) Grey in colour
(ii) It is granular
(iii) Causes no corrosion
(iv) It is highly hygroscopic
(v) It is neutral

(a) Identify the fertilizer

- **Calcium Ammonium Nitrate (CAN)**

(b) At what stage of growth of maize should it be applied?

- **Knee high / 30 – 45 cm height.**

(c) Calculate the amount of K_2O contained in 400kg of a compound fertilizer 25:10:5

N: P: K

25:10:5

$\therefore K_2O$ = 5 %

100 kg (of compound fertilizer) = 5 kg of K_20

400 kg (of compound fertilizer) =?

$\frac{\cancel{400}^{4}}{\cancel{100}^{1}}$ x 5 = 20 kg of K_2O

30. A compound of fertilizer has a fertilizer grade of 25:10:5.calculate the a mount of phosphorus contained in 400kg of this fertilizer

N: P: K

25:10:5

If 10kg P_2O_5 = 100kg NPK

? = 400kg NPK

= $\frac{400 \times 10}{100}$

$\therefore$ = 40kg P_2O_5

31. a)Give **four** functions of Sulphur in crops

- **Synthesis of amino acids /protein**
- **Formation of enzymes and hormones**
- **Increase oil content seeds**
- **Needed for formation of chlorophyll**
- **Needed in carbohydrate metabolism**
- **Nitrogen fixation by legumes.**

b) State **two** symptoms of Sulphur deficiency in plants

- **Stunted growth**
- **Leaf chlorosis followed by Anthocyanin / purple**
- **Stems become thin**
- **Nodulation in legumes is reduced**

32. a)State **two** roles of potassium in crop production

- **Important in carbohydrate formation and translocation**
- **Necessary for the neutralization of organic acids in plants**
- **Assists in uptake of nitrates from the soil hence influences a balance of nitrogen and phosphorous uptake by plants**
- **It is a component of chlorophyll molecule**
- **Strengthens plant stalks/ imparts resistance to lodging**
- **Imparts resistance to crops against diseases**

b) State the symptoms of potassium deficiency in crops.

- **Chlorosis/yellowing of leaves**
- **Premature leaf fall/premature shedding of leaves**
- **Stunted growth**
- **Margins of leaves are scorched**
- **Mottling / brownish spots on leaves**

- **Lodging in crops / weak stems in cereals**

33. State **a** reason why a crop may continue showing potassium deficiency despite application of recommended amount of potassic fertilizer
- **The soils could be very acidic leading to unavailability**
- **Too much rainfall leading to leaching / erosion.**

34. a) State **two** roles of phosphorus in crop production
- **Strengthens straw in cereals**
- **Cell division**
- **Synthesis of proteins**
- **Nodulation in legumes**
- **Impart disease resistance in crops**
- **Root establishment and development**
- **Important in metabolic processes e.g. respiration, photosynthesis**
- **It is essential for flowering, fruiting and seed formation**
- **Increases the size of the grains.**

b) State the symptoms of phosphorus deficiency in crops.
- **Dormant lateral buds**
- **Retarded / reduced branching in stem / roots / stunted growth**
- **Purple colouration of leaves**
- **Reduced formation and development of seeds, fruits and tubers in crops**
- **Weak stems /lodging in cereals**
- **Premature leaf fall**

c) Give **one** reason why phosphatic fertilizers benefit subsequent crop in Second and third year after application.
- **High residual effect**
- **Released slowly thus benefit crop for longer time**

d) State **four** ways by which **nutrient** phosphorous is lost from the soil.
- **Leaching**
- **Soil erosion**
- **Uptake / utilization by crops**
- **Fixation by iron and aluminium**

35. a) State **two** roles of calcium in the soil
- **Binds soil particles together / flocculation improving soil aeration, water infiltration and retention**
- **Raises the soil pH**
- **Increases CEC (Cation Exchange Capacity) making more nutrients available e.g. K ,P**

b) State **two** roles of calcium in crop production
- **Protein synthesis**
- **Strengthens plant cell wall**
- **Cell division / Elongation of shoots and root apices**
- **Formation of middle lamellae in cells**

c) State the deficiency symptoms of calcium in crops.
- **Stunted growth**
- **Poor root development**
- **Leaf curling**
- **Blossom end rot**
- **Dying back of plant tips**

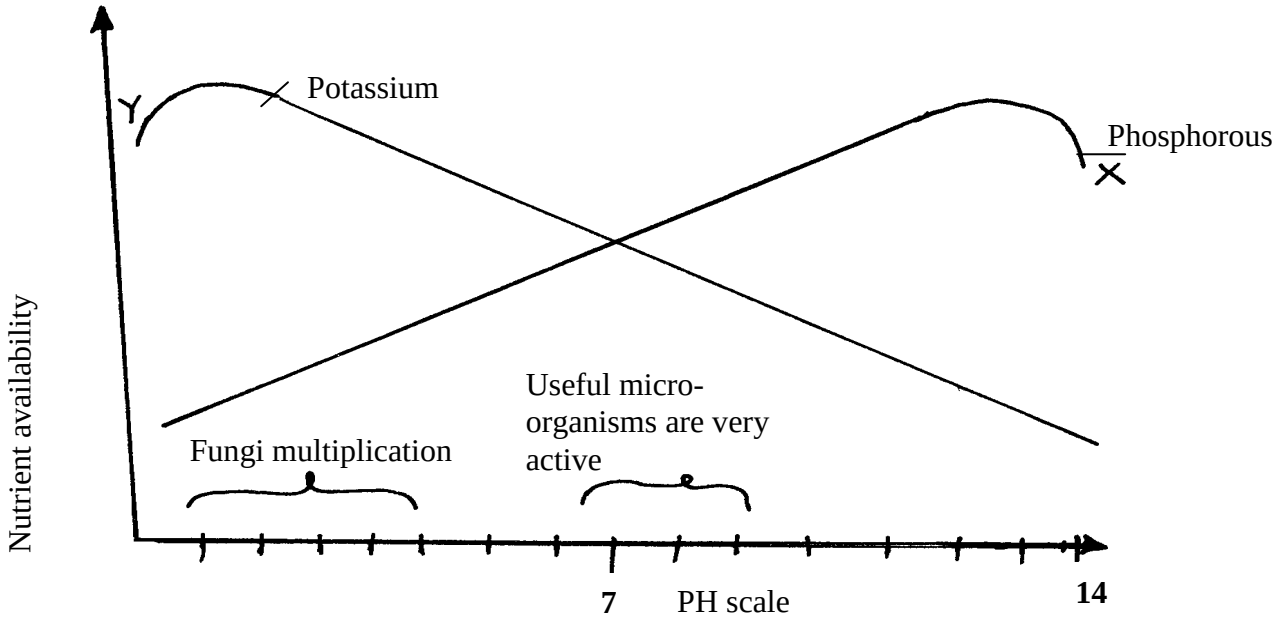
36. State **one** role and one deficiency symptom of **magnesium** on crops.

(i) Role
- **Promotes growth of soil bacteria**
- **Promote nitrogen fixation**
- **Component of chlorophyll**
- **Activate enzyme in metabolic processes**
- **Oil synthesis in oil crops**

(ii) Deficiency symptom.
- **Interveinal chlorosis**
- **Poorly developed / branched roots**
- **Leaves develop purple, orange and red patches (In horticultural crops)**

- **Anthocyanin pigment develops after chlorosis leaves turn brown and die**

37. Study the graphs below, showing relationship between soil pH and nutrient availability.



a) Explain the two graphs X and Y.

Graph X:

Phosphorus is least available at low pH (high acidic conditions) and is highly available at high pH (high alkaline conditions).

Graph Y

Potassium is highly available at low pH (high acidic conditions) and is least available at high pH (high alkaline conditions)

b) Suggest what is likely to happen to crops at pH of between 2 and 5 (from your study of the graph above)

- **Crops are likely to show deficiency symptoms of phosphorus (graph X)**
- **Crops are likely to be affected by fungal diseases**
- **Sizes of grains may increase (from graph Y)**
- **Plants would not lodge (from graph Y)**
- **Enough chlorophyll (from graph Y)**

38. List **four** elements whose deficiency results into chlorosis in plants

- **Nitrogen**
- **Calcium**
- **Potassium**
- **Magnesium**
- **Sulphur**

39. State **four** advantages of applying lime in clay soil

- **Lower soil acidity**
- **Increase calcium content**
- **Hastens decomposition of organic matter**
- **Improve soil structure/ improve drainage**
- **Facilitates availability and absorption of Nitrogen and phosphorous**
- **Improve legume nodulation and nitrogen fixation**
- **Increase multiplication of micro- organisms**

40. State **four** advantages of liming as a measure of soil improvement

- **Allows wide production of different crop varieties**
- **Improves soil aeration**
- **Improves drainage**
- **Improves soil structure**
- **Improves soil PH hence microbial activities**

41. A compound fertilizer bag has the labels 20-20-0. What do the figures stand for?

- **20 – 20% Nitrogen (N)**
- **20 – 20% Phosphorous Pentoxide (P_2O_5)**
- **0% Potassium Oxide (K_2O)**

42. A farmer was advised to apply compound fertilizer 20-20-10 on an orchard measuring 20m X 10m at the rate of 80kg/ha. Calculate the amount of fertilizer the farmer would require for the orchard.

Area – 10x20 =200m²
100,000m² = 1 Ha
200m² =?
$\frac{200m^2}{10,000m^2}$
= 0.02 ha.

1Ha. = 80kg
0.02 Ha. = ?
$\frac{0.02\ Ha. \times 80\ kg}{1Ha.}$
=1.6kg

43. A farmer had a plot of land measuring 5 hectares in which he intended to plant maize. He was advised to apply 150 kg of P_20_5 per hectare at planting and 200kg N per hectare during top dressing. The fertilizer available in the market was Calcium Ammonium Nitrate containing 20% N and Di-ammonium phosphate 50% P_20_5. Calculate.

(i) The amount of Diammonium phosphate required

100 kg contains 50 kg P_2O_5
? Contains 150 kg P_2O_5
$\frac{150x100}{50}$
=300kg of DAP per Ha
1ha = 300kg of DAP
5Ha =?
$\frac{5ha \times 300}{1}$
= 1500kg of DAP

(ii) The amount of calcium ammonium nitrate required in 50 Kg bags

100kg CAN = 20kg of N
? =200kg N
$\frac{200}{20}$x 100 = 200kg
= 1000kgof CAN/Ha
I ha = 1000kg
5ha =?

1000 x 5
= 5000kg
If 1bag = 50kg
? =5000kg
$\frac{5000}{50}$ x 1
= 100bags of CAN

44. i) Calculate the number of 50kg Sulphate of Ammonia (SA) fertilizer bags that would be applied in one hectare of land that requires 60kg of Nitrogen per hectare. SA fertilizer contains 20% Nitrogen. (Show your working)

% of N in SA fertilizer = 20%
In 100kg of SA =20Kg N
? = 60Kg N
= $\frac{60x100}{20}$
=300Kg.SA

If 1 bag = 50 kg
No. of bags will be =$\frac{300}{50}$
=6 bags

ii) Why did the farmer need to apply Sulphate of Ammonia as a top dress?

- **At this time the maize root system is well established to absorb it before it is leached**
- **The fertilizer is highly soluble**

45. **Calculate** the amount of Phosphorous Pentoxide ($P_2\ 0_5$) contained in 300kg of compound fertilizer 25: 10:5

25:10:5
N: P: K
100kg = 10kg of P_2O_5
300kg =?

$$\frac{300 \times 10}{100}$$

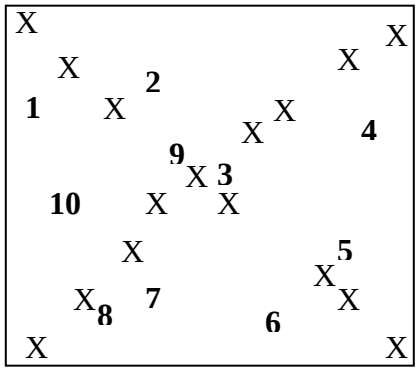
= 30KG OF P_2O_5

46. Give **two** pieces of information that should accompany the soil sample.

- **Name of farm/farmer**
- **Address of the farm/farmer**
- **Field number**
- **Date of sampling**
- **Location of field**
- **The type of test to be carried out**

- **History of land use**
- **Crop to be grown**
- **Special feature of land (if any)**

47. The diagram below illustrate methods of collecting soil sample from a field



a) Identify the methods illustrated by **X** and **1-10**

X -Diagonal/traverse method

1-10- Zigzag method

(b) State **three** precautions taken when collecting the soil for testing using the above method

- **Avoid contaminating the soil samples /use sterilized container**
- **Avoid sampling soil from unusual sites e.g. ant hills**
- **Avoid mixing top soil with sub-soil**
- **Collect samples at the correct depth**

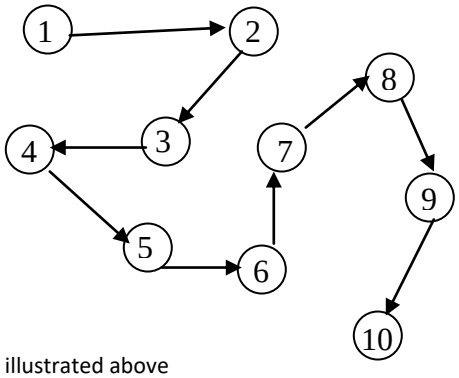
48. Define soil testing.

- **Soil testing is the process of testing for soil nutrients and soil ph (acidity or alkalinity)**

49. State **TWO** importance of soil testing.

- **Determine the pH of the soil so as to determine if it is necessary to modify the soil**
- **To know the type of soil hence the type of crop to grow**
- **To find out the amount and type of fertilizer or liming material needed**
- **To give projections of the yield expected based on recommendations of soil treatment**
- **To determine the nutrient status of the soil**
- **May help in diagnosing low crop yield/mineral deficiency**

50. The diagram below shows a soil sampling method.



(a) Identify the method illustrated above

- **Random/zigzag soil sampling**

(b) Name any **two** spots in a farm that should be avoided during sampling

- **old manure heaps**
- **Ant hills**
- **Dead furrows**
- **Fence lines**
- **Cattle boma**

(c) Describe the steps followed while carrying out the exercise in **(a)** above

- **Clear vegetation from sampling spot**
- **Remove superficial layer / roots**
- **Make a vertical cut of about 15 to 25cm deep and scoop out the soil. Put soil in clean containers and label ' top soil'**
- **Collect sub-soil from a depth of 25-45cm and place it in a bucket labeled 'sub-soil'**
- **Repeat the above procedure in 15-30 spots**
- **Thoroughly mix the soil samples from different spots**
- **Take some subsample from mixture/composite sample**
- **Put soil in clean container and seal it**
- **Label the container clearly**
- **Sent to laboratory for testing**

51. Distinguish between soil sampling and soil testing.

- Soil sampling **is collecting a representative soil for analysis while** soil testing **is the actual analysis process to determine nutrient content and PH**

52. Out line the procedure to be followed in preparing soil sample collected for laboratory testing.

- **Dry the soil**
- **Breaks big lumps/clods of the soil**
- **Mix the soil samples homogenously**
- **Obtain a representative sample**

53. a) What does soil pH stand for.

- **Potential hydrogen ion concentration in the soil.**

b) State two methods of testing soil pH

- **Using colour indicator dyes**
- **BDH universal indicator**
- **Litmus paper**
- **Use of a pH meter**

c) State **two** methods of increasing soil pH

- **Liming**
- **use of alkaline fertilizer**

d) Different soils samples were tested and their PH values tabulated as shown below.

Soil sample	**S_1**	**S_2**	**S_3**	**S_4**	**S_5**	**S_6**	**S_7**	**S_8**
PH value	4	5	6	7	8	9	10	11

i) Which soil sample had the highest acidity

- **S_1**

ii) How would pH value of the soil sample S_8 be reduced?

- **Application of sulphur**
- **Application of acidic fertilizers e.g. Sulphate of Ammonia ,ASN ,DAP, MAP**

iii) Which soil sample would be ideal for growing of maize?

- **S_4**

iv) Give **two** effects of low soil pH on the activity of soil micro-organisms.

- **Inhibit activity of micro-organisms**
- **Favour Fungi**
- **Discourage bacteria**

54. **Give two** reasons why it is important to determine soil pH before planting.

- **Each crop got its own pH range of optimum performance**
- **Some nutrients are fixed up in acidic soils e.g. Phosphorous and molybdenum.**
- **Acidity affects the activities of soil organisms e.g. nitrogen fixing bacteria**
- **High alkalinity makes manganese, potassium, iron, boron, and Zinc less available**

55. State **two** effects of soil pH on the growth of crops.

- **Extremes of PH injure / are toxic to plants**
- **Affects the activity of soil micro- organism**

- **Affects the availability of various plant nutrients**
- **Influences the distribution of crops. Different crop species react differently to soil PH**
- **Affects the resistance of plants against pests**

56. Outline **two** ways in which soil pH influences soil fertility.
- **Affects availability of soil nutrients.**
- **Affects the activities of soil micro-organisms.**
- **Influences occurrence of soil – born diseases/pests.**

57. State **four** ways of modifying soil pH
- **Application of lime**
- **Application of basic fertilizer**
- **Application of acidic fertilizer e.g. Sulphate of ammonia**
- **Application of Sulphur**

58. Give two methods that can be used to determine the types of nutrients present in the soil.
- **Soil testing /Soil analysis**
- **Plant tissue analysis /Leaf analysis**
- **Deficiency symptoms in crop**

59. Calculate the amount of K_2O contained in a 200kg of a compound fertilizer 20:20:10

N: P: K
20:20:10
100kg = 10kg of K_2O
200kg =?

$$\frac{10}{100}X200$$

=20 kg of K_2O

60. A farmer was advised to apply 150kg of C.A.N to maize field . Calculate the amount of nitrogen applied per hectare if C.A.N contains 21%. N

100 kg = 21 kg N
150kg = ?

$$\frac{21 \times 150}{100}$$

= 31.5kg N

61. The recommended rate of top dressing maize is 200kgN per hectare. If CAN contains 25% N, how many 50 kg bags of CAN should a farmer apply to 0.25ha of maize crop to achieve the above rate

100kg CAN contains 25% N
1 ha require 800 kg of CAN
25 kg N is contained in 100kg CAN
Therefore 200kg is contained in

$$\frac{200}{25} \times 100$$

=800kg

Therefore 0.25ha requires $\frac{0.25 \times 800}{1}$ = 200kg
50kg makes 1 bag therefore 200kg makes $\frac{200 \times 1}{50}$
= 4 bags

62. A farmer was advised to apply 40kg/ha P_2O_5 in planting holes, 60kg/ha Nitrogen in top dressing and 60kg/ha K_2O in a Maize field. The available fertilizers were Sulphate of ammonia 20% N, DSP 20% P_2O_5 and muriate of potash 50% K_2O.Calculate how much Sulphate of ammonia and muriate of potash would be required in one hectare of land. (Show your working.)

Sulphate of ammonia
If 100kg of SA contain 20 kg N
? Contain 60kg N
= $\frac{60}{20}$ x 100
= 300kg of SA

Muriate of potash
If 100kg of KCl contain 50kg K_2O
? Contain 60Kg K_2O
= $\frac{60}{50}$ x 100
= 120kg of Murate of potash

63. A farmer was advised to apply 200kg of CAN/ha, while top dressing the beans crop. CAN contains 21%N. calculates the amount of CAN applied per hectare.

21kg N =100kg CAN
? =200kg CAN

$$\frac{200 \times 21}{100}$$

= 42kg N/ha

64. How much of the fertilizer 20:20:0 would be applied in a plot that requires 30kg P_2O_5.

20kg P_2O_5 = 100kg fertilizer
30kg P_2O_5 = ?

$$\frac{30 \times 100}{20}$$

= 150kg

65. After soil testing a farmer was asked to apply fertilizers as follows:
50 kg/ha Nitrogen as top dressing, 60 kg/ha P_2O_5 at planting, 60 kg/ha K_2O for top dressing

a) Calculate how much calcium ammonium nitrate (20%N) would be required per hectare?

100 kg CAN. Contain 20 kg N

50 kg N contains

$\frac{100}{20}$ **x 50 CAN**

= 250 kg CAN

b) Calculate how much double super phosphate 40% P_2O_5 would be required per hectare.

100kg DSP contain 40kg P_2O_5

∴60kg P_2O_5 contained in $\frac{100}{40}$ **x 60 DSP**

= 150 kg DSP

c) Calculate how much muriate of Potash50% K_2O would be required per hectare.

100kg of KCl contain 50 kg of K_2O

∴ 60Kg K_2O contained in $\frac{60}{50}X100$

=120 kg of KCl

66. A farmer was advised to apply 100 kg/ha of a compound fertilizer 20-15-10. How much potassium Pentoxide will he apply in 0.5ha farm?

N: P: K

20:15:10

In 100Kg of NPK = 10kg K_2O

100kg =?

$\frac{100kg}{100kg}x10$ Kg K_2O

= 10 Kg K_2O

1 Ha. = 10 Kg K_2O

0.5 Ha. = ?

∴ 0. 5 x 10

1

= 5Kg

8. CROP PRODUCTION II (PLANTING)

1. What is planting?

- **Placement of planting material in the soil for the purpose of regeneration in order to produce more of the plant species**

2. Name **two** types of planting materials.

- **Seeds**
- **Vegetative materials**

3. State the various plant parts used for vegetative propagation of crops.

- **Bulbs- e.g. onion**
- **Stem tubers- e.g. Irish potatoes**
- **Root tubers- e.g. sweet potatoes**
- **Suckers- e.g. Banana , pineapples**
- **Splits- e.g. Pyrethrum, most pasture grasses**
- **Bulbils- e.g. sisal**
- **Runners- e.g. strawberry**
- **Corms – e.g. cocoyams**
- **Crown – e.g. pineapples**
- **Rhizome – e.g. Kikuyu grass**
- **Stem cutting- e.g. Cassava , sugar cane, Napier grass**
- **Vines- e.g. sweet potatoes**
- **Slips- e.g. pineapples**

4. State and explain factors considered when selecting materials for planting

- **Suitability to ecological conditions – should be well adapted to the soil conditions, temperature and amount of rainfall in the area**
- **Purity of the materials (should not be mixed with off-types) - Low seed rates are used for pure seeds and higher seed rates are used for impure seeds**
- **Germination percentage - Lower seed rates for crops with higher germination percentage while higher seed rates are used for those with lower germination percentage.**
- **Certified seeds-Seeds tested and proved to have 100% germination potential and free from diseases and pests**

5. Give **four** reasons for seed selection in crop production
- **To obtain high crop yield;**
- **To reduce chances of diseases and pests attack / to control diseases, pest and weeds;**
- **To obtain seed with high germination percentage / viable seeds;**
- **To obtain seeds that can be grown in a given area;**
- **To obtain high quality produce.**
- **To ensure seed purity which lead to low seed rate**

6. Explain **four** methods of preparing planting materials.
- **Breaking seed dormancy – by mechanical, heat treatment, chemical treatment etc**
- **Seed dressing – coating seed with pesticides to control soil borne pests.**
- **Seed inoculation – promotes nitrogen fixation.**
- **Chitting – promotes sprouting before planting.**
- **Seed cleaning**

7. Differentiate between **chitting** and **seed inoculation**.
- **Chitting (sprouting) is the breaking of Irish potatoes' dormancy while seed inoculation is the coating of legume seeds with a nitro-culture to attract nitrogen fixing bacteria.**

8. Differentiate between "**chitting** and **pricking** out" in crop production
- **Chitting or sprouting is the breaking of "setts" dormancy before planting while pricking out is the in removal of congested seedlings in a nursery bed and transferring them to a seedling bed / secondary nursery**

9. a) Give **four** possible causes of seed dormancy.
- **Old age/depleted food reserves**
- **Impermeable testa/seed coat to water and oxygen**
- **Damage by pests/broken**
- **Damage by diseases**
- **Lack of moisture, Oxygen in the soil.**
- **Immature embryo**
- **Presence of germination inhibitors**
- **Extreme temperatures during seed maturity**

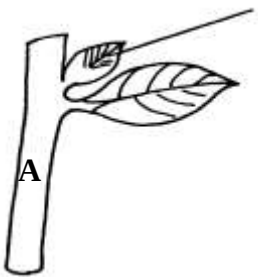
b) **Give four** methods of seed treatment.
- **Inoculation**
- **Seed dressing**
- **Cleaning /winnowing**
- **Drying**
- **Breaking dormancy**

c) Give two reasons for treating seeds
- **To protect the seeds against pests and diseases**
- **To break seed dormancy**
- **To coat legume seeds with the right strain of Rhizobium for nitrogen fixation**
- **To improve germination percentage**

d) State any **two** ways of breaking seed dormancy during the preparation of planting materials.
- **Mechanical methods (Scarification/filing / nicking)**
- **Heat treatment (slight burning / charring / soaking in hot water)**
- **Drying in the sunlight**
- **Soaking in water**

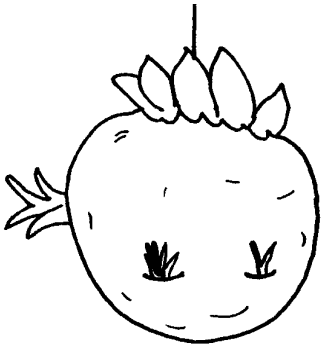
10. State **two** advantages of carrying out chitting in preparation of Irish potatoes for planting.
- **The crop gives uniform growth**
- **Encourages the production of short green and healthy sprout.**
- **Faster establishment after planting.**
- **Enables farmers to select quality planting materials.**

11. The illustration below shows materials used in vegetative propagation, labeled **A** and **B**.



A **B** **Y**

X



(a) Identify materials **A** and **B**.

A – Stem cutting **B- Stem Tuber**

(b) Name the parts labeled **X** and **Y**.

X – Bud **Y – Shoots/sprouts**

(c) Name the preparation method used to get the vegetative material labeled **B**.

- **Chitting/sprouting**

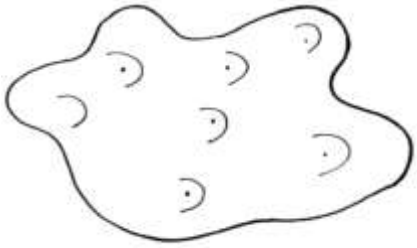
12. Name o**n**e crop each, propagated using the below stated vegetative parts.

a) Bulbils **= Sisal**
b) Splits **= Pyrethrum; pasture grasses**
c) Crowns **= Pineapple**
d) Setts= **Sugarcane / potatoes**

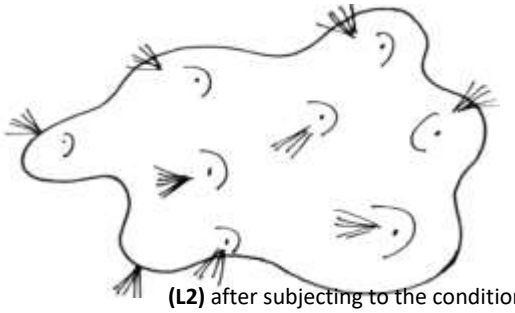
13. Define the following terminologies as used in agriculture

(a) Seed inoculation -**Treatment of legume seeds with bacterial culture to increase their Nitrogen fixation in the soil.**
(b) Chitting**- Breaking of dormancy in Irish potatoes before planting**

14. Below are two diagrams of Irish potato tuber after being subjected to some conditions before planting.



(L_1) Before subjecting to the conditions



(L2) after subjecting to the conditions

(a) Which process of potato treatment is illustrated above?

- **Chitting/sprouting.**

(b) State **two** conditions necessary for the above process.

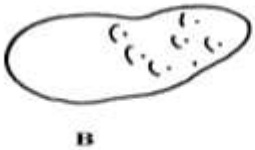
- **Humid/moist environment**
- **Diffuse light.**

(c) Give **two** reasons for carrying out the above practice.

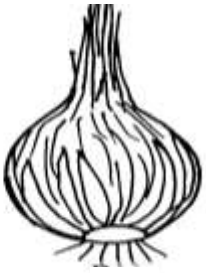
- **Ensure uniform growth after selection.**
- **To ensure growth commences immediately after planting.**
- **To break seed dormancy.**

15. Below are diagrams showing vegetative material used for propagation.

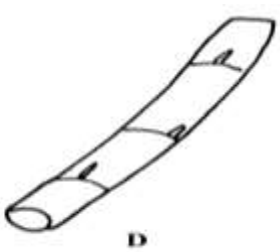
A



B



C



D

A - Banana sucker **B -Stem tuber**
C - Bulb **D- Stem cutting**

b) What is the term used for inducing **B** to start germinating?

- **Chitting**

16. Give any **three** parts from which pineapples can be propagated.

- **Crowns**
- **Slips**
- **Suckers**

17. Name any **two** crops propagated through suckers.

- **Banana**
- **Pineapples**
- **Sisal**

18. Name the vegetative structure used to propagate the following crops.

(a) Sugar cane

- **Setts / stem cuttings.**

(b) Pyrethrum

- **Splits**

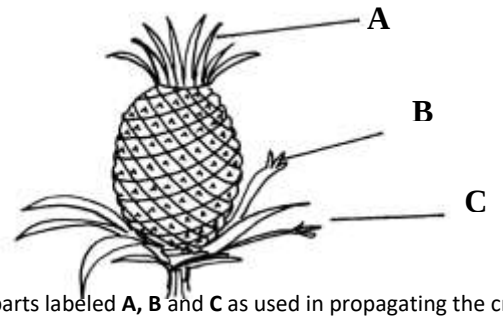
19. Name **three** reasons why bulbils make good planting materials than suckers.

- **Small in size hence portable**
- **Establish uniformly**
- **Can be raised in a nursery and later transplanted.**
- **More readily available than suckers**

20. Complete the table below showing the various vegetative planting materials for crops

Crop	**Vegetative materials**
(1) Sisal	(i) **Bulbils**
(ii) Pyrethrum	(ii) **Splits**
(iii) Pineapples	(i) **Suckers / Crown / Slips**
(iv) Sweet potatoes	**Vines**
(v) Guatemala grass	**Splits**

21. The diagram below represents a pineapple plant



(a) Identify the parts labeled **A, B** and **C** as used in propagating the crop.

A - Crown.
B - Slips
C - Sucker

(b) Give **one** advantage of using the part labelled **C** over **A** and **B**

- **Gives uniform growth**
- **Take short time to reach maturity**

22. a) What is seed inoculation?

- **Coating of leguminous seeds with the right strain of Rhizobium bacteria to encourage nodulation and fix nitrogen**

b) Why is it necessary to inoculate legume seeds before planting?

- **Increase nitrogen fixing bacteria for nitrogen fixation**
- **Economizes on nitrogen fertilizers**
- **To improve the quality of pasture**

23. Distinguish between seed dressing and seed inoculation.

- **Seed dressing is the coating of seed with fungicide, insecticide or both to protect it from soil borne pest and diseases while seed inoculation is the coating of leguminous seeds with right strain of Rhizobium bacteria to encourage nodulation and fix nitrogen.**

24. Using planting material whose diagram is shown below, list **four** factors that would influence the rooting of the structure

- **Temperature;**
- **Relative humidity;**
- **Light intensity;**
- **Oxygen supply;**
- **Leaf area;**
- **Chemical treatment;**

25. State **two** advantages of propagating tea using cuttings

- **It establishes faster**
- **There is retention of genetic characteristics/propagated crops are exactly similar to --their mother plants**
- **There is early maturity**
- **It is high yielding**

26. State two characteristics of a Mother plant where **stem cuttings** should be obtained.

- **High yielding**
- **High leaf quality**
- **Good rooting ability**
- **Adapts easily to a wide range of ecological conditions**
- **High pest and disease resistances**

27. List **two** factors that affect rooting of cuttings in crop production

- **Temperature**
- **Relative humidity**
- **Light intensity**
- **Oxygen supply**
- **Chemical treatment**
- **Leaf area**

28. a) State **four** advantages of vegetative propagation on crop production

- **Crops mature earlier than those from seeds**
- **Crops show uniformity.**
- **More varieties of compatible crops are produced from the same roots stock.**
- **It is easier and faster.**
- **Results in plants with desirable shape and size.**
- **Crops which are seedless are propagated.**
- **True copy of mother plant**
- **Have no dormancy period**

b) State **three** disadvantages of vegetative propagation.

- **Vegetative propagation does not result in new crop varieties.**
- **Keeping the materials free of disease is difficult.**
- **Materials can not be stored for long.**
- **Materials are bulky and so difficult to store and transport.**

29. Give **two** advantages of producing crops by use of seeds over vegetative propagation materials

- **Seed treatment is easier**
- **Seeds can be stored for a long time**
- **Faster and uniform germination**
- **Mechanization of farm operation is easy/possible**
- **Application of fertilizer/manure is easy and can also be mechanized**

30. Explain briefly the factors that influence timely planting

- **Climatic conditions – prevailing rainfall patterns determines the crops to grow**
- **Market demand – early planting enables crops to mature early before the market is flooded**
- **Weed control- plant early before weeds germinate**
- **Pests and disease control- plant crops early for them to outgrow stages when adversely affected by pests.**

31. Give **four** qualities of a mother plant which should be considered when selecting vegetative material for propagation

- **High yielding.**
- **High quality products**
- **Diseases resistance.**
- **Healthy/diseases free**
- **Pest free**
- **Fast growth/early maturing**
- **Adaptability to environment.**

32. Distinguish between over sowing and under sowing
- Under sowing **is the establishment of pasture under a cover crop usually maize while** over sowing **is the establishment of pasture legume in an existing grass pasture**

33. Define broadcasting as a method of planting
- **Broadcasting is the scattering of the seeds all over the field/ farm in a random manner**

34. Give **four** disadvantages of broadcasting as a method of planting.
- **It is wasteful because a higher seed rate is used.**
- **It is not possible to use machines.**
- **It is not possible to establish plant population.**
- **Lack of uniformity in seed establishment.**

35. List **two** advantages of row planting
- **Machines can be used easily between the rows**
- **Easy to establish the correct plant population**
- **Lower seed rate is used**
- **Easy to carry out cultural practice**

36. Outline **four** advantages of using certified seeds in crop production.
- **High germination percentage.**
- **Free from pests and diseases.**
- **Higher resistance to diseases**
- **Have uniform growth rate.**
- **Free of weed seeds / foreign materials.**
- **Have a vigorous growth rate/ Grow faster**
- **Have high yields.**
- **They are of high quality.**
- **Good adaptation to recommended ecological zones**
- **Correct age not over stored**
- **Right texture, size, shape and colour**
- **High viability, no dormancy**
- **True to type/not contaminated with other crop varieties**

37. State **four** factors that determine the spacing of annual crops
- **Moisture content of soil**
- **Use of which the crop is to be put**
- **Number of seeds per hole**
- **Prevalence of certain diseases/ pests**
- **Machinery to be used in subsequent operations**
- **Fertility status of the soil**
- **Spreading habit/ tillering / growth habit**
- **Height / size**

38. Explain the factors considered in spacing of crops in the field.
- **Height-shorter crops require narrower spacing**
- **Size of the plant – crops forming canopies require wide spacing**
- **Plant tiller –produces suckers will end to occupy a big space thus wider spacing**
- **Soil fertility fertile soil support narrows spacing than infertile soil.**
- **Purpose of the crop-maize for silage preparation is spaced narrowly than maize for grains.**
- **Soil moisture- dry areas require wider spacing than wet areas.**
- **Spreading habits –crops that spread are spaced at wider spacing than crops that do not spread.**
- **Number of seeds /hole- if more seeds are planted wider spacing is required.**
- **Mechanization – mechanical operations require wider spacing**
- **Pure stand- requires narrower spacing that inserts cropped crops.**
- **Disease/ pest control – proper spacing minimizes the spread of pests and diseases.**

39. Mention **four** factors that influence spacing in a pure sorghum stand
- **Variety of the sorghum/ growth habit**
- **Method of planting i.e. broadcasting and row planting**
- **Purpose of the crop e.g. Grain vs. Silage**
- **Number of seeds per hole**
- **Soil fertility**
- **Soil moisture content**
- **Use of machines for subsequent operations e.g. Weeding**

40. a) A farmer planted 100 maize seeds and 90 seeds germinated.
Calculate the germination percentage

Germinated seed x100% =90 x100%
Total seeds planted 100 = 90%

b) Given that maize is planted at a spacing of 75cm by 25cm, calculate the plant population in a plot measuring 4m by 3m

Plant pop = land area
Spacing

4mx3m
75x25cm
400cmx300cm
75cmx25cm
= 64plants

41. a) List **four** factors which determine the depth of planting seeds.

- **Soil type**
- **Soil moisture content**
- **Size of seed**
- **Time of planting**
- **Risk of pests damage**
- **Type of germination displayed by the seed.**
- **Type of machine used for planting**
- **Age of the seed**
- **Environmental temperatures**

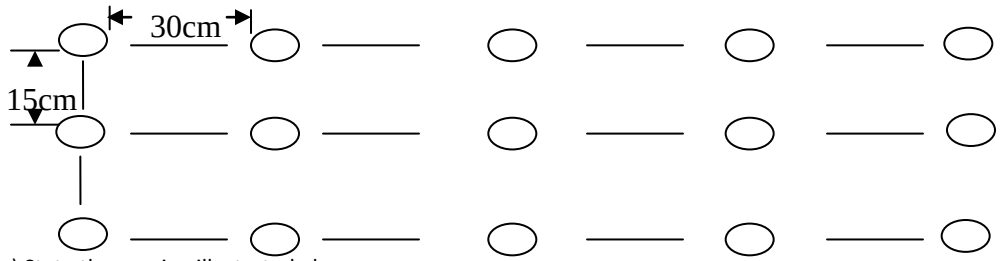
42. Calculate the number of tea plants in two hectares (2ha) given that the spacing is 150cm x 75cm

Tea population =Area of land
Spacing of crop
= (10,000x2
1.5mx 0.75)
20,000m²
1.125m²
= 17,777 plants

43. Given that maize is planted at a spacing of 75cm x 25cm. Calculate the plant population in a plot of land measuring ½ ha. (Show your working).

Plant population=Area x No. of seeds per hole
Spacing
Area = ½ x10, 000m^2=5,000m^2
Spacing=0.75mx0.25m
=5000m^2 x1
0.75mx0.25m
=5000m^2
0.1875m^2
=26,667 plants

44. The diagram below illustrates the spacing which is used when planting beans. Study the diagram and answer the questions that follow



(a) State the spacing illustrated above

- **30cm X 15cm**

(b) Suppose the student is asked to use the illustrated spacing to plant in a plot 4m by 3m leaving 30cm distance from the edge; calculate;
(i) The number of rows on the wider side of the plot

4M – 0.6 M + 1
0.3M
3.4 + 1
0.3

= 12 rows

ii) Calculate the plant population

Plant population = $3M \frac{-0.6}{0.15} + 1$

= $\frac{2.4}{0.15} + 1$

= 17 plants X 12 rows

= 204 plants

45. a) **Give two** harmful effects of high population density in cabbage production.

- **Difficult to carry out field operations**
- **Reduce yield**
- **Reduce quality of yield**

(b) **Calculate** the plant population per hectare of cabbage at a spacing of 100cm by 50 cm.(Show your working.)

Ha=10,000m^2

Spacing: 100cm x 50 cm = 1mx0.5m

PP = $\frac{10{,}000\ M^2}{1x0.5m^2}$

=20,000 plants/ha

46. A farmer planted 30 bean seeds in his kitchen garden. He noticed that only 20 beans germinated despite regular irrigation. Calculate the germination percentage of the beans. (Show your working)

$$\textbf{Germination percentage} = \frac{\textbf{germinated seed}}{\textbf{Total number of seeds planted}} \textbf{x } 100$$

$$= \frac{20}{30} \textbf{ X } 100$$

$$\textbf{= 66.6\% } \approx \textbf{ 67\%}$$

47. **Given** that onions are planted at a spacing of 30cm x 8cm calculate the plant population in a plot of land measuring 4m x 3m (show your working.)

Plant population = $\frac{\text{area}}{\text{Spacing}}$

= $\frac{400\ cm x 300\ cm}{30\ cm x 8\ cm}$

500 onions

48. A plot of land measures 6.6m long and 3.6m wide. The plot is prepared for planting cabbages at a spacing of 60cm by 60cm. The outermost rows start 30cm from the edges all around the plot. Showing your work, calculate the:

(i) Number of rows falling on the wide side of the plot

Number of rows: $\frac{(360 - 60)}{60} + 1$

= 6

(ii) Number of cabbage seedlings that should be planted in the plot,

The number of plants in one row

$\frac{(660 - 60)}{60} + 1$ = 11

Number of plants for the whole plot =11 × 6

= 66 cabbages

49. Give **six** benefits of timely planting of annual crops

- **Enables crop to benefit maximumly from available moisture /Utilization of early rainfall**
- **Crops make use of nitrogen flush in the soil that has accumulated during dry season**
- **Crops fetch high market prices**
- **There is high vigour in crops that resist diseases**
- **Ensures timely harvesting**
- **Escape from serious weed competition;**
- **Escape from serious pest and disease attack e.g. stalk borer in maize;**
- **Reduce competition for labour during labour peak period;**
- **For harvesting season to coincide with dry period to reduce losses e.g. cotton(allow easy drying of crop produce)**
- **Crop is capable of escaping water-logging conditions of the soil**

- **Crops will escape drought conditions incase rains disappears after onset**

50. Give **three** disadvantages of row planting in crop establishment.
- **Expensive**
- **Labour demanding**
- **Encouraging soil erosion as a lot of spaces are left uncovered on soil surface.**
- **Requires skills e.g. in measuring distances.**
- **Land is not used fully/not fully utilized.**

51. The table below shows the average spacing for some crops. Study it and answer the questions that follow.

Crop	Spacing
Beans	30cm x 15cm
Maize	90cm x 30cm
Tea	150cm x 75cm

a) What **three** factors determine correct spacing for crops?
- **Type of machinery used**
- **Size of the crop**
- **Soil moisture**
- **Soil fertility**
- **Growth habit**
- **Purpose of the crop**
- **Number of seeds/hole**
- **Pests & diseases**
- **Intercropping**

b) What is the main aim of correct crop spacing?
- **To obtain optimum plant population**
- **To obtain maximum yields**

c) Calculate the appropriate plant population per hectare for maize.

Plant population = $\frac{\text{Area of land}}{\text{Spacing of crop}}$

$= \frac{10000\ m^2}{0.9m \times 0.3m}$

= 37,037 plants

52. Give **two** precautions taken to ensure good crop establishment during planting.
- **Use of certified seeds**
- **Proper depth of planting**
- **Recommended tilth**
- **Timely planting**

53. State **two** factors to consider when choosing seed rate.
- **Seed purity**
- **Germination percentage**
- **Spacing**
- **Number of seeds per hole**
- **The purpose of the crop**
- **Method of planting.**

54. Give **two** advantages of planting maize with correct plant population.
- **To obtain high quality crops**
- **To obtain high yields**
- **Helps a farmer to carry out other cultural practices like weeding, pest and diseases control**
- **Reduce competition for light and nutrients**
- **Help to control soil erosion**

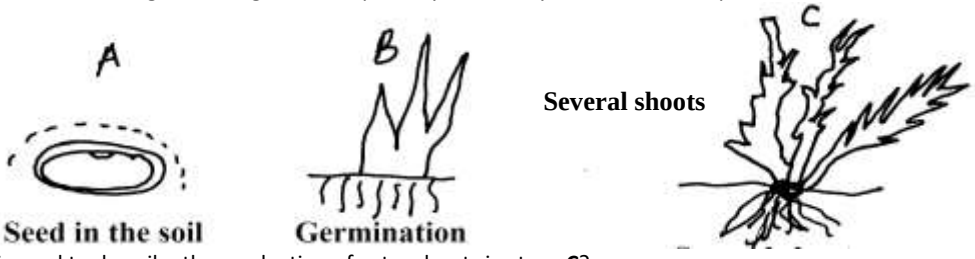
55. Give **four** factors that influence time of planting crops.
- **Variety of crop**
- **Prevalence of pests and diseases**
- **Market demand**
- **Rainfall pattern/ moisture content of crop**

56. Give **four** reasons why seeds may fail to germinate after planting.

- **Pest and disease attack**
- **Deep placement/shallow placement**
- **Inadequate moisture in the soil**
- **Long storage of seeds**

57. State **four** factors considered in timing planting.
- **The rainfall pattern/ moisture condition of the soil**
- **Type of crop to be planted**
- **Soil type**
- **Market demand**
- **Weed control**
- **Prevalence of pests and diseases**

58. The diagram below illustrates growth stages of a crop. Study it carefully and answer the questions that follow.



(a) What term is used to describe the production of extra shoots in stage **C**?
- **Tillering**

(b) Name four examples of crops that produce additional shoots as illustrated in diagram **C.**
- **Rice**
- **Millet**
- **Sorghum.**
- **Sugarcane.**
- **Napier grass**
- **Maize**

59. i) **Describe** practices that a farmer should carry out to ensure uniform germination of seeds.
- **Select seeds of the same size, age and variety**
- **Select seeds free from diseases**
- **Plant seeds at same time**
- **Prepare seedbed to the required uniform tilth**
- **Treat seeds against soil borne pests and disease.**
- **Plant at the right moisture content of the soil / irrigation uniformly.**
- **Treat seeds before planting i.e. break dormancy.**
- **Plant at the correct depth.**

(ii) Give **two** reasons that could lead to low germination percentage of beans.
- **Pests and diseases attack of seeds**
- **Long period of storage;**
- **Inappropriate depth of planting;**
- **Inadequate moisture;**
- **Planting seeds that are not certified;**

iii) State **three** ways of ensuring high germination percentage of beans.
- **Planting certified seeds**
- **Proper sorting of seeds;**
- **Proper selection of seed**
- **Planting of seeds at correct moisture content of the soil.**
- **Proper drying**
- **Planting at correct/recommended depth;**

CROP PRODUCTION III (NURSERY MANAGEMENT PRACTICES)

1. List **three** categories of nurseries
   - **Vegetable nursery**
   - **Vegetative propagation nursery**
   - **Tree nursery**

2. List **two** types of vegetable nurseries
   - **Movable**
   - **Open fixed / ground**

3. Name **two** types of ground nurseries
   - **Sunken**
   - **Raised**

4. State the differences between a nursery and a seedbed
   - Nursery bed **is a portion of land specially prepared to raise seedlings before transplanting, while** a Seed bed- **a piece of land (small or large) that has been prepared and is ready to receive planting materials to grow to harvesting time.**

5. **Differentiate** between a seedbed and a seedling bed
   - Seed bed- **a piece of land (small or large) that has been cleared, dug and is ready to receive planting materials to grow to harvesting time**
   - Seedling bed- **a special type of nursery bed, for raising seedlings that have been removed form nursery bed due to overcrowding before they are ready for transplanting**

6. State **four** factors to be considered when siting a nursery bed.
   - **Accessibility**
   - **Topography to discourage water logging / Gentle slope**
   - **Type of soil.**
   - **Nearness to reliable water source**
   - **Well drained soil**
   - **Security**
   - **Consider previous crop grown in the area**

7. State **three** advantages of raising seedlings in a nursery bed.
   - **Facilitate the production of many seedlings in a small area.**
   - **Routine management practices are easily and timely carried out in the nursery bed.**
   - **It makes it possible to provide optimum conditions for growth such as fine tilth, leveled field and shade.**
   - **Facilitate the planting of tiny seeds which develop into strong seedlings that are easily transplanted.**
   - **Ensures transplanting of only seedlings that are healthy and vigorously growing.**
   - **Facilitate the transplanting of seedlings that are already well established thus reducing the period taken in the field.**
   - **Excess seedlings from the nursery may be sold, thus become source of income to the farmers**
   - **Low seed rate per unit area of land**
   - **Reduced labour to care for seedlings.**
   - **Economize on use of chemicals/ water.**
   - **Gives a farmer a head start in planting hence early maturity of the crop**

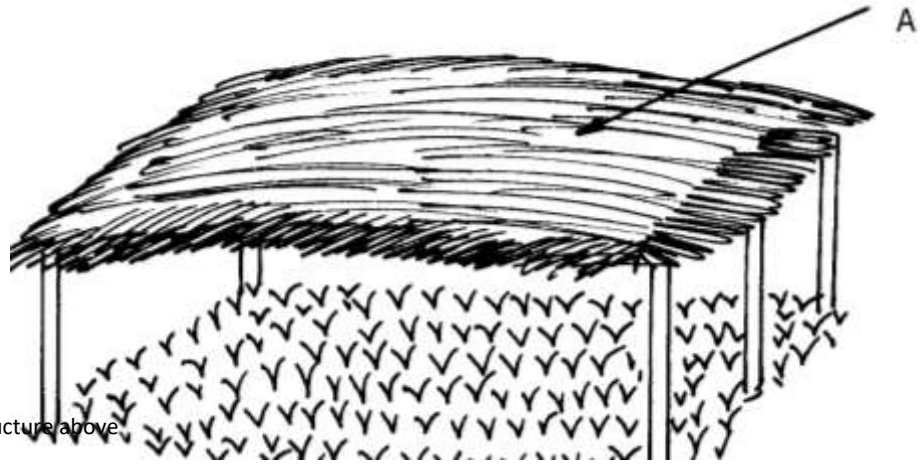
8. State **four** importance of thinning seedlings in the nursery bed
   - **To control spread of pests and diseases**
   - **To create space for other seedlings**
   - **To avoid competition for light, nutrients**
   - **Allow rapid/vigorous growth of seedlings**

9. Give **three** conditions which make it necessary to use a nursery in crop establishment
   - **The crop seedlings are delicate and need great care.**
   - **Bulking up of planting materials is necessary like sugar cane.**
   - **Gives opportunity to select the healthy and strong seedlings.**
   - **When cuttings to propagate the crop need special treatment.**
   - **When seeds are too small**
   - **When cuttings need special treatment**

10. Outline the procedure of establishing a vegetable nursery bed.
    - **Select a suitable site**

- **Mark out the site**
- **Clear the vegetation using appropriate tool**
- **Remove the trash**
- **Deeply dig/plough to remove all the perennial weeds especially the grass**
- **The various nursery beds are measured and marked. Paths of 60cm wide are left in between**
- **The beds are sunk in dry areas or raised in wet areas.**

11. The diagram below shows a structure used in crop production:



(a) Identify the structure above
- **A nursery bed**

b) **State three** importance of the part labelled **A** in the above structure.
- **To reduce the amount of water that may be lost through vaporization/ evaporation / transpiration.**
- **To modify nursery temperature.**
- **To reduce the impact of rain drops / hailstones there by minimizing damage on the seedlings.**
- **Reduce splash erosion.**
- **Reduce the scorching effect from the sun on the seedlings.**

12. Explain the importance of each of the following practices:
i)Hardening off
- **To acclimatize the seedlings to the actual conditions in the seedbed /reduce transplanting shock**

(ii) Pricking out
- **To avoid overcrowding and reduce competition for light.**
- **Produce healthy and strong seedlings**

13. State **two** practices done during hardening-off of seedlings in a nursery bed.
- **Reduce amount of shade gradually.**
- **Reduce watering gradually.**

14. Give the measurement of a vegetable nursery.
- **1-1.5 metre wide by any convenient length.**

15. List **four** management practices carried out on a nursery bed
- **Watering**
- **Shading**
- **Pest and disease control**
- **Weed control**
- **Mulching**
- **Hardening off**
- **Pricking out**

16. State management practices, which should be carried out in tree nurseries
- **Maintenance of shade**
- **Pruning of lateral shoots**
- **Weed control by uprooting**
- **Pest control using appropriate pesticides**
- **Control diseases using appropriate chemicals.**

- **Regular watering**
- **pricking out / thinning**
- **Hardening off.**
- **Control overgrown lateral / vertical roots**

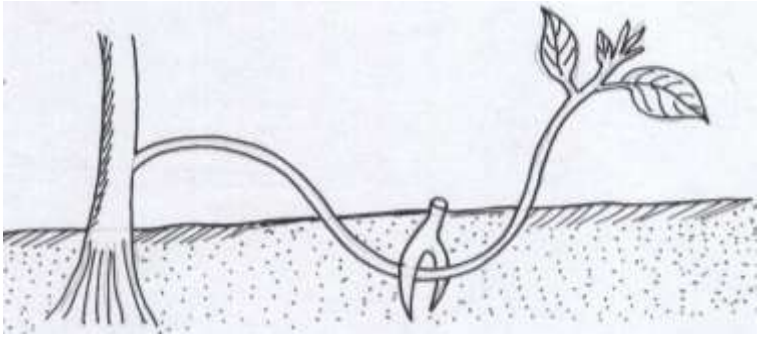
17. Give four factors that influence rooting of cuttings.
- **Temperatures**
- **Relative humidity**
- **Chemical /hormone treatment. .g. rooting hormone**
- **Oxygen supply**
- **Light intensity**
- **Moisture supply.**
- **Leaf area.**

18. Give **three** benefits of using polythene sleeves in raising seedling.
- **Roots are not disturbed**
- **The farmer can plan on when to plant waiting for favourable conditions because the seedlings can be stored securely.**
- **Seedlings are easier to carry / transport.**
- **Soil borne pests and diseases are evaded since fresh mixtures are prepared every time seedlings are planted (prepared)**

19. Differentiate between grafting and budding.
- **Grafting is the practice of uniting two separate woody stems so that they grow as one while budding is the practice of uniting a vegetative bud (scion) and a seedling of another plant (rootstock.)**

20. List **four** methods of layering.
- **Marcotting /aerial layering**
- **Compound/serpentine layering**
- **Trench layering**
- **Tip layering**
- **Stool layering.**

21. The figure below is a diagram illustrating a method of crop propagation. Study it carefully then answer the questions that follow.

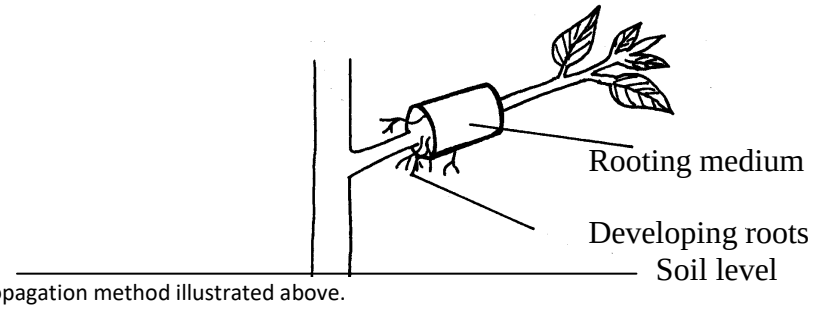


b) Name the method of propagation illustrated above
- **Tip layering**

c) Give **two** ways of initiating faster root development in the propagation method shown above
- **Apply hormones e.g. I.A.A**
- **Debarking / wounding the part of the plant buried in the ground / ring barking**
- **Bending the part of the plant buried in the ground**
- **Applying a rooting medium**
- **Wetting the soil.**

d) What would make it necessary for a farmer to choose the above method of propagation instead of using cuttings?
- **Used for plants whose cuttings do not root easily**
- **When a larger planting part (propagules) is required.**

22. The diagram below shows a method of crop propagation.



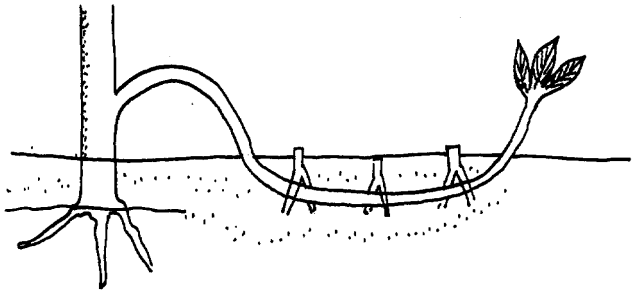
(i) Identify the propagation method illustrated above.

- **Marcotting/Aerial layering**

(ii) State **three** ways of initiating faster root development in propagation method illustrated.

- **Debarking/Ring barking**
- **Applying a rooting hormone/IAA/IBA/NAA**
- **Applying rooting medium e.g. Silica, saw dust, sisal waste**
- **Wetting the soil around the area**

23. a) Identify the crop propagation method illustrated below



- **Trench layering**

b) State **two** factors that would promote root formation in the propagation method in a (ii) above

- **Availability of moisture**
- **Treatment and application of auxins (hormones)**
- **Availability of oxygen**
- **Use of proper propagation technique to ensure better healing of wound/ keeping rooting medium in contact with the stem.**

24. The diagram below is of a tea cutting. Study it carefully and answer the questions that follow.

(a) Which part of the branch is the most appropriate for raising a new seedling?

- **X**

(b) Give reasons for your answer in (a) above.

- **Not too succulent.**
- **Cannot rot easily.**

(c) Give **two** factors which affect rooting of cuttings

– Temperature
- **Oxygen supply.**
- **Chemical treatment.**
- **Leaf surface area.**
- **Light**

25. The diagram below illustrates a vegetative propagation method. **Study** it carefully and use it to answer the questions that follow.

(a) **Name** the method shown.

- **Whip / Tongue grafting**

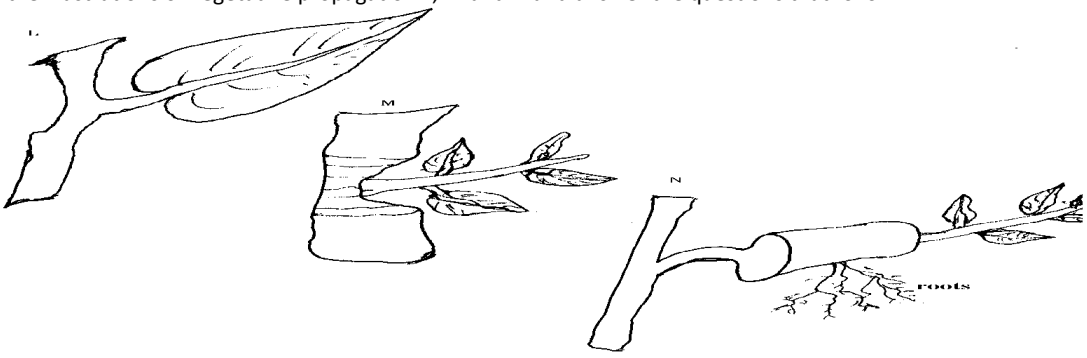
(b) **Mention three** factors considered when selecting the section labeled M.

- **Health / free from pests and diseases**
- **Compatibility with different scions**
- **Resistance to soil borne pests and diseases**
- **Adaptability to different soil conditions**
- **Good rooting system**

(c) **Give three** factors which determine the success of the method shown above.

- **Botanically close related scion and root stock**
- **Intimate contact between scion and root stock cambial regions**
- **Should be done at proper physiological growth stages of scion and root stock**
- **Union protected from excessive loss of moisture**
- **Removal of shoots emerging from root stock**

26. Study the illustrations of vegetative propagation L, M and N and answer the questions that follow.



(a) **Name** the method of vegetative propagation illustrated in:

Diagram **L**: = **Stem cutting**

Diagram **M**: = **Budding**

Diagram **N**: = **Aerial layering**

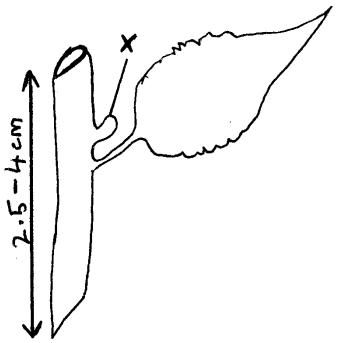
(b) **Name** a tool used to carry out the method of propagation illustrated in diagram M above.

- **Budding knife**

27. List **two** methods of budding used in crop propagation

- **T-budding**
- **Top budding**
- **Patch budding**

28. Study the illustration below of the tea vegetative materials and answer the questions that follow



(a) **What name** is given to the vegetative material drawn above for tea propagation?
- **Single leaf internode**

(b) **Name** the part labelled **X**
- **Bud**

(c) **State any three** desirable characteristics of the selected plants used to develop the planting materials shown.
- **High yielding,**
- **Good rooting ability,**
- **High quality,**
- **Adaptable to a wide range of ecological conditions**

(d) **State any two** precautions observed during the preparation of the material illustrated above before planting.
- **The top cut must be made as near to the auxiliary bud as possible and sloping away from it.**
- **The lower cut must be sloping and must allow for 2-3cm of stem below the leaf**
- **The single leaf internode cuttings must be kept shaded and wet /floating in water from the time of cutting to planting**

29. Name **three** methods of grafting that are used in propagation of plants
- **Whip / tongue grafting**
- **Side grafting**
- **Approach grafting**
- **Bark grafting**
- **Notch / wedge grafting**

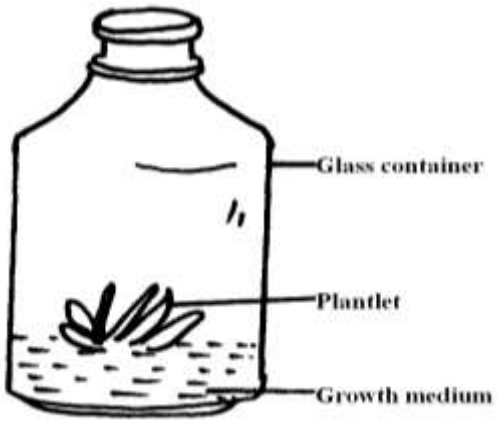
30. State **four** reasons why grafting is considered an aspect of crop improvement
- **Early maturity**
- **Different fruits can be produced on same root stock**
- **Use of resistant rootstock to diseases**
- **Possible to propagate seedless fruits**
- **Improve unproductive trees**

31. Give **two** reasons why a rough lemon is preferred to be used as a rootstock during budding / grafting of citrus
- **Compatible with the scion.**
- **Resistant to soil- borne diseases and pests.**
- **Adaptable to different soil conditions**
- **Vigorous root system.**
- **Drought resistant**

32. a) What is tissue culture?
- **Biotechnology used to clone vegetatively propagated plants**

b) Outline **two** importance of tissue culture in crop propagation
- **Propagate pathogen free plants**
- **Disease free planting materials can be obtained /used in disease control**
- **used in mass production of Propagules**
- **It is fast**
- **It requires less space than other methods**

33. The diagram below illustrates materials and a method of vegetative propagation. Study it and answer the questions that follow.



a) Identify the method of propagation illustrated above.

- **Tissue culture**

b) Give one advantage associated with the method.

- **Used in mass production of propagules.**
- **It is fast.**
- **Used to recover and establish pathogen free plants.**

c) State **two** reasons why the method in a, above is rarely practiced by farmers.

- **Requires high level of sanitation**
- **Certain crops cannot be propagated by this method.**
- **Requires special structures e.g. lab, green houses etc.**
- **Requires high skills and extreme care.**
- **Require high capital to carry out**
- **Plantlets take longer to grow and establish**

34. Name **two** ingredients of the culture medium at Stage I of the tissue culturing

- **Inorganic minerals**
- **Carbon and energy source (preferably sugar)**
- **Vitamins**
- **Organic supplements**
- **Growth regulators**

35. Give **two** reasons for watering a nursery a day to transplanting.

- **It ensures that a ball of earth round the roots remains intact to reduce root damage.**
- **It ensures that seedlings are easily lifted**

36. State **two** damages caused by animals on tree seedlings in the field.

- **Ringing the bark**
- **Browsing/nibbling**
- **Trampling**

37. Describe the siting and establishment of a crop nursery

a) Siting crop nursery-factors considered;

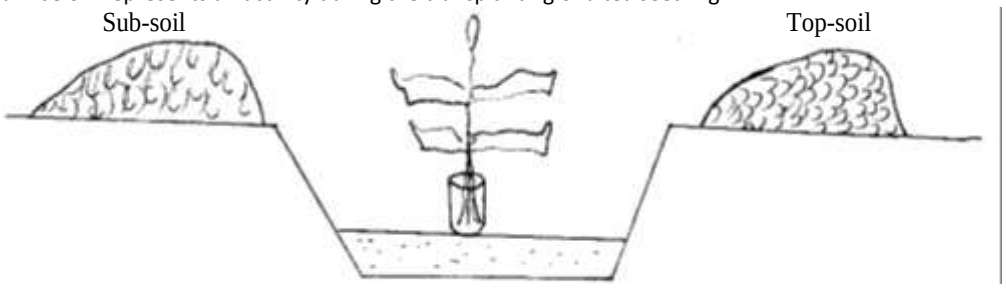
- **Accessibility**
- **Topography should discourage water logging / Gentle slope**
- **Type of soil.**
- **Nearness to reliable water source**
- **Well drained soil**
- **Security**
- **Consider previous crop grown in the area**

b) Establishment

- **Prepare fine tilth**
- **Add manure or fertilizers to the nursery**
- **Sterilize soil against soil borne pests/ diseases**
- **Ensure nursery is 1m wide**
- **Make drills 15 cm apart**
- **Plant seeds in drills and cover with light soil layer**
- **Cover with light mulch and water**

- **Shade the nursery bed immediately germination starts**

38. The diagram below represents an activity during the transplanting of a tea seedling.



Briefly explain step by step how the above seedling can be transplanted in the hole that has been dug in the main seedbed.
- **Mix top soil with manure and a handful of DAP fertilizer**
- **Put the mixture of top soil in the hole.**
- **Remove the polythene sleeve carefully by tearing.**
- **Insert the seedling at the centre of the hole.**
- **Fill the hole with sub soil, not submerging collar of the seedling**
- **Firm the soil around the seedling from the bottom upwards.**
- **Mulch and water the seedling after firming the soil.**

39. Describe the transplanting of coffee (*Coffea arabica*) on an already prepared land.
- **Start transplanting at beginning of the rains**
- **Open holes before transplanting**
- **Plant with the roots well spread and at the same depth as they were in the nursery /polythene sleeves**
- **Press soil as you fill the whole with mixture of top soil and sub soil**
- **Apply mulch around seedling**
- **Apply shade after planting**
- **Water seedlings the evening before transplanting**
- **Water seedling after transplanting**
- **Lift seedlings from nursery bed with as much soil as possible / remove polythene sleeve when transplanting**
- **Transport seedlings carefully to the planting site**

40. Outline the procedure of transplanting tree seedlings
- **Water seedlings in the nursery thoroughly**
- **Prepare planting holes**
- **Separate top soil and sub soil.**
- **Lift the seedlings from the nursery bed by use of garden trowel with a lump of soil on the root**
- **Mix top soil with organic manure**
- **Place the seedlings at the centre of the hole**
- **Take care not to disturb / damage the roots**
- **Fill holes with topsoil mixed with manure and use sub soil to fill the hole.**
- **Plant the seedling at the same depth as they were in the nursery.**
- **Firm gently the soil around the seedling's root system**
- **Water the seedlings.**
- **Mulch / shades the seedling**

41. Study the illustration in the diagram below and answer questions that follow.

a) Identify the practice being illustrated above.
- **Transplanting/lifting of seedlings**

b) State **three** activities that should be carried out for successful results in the practice shown above.

- **Watering thoroughly before lifting**
- **Lifting using a garden trowel**
- **Lifting seedlings with a ball of soil on roots**
- **Lifting early in the morning/evening/cloudy day**

c) At what stage should the practice be carried out in vegetable seedlings?

- **4 – 5 weeks old / 4 – 6 true leaves/ 10 – 15cm tall.**

d) Give **two** ways of minimising root damage during lifting from the nursery.

- **Watering the seedling thoroughly**
- **Lifting seedling gently using appropriate tools**
- **Remove the seedling with reasonable amount of soil**

42. Give **four** reasons why farmers are advised to raise tea in polythene sleeves

- **For easy transplanting**
- **Root system is not disturbed during transplanting**
- **Can be carried over a long distance**
- **Seedlings can easily be stored before planting**

43. Explain management practices in a crop nursery

- **Mulch to conserve moisture and suppress weeds**
- **Water regularly in the morning and afternoon**
- **Pricking – remove excess seedlings and transfer to another nursery or use polythene sleeves**
- **Weed control – done by hand uprooting**
- **Pest and disease control – use clean seeds and apply chemicals as recommended**
- **Hardening off – Done by gradual removal of shade a week to transplanting to make seedlings survive after transplanting**

44. Describe the selection, preparation and raising of vegetative tea seedlings in the nursery

<u>Selection of mother plants (tea);</u>

- **Select healthy bushes/free of pests and diseases**
- **Select high quality bushes**
- **Select those which are high yielding**
- **Select those with good rooting ability**
- **select those which adapt to a wide range of ecological conditions**

<u>Preparation of planting materials</u>

- **Prune the selected tea bushes and leave unchecked for six months**
- **Select and cut good branches for making cuttings**
- **Obtain the cuttings from the middle of the branches/discard the brown and the hard bottom part/ the green soft top part**
- **Make single leaf internodes cutting carefully 2.5-4cm long**
- **Make slant cut with the use of scalpel/sharp knife slanting away from the node**
- **Make top cutting near the auxiliary bud as much as possible**
- **Keep the cuttings wet in the water to avoid dehydration until they are planted**
- **Keep the cutting under the nursery**

<u>Raising of tea seedlings in the nursery</u>

- **Plant cuttings on rooting medium in polythene sleeves/sleeves measure 25 x 7.5-10cm and sealed cut.**
- **Rooting medium consists of fertile sub-soil and phosphate fertilizer**
- **Plant single leaf internodes per polythene sleeve**
- **Place the sleeves in the vegetative propagation units**
- **Erect wooden hoops over the sleeved cuttings, then place polythene sheet over it/erect shade over the nursery**
- **Water sleeved seedlings every 3weeks/maintain high humidity**
- **Uproot weeds when they appear**
- **Hardening off done 4 months after raising**

<u>CROP PRODUCTION IV (FIELD MANAGEMENT PRACTICES)</u>

1. Distinguish between **staking** and **propping** as a field management practice on crops

- Staking **is supporting tall varieties of tomatoes using a stick fixed next to the plant and tied with sisal string while** propping **is supporting of banana plant with 'Y' shaped sticks**

2. Give **two** reasons why **staking** as a field management practice should be carried out in some vegetable crops.
- **Makes cultural practices like harvesting , spraying easier**
- **Prevent decolouration of fruits**
- **Prevent fruits from getting dirty/Clean fruits / fruits not contaminated / soiled.**
- **Easy Control of pests and diseases**
- **Maintains quality of fruits**
- **Prevent rotting of fruits**
- **Application of chemicals is economical /Less wastage of chemicals while spraying**
- **Prevent malformation of fruits.**

3. Explain **five** advantages of crop rotation
- **Improves soil fertility: where legumes are included nitrogen is fixed/ added in the soil**
- **Control pests and diseases: disrupts the life cycle of certain pests and diseases**
- **Control weeds: control weeds which are specific to certain crops e.g. striga in cereals; cover crops in a rotation will smother certain weeds**
- **Better use of the soil nutrients: different crops (due to differing root systems) draw nutrients from varying soils horizons/ different crops require different nutrients**
- **Control of soil erosion: cover crops included reduce soil erosion**
- **Improve soil structure: When grass leys are included during the crop rotation period, organic matter will accumulate to enrich the soil and improve soil structure**

4. Describe **five** factors that influence crop rotation.
- **Rooting characteristics – Deep-rooted crops should be alternated with shallow rooted crops**
- **Crop nutrient requirements – Heavy feeders/ crops with high nutrient requirements in a new piece of land/virgin land**
- **Pests and diseases – Crops attacked by the same pests and diseases should not follow one another, to prevent build-up of pests and diseases**
- **Rest season – A fallow season should be included for a duration of 3 to 6 years, to improve soil structure fertility and pests and disease control**
- **Weeds associated with specific crops- Crops associated with specific weeds should be rotated with crops not attacked by those weeds**
- **All crops which requires more operations should be alternated with those which requires less operation**
- **Leguminous crops – Include legumes to improve soil fertility through nitrogen fixation**
- **Availability of capital / economic factors – some programmes are expensive and uneconomical to small scale farmer;**
- **Personal tastes and preferences of farmer. Enables the farmer decides on the range of crops to grow in order to satisfy his/her needs**
- **Soil type and soil conditions – enables the farmer to grow suitable crops in the area**

5. State **two** reasons why cassava should be grown as last crop in crop rotation programme.
- **Less feeder**
- **Require little cultivation after establishment**

6. State **four** factors which influence the stage at which the crops are harvested
- **Moisture content.**
- **Weather condition**
- **Market demand.**
- **Use of which the crop is to be put /Purpose of the crop.**
- **concentration of required chemicals**
- **Prevalence of certain diseases/ pests**
- **Machinery to be used in subsequent operations**
- **Stage of growth/ maturity**

7. **Give three** factors that determine the stage at which grain crop is ready for harvesting.
- **Moisture content of the grain**
- **Intended use of the crop**
- **Colour of leaves or grains**

8. a) **Define** the term mulching
- **Placement of materials such as banana leaves or polythene sheets on the ground next to growing crops**

b) Mention **two** types of mulching materials
- **Organic mulching materials**
- **Inorganic/synthetic materials**

9. List **two** importance of mulching

- **Prevent water loss/ reduce evaporation rate**
- **Smothers weeds**
- **Organic materials decompose to release nutrients and forms humus**
- **Regulate soil temperature**
- **Reduce soil erosion**
- **Improve soil structure**
- **Improve water retention capacity of the soil**
- **Improve texture**
- **On decompositions increases activities of soil organisms.**

10. Give **two** disadvantages of mulching in crop production.
- **Provide a breeding ground / hiding place for pests**
- **Prevents light showers of rainfall from reaching the soil**
- **It's a fire risk**
- **It's expensive to acquire, transport and apply**

11. State **four** ways in which organic mulch material conserves soil and water
- **Prevents evapotranspiration / cools the soil**
- **Stops raindrop/ reduces splash erosion**
- **Reduces the speed of surface runoff which is erosive**
- **Traps soil particles in water being carried away**

12. Give **one** reason why saw dust should not be used as mulching material in the field.
- **Use nitrogen to decompose hence depriving plants off the nitrogen compound**

13. **Outline three** disadvantages of organic mulch in crop production.
- **Can harbour pest and diseases**
- **If dry it can catch fire and causes destruction of livestock, crop or farm buildings**
- **It can harbour weeds**

14. Give **two** ways in which inorganic mulch helps to conserve water
- **Reduces runoff thus increasing amount of water into the soil**
- **Reduces evaporation thus increasing the amount of water retained**

15. State **four** benefits of using organic matter for mulching
- **Improve soil aeration upon decomposition**
- **Reduce toxicity of plant poisons upon decomposition**
- **Reduces soil erosion**
- **Improve soil structure upon decomposition**
- **Modify soil temperature**
- **Con trolls weeds**
- **Improves water infiltration**
- **Increases microbial activities**
- **Reduces evaporation of water**
- **Buffers soil pH upon decomposition**
- **Adds nutrients to soil upon decomposition**

16. Name **four** disadvantages that farmers experience when they use synthetic type of mulches
- **Expensive**
- **Requires skilled labour**
- **They do not add nutrients to the soil /Do not decompose**
- **May overheat soil around crop roots**
- **Prevent water infiltration**
- **No modifying of soil pH**

17. **Give three** reasons for pruning tea.
- **Increase the yield.**
- **Achieve a uniform plucking table.**
- **To reduce what is generally a tall tree to a low spread bush.**
- **To facilitate harvesting.**

18. a) Identify **two** methods of plucking table formation in tea establishment
- **Formative pruning**

- **Pegging**

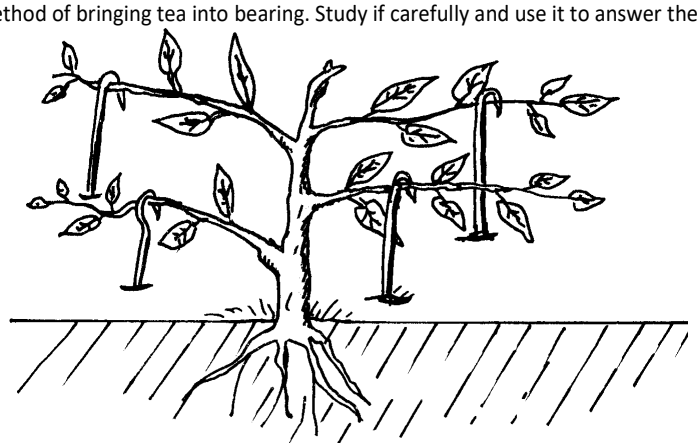
b) State **three** different ways by which pegging can be carried out in tea.
- **Use of individual hooked pegs**
- **Use of rings and pegs**
- **Use of parallel sticks / fitos and pegs**

c) Outline how any one of the pruning systems stated in (a) above is carried out.
Pegging method
- **Grow tea for 1 year to height of 25- 30 cm.**
- **Cut back the main stem 1 year after transplanting.**
- **To a height of 15cm above the ground.**
- **This encourages the development of lateral branches left to grow to a height of 60- 75cm.**
- **Use pegs to enable there shoots to grow at slanting angle / 30- 45^0**
- **Three months after pegging, remove new developing shoots/tipping above pegging height.**
- **This encourage good uniform and flat plucking table.**

Formative pruning
- **Plant is cut back at different heights.**
- **At 15cm above the ground level**
- **At 30cm above the ground level**
- **At 40cm above the ground level**
- **Capping discourages vertical growth, but encourages lateral growth.**
- **After 4 years cut back the whole tea bush to 45cm above the ground, this lowers the plucking table.**
- **This system is most unpopular because tea crop takes a long time to bring it into bearing**

19. What is Tipping?
- **Removal of 3 leaves and a bud from each shoot above the required height of the table in tea during plucking table formation/ formation of a uniform and flat plucking table in tea**

20. The diagram below shows a method of bringing tea into bearing. Study if carefully and use it to answer the questions that follow.



a) Identify the method shown in the diagram.
- **Individual pegging method**

b) Why is it necessary to prune young tea plants as illustrated above?
- **To encourage young tea plants to develop several lateral branches which will establish a frame for the plucking table.**

c) Outline the procedure followed when using the pruning methods shown in the diagram on a tea bush.
- **Young tea plants grow for one year or to 30cm tall**
- **Cut back the tea plant to 15cm above the ground**
- **Allow branches to grow to 60-75cm tall**
- **Force the branches to grow at an angle of 30^o -40^o by using pegs**
- **Nip off the tips of the branches to encourage the dormant buds to grow into shoots**

21. State **four** reasons of cutting back in pyrethrum.

- **To encourage fresh/ vegetative growth**
- **To conserve moisture**
- **To eliminate some diseases e.g. bud rot**
- **To provide mulch materials**
- **To ease weeding**

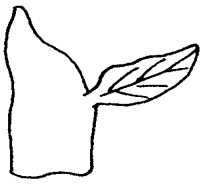
22. List **four** benefits of pruning in crop production
- **Enable controlling over bearing by ensuring required crop leave ratio/ Regulate bearing**
- **Open up canopy for air and light penetration**
- **Reduce chemical wastage / Economise on the use of chemical spray**
- **Facilitate the penetration of sprays**
- **Control pests and diseases**
- **Give crop desired shape**
- **Remove old and unproductive branches**
- **Make harvesting easy by regulating the height**
- **Open up the bush by removing micro- climate and allow better air circulation thus discouraging pests and disease organisms**

23. State importance of pruning coffee.
- **It regulate bearing**
- **To remove old and unproductive branches.**
- **For easy harvesting**
- **For better air circulation by opening up the bush.**
- **To facilitate penetration of sprays**
- **Economical use of chemicals**

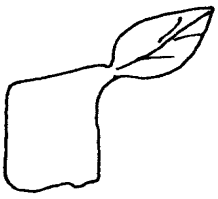
24. State **two** problems that a farmer may experience for failing to cut back pyrethrum.
- **Decline in yields in the following season**
- **Increase in Bud disease**

25. Agriculture students made the following pruning cuts on citrus in their orchard using secateurs.

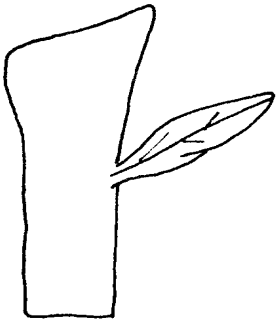
A



B



C



(a) Give one reason in each case why the above methods of cutting were incorrect.

A-The cut is sloping the wrong way

B-The cut is too close to bud

C-The cut is too far from bud

26. a) What is trellising?
- **Support given to crops with weak stem so as to grow in the desired direction**

b) State **two** importance of trellising
- **Easy to carry out crop management practices i.e. weeding, spraying**
- **Effective spray application**
- **crop receives adequate light/ suitable micro-climate**
- **Avoid contamination of fruits by soil**
- **Reduced infections of diseases from the grounds**

27. a) What is rogueing in crop production?
- **It is a farming practice that involves the removal and destruction of crop plants which are heavily infested by pests and diseases**

.

b) State the importance of rogueing as used in crop management.
- **Controls the spread of diseases and pests**
- **Ensures a healthy crop stand**

28. a) Give **two** management practices carried out in a banana stool

- **De- suckering**
- **Pruning of leaves**
- **Propping**
- **Mulching**
- **Manuring**

b) State **three** ways used in banana stool management.

- **Thin extra suckers to 3-6 plants per stool**
- **Weed around the base of the stool**
- **Control of pests and diseases using suitable chemicals**
- **Trim off diseased leaves to control their spread**
- **Prop/support the tall banana plants before the fruits mature**
- **Apply manure (organic) or Nitrophorous fertilizers 20:20:0**

29. a) What is training in crop production?

- **Manipulation of the plant so as to grow in a particular shape/direction**

b) Name **two** methods used in training in crop production.

- **Staking**
- **Propping**
- **Trellising**
- **Pruning**

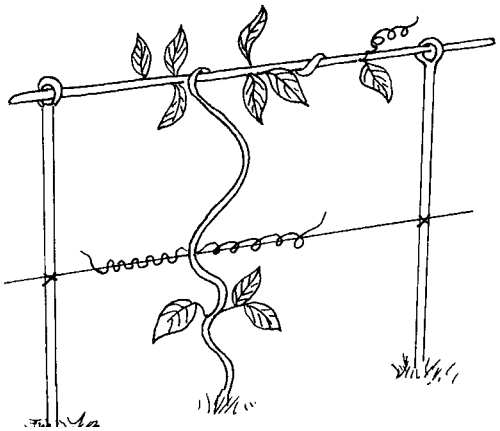
c) Name **two** crops which require training.

- **Tomatoes**
- **Gourd plant**
- **Garden peas**
- **Roses**
- **Indeterminate beans.**
- **Hops**
- **Bananas**
- **Okra.**
- **Passion fruits**
- **Cucumbers.**
- **Money plant**
- **Grapes**
- **Tea**
- **Pumpkins**
- **Water melon**
- **Yams**

30. State and explain **three** methods through which training is achieved in crop production.
- **Staking – Supporting plants having weak stems with the help of thin strong stick e.g. for tomatoes**
- **Propping – providing support to tall varieties of bananas and those with heavy bunches.**
- **Trellising – providing support to crops with vines using wire or sisal strings.**

31. State **two** advantages of training in crop production.
- **Production of clean fruits**
- **Facilitates spraying and harvesting of the crops**
- **Controls incidences of disease out break**
- **Prevents infestation by soil – borne pests**
- **Improves crop quality by preventing soiling**
- **Enable crop grow in the required direction**
- **Improve yield**

32. Study the diagram below and answer the questions that follow



(a) Identify the practice being carried out above.
- **Trellising**

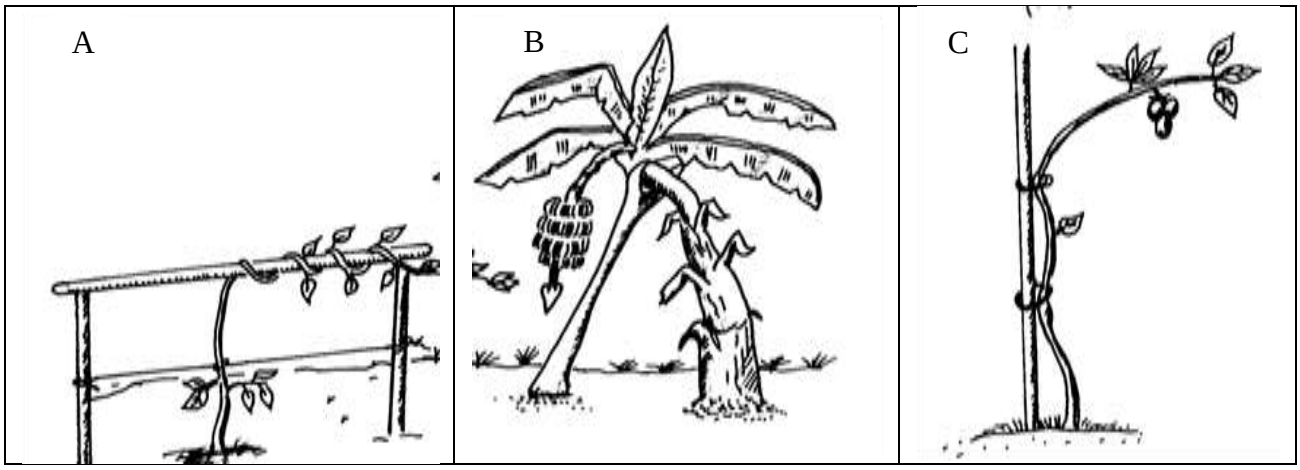
(b) Name **two** materials that may be used in the diagram
- **Wires**
- **Twine/ sisal strings**

(c) State **two** reasons why the practice is done in crops.
- **Easy to carry out crop management practices/ weeding, spraying**
- **Effective spray application**
- **crop receives adequate light/ suitable micro-climate**
- **Avoid contamination of fruits by soil**
- **Training of crops to grow a particular way**
- **Support of heavy products such as fruits**
- **Prevent attach by pest and diseases**

(d) Give any **two** examples of crops that are maintained by the above practice.
- **Passion fruit**
- **Grapes**
- **Broad beans**
- **Pumpkin**
- **Cucumbers**

33. State two disadvantages of growing one type of annual crop on the same piece of land continually.
- **Build up of pests/ diseases.**
- **Depletion of certain /same type of nutrients**
- **Build up of weeds characteristic to the crop**
- **Destruction of soil structure.**

34. Study the illustrations showing field practices below.



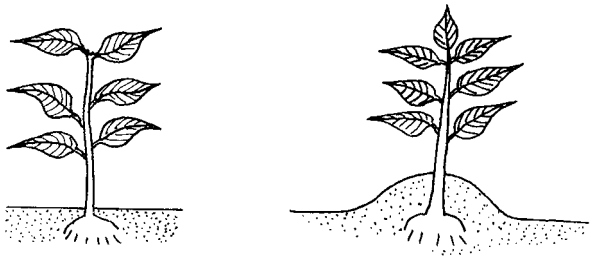
a) Identify the field practices shown in the diagrams above.

A. Trellising
B. Propping
C. Staking

35. What is earthing up?

- **The placement of soil in form of a heap around the base of the plant**

36. The diagrams below show a practice carried out on various crops on the farm. Study them carefully and answer the questions that follow.



Before **After**

a) Identify the farm practice represented by B.

- **Earthing up**

b) State the importance of the above practice in the following crops.

(i) Maize - **provides support to prevent lodging**
(ii) Irish potatoes - **Improves tuber formation/expansion**
(iii) Tobacco – **Improves drainage around the plant**
(iv) Ground nuts – **promotes seed formation**

c) At what stage of growth should the above practice be carried out in maize?

- **During second weeding**

37. Give **two** functions of earthing up in crop production

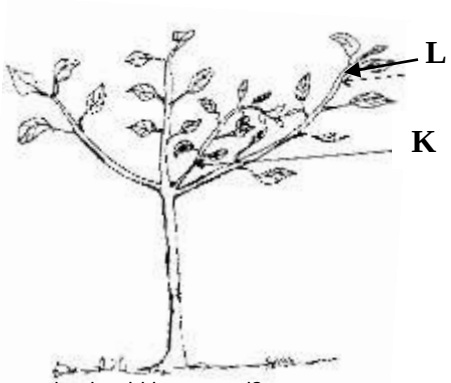
- **To retain water between the ridges which increases water conservation/infiltration**
- **Reduces soil erosion**
- **To prevent the greening effect in potatoes**
- **Provides support for plants e.g. in maize, it prevents lodging**
- **Improves drainage in poorly drained soils**
- **Promotes tuber development and enlargement in root crops**

38. Outline **three** reasons for planting sweet potatoes on ridges.

- **Increase the size of Tubers / proper growth and development of tubers.**
- **Eases harvesting / lifting of tubers.**

- **Facilitate drainage**
- **Improve water conservation**

39. Below is a diagram of a young orange tree.

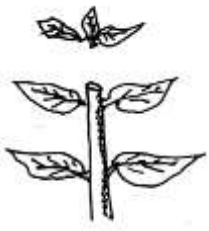


a) Which **one** of the branches labeled **K** and **L** should be pruned?
- **K-should be pruned**

b) Give **three** reasons for your answer in (a) above.
- **To open up the centre of the tree for light and air**
- **It is thinner branch and it is likely to be weak**
- **It is twisted / bent**
- **Make spraying easier**
- **Helps to control pests**
- **Saves on chemicals**

c) Name the correct tool for pruning the branch.
- **A pair of secateurs.**

40. The diagram below illustrates a method of pruning.



(a) Identify the method of pruning shown above
- **Pinching out**

41. Distinguish between pinching out and coppicing.
- Pinching out **is a method of pruning where the terminal bud is removed to encourage internal growth while** coppicing **is a method of pruning carried on trees by cutting branches at specific points to achieve a desired shape.**

42. Study the tomato plant diagram below then answer questions that follow.

(a) State **two** management practices that have not been carried out on the tomato plant drawn above.

- **Pruning.**
- **Staking.**
- **Weeding/weed control.**

(b) For each management practice mentioned state **two** reasons why it should be carried out.
Pruning:
- **Facilitate picking.**
- **Control cropping.**
- **Remove the diseased/unwanted parts.**
- **Reduce cost of spraying.**
- **Proper air circulation.**
- **Get required plant shape.**

Staking:
- **Produce clean fruits.**
- **Prevent fruits being in contact with soil – this would cause infection from soil borne pests and diseases.**

Weeding
- **Reduce competition for nutrients, water and space.**
- **Weeds could harbour pests that destroy the crop.**

43. Below are diagrams **K** and **L** showing coffee plants established using two different formative pruning systems. Study them and then answer the questions that follow

K **L**

a) Name the system of pruning illustrated in the diagram labeled
K multiple stem pruning
L Single stem pruning

b) Describe the procedure of carrying out the pruning system labeled **K**
- **Main stem of the seedling is capped/ cut at 38 cm – 60 cm high.**
- **Select two healthy suckers and allow to grow**
- **Remove the rest of the suckers**

44. State **three** advantages of multiple stem pruning over single stem pruning in coffee
- **Requires less skills to establish**
- **It is easy to prune**
- **Does not allow accumulation of coffee berry disease**
- **No shade is required**
- **It is more convenient to work on the plant i.e. when picking or spraying**
- **Easy passage of implements / machinery**
- **Less frequent change in the cycle**

- **Minimum breakages of branches / strong frame work**

45. What is meant by the term "changing the cycle" in coffee growing?
- **It is the replacement of old bearing stems by suckers. The cycle is usually changed after 4 – 6 years.**

46. State **four** post-harvesting practices carried out on maize grain.
- **Sorting and grading**
- **Drying**
- **Seed dressing**
- **Storing**

47. Give **four** advantages of under-sowing in pasture production.
- **Efficient / intensive land use**
- **Control soil erosion due to ground cover**
- **Reduces cost of production**
- **Saves time for pasture establishment**

48. **State two** reasons why a farmer should intercrop maize and beans.
- **To enhance nitrogen fixation / soil fertility**
- **To reduce soil erosion/ enhance soil and water conservation.**
- **To improve soil structure**
- **It increases yield per unit area.**
- **If one crop fails the farmer benefits from the other / diversification.**
- **To suppress weeds growth.**

49. State **four** advantages of timely harvesting.
- **Fetch better prices**
- **To maintain quality of some crops**
- **To prevent (escape) field pests**
- **For better use**

50. Outline any **five** general post-harvesting practices carried out on crops
- **Threshing/shelling**
- **Drying**
- **Cleaning**
- **Sorting and grading**
- **Dusting**
- **Processing**
- **Packaging**
- **Storage**

51. **State two** reasons for processing agricultural produce.
- **To enhance / increase the keeping quality**
- **Reduce bulkiness**
- **To improve the quality of the produce**
- **To improve market value**
- **To improve its utility.**

52. State **two** preparations that should be carried on a store before crop storage.
- **Thorough cleaning of the store to eliminate storage pests.**
- **Repairing broken or worn out parts to ensure security of the produce.**
- **Dust the store using appropriate chemicals to prevent occurrence of storage pests.**
- **Clear the vegetation around the store to prevent vermin from entering the store.**

53. Give **four** practices that can be used to control storage pest
- **Proper drying of produce**
- **Keeping storage facility/ structure clean**
- **Use of pesticides on storage structure**
- **Treating produce with pesticides e.g. cereals**
- **Use of rodent guards**

54. List **two** non-chemical methods of pest control in a bean store
- **Cleaning the store**

- **Proper drying of beans**
- **Making store vermin proof**
- **Use of traps / physical destruction**
- **Use of cats**

55. Give **four** ways by which farmers minimize grain losses in stores.
- **Dressing seeds against pests/ Dusting of crops with pesticides before storage.**
- **Proper drying against rotting**
- **Use of proper storage structures**
- **Proper cleaning of stores before storage**
- **Ensuring proper ventilation**
- **Securing store against theft.**

56. **State two** maintenance practices carried out on a green house
- **Repair / Replace broken frames**
- **Clean dirty polythene sheets**
- **Replace torn polythene materials**

57. Explain the terms "**close season**" as used in crop production.
- **It is a period during which a particular crop is not grown on a particular area in order to control disease and pest buildup.**

58. Distinguish between capping and gapping.
- **Capping is the cutting upward growth of shoots in tea at various heights, while Gapping is the filling of empty spaces (gaps) or ungerminated seeds in the field.**

59. Differentiate between thinning and pricking out.
- Thinning **is the removal of excess seedlings and discarded while** pricking out **is the removal of excess seedlings into another nursery bed**

60. State **three** ways by which mixed cropping maintains soil fertility.
- **Balance nutrients composition**
- **Legumes fix nitrogen**
- **Smoothers weeds**
- **Control soil erosion.**

61. Differentiate between **Rogueing** and **Close season**.
- Rogueing -**The removal of diseased crops from the field/the removal of crop plants with undesirable characteristics.**
  Close season -**A period during which a particular crop is not supposed to be grown in a given area so as to control diseases and pest build up;**

62. State **two** disadvantages of mono cropping.
- **Soil erosion may be encouraged.**
- **Great losses incase of crop failure.**
- **Some soil nutrients may be exhausted or under utilized.**

63. Give **four** features of a good maize granary
- **Leak proof**
- **Easy to clean**
- **Well ventilated**
- **Vermin proof**
- **Easy to load and off load**
- **Strong enough to support the store**
- **Raised from the ground**

64. Give **two** reasons for drying grains before storage
- **To prevent sprouting**
- **Reduce pest attack**
- **Prevent rotting/fungal attack**

65. What is winnowing?
- **Removing of chaff by use of wind**

66. What is crop rotation?

- **Growing of different types of crops on the same piece of land following an orderly sequence**

67. State **two** factors considered when designing a crop rotation programme
- **Deep rooted crops alternate with shallow rooted crops**
- **Always Include a legume crop**
- **Crops easily weed are alternated with those difficult to weed**
- **Heavy feeders should come first in the circle**

CROP PRODUCTION V (VEGETABLES)

1. Describe **five** categories of vegetables on the basis of the part used as food giving relevant examples
- **Leaf vegetables e.g. kales**
- **Root vegetables e.g. carrot**
- **Fruit vegetables e.g. tomatoes**
- **Pod vegetables e.g. legumes**
- **Stem vegetables e.g. leeks, asparagus, spring onions**
- **Bulb vegetable e.g. bulb onion**

2. List **two** vegetables where the stem part is used as a vegetable.
- **Leeks**
- **Asparagus.**
- **Spring onions.**

3. Give **two** examples of root vegetables.
- **Carrots.**
- **turnips**
- **Radish.**
- **Beet roots.**
- **Tulips**

4. The diagram below is of a tomato plant. Study it and answer the questions that follow:-

5. a) State **three** management practices that have not been carried on the plant above
- **Pruning**
- **Staking**
- **Weed control**

b) For each management practice state **one** reason why it should be carried out
- **Staking – prevents lying on ground where fruits are soiled and get diseases and allow easy movement in field**
- **Pruning to leave one to three main shoots for best yields.**
- **Weeding – reduce competition for nutrients, water and space**

c) Name **two** diseases that attack the crop above in the field
- **Bacterial wilt**
- **Blossom – end rot**
- **Early Blight.**
- **Late blight.**
- **Leaf mould.**

- **Downy mildew.**

6. Give any **two** diseases which affect tomatoes and in each give one method of control.
- **Bacterial wilt – requires use of certified seeds, crop rotation, rogueing**
- **Late blight – preventive spraying using fungicides.**
- **Blossom end rot – application of calcium compound in soil, regular watering, use the right amount of Nitrogen fertilizers**

7. Name any **two** physiological diseases of a tomato crop.
- **Blossom end rot.**
- **Cracking of tomato fruits.**
- **Concentric and radial rings.**
- **Cat's face.**
- **Sun's scald.**

8. a) Give **two** causes of blossom end rot disease in tomatoes
- **Deficiency of element calcium**
- **Irregular watering**
- **Excessive application of Nitrogen in early stages of the plants growth**

b) State **two** methods of controlling blossom end rot in tomatoes
- **Regular watering**
- **Topdressing the crop with the right amount of nitrogen**
- **Application of calcium compounds in the soil**
- **Mulching**

9. State **two** ways of controlling purple blotch in onions
- **Crop rotation**
- **Application of fungicides**

10. List **four** symptoms of late blight in tomatoes
- **Rapid drying of leaves.**
- **Necrotic spots on the stem.**
- **Brownish dry rots of fruits.**
- **Premature fruit fall**
- **Destruction / drying of the whole plant.**

11. Give **two** reasons why organic manures are not used in carrot production.
- **Leads to high vegetative growth leading to small taproots;**
- **It encourages/ induces forking in carrots.**

12. State any **four** factors considered when grading tomatoes for fresh market
- **Size i.e. large, medium, small.**
- **Degree of ripeness of fruit.**
- **Damage of tomatoes e.g. bruises on skin.**
- **Shape of the fruit.**

13. The following is an illustration of an infected tomato plant. Study it carefully and answer the questions below:

(a) Identify the disease which may have caused the condition shown in the illustration
- **Bacterial wilt**

(b) Name any other crop which may be affected by the disease identified in **(a)** above
- **Irish potatoes**

(c)Mention **two** other factors which can lead to the same condition as shown by the illustration

- **Nematode attack**
- **Lack of water**
- **Physical damage on the roots/mole attack**
- **Fusarium wilt**

(d) State **two** measures that can be used to control the disease named in **(a)** above

- **Crop rotation**
- **Rogueing /field hygiene**
- **Use of certified seeds**

14. Give t**wo** ways in which pruning helps to control diseases in tomatoes

- **Enables efficient coverage of plant with chemicals**
- **Creates unfavorable micro climate for disease causing organism**
- **Diseased branches are removed hence reduced incidences of disease spread**
- **Remove branches touching the ground to avoid infection**

15. State four reasons which necessitate pruning of tomatoes.

- **To control pests and diseases.**
- **To ease penetration of chemical spray.**
- **To remove diseased parts**
- **To avoid the crop being too bushy.**
- **To reduce competition for nutrients.**

16. Describe the procedure of pruning Tomatoes (*Lycopersicon esculentum*).

- **Allow one to three branches to grow**
- **Remove all lateral shoots by pinching them off as they grow**
- **When 6 to 8 trusses of fruits are formed pinch off the top to encourage the formation of good size marketable fruits**
- **Remove leaves close to the ground to prevent them from being attacked by tomato blight**
- **Pruning is done on a weekly basis**

17. Outline **four** ecological requirements for cabbages

- **Altitude 1800-2900m above sea level.**
- **Temperature range 13 - 21^{o} C**
- **Rainfall – well distributed during the growing season. (750 - 2000mm pa)**
- **Soils - deep, fertile and well drained soils with a pH of 5.5 – 6.5**

18. List **three** ecological requirements of tomatoes.

- **Altitude – 0-2100 meters above sea level**
- **Rainfall - 760mm -1300 mm per annum well distributed throughout the growing period / Practice irrigation**
- **Soils – well drained, Deep rich, Slightly acidic PH of 6.0- 6.5**
- **Temperature - 18°c - 29°c**

19. Explain why tomato plants should not be fed to rabbits.

- **It is poisonous as it contains Solanin which is poisonous.**

20. Give two reasons for raising cabbage seedlings before transplanting.

- **Less seeds required per unit area.**
- **Enable farmer to select healthy and vigorous seedling.**
- **Gives farmer head start in planting hence early maturity of crop.**
- **Less labour required to care for seedlings**

21. Describe the production of **tomatoes** under the following sub-headings.

a) Varieties

Fresh market -round in shape	Processing type-oval shaped
Money maker	**Roma VF**
Marglobe	**Cal J**
Ponderosa	**Roma nova**
Kenton	**Primabel**
Early beauty	**San marzano**
Beef eater	**Seinz**
Hotset	**Kenya beauty**

Super Marmande	**Rutgers**
Best of all	**10 x hybrid**
Hundred fold	**Heinz**
Ailsa Craig	

b) Nursery establishment

- **Select the site**
- **Clear the vegetation**
- **Dig to remove weeds and harrow to fine tilth**
- **Mark out nursery beds 1-1.5M wide with convenient length and level it**
- **Raise the soil slightly above the ground**
- **Make drills 10cm apart and drop seeds singly in furrows**
- **Cover with thin layer of soil**
- **Mulching the nursery/ Erect a shade**

c) Nursery management practices.

- **Watering - water the nursery twice a day; morning and evening.**
- **Mulching – Apply a light mulch on the nursery bed but remove it on the fourth day or as soon as the seedlings emerge**
- **Shading – erect a shade over the nursery, avoid dark and dump conditions**
- **Weeding – Keep the nursery bed weed free by uprooting/ shallow cultivation**
- **Pest and disease control – spray with appropriate chemicals to control pests and diseases.**
- **Pricking out – incase of overcrowding remove some seedlings and plant in a seedling nursery.**
- **Hardening off –Gradually reducing frequency of watering and partial removal of the shade 2 -3 weeks before transplanting.**

d) Land preparation.

- **Early preparation of the land**
- **Deep cultivation to remove perennial weeds**
- **Secondary cultivation /Harrowing**
- **Panga, jembe, ox drawn mouldboard plough or tractor drawn ploughs is to be used depending on the scale of production.**
- **Holes are dug 15 cm deep, at a spacing of 90x60cm or 100x50cm depending on the variety.**
- **A handful of well rotten manure and a teaspoonful of double super phosphate should be added to each hole and thoroughly mixed with the soil (this totals to 200kg/ha or 10 tonnes of manure per hectare.)**

e) Transplanting

- **Ready after 1 month / when they have 4 -5 true leaves/ when 15cm high /when pencil thick.**
- **Select health and vigorous seedlings**
- **Water the nursery thoroughly before to make lifting of seedlings easy.**
- **Lift the seedlings with a ball of earth on the root.**
- **A garden trowel should be used to lift**
- **Transport without damaging the root**
- **Plant seedlings at the same depth as they were in the nursery**
- **One seedling planted per hole**
- **Apply 200 Kg of double supper -phosphate per ha. Or one tea spoonful of same per planting hole**
- **Mix the fertilizer thoroughly with the soil**
- **Firm the soil around the base of the planted seedling.**
- **Transplant on a cloudy day or during late in the evening/ early in the morning**
- **Water the seedlings immediately after transplanting.**
- **The seedling should then be mulched and watered regularly**

(d) Harvesting and marketing

- **Tomatoes will be ready for harvesting 3-4 months after transplanting**
- **Canning varieties are harvested when ripe**
- **Fresh market varieties should be harvested as soon as they yellow up and the reddish colour begins to appear at the blossom end.**
- **Large wooden crates are used in transporting tomatoes to the market.**
- **Ensure the fruits are level with the tops of the crates to enable piling of crates without causing damage to the fruits.**

(e) Marketing

- **Sort and grade them**
- **Pack in wooden boxes**
- **Sold to consumers directly**

- **Sold to green grocers**
- **Sold to canning factories**
- **Fresh market tomatoes should have a reddish colour**
- **For canning should be left to ripen**

22. Describe the production of tomatoes (*Lycopersicon esculentum*) under the following subheadings

(a) Field management practices

- **Gapping-to replace dead seedlings and maintain optimum plant population**
- **Weed control-remove weeds mechanically to prevent competition for nutrients, space, light and moisture**
- **Staking-train plants to grow in desired shape; to produce clean fruits, control pests and disease**
- **Pruning-to remove unwanted branches which create micro climate ; facilitate spraying**
- **Pest control-use pesticides and other appropriate methods to control pests e.g. American boll worm, leaf hopper**
- **Disease control-use fungicides, legislative methods ,etc to control early blight, damping off and bacterial wilt**
- **Mulch to conserve moisture**
- **Top dress with C.A.N two times at 25cm height (100kg/ ha) and during fruiting(200kg/ ha)**
- **Irrigation recommended where rainfall is inadequate**

(b) Disease control

Disease	Symptoms	Control
Blossom end rot	- **Development of water soaked spot near the blossom end** - **Blossom end turns dark**	- **Top dressing the crop with the right amount of nitrogen e.g. CAN** - **Application of calcium compound in the soil** - **Water plants regularly**
Bacterial wilt	- **Plants wilt under wet conditions** - **Sticky white exudes oozes out of stem if cut**	- **Use resistant varieties** - **Use disease free /certified seeds** - **Crop rotation** - **Practice field hygiene** - **-Uproot and burn affected plants** - **Rogueing**
Septoria leaf spot	- **Small brownish elongated lesions on the stem** - **Leaf with tiny brown-black angular spots**	- **Spray early with fungicide**
Damping off	- **Stem shrivel, plant topple and fall**	- **Sterilize the nursery bed** - **Treat plants with appropriate fungicide** - **Keep soil surface dry** - **Thin seedlings in nursery bed**
Tomato Blight	- **Brown lesions on stems, leaves and fruits** - **Fruits appear rotten and fall of prematurely**	- **Spraying using fungicides** - **Use of certified seeds** - **Crop rotation**

(c)Pest control

Pest	Symptoms of attack	Control
American bollworm	- **Bore into fruits damaging them**	- **Spray with suitable pesticide** - **Practice crop rotation** - **Destroy crop residues** - **Rogueing in case of heavy infestation**
Cutworm	- **Cut stem at base causing lodging**	- **on small scale are killed physically spray with pesticides**
Red spider mite	- **Sucking sap lowering quality**	- **Spraying with pesticides**
Nematodes	- **Swelling of roots**	- **Crop rotation in nematode control**

23. Describe the establishment of **kales** under the following sub-headings:

a) Nursery preparation.

- **Clear vegetation if bushy**
- **Dig/prepare the site to a fine tilth.**
- **Remove roots and stones from the site.**
- **Prepare nursery beds – 1-1.5 m wide by any convenient length.**

- **Prepare raised or sunken nursery bed depending on moisture content available.**
- **Level the nursery bed**

b) Establishment of the nursery.
- **Make shallow drills/furrows about 10- 15 cm apart.**
- **Apply phosphatic fertilizer in the furrows/ drills and mix with soil.**
- **Sow seeds by drilling.**
- **Cover the seeds lightly with soil.**
- **Apply thin layer of mulch after sowing seeds.**
- **Water the nursery thoroughly.**

c) Management of seedlings in the nursery.
- **Remove the mulch as soon as seedling emerge and erect a shade.**
- **Water the nursery at least twice a day, preferably mornings and late evenings.**
- **Remove weeds as they come up.**
- **Thin young seedlings if overcrowded/prick out, seedlings.**
- **Control diseases**
- **Control pests**
- **Harden off the seedlings by removing shade gradually and reduce frequency of watering.**

d) Transplanting of seedlings
- **Water the nursery thoroughly three hours before transplanting**
- **Dig the planting holes at appropriate depth of 10cm and correct spacing of 60-90cm x 90 x 60cm**
- **Select healthy seedlings**
- **Uproot seedlings carefully with as much soil as possible to avoid root damage/ use gardener's trowel**
- **Transport seedlings carefully to the field using appropriate means**
- **Transplant on a cloudy day / late in the afternoon**
- **Place phosphatic fertilizer / manure in the planting holes and mix with soil**
- **Place insecticides in the holes to control soil borne pests**
- **Place the seedlings in the planting holes at the same depth as they were in the nursery bed**
- **Fill the holes with the soils and firm around the seedlings.**
- **Apply mulch**
- **Water the seedlings thoroughly.**

24. Discuss production of **cabbages** under the following headings.

(a) Ecological requirements.
- **Altitude - 1800-2900m above sea level.**
- **Temperature range- 13 - 21^{o} C**
- **Rainfall – well distributed during the growing season. (750 - 2000mm pa)**
- **Soils - Deep, fertile and well drained soils with a pH of 5.5 – 6.5**

(b) Varieties of cabbages.

Early maturing	Late maturing
Sugar loaf	**Early drum-head**
Early jersey	**Prize drum-head**
Mukuki	**Surc-head**
Copenhagen market	**Perfection**
Golden acres	**Savoy cabbage**
Gloria hybrid.	**Mammoth red rock**
Brunswick	**Dwarf flat Dutch**
Maincrop	**Gloria F1 Hybrid**

(c) Nursery establishment.
- **Choose a suitable nursery site, considering accessibility and source of water**
- **Dig and prepare the chosen site to a desirable tilth**
- **Remove roots or previous plants and stones from the site**
- **Make raised or sunken nursery beds (depending on soil moisture) Measuring one metre wide and convenient length**
- **Plant seeds by drilling at a spacing of 15cmx3cm**
- **Apply phosphatic fertilizer or manure**

- **Cover the seeds to a depth of about 1 cm**
- **Erect a shade or apply some mulch on the nursery**
- **Water the nursery thoroughly**

(d) Pricking out of seedling

- **Done when the seedlings develop two true leaves**
- **Seedlings are uprooted by use of small stick**
- **Long roots are trimmed**
- **Holes are made with the same stick**
- **The seedlings are inserted into the hole carefully and soil firmed around it**
- **Seedlings are planted at a spacing of 4-5 cm away from each other**
- **Seedlings are shaded and watered immediately to prevent wilting**

(e) Nursery bed management practices

- **Watering in the morning and evening**
- **Thinning**
- **Gapping/ reseeding**
- **Weeding**
- **Controlling pests and diseases/ spraying with appropriate pesticide**
- **Removal of mulch after germination**
- **Pricking out**
- **Hardening off**

(f) Transplanting

- **To be done after 1 month after sowing**
- **Done early in the morning or evening/ cloudy cool rainy day**
- **Wetting the nursery before uprooting seedlings**
- **Seedlings uprooted with a ball of soil / Avoid damaging roots**
- **Tea spoonful of DAP/ phosphatic fertilizer per hole /Well rotten manure is added and mixed thoroughly with soil**
- **Seedlings to be planted in the seedbed at same depth as they were in the nursery/10cm deep**
- **Spacing of 60x90 cm / 60cm x 60 cm depending on the variety**
- **Seedling to be kept upright and soil around it firmed by pressing**
- **Mulching between the rows**
- **Watering of seedlings especially during the morning and evening**
- **Only big seedlings should be transplanted**
- **Weak ones should be used for replacing those which dry up after transplanting**

(c) Pests and diseases control.

i) Diamond black moth
-Eats underside of the leaf making windows
Spray with recommended insecticides

ii) Cut worms
-Attack stems at the ground level
-Spray recommended insecticides

<u>General control measures</u>

- **Proper seedbed preparation.**
- **Using appropriate pesticides**
- **Using certified seeds**
- **Rogueing**
- **Soil fumigation before planting/sterilization**
- **Control of weeds/alternate hosts.** **.**

(d) Harvesting.

- **Harvested/ Mature 3-4 months after transplanting**
- **Heads are cut when they are solid and compact**
- **Use a sharp knife or panga for cutting the stalks at the base,**
- **Leave the outer leaves intact of the heads.**
- **Harvested cabbages may be bagged first or just thrown onto Lorries and pick ups**
- **Harvested cabbages should have 2-3 wrapper leaves to maintain freshness but excess foliage should be removed**

- **Ensure you do not bruise any leaves especially around the head and even the wrapper leaves**

25. Explain field production of **onions** under the following sub headings.

a) Varieties
- **Red Creole**
- **White Creole**
- **Tropicana hybrid**

b) Nursery preparation and establishment.
- **Proper choice of site e.g. near water source**
- **Clear vegetation**
- **Dig deep to uproot/ eradicate perennial weed**
- **Level the nursery bed**
- **Measure 1 m width and convenient length**
- **Broad cast organic manure and mix with soil.**
- **Make drills 15 cm apart , 1cm deep**
- **Apply appropriate phosphatic fertilizer and mix with soil and**
- **Singly place the seeds along the drills and cover it lightly.**
- **Mulch**
- **Erect shade after removing mulch**
- **Water regularly**
- **Uproot the weeds that may have emerged.**
- **Do thinning / pricking out**
- **Control pest using appropriate pesticides.**
- **Control diseases using appropriate chemicals**
- **Harden off the seedlings at least 2 weeks before transplanting by gradually reducing shade and watering.**

c) Transplanting
- **Seedlings should be 1 ½ months old or half pencil thickness**
- **Water seedlings in the nursery before transplanting /uprooting**
- **Transplant early in the morning or late in the evening when conditions are cool , cloudy or rainy**
- **Make rows / drills 30 – 45 cm a part / holes 10 – 15cm deep.**
- **Apply appropriate phosphate fertilizer and mix with soil.**
- **Uproot the seedling carefully with a ball of soil using a garden trowel.**
- **Place each seedling in the hole, cover and firm the soil.**

d) Field operations
- **Weed control through shallow cultivation to avoid damage to the shallow onion roots**
- **Remove soils around the bulb to facilitate bulb expansion**
- **Irrigate the crop during dry weather / watering regularly**
- **Top dress with appropriate nitrogenous fertilizer at appropriate rate, three weeks after planting.**
- **Control pests e.g. Thrips using appropriate pesticides**
- **Control diseases e.g. rust, mildew, using appropriate method**

e) Harvesting
- **Done 4- 5 months after planting /when leaves wither / turn brown**
- **Bend / break the tops of the neck to hasten withering.**
- **Harvesting done by lifting /pulling /Dig out the bulbs .**
- **Leave the bulbs on the ground / under shade**
- **Turn the bulbs frequently to ensure even drying**

AGRICULTURAL ECONOMICS II (LAND TENURE AND LAND REFORM)

1. What is land tenure?
- **Method by which an individual /group of people acquire the right to use land in any place**

2. What is land tenure system?
- **Set laws/Conditions under which one has the right to own and use land**

3. Identify the **two** main categories of land tenure systems

- **Collective tenure**
- **Individual tenure**

4. Name **two** types of Collective tenure system
- **Communal land tenure system**
- **Co-operative land tenure**

5. Name **two** types of Individual tenure system
- **Individual owner operator**
- **Leasehold/landlordism and tenancy**
- **Concession ownership**
- **State ownership**

6. **What** is lease hold land tenure system?
- **A tenure system whereby the state gives legal rights to individual to own and use land for a certain period of time.**

7. State **three** advantages of communal land tenure system
- **To achieve flexibility in farming patterns to meet changing national and market demands**
- **Achieve effective utilization of National land and introduction of irrigation schemes**
- **Problems of landlessness does not exist**
- **Land cannot be easily fragmented**
- **The land is left rest for a while so as to allow pasture regeneration**

8. **State four** disadvantages of communal land tenure system.
- **Quick spread of diseases.**
- **Uncontrolled breeding**
- **Disputes are common**
- **Not easy to access credit**
- **No individual takes the responsibility of taking care of the land**
- **No security of land ownership**
- **There's tendency to overstock leading to overgrazing**
- **Difficult to control parasites and diseases**
- **Quick spread of parasites.**
- **No incentives to improve pasture**
- **Each individual aims at short term maximization**

9. Give **four** advantages of concession tenure system farming
- **Create employment opportunities to citizens**
- **Earn government income through taxes**
- **High efficiency in land use and management/ high yield / good economic returns**
- **Saves government foreign exchange on importation**
- **Enable government to put to use idle land.**

10. State **four** advantages of individual owner operator land tenure system
- **The owner uses title deed to secure loan**
- **Owner can make permanent production plan**
- **Owner can sell part of or whole land**
- **Sole ownership motivates farmer to work hard in terms of land improvement**

11. Distinguish between land **settlement** and land **resettlement**.
- **Settlement – Is the occupation of land which was previously uninhabited.**
- **Resettlement- Is the movement of people from highly populated areas to sparsely populated areas**

12. Give **three** advantages of cooperative land tenure system.
- **No land disputes**
- **Labour is well utilised**
- **Profit is distributed according to shares**
- **Large membership increases resources**

13. State **four** advantages of landlordism and tenancy
- **Enables landlords who cannot use land to get income from tenants**
- **Idle land can be put into good agriculture use increasing agricultural production**
- **Ensure equitable distribution of land as a natural resource**
- **It reduces land dispute since the land lord or the state control its allocation**

- **Enables the landless to have access to farming land**
- **Reduces land disputes.**

14. State **two** disadvantages of tenancy system of land tenure.
- **The tenant may lose in case of no written lease**
- **The method of rent-payment may discourage the tenant**
- **The tenant will not invest in long-term projects**
- **The landlords may overcharge the tenant leading to loss of morale**
- **The tenant will not carry out soil and water conservation if the lease period is short.**

15. State **two** factors that will determine the economic performance of leasehold land tenure system.
- **Whether the tenant has a lease**
- **Length of lease**
- **Method of rent repayment**

16. What is meant by the term **land reform?**
- **Specific integrated action to bring about more effective control and use of land**
- **An organized action taken to improve the structure of land tenure and land use**

17. State three types of land reforms which are applied in Kenya.
- **Land consolidation**
- **Land subdivision /demarcation**
- **Land adjudication and registration**
- **Settlement and resettlement**
- **Form some kind of tsetse fly consolidated barrier**

18. State **three** objectives of land reforms that are taking place in Kenya.
- **Put idle land into use**
- **To achieve increasing productivity of both land and labour.**
- **Increase commercial farming.**
- **Increase land conservation and improvement.**
- **Achieve flexibility in the farming patterns to meet the changing market demands**
- **Achieve effective utilization of national land resources**
- **Achieve high level of output through security, incentive and investment**
- **Settle the landless easing population pressure in some areas.**
- **Enhance commercial instead of subsistence production.**
- **Encourage soil conservation measures**
- **Promotes unity among members**
- **Employment in rural areas**
- **Freedom to use of land by all members**
- **Promotes use of land according to general requirements of the community**

19. Explain four ways how land reform has contributed to the improvement of crop production in Kenya.
- **More efficient utilization of land hence high yields / better supervision/management.**
- **New lands put into use**
- **Security of land achieved hence higher investment.**
- **Better control of soil erosion**
- **Credit facilities are made available due to land registration.**
- **Encourages farmers to undertake long term projects.**

20. Give **two** reasons why the Kenya government introduced settlement and resettlement reforms.
- **Ease population pressure**
- **Increase agricultural production**
- **Create employment**
- **Form some kind of tsetse fly consolidated barrier**

21. State **two** characteristics of high density settlement schemes.
- **Situated where land was fertile**
- **Were small in size**
- **Were planned for the landless, unemployed and squatters.**
- **Loans given to concerned were low.**
- **Required payment of Kshs. 120/= for allocation.**

22. **Discuss four** contributions the settlement schemes have made to Kenya's agriculture.
- **Increased production**
- **Land has improved intensively**
- **Better use of extension services is realized**
- **Increased agriculture credit**
- **Marketing co-operatives increased**
- **Farmers introduced to cash economy/ increase in commercial farming.**
- **More improved livestock and planting material are made available easily to farmers.**
- **Development of infrastructure is accelerated.**

23. State **four** aims of land settlement programmes in Kenya.
- **To settle the landless.**
- **To ease population pressure in densely populated areas**
- **To create employment**
- **To increase agricultural production of particular crops.**
- **To help control some vectors**

24. **Define** the term Land fragmentation.
- **Situation in which a farmer owns several pieces of land located in different areas.**

25. Give **four** conditions that have led to fragmentation and sub-division of agricultural land in Kenya.
- **Shifting cultivation**
- **Traditional systems e.g. land inheritance by family members**
- **Population pressure on a limit area of land**
- **Accumulation of land holdings**
- **Land may be used to settle debts**
- **Compensation when the government takes part of one's land for public use.**
- **Gifts/donations**
- **Land allocation by government**

26. State **five** effects of fragmentation and subdivision of land.
- **Time wasted while traveling from one holding to the next**
- **Difficult to properly and effectively control weeds and pests**
- **Difficulty in following a sound farm plan arising from the distance between fragments and the farmer's home**
- **Difficult in the supervision of scattered plots**
- **Difficulty in carrying out various soil and water conservation measures**
- **Difficulty in offering agriculture extension advice/services**
- **Productivity is poor leading to low living standards**
- **Difficult to control livestock parasites and diseases**
- **Not easy to restrict grazing because the holding are smaller**
- **Due to the small size of units of land communal grazing is common leading to overgrazing and soil erosion**

27. What is land consolidation?
- **Practice of putting scattered land parcels under one holding.**

28. Outline **two** objectives of land consolidation.
- **To facilitate mechanization.**
- **For efficient supervision of labour force.**
- **To facilitate effective and efficient farm planning.**
- **To save time and transportation costs.**

29. State the benefits of land consolidation as far as agriculture is concerned.
- **Sound farm planning and adoption of crop rotation programmes**
- **Facilitate land improvement and conservation of soil**
- **Easy to access agricultural extension advice**
- **Saves time and transportation costs**
- **Enables proper supervision**
- **Convenient to farmers**
- **Facilitates construction of permanent structures**
- **Economical operation of activities on the land**
- **Easy to control pests and diseases**
- **To make it easy for long term investments in the farm**
- **Rotational programmes can be easily affected.**

- **Mechanization is possible on enlarged area**
- **Cheaper to register land.**

30. Outline the process followed in land adjudication
- **Ownership of land within a specific area is established**
- **Land is surveyed /measured**
- **Detailed maps showing existing boundaries of the land are drawn by surveyors**
- **The land is recorded against individual owners**
- **Solving objections if any.**
- **The maps and record of land are submitted to the district land registry**
- **The land is registered**
- **Title deeds/ land certificates are issued**

31. a) What is a land title deed?
- **A certificate that proves ownership of land.**

b) Give **four** benefits of possessing a land title deed to a farmer.
- **Can be used as security for credit.**
- **Minimizes land disputes**
- **Encourages long term investments.**
- **Motivates the farmer to conserve soil and water.**
- **The farmer can lawfully lease a part or whole of his land to earn extra income**
- **Farmer has security of land ownership**
- **It is a proof of ownership**

32. Apart from the **identity of owner, title number and size of land**, name other essentials contained on a land title deed.
- **Location/plot number**
- **Serial no**
- **The seal**
- **Signature of issuing officer**
- **Date of issue**
- **Type of ownership i.e. leasehold, absolute or free hold**
- **Conditions of ownership if any**

33. Give any **two** objectives of land redistribution.
- **To ease population pressure- To increase agricultural production**
- **To create employment**
- **To form some kind of tsetse fly consolidated barriers**

34. Give **three** reasons why a landlord may not be in a position to use his land.
- **Incapacitation**
- **Lack of enough capital**
- **The landlord may be far away from the land**
- **The land may be too big**

SOIL AND WATER CONSERVATION

1. What is soil erosion
- **Process by which top soil is detached, removed and carried away from one place to another**

2. Explain the negative impacts of soil erosion in agriculture
- **Removal of soil nutrients hence lowers productivity of land**
- **Removal of beneficial organisms from the soil**
- **Sedimentation and siltation of dams, lakes, rivers, and ponds leads to decline of fish**
- **Uprooting plants and exposing plant roots**
- **Burying of crops**
- **Destruction of soil structures**

3. Give **four** natural factors that encourage soil erosion.
- **Steep slopes**
- **Light soil/sandy soils.**
- **Large volumes of surface run off.**

- **High amount of rainfall**
- **Bareness of the land.**
- **High rain intensity.**
- **Long slopes.**
- **Strong winds.**
- **Shallow soils.**

4. Give two reasons for carrying out soil conservation in a farm.
- **Prevent loss of plant nutrients from the soil**
- **Maintain soil structure.**

5. Name **three** human activities that may influence soil erosion
- **Ploughing up and down slope**
- **Over cultivation**
- **Planting annual crops on slopes**
- **Overstocking/ burning vegetation/ clean weeding**
- **Over irrigation**

6. Outline three factors that influence mass wasting.
- **Slope of land**
- **The nature of material**
- **Climate**
- **Vegetation cover**
- **Human activities**
- **Forces within the earth's crust**

7. Name **four** improper farming methods that increase the rate of soil erosion.
- **Ploughing along the slope**
- **Clean weeding**
- **Planting pastures on steep slopes**
- **Burning vegetation**
- **Clean weeding**
- **Spacing wider than appropriate.**

8. State **six** factors that influence the rate of soil erosion.
- **Slope of the land (topography)**
- **Amount and intensity of the rainfall -Excess water run off take with it loose soil particles**
- **Speed of water-the flow is determined by the slope of the land, the steeper the slope the higher the rate of erosion**
- **Type of soil- Some soils drain water faster than the others e.g. sandy soil hence are easily eroded than clay**
- **Soil depth- Shallow soil become saturated with water quickly than deep soils hence easily eroded**
- **Vegetation cover- Forests protect soil against erosion than bare soil by preventing direct rain drop impact**
- **Overstocking- Overstocking leaves bare soil exposing it to agents of soil erosion**
- **Deforestation - Cutting down of trees expose soil to agents of erosion leading to soil erosion**
- **Planting annual crops in steep slope- It leads to frequent cultivation hence exposure soil to erosion**
- **Indiscriminate burning of vegetation before cultivation -The land is exposed to erosive forces of rain and wind**
- **Clean weeding - This leaves the soil less protected against water and wind erosion**
- **Ploughing up and down the slope- creates rills between furrow lines that promote rill erosion**

9. State the factors that influence solifluction.
- **The slope of land /topography**
- **The nature of material**
- **Climate**
- **Vegetation cover.**
- **Human activities.**
- **Rocks within the earth's crust.**
- **Forces**

10. Mention **four** control measures of river bank erosion
- **Construction of dams**
- **Construction of dykes**
- **Planting trees along river bank to hold soil together**
- **Observing government regulation on leaving a sizeable strip of an uncultivated land along the river bank**

11. Name six types of erosion on the basis of the agent.
- **Raindrop / splash erosion.**
- **Sheet erosion**
- **Rill erosion**
- **Gulley erosion**
- **River bank /stream / channel erosion**
- **Wind erosion**
- **Solifluction.**

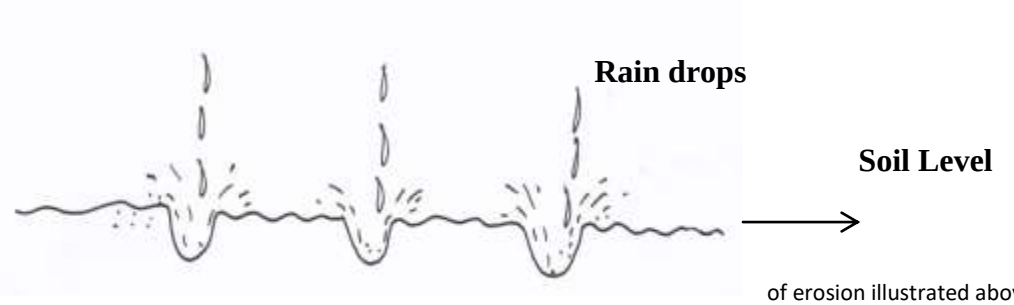
12. Outline **two** ways through which rain drops initiate the process of erosion
- **Detaching soil particles on the surface**
- **Transferring the soil particles in splashes**

13. Give **four** types of water erosion
- **Rill erosion**
- **Gully erosion**
- **Rain drop/splash erosion**
- **Sheet erosion**

14. Give **one** way through which check dams control soil erosion
- **Reduce the speed of water hence its erosive ability**
- **Trap soil being carried by moving water**
- **Increase infiltration of water hence reduce surface run off**

15. State **three** characteristics of sheet erosion.
- **Caused by water or wind**
- **Top thin uniform layer of soil eroded**
- **Speed of erosion is relatively slow.**
- **Loose shallow top soil in gently sloping areas are more susceptible**

16. The diagram below illustrates a type of soil erosion. Study it carefully and answer the questions that follow.



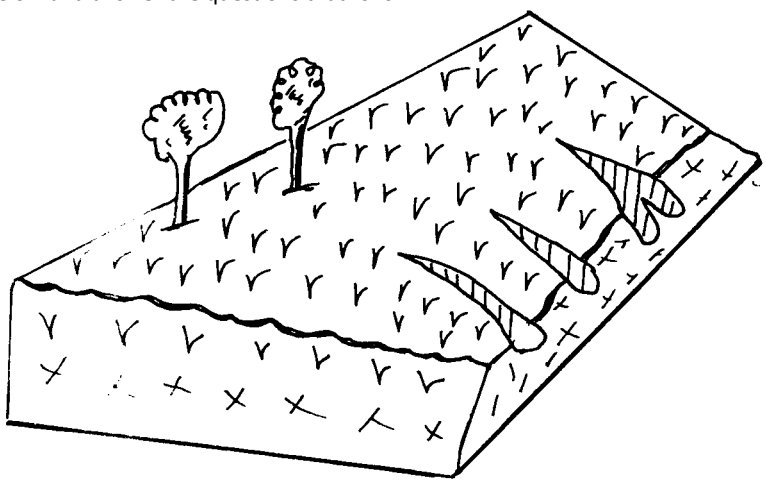
(a) Identify the type of erosion illustrated above.
- **Splash erosion**

(b) State **two** measures that could be used to control the type of soil erosion illustrated above.
- Planting cover up
- Mulching

17. State **four** methods used in water harvesting.
- **Dams**
- **Weirs**
- **Ponds**
- **Roof catchment**
- **Rock catchment.**

18. Name **two** forms of gully erosion
- **V- shaped**
- **U – shaped**

19. Study the illustration below and answer the questions that follow.



a) Identify the illustration shown above.

- **Rill erosion**

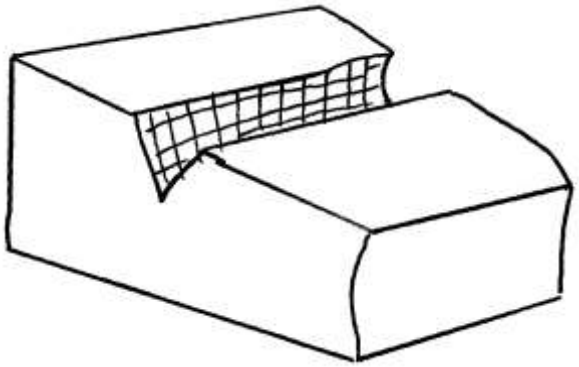
b) Under what conditions would you expect the above illustration to occur?

- **Where there is little vegetative cover.**
- **Where land has just been ploughed.**
- **Where there is concentration of flowing water down the slope**

c) State **two** ways of preventing conditions shown in (a) above from occurring.

- **Practice cover cropping**
- **Avoid clean seedbed preparation.**
- **Cultivation along contours**
- **Mulching**
- **Intercropping**

20. The diagram below represents a type of gully erosion. Study it carefully and answer the questions beneath



a) Identify the type of gully illustrated above.

- **V – shaped gully**

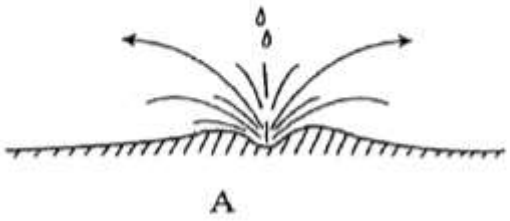
b) Briefly explain how the gulley is formed

- **Flowing water causes channel erosion**
- **Wearing of the sides of the channel**
- **Scouring of the floor of the channel by moving water.**

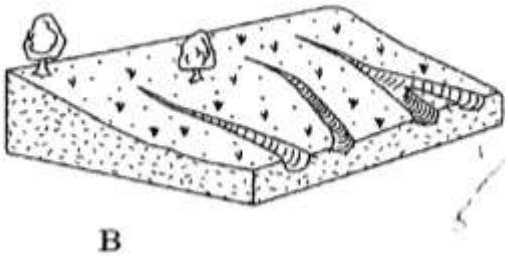
c) Name **one** control measure that has been used over many years to control gully erosion

- **Building of gabions across the gully**

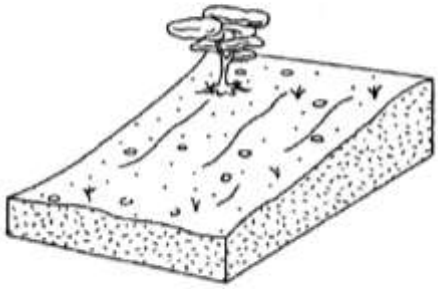
21. The illustrations below indicate types of soil erosion that take place on cultivated farm land. Study them and then answer the following questions.



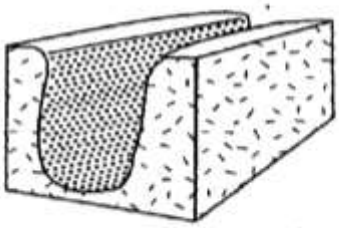
A



B



C



D

a) Identify the type of erosion represented by each of the illustrations **C** and **D**

- **C-Sheet erosion**
- **D-Gully erosion**

b) Name **two** factors that may accelerate the rate of the type of erosion represented by **A**

- **Bareness of the land**
- **Type of soil**
- **Rainfall intensity**

c) Give **one** practice that may reduce the impact of the type of erosion represented by **B**

- **Avoid fine tilth/have rough tilth**
- **Use of manures**
- **Mulching**

d) A part from loss of soil what other types of destruction are caused by the type of erosion represented by **A**

- **Destruction of soil structure**
- **Loss of soil nutrients**
- **Decrease in particle aggregation**

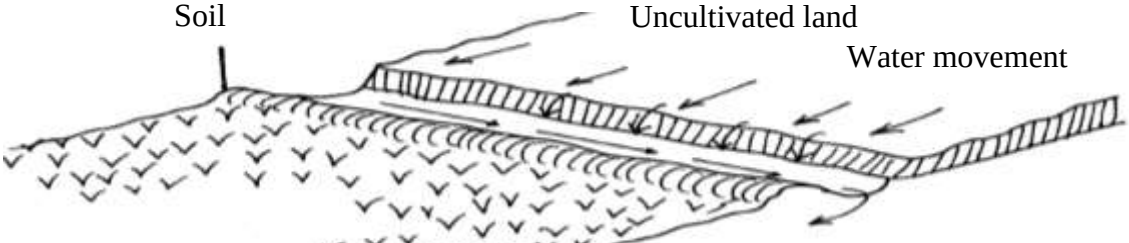
22. State **two** factors that would determine the width and depth of a cut off drain.

- **Expected volume of run off**
- **Bed rock soil type**
- **Soil type**

23. Explain **five** ways by which grass helps to conserve soil

- **Reducing the speed of surface run-off – hence reducing the runoff water's erosive power.**
- **Trap soil from surface run-off/ filter out soil.**
- **Reduce the impact of rain drops on the soil thus reducing splash erosion.**
- **Grass roots hold soil particles together hence reducing soil erosion.**
- **Soil structure is improved by organic matter from grass thus rate of water infiltration increases.**

24. Below is a diagram showing soil erosion control method



Cultivated land with crops

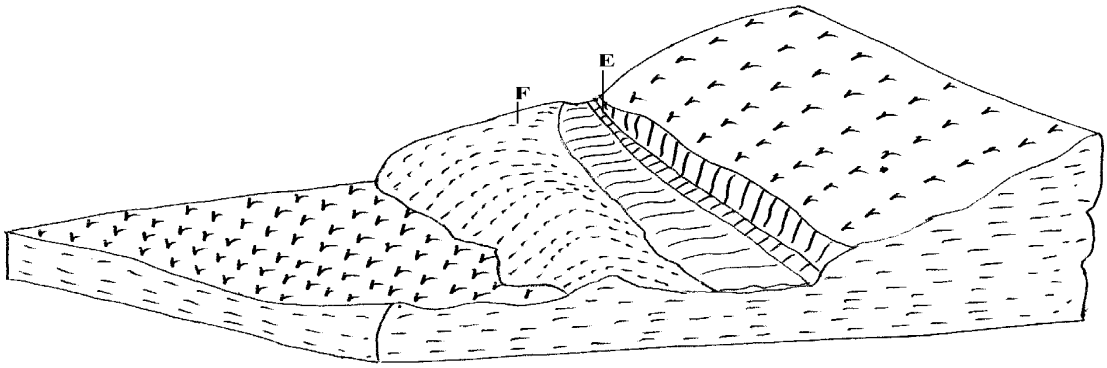
a) Identify the structure used to control soil erosion
- **Cut off drain**

b) What is the function of the structure made?
- **Collect water from uncultivated land and drain it into a water way**

c) Why was soil not put on the upper side of the trench made
- **Will be washed by water back to the trench filling it**

d) State **four** effects if water was allowed into the cultivated land
- **Will wash top fertile soil away**
- **Will uproot planted crops**
- **Expose unproductive soil**
- **Soil washed will cover crops on the lower end of the farm**

25. The feature illustrated by diagram **H** below is used in soil and water conservation. **Study** it and answer the questions that follow.



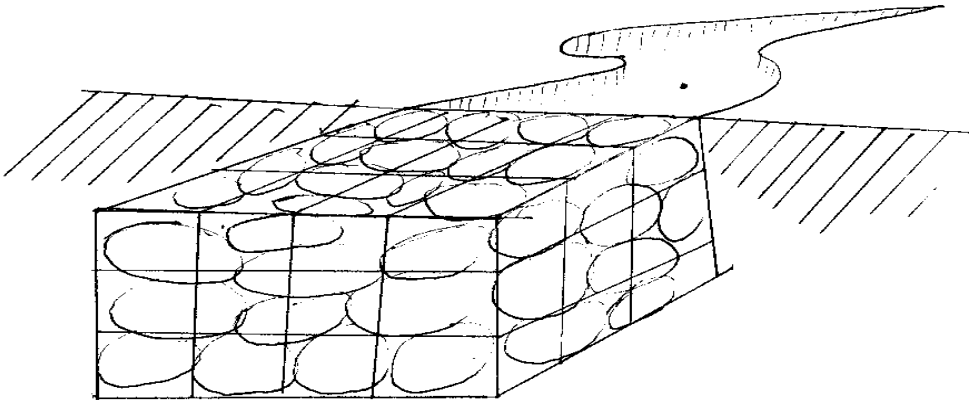
(a) **Identify** the above structure.
- **Cut-off drain**

(b) **What** features are represented by **E** and **F?**
E – Channel
F – Embankment /heaped soil

(c) **Give** the function of structure illustrated in letter **E**
- **Collects and diverts /cut-off excess water from the cultivated slope and discharge it to a river valley or wasteland**

(d) **State two** maintenance practices that should be carried out on this feature.
- **Planting grass /vegetation on F**
- **Removing /drudging silt from the channel**

26. Study the diagram below and answer the following questions.



a) Identify the above method of soil and water conservation.
- **Gabion.**

b) List three materials used in construction of the above structure.
- **Binding wires**
- **Galvanized Wire mesh.**
- **Stones**
- **Sacks.**

c) State two factors that determine the size of the structure above
- **Amount and distribution of rainfall in the area.**
- **Slope of the land /topography.**
- **Width of the gully.**
- **Volume of water in the gully.**

27. List **three** materials that may be used for constructing a gabion
- **Wires.**
- **Stones.**
- **Concrete/ sand/ cement/ water/ ballast.**
- **Wood/ Metal / poles/ metal pegs/ rods.**
- **Galvanized wire mesh/ Wire mesh**

28. Give **two** ways through which gabions control soil erosion
- **Slow down surface run – off**
- **Filter soil particles from surface run off**

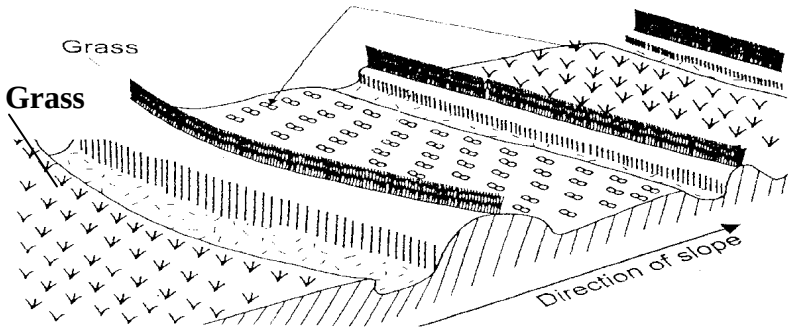
29. (i) What is a terrace?
- **It is a ridge of soil with a trench / ditch constructed across a slope to decrease the length of slope and reduce water runoff**

(ii) Name any **two** types of terrace constructed in farm lands
- **Narrow based terrace**
- **Broad based terrace**
- **Bench terrace**
- **Fanya juu terrace**
- **Fanya chini terrace**

30. State **two** advantages of bench terraces.
- **Enables better retention of fertile soil/ reduce soil erosion.**
- **Enable conservation of soil moisture**
- **Helps to reduce the slope of the land**

31. Study a section of the diagram of soil conservation practice shown below then answer the questions that follow

Crops

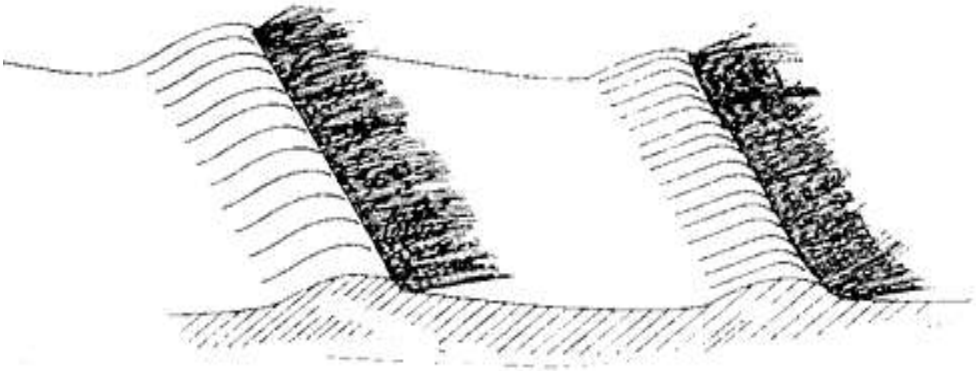


a) Identify the method of soil conservation illustrated on the diagram above.
- **Fanya Juu terrace**

b) Explain **two** ways in which the above method helps to conserve the soil and water.
- **Has a channel to drain water**
- **Has grass planted on the ridge to reduce the speed of running water and also protect it from erosion**
- **Ridge/ retain eroded soil**
- **Has ridges to reduce the speed of running water and hold back soil**

32. Outline any **three** benefits of terracing on a sloping area.
- **Reduces the speed of run – off.**
- **Trap and hold soil from surface run-off.**
- **Improves water infiltration.**
- **Allows use of machinery in farm operation/mechanization.**

33. The diagram below shows a method of soil and water conservation method. Study it and answer the questions that follow.



a) Identify the method.
- **Bench terrace**

b) List **two** methods of establishing the structure.
- **planting a line of grass / vegetation**
- **Excavation / digging method.**

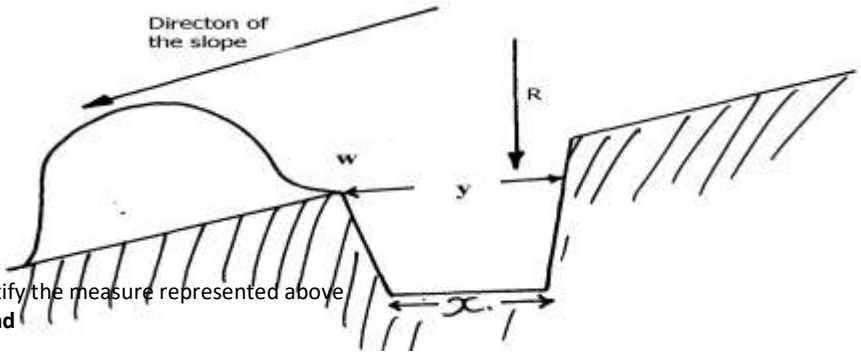
c) Give **two** factors that necessitate the construction of the structure.
- **When high valued crop is to be grown**
- **When there is acute shortage of land**

d) Give **four** other physical structures that can be used for the same purpose as the structure.
- **Fanya juu terrace**
- **Broad based terrace**
- **Cut off drain**
- **Narrow based terrace**
- **Gabion**

34. Explain the cultural methods of soil erosion control
- **Planting cover crops – The more the soil is covered by a crop or grass, the less erosion will occur**

- **Early planting- Established an early ground cover by crops thus reducing the risk of soil erosion**
- **Inter-cropping – Increases the ground cover protecting the soil from erosion**
- **Crop rotation – improves soil structure where the rotation includes a grass ley**
- **Strip cropping/contour/filter strip cropping – This is the growing of alternate strips of different crops in the same field with the purpose of interrupting the continuous flow of water or wind**
- **Weed or disease and pest control – This ensures a good crop stand that covers the soil more**
- **Harvesting procedures that leave crop residues on the field**
- **Mulching- The covering of the soil with organic or inorganic materials**
- **Contour farming follows the contours during ploughing, ridging and planting which reduces surface run off**
- **Grass strips formed by either leaving narrow strips of land un ploughed or planting grass on strips along the contour**
- **Afforestation and reafforestation-trees planted to provided soil cover, prevent rain drop impact and bind soil particles together**
- **Fallowing – leave the land uncultivated for same time**

35. The figure below represents a physical soil and water conservation measure used on various slopes



a) Identify the measure represented above
- **Bund**

b) Describe the construction of the identified measure above
- **It is constructed along the contours**
- **A channel is dug with the upper width (y) 1.5cm and bottom width (x) 90cm**
- **Excavated soil is put on the lower part of the channel leaving the part (W) the edge**
- **The steeper the slope the closer the bunds**

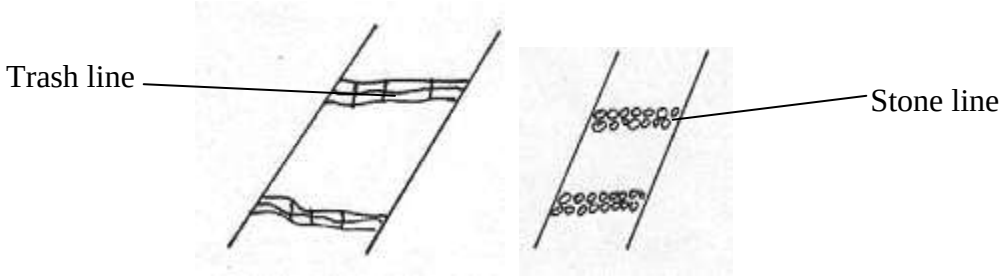
36. State **three** physical methods of controlling soil erosion.
- **Stone lines**
- **Filter strips**
- **Trash line**
- **Terraces**
- **Bunds**
- **Cut off drains**
- **Gabions**
- **Dams**
- **Ridging.**

37. Describe the physical (structural) methods of soil and water conservation

- **Physical or structural control measures are measures that involve mechanical construction and include:**

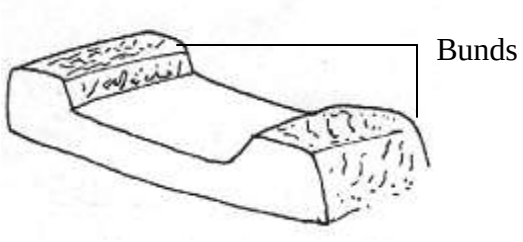
i) Trash lines/ Stone line

- **Trash which is made up of residues or stones are heaped along the contours**
- **Helps to trap soil when being washed away besides reducing the velocity of run-off**
- **Trash are held in position by pegs/ poles**



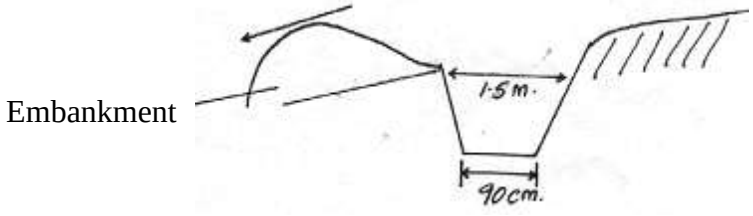
ii) Bunds

- **Are heaps of soils along the contour**
- **Grass may be planted on top of bunds to hold them together**
- **The banks of earth are 1-2m wide at the base of 60 cm high**
- **They are built on contour with short-ties 5-10 m to channel above the bund**
- **Bunds are suitable for fairly small cultivated areas on moderate slopes, where they should not be more than 30 m apart**



iii) Cut-off drains

- **Open trench with embankment on lower side**
- **Diverts excess water from farm land to less erodable area**
- **Reduce speed of run-off and trap soil**



iv) Terraces

- **Constructed to reduce the surface flow and carry away excess water which cannot be absorbed by soil.**
- **Types include: broad based, narrow based, bench and fanya juu terrace**

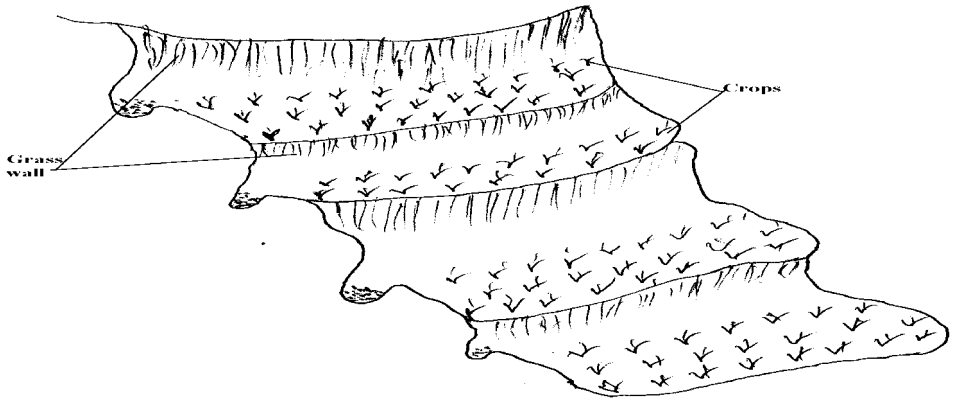
v) Gabions/ Porous dams

- **Gabions are boxes of galvanized wire mesh filled with stones which are built across slopes and gullies**
- **The boxes are heavy enough to resist movement even by large water flows**
- **Gabions trap soil and also reduce the erosive force of run-off by reducing the speed**

vi) Dams and weirs

- **Are barriers constructed across a river or another water way to hold and restore water**
- **Also reduces the speed of water**

38. Study a section of the diagram of a soil conservation practice shown above, and then answer the questions that follow



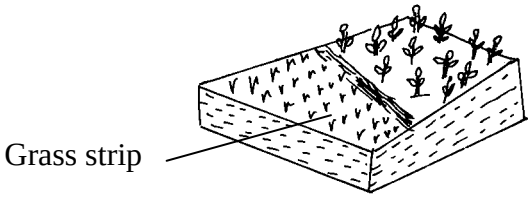
(a) **Identify any one** soil conservation practice on the diagram other than grass wall.
- **Bench terraces**
- **Contour farming**
- **Trench / drain / ditch channels**

(b) **Explain two ways** in which grass wall helps to conserve the soil.
- **Hold / binds the soil particles hence reducing soil erosion.**
- **The grass cover reduces the speed of water run – off**

39. State four roles of trees in soil and water conservation
- **Reduce the impact of raindrops on the ground reducing splash erosion.**
- **Provide shade which reduces loss of moisture by evaporation**
- **Act as wind breaks / Break wind velocity**
- **Roots bind soil particles together.**
- **They reduce speed of run-off thus reducing its erosive power.**
- **Add Organic matter from decomposing of leaves improve soil structure and thus infiltration**

40. State and explain five ways in which trees help in soil conservation.
- **Reduce volume of run-off - As a result of reduction in volume of run-off there would be high rate of infiltration**
- **Act as wind breaker- Trees reduces spread of wind hence topsoil would not be washed away.**
- **Binding of soil particles by roots – The roots assist in binding soil particle together hence soil would not be easily carried away /vulnerable to soil erosion.**
- **Improve soil structure – the leaves of plant fall off and when they decay make soil structure stable hence less vulnerable to soil erosion.**
- **Reduce impact of raindrops – trees reduce the speed of rain drops resulting in less splash erosion.**
- **Reduction of speed of surface run-off – the speed of water running on the surface is greatly reduced by the trees hence controlling erosion rate.**

41. Study the diagram below which illustrates a method of soil conservation and answer the questions that follow.



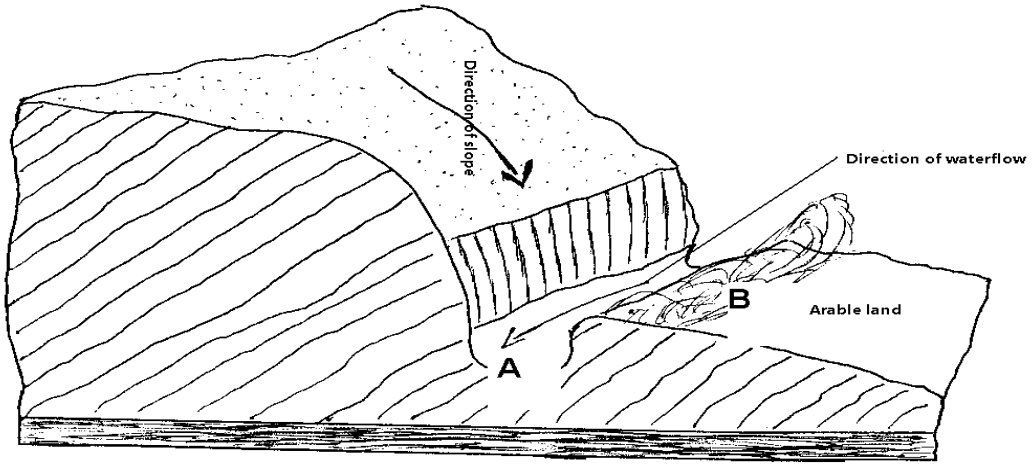
(a) Identify the methods of soil conservation illustrated above.
- **Contour farming and strip cropping.**

(b) Under which condition should the farmers would apply these method.
- **Slopping land**

(c) State the role played by the grass strip in the diagram above.

- **Act as barriers to the flowing water**

42. The illustration below shows a newly constructed cut –off drain **study** it carefully and answer the questions that follow.



a) **Identify** the parts of the cut-off drain labeled A, and B.
   - **A- Trench / channel**
   - **B- Ridge/ embankment**

b) **Describe** the procedure of constructing a cut –off drain.
- **Measure and mark the layout**
- **Dig and remove the soil from the channel and heap it on the lower side of the drain.**
- **Planting grass /any other suitable vegetation on the ridge to stabilize it.**

c) **How** can the part of the structure labeled B be stabilized after it has been constructed?
- **Plant grass /any other vegetation.**

d) **Give one** factors that would determine the width and depth of the cut off drain.
- **Expected volume of surface run-off.**
- **Soil type / bed rock.**

43. Name **two** cropping systems that help in soil and water conservation
- **Mixed cropping**
- **Cover cropping**
- **Intercropping**
- **Alley cropping**
- **Multistorey cropping**

44. Use the diagram below to answer the questions that follow;

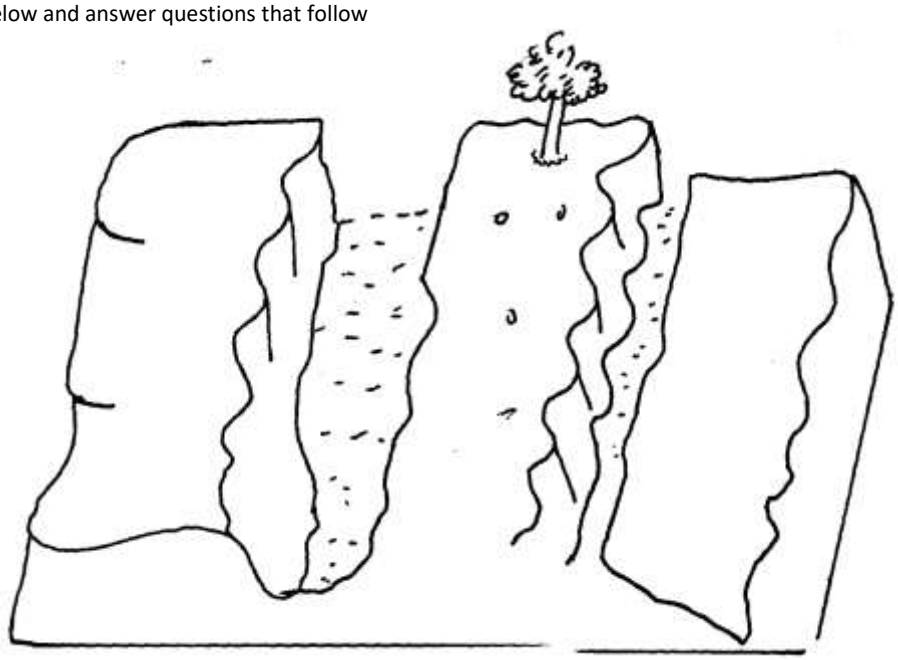
(a) What type of erosion is represented above?
- **Solifluction erosion/washing**

(b) State **three** factors influencing such type of erosion mentioned in 44(a) above.
- **Slope of land**
- **Vegetation cover**
- **Nature of materials underlying massive rocks**
- **Climate**
- **Human activities**

- **Forces within the earth's crust**

45. State **two** ways how ridging controls soil erosion
- **Stops surface run off**
- **Holds the water for infiltration instead of surface flow**

46. Study the diagram below and answer questions that follow



i) Name the type of erosion
- **Gulley erosion**

ii) Describe the formation of the type of erosion named in (a) above
- **Widening rills on sides and floor due to high volume of and erodibility of soil**
- **V-shaped valleys develop where soils are deep and have bare depressions**
- **U – shaped valleys develop where the materials on the channel floor are resistant to scouring**

iii) State the effect of this type of erosion in the farm
- **Mechanical cultivation of land is impossible.**

47. a) Differentiate between Erodibility and erosivity
- **Erodibility - the extent to which soil is vulnerable to erosion while erosivity – is the ability of wind and water to cause erosion**

b) State **two** factors which influence solifluction
- **Slope or topography**
- **Soil moisture content**
- **Soil cover**
- **Human activities**
- **Wind speed and velocity**
- **Type of soil**

48. a) State **four** steps followed in the development of a gully.
- **Movement of water from the water shed.**
- **Channel erosion caused by flowing water.**
- **Wearing of sides of the channel.**
- **Scouring of the floor of the channels by moving water.**

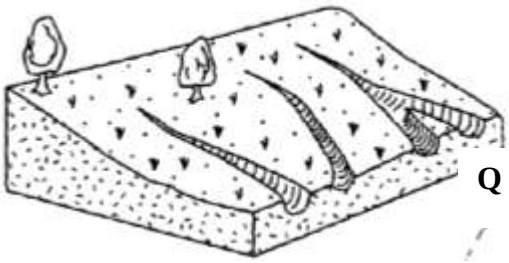
(b) Outline farming activities which may encourage soil erosion
- **Continuous cropping without giving the land a rest**
- **Burning**
- **Ploughing along the slope/ farming on step land**
- **Deforestation**
- **Ploughing along river banks**

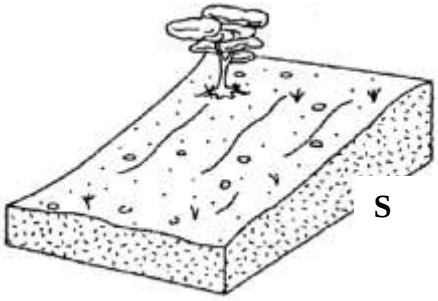
- **Cultivating when the soil is too dry or wet**
- **Overgrazing/overstocking**
- **Flooding/application of a large amount of water at high rate**
- **Over cultivating the land to fine tilth/pulverizing the soil**

(c) Explain how various farming practices would help to conserve soil in a farm.
- **Mulching by reducing the speed of run- off and reducing the impact of raindrops**
- **Contour farming by reducing the speed run off**
- **Terracing effective length of the slope and consequently slowing down speed of running off**
- **Planting trees/ holding soil particles together hence reducing effects of wind erosion and reducing the impact of rain drops ,**
- **Establishing and maintaining vegetated water ways by reducing the impact of livestock on the soil erosion**
- **Establishing trash lines/ stones lines by reducing speed of run- off an effects of wind erosion**

49. Outline two ways in which inorganic mulch helps in conservation of water and soil.
- **Reduce run-off thus increasing amount of water infiltration into soil.**
- **Reduce evaporation thus increase amount of water retained in the soil.**

50. The diagrams labeled Q and S below illustrate some types of erosion. Study the diagrams carefully and answer the questions that follow.





(a) Identify the methods of soil erosion in Q and S.

Q – Rill erosion

S – Sheet erosion

(b) A part from the above method of soil erosion represented by **Q** and **S** name any other **two** methods of soil erosion.
- **Gulley erosion,**
- **Splash erosion**
- **River bank erosion.**

(c) State **two** common methods of controlling soil erosion in **Q** and **S**.
- **Contour farming**
- **Trash or stone lines**
- **Grass strips / filter strips**
- **Mulching**
- **Bunds**
- **Cover cropping**

51. (a)**Define** the term micro-catchment as used in soil and water conservation.
- **Are micro- environments which have been designed in such a way that they aim at conserving soil and water around growing crops like bananas and citrus tree crops?**

b) Name **four** types of micro-catchment commonly used in the farm.
- **Triangular/ U- shaped Negarims.**
- **Semi – circular bunds.**
- **Contour bunds/furrows**
- **Planting holes/pits.**
- **Trapezoidal bunds**

c) Distinguish between the **two** micro-catchments for water conservation.

i) Negarims
- **Negarims: are V shaped or closed grid-like earth ridges constructed on sloppy or gentle Slopes for planting trees or tree crops.**

ii) Semi-circular bunds

- **Semi circular bunds: are semi-circular earth bunds/ ridges constructed along the contours in a staggered pattern on range lands for tree planting.**

52. Give **three** benefits of micro-catchments in water conservation

- **Slows down the speed of surface run off hence increasing the rate of water infiltration**
- **Collected surface run off may be used for irrigation of food crops and use of livestock**
- **Can be used as a strategy for afforestation in arid and semi arid areas**
- **Can be used to reclaim land to improve food production in arid areas**
- **Suitable for establishing vegetation parks and roadside rest areas**
- **Hold surface run-off encouraging sedimentation of soils.**

53. Outline the uses of micro-catchment in the farm.

- **Conserving soil**
- **Conserving water**

WEEDS AND WEED CONTROL

1. What is a weed?

- **Any plant growing where it is not wanted**

2. What is biological weed control

- **A deliberate use of a living agent e.g. insects/virus/bacteria/fungi/animal to reduce the population of target weed.**

3. Name **four** different ways of classifying weeds.

- **Growth cycle**
- **plant morphology**
- **Where they grow (habitat)**
- **Growth habits**
- **Number of cotyledons.**

4. Name **two** classes of weeds based on their morphology

- **Narrow – leaved weeds**
- **Broad – leaved weeds**

5. Outline **two** characteristics of **annual** weeds

- **Rapid growth rate**
- **Produce a lot of seeds for dispersal**
- **Only propagate by seeds**
- **Spread and colonise a large area very quickly**

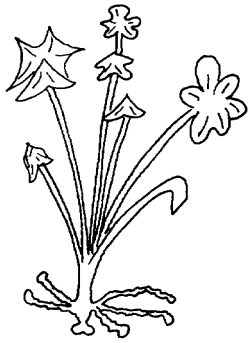
6. State **two** main factors which contribute to competitive ability of weeds.

- **Weeds have extremely successful mean of propagation**
- **Produce large quantities of seeds.**
- **Remain viable in soil for along time**
- **Easily dispersed**
- **Propagate vegetative**
- **Weeds are excellently adapted to the environment**

7. What is a companion crop?

- **A crop grown in the field to help suppress weed growth and control erosion**

8. Study the diagram below and answer the questions that follow:



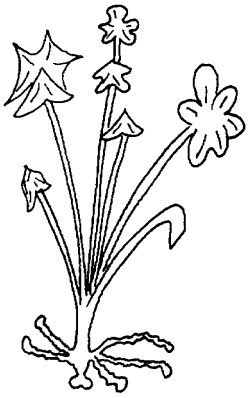
(a) Identify the weed
Oxalis/ *Oxalis* Latifolia/ *Oxalis spp*

(b) **Briefly explain** why it is difficult to eradicate the weed above in a crop field
- **Has underground storage organs i.e. bulbs /bulbils.**
- **Underground storage organs are not desiccated by sunlight when exposed by cultivation.**
- **Has numerous storage organs bulbs/bulbils and extensive root system that support the plant**
- **Method of propagation favours its regeneration.**

(c) State the economic importance of the weed shown above
- **Reduces yields of crops.**
- **Increases cost of production.**
- **It's a livestock feed.**
- **Assist in fixation of nitrogen.**

(d) **What** are the **two** possible herbicides that can be used in the control of the above weed?
- **Duron**
- **Linuron**
- **Dalapon.**

9. Study the diagrams of weeds below and answer questions that follow.



P

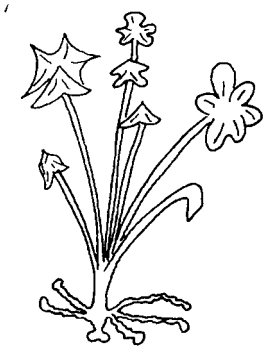
Q

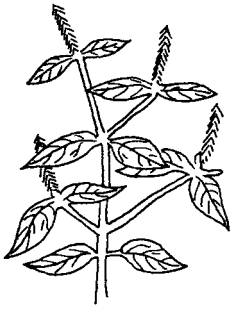
(i) Identify the weeds shown by diagrams **P** and **Q**.
P- Oxalis (*Oxalis* Latifolia)
Q- Sodom apple

(ii) Give **two** feature that make the two weeds in **P** and **Q** difficult to control by use of herbicide.
P- Has underground structures (knot) that can sprout
Q- The plant can regerminate from the roots

10. Study the diagrams of weeds below and answer questions that follow.

A **B**





a) Identify the weeds illustrated in diagrams **A** and **B**
A– Oxalis/ *Oxalis Latifolia*/ Oxalis spp
B – Devils Horse Whip/ *Achyranthes aspera* /*Achyranthes spp*

b) State **one** reason why the weed labeled **A** is difficult to control.
- **A has underground storage structures that regenerate easily**

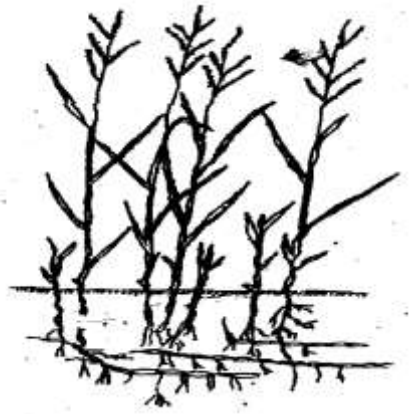
c) State **two** economic importance of the weed labeled **B** in Agriculture.
- **It's a weed in annual crops**
- **It irritates farm workers reducing their efficiency**

11. Give the reasons why it is difficult to control the following weeds
a) Oxalis spp-**because of presence of bulbs that remain in the soil/have underground bulbs which regenerates**

b) Couch grass **- because of deep extensive underground stems / rhizomes**

c) Nut grass**- because of many nuts/ bulbs that remain in the soil**

12. The following is an illustration of a common weed of arable land



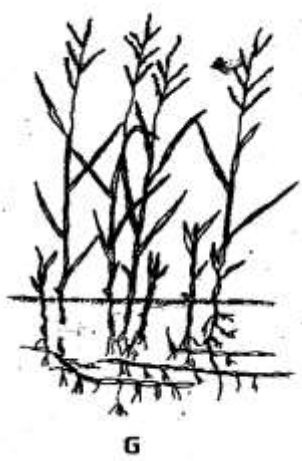
(a) Identify the weed
- **Couch grass /*Digetaria scalarum***

(b) Why is it difficult to control the weed?
- **It has got underground rhizomes which grow deep in the soil**
- **Increases the cost of production when controlling it**

(c) State **one** harmful effect of the weed on crop production
- **Competes with crops for nutrients/soil moisture and space resulting to low yields**

(d) Give **two** measures used to control the weed
- **Use of appropriate herbicides**
- **Physical removal of rhizomes**

13. Below are diagrams of common weeds on the farm, study them and answer the questions that follow.

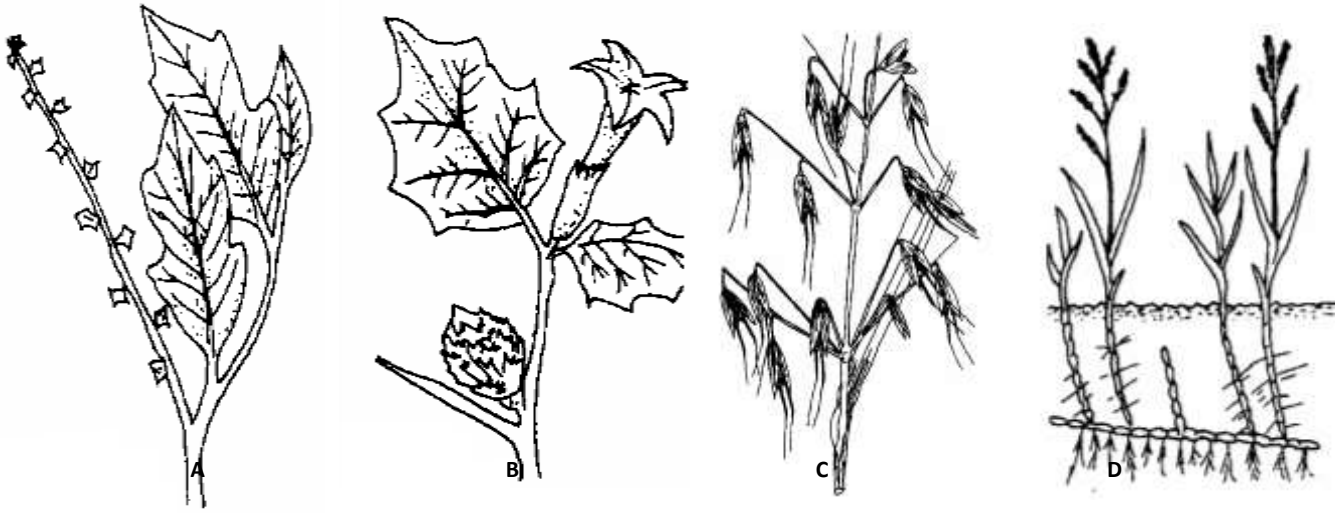


a) Identify the weeds **G** and **H**
G-Couch grass (*Digetaria* scalarum)
H-Sodom apple (*Solanum incanum*)

b) State **any** economic importance of the weed shown in diagram **G**
- **Reduce carrying capacity of pasture**
- **Compete with crops for nutrients**
- **Reduce quality/quantity of produce**
- **Increase production cost**

c) Why is it difficult to control the weed in diagram G
- **It reproduces by rhizomes which need to be cultivated deeply for their elimination**

14. Below are diagrams of common weeds on the farm. Use them to answer the questions that follow.



(a) Identify the weeds **A**, **B**, **C**, **D**.
A – Double thorn /*Oxygonum sinuatum*
B - Thorn apple/ Datura/Datura *stramonium*
C – Wild Oats/<u>Avena</u> fatua.
D – Couch grass (<u>Digitaria</u> <u>scalarum</u>)

(b) Give the negative effect of weed labelled **B** in livestock
- **poisonous**

(c) State **two** effects of weed **D** on crop production
- **Lower the quality of produce**
- **Lower yields**
- **Compete with intended plants for nutrients and water**

(d) Give a reason why weed **D** is difficult to control

- **It has underground rhizomes**

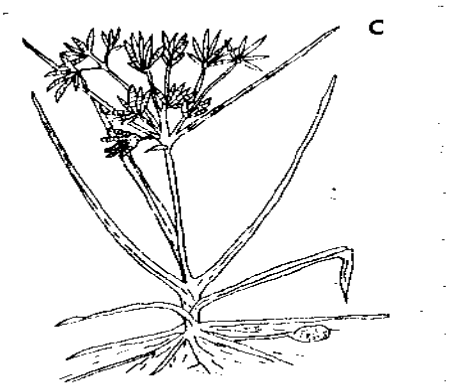
(e) Suggest the most appropriate method of controlling weed labeled **D**.

- **Using herbicides e.g. Dalapow, MCPA or Glyphosate.**

15. List any **four** types of weeds known to be poisonous to livestock

- **Thorn apple**
- **Sodom apple**
- **bracken fern**
- **Abutilon**
- **subukia weed**
- **mallow weed**

16. The diagrams below shows, weeds.



(a) Identify the weeds **C** and **D**.

C-Nut grass (*Cyprus rotundus*)

D- Sow thistle (*Sonchus oleraceus*)

(b) **State** why it is difficult to control weed **C**

- **It has underground storage organs (bulbs)**

(c) **State two** economic importance of weed **D**

- **Used as animal feed**
- **Used as human food (vegetable)**
- **It is a source of medicine / medicinal.**

17. Study the illustration below and answer the questions beneath.

a) Identify the weeds labelled

M- Nut grass (*cyperus rotundus*)

N – Double thorn (*Oxygonum sinuatum*)

b) Give **two** reasons as to why it is difficult to control weed M
- **Have underground nut which remains viable in the soil for a long time waiting for favourable conditions**
- **Have the ability to survive where there is limited nutrients supply.**

c) What **is** the economic importance of **N.**?
- **Used as livestock feed during early stages of growth**
- **Irritates workers and reduces their efficiency**

18. The diagram below illustrates an example of an arable weed. **Study** the diagram carefully and answer the questions that follow.

a) **Identify** the weed illustrated above.
- **Thorn apple / datura stramonium**

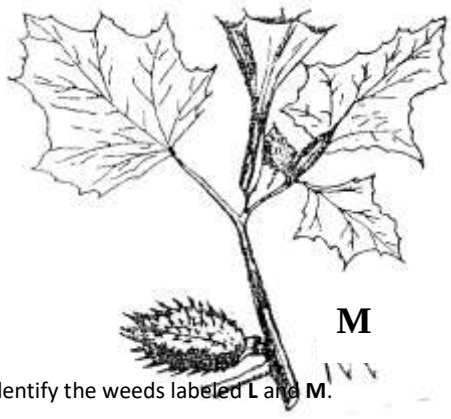
b) **Classify** the weed according to its life span.
- **Annual weed**

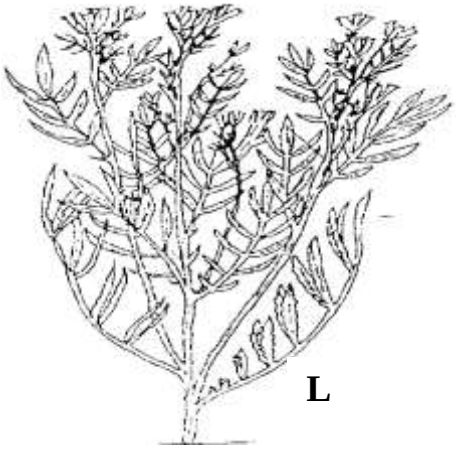
c) Using observable features classify the weed
- **Broad leaved**

d) **State two** harmful effects of the above on the farm.
- **Poisonous to livestock**
- **Poisonous to the farmers**
- **Lower the quality of farm products / milk.**

e) At what stage of life cycle is best recommended to control weeds
- **Before flowering to avoid spread through seeds**
- **Early stage before spreading underground organs**

19. The illustration below are crop weeds labeled L and M. Study it an answer the questions that follow.





a) Identify the weeds labeled **L** and **M**.

L – Thorn apple / *Datura stramonium.*
M – Mexican marigold / *Tagetes minuta*

b) Give **one** economic importance of the weed labelled **L**.
- **L is poisonous to livestock and the farmer.**
- **It is a weed on arable land.**

c) Classify the weed labeled **L** according to its life span.
- **Annual weed**

d) Apart from competing for moisture, nutrient and light what other reason is it necessary to control the weed labelled **M** in a field of pastures.
- **It taints milk when fed by dairy animals**

20. The diagram below shows a weed.

(a) Identify the weed

- **Blackjack/ *Bidens pilosa***

(b) State **two** reasons for controlling the weed.
- **To avoid competition for nutrients, moisture arid light**
- **Black jack seeds may contaminate some crops/ farm produce e.g. wool**
- **Blackjack may be an alternate host to some pest e.g. aphids which may attack crops like beans**
- **Black jack seed prick and irritate workers**

21. Give **one** economic importance of **Pig weed**.
- **Increases cost of production when controlling it**
- **Used as food by both man and livestock**

22. Give an account of economic importance of weeds
- **Complete for nutrients/ light/ space**
- **Act as alternate host of insect pests**
- **Some produce poisonous substances**
- **Blocks water channels/pipe**
- **Lowers the quality of pasture**
- **Poisonous to man and livestock**
- **Parasites of desired crops**
- **Aquatic weeds affect navigation and water animals**
- **Increase the cost of production**
- **Cause irritation to workers/livestock**
- **Some have medicinal value**
- **Eaten by man and livestock**
- **Acts as soil cover**
- **Add organic matter in the soil**
- **Some are legumes hence fixes nitrogen in the soil**

23. State **four** advantages of weeds in Agricultural production
- **Some are food for browsers e.g. pig weed**
- **Covers the soil against erosive forces**
- **Die and rot, this, increases organic matter in the soil**
- **Leguminous weeds fix Nitrogen back in to the soil adding to its fertility**

24. Describe the harmful effects of weeds in crop production.
- **Compete with crops for nutrients, space/light and soil moisture and hence reduce crop yields**
- **Some are parasitic to cultivated crops e.g. *striga spp* is parasitic to maize crop**
- **Some lower the quality of agriculture produce; i.e. Weed seeds may mix with produce reducing quality**
- **Some give unfavourable flavour to milk if dairy cows feed on them e.g. Mexican marigold**
- **Some get attached to sheep wool lowering their quality , e.g. Devils horsewhip, black jack , forget – me- not and bristly fox-tail**
- **Some are poisonous to man and livestock e.g. Sodom apple thorn apple, subukia weed , mallow, Abulitun flower**
- **Some act as alternate hosts for insect pest and diseases e.g. wild oats is an alternate host for rusts**
- **Some weeds are allelopathic, Produce poisonous substances that may suppress the growth or germination of cultivated plants to which they become into contact.**
- **Some weeds block irrigation channels making it difficult for water to flow freely in the irrigated land.**
- **Aquatic weeds affect fishing since they block navigation and deprive fish and other water animals of oxygen dissolved in water e.g. water hyacinth in lake Victoria and Salvinia in lake Nakuru**
- **Weeds lower the quality of pasture e.g. Tick berry**
- **Irritate farm workers reducing their efficiency e.g. Double thorn, stinging nettle and Devils horse whip**
- **Increase cost of production.**
- **Hinders farm operations like harvesting.**

25. Listing specific examples of weeds, describe their harmful effects in agricultural production
- **Compete with crops for nutrients spacing ,light, moisture lowering yield e.g. MacDonald's eye etc**
- **Some are parasitic e.g. witch weed**
- **Low quality of produce e.g. Mexican marigold lowering quality of milk/pigweed seeds in finger millet**
- **Poisonous to both man and livestock e.g. thorn apple , Bracken fern**
- **Alternate hosts for pests and diseases e.g. mallow weed –for cotton strainer**
- **Some are allelopathic/hinder germination e.g. Mexican marigold**
- **Block irrigation channel e.g. *Salvinia spp* and water hyacinth**
- **Affect fishing and navigation-*Salvinia spp* and water hyacinth**
- **Lower quality of pasture e.g. manyatta grass**
- **Reduce workers efficiency/irritate e.g. double thorn, stinging nettle, devil's horse whip**

26. a) State **FOUR** harmful effects of weeds in **pasture** production and livestock nutrition
- **Outcompete pasture crop formoisture nutrients and sunlight**
- **Poisons livestock e.g. *Datura stramonium***
- **Lowers palatability of pasture e.g. Devils horsewhip**
- **Reduces quality of livestock product e.g. *Mexican marigold***
- **Suppress pasture re-growth after defoliation/Reduce quantity and quality of herbage**
- **Reduce life span of pastures**

(b) Weeds lower the quality of farm produce. Give **two** examples to support this.
- **Mexican marigold gives undesirable flavour to milk.**
- **Devils horsewhip/Forget me not/black -lower quality of wool.**
- **Wild oats lower quality of wheat grains.**

(c) Enumerate **two** effects of water hyacinth in agriculture
- **Clogging of water masses which impedes navigation**
- **Distracts movement of fishing boats**
- **Interferes with aquatic life by reducing numbers of some aquatic animals**
- **Expensive to control**
- **Affects recreation sports e.g. yachting and sailing**

27. State **four** reasons for weed control in crop production.
- **To avoid contamination of crop with weed seeds**
- **Reduce competition for light/water/nutrients between weeds and crops**
- **Minimize the spread of crop pests/diseases for which weeds act as alternate hosts.**
- **Reduce multiplication and spread of weed seeds in the field**
- **Prevent allelopathic effects of weeds**

- **Prevent injury to the farmer and livestock**

28. Explain the various methods used to control weeds in the farm.

(i) Chemical methods- involve use of herbicides which work in variety of ways, i.e.
- **Inhabiting Nitrogen metabolism**
- **Killing the cell- e.g. Diquat and oils**
- **Causing abnormal tissue development- 2, 4-D, M.C.P.A**
- **Inhibiting photosynthesis eg – Atrazine, simazines, Duron, Uracils etc**
- **Inhibiting respiration- e.g. Dinozebs**

ii) Mechanical weed control
- **Tillage (cultivation)**
- **Slashing (mowing)**
- **Uprooting**

iii) Cultural methods of weed control
- **Mulching- Clean seed bed**
- **Crop rotation- Cover cropping**
- **Timely planting- Flooding**
- **Use of clean seed/ planting materials**

iv) Biological weed control- use of living organisms to control weeds

v) Legislative weed control- Involves governmental laws and acts which prevent the introduction of noxious weeds in a country or the spreading of foreign weeds from one part of the country to another

29. **State two** ways of controlling weeds in a field of Kikuyu grass.
- **Slashing**
- **Uprooting**
- **Use selective herbicides/suitable/appropriate herbicide.**

30. State **two** disadvantages of using herbicides
- **Requires skilled labour**
- **Have long residual effect which interferes with future crops**
- **It is not environmental friendly/ pollutes the environment**

31. Distinguish between **contact** and **systemic** herbicides in weed control.

- Contact herbicides kill exposed parts it comes in contact directly while systemic herbicides are taken in by plants through foliage or roots and Tran located /carried to all parts of plant killing whole plant (MAW)

32. a) Name **four** herbicides that can be used to control weeds in a field of maize
- **MCPA**
- **2 - 4 – D**
- **Bentazon**
- **Bromoxynil**
- **Linuron**
- **Loxyyril**
- **Atrazine**
- **Metrubuzin**

b) At what stage of growth of maize should the weeds be controlled by use of a post emergence herbicides?
- **10 – 15cm high**
- **2 – 4 weeks after emergence**

33. What is herbicide selectivity?
- **Certain herbicides kill one/certain kinds of plants but have very little effects on other plants i.e. the desired plants.**

34. State **four** factors that affect the effectiveness and selectivity of herbicides.
- **Concentration of herbicide**
- **Stage of growth of weeds**
- **Plant anatomy and morphology**
- **Mode of action/Herbicides characteristics**
- **Environmental factors**
- **Stage of plants growth**
- **Psychological /metabolic factors**
- **Method of application.**
- **Persistence of the chemical**

35. State **five** safety measures that a farmer must consider in order to prevent danger to other people and environment when using herbicides.

- **Avoid herbicide drift to unintended crops avoid spraying on windy day**
- **Avoid contaminating animal feeds and water with chemicals**
- **Avoid spilling herbicides on pasture or fodder**
- **Empty containers must be properly disposed**
- **Spraying equipment must no be washed at water sources.**
- **Chemicals must be stored in safe places out of reach of children**
- **Equipment used in spraying herbicides must be thoroughly washed.**

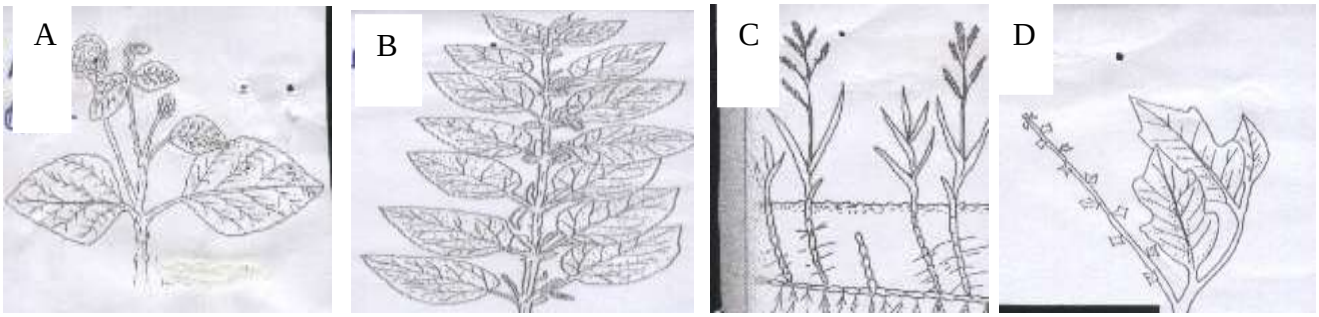
36. Describe **eight** safety precautions that should be taken when using herbicides to control weeds.

- **Read manufacture's instructions and follow them.**
- **Wearing protective clothing.**
- **Avoid inhaling the herbicide.**
- **User to bath thoroughly after handling chemicals.**
- **Do not blow or suck blocked nozzles.**
- **Do not spray the chemical during wind conditions.**
- **Do not spray unintended places – pastures and fodder crops.**
- **Destroy left over containers.**
- **Mixing of the herbicide be done away from water sources for man and animals use.**
- **Store in herbicides in safe places out of the reach of children.**
- **Equipment used in spraying herbicide be washed thoroughly before next use.**

37. State **two** reasons why chemical weed control is uncommon in small scale farms.

- **Buying chemicals is very expensive.**
- **The mixing and application requires technical skills.**
- **The application's are expensive to buy and maintain**
- **Lands are small and manual labour is more appropriate and cheap**

38. The following diagrams show weeds with different leaf morphological characteristics



(a) Arrange plants A, B and C in order of herbicide susceptible

- **B – Most susceptible**
- **A - Average**
- **C – Least susceptible**

(b) Give a reason for your answers in (a) in reference to **A** and **B** above

- **B –Most susceptible because leaves are horizontal and are able to retain herbicides**
- **C- Least susceptible because leaves are vertically inclined and cannot retain herbicides**

(c) Identify weed D

- **Weed D - Double thorn (*Oxygonum sinuatum*)**

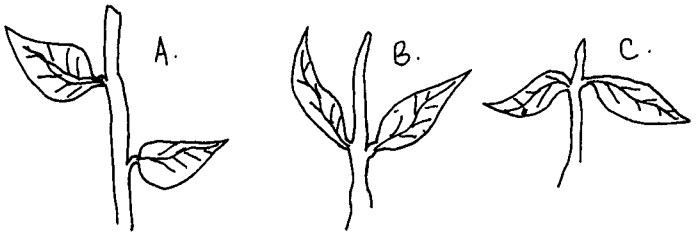
(d) Name **two** herbicides that can be used to control the weed in a field of maize

- **MCPA**
- **2,4-D**

(e) At what stage of growth of maize should the weed be controlled using a post emergence herbicide?

- **At what stage of growth of maize should the weed controlled using a pest?**
- **10 to 15 high**
- **2 to 4 weeks after emergence**

39. The drawings below show leaves of a certain weed with different morphological characteristics.



(a) Which of the leaves represents a weed that is more susceptible to herbicides?
- **leaves of weed B**

(b) Give a reason for your answer in (a) above.
- **Weed B has the leaves at an acute angle to the stem/branch thus providing room for herbicide to accumulate and thus cause damage**

(c) State any other **two** morphological / or anatomical characteristics that affect selectivity and effectiveness of herbicides.
- **Stage of growth of plant**
- **Age of plant**

40. Describe any **five** cultural methods of controlling weeds.
- mulching-**Covers the ground smothering weeds especially inorganic mulch**
- Cover cropping**- form a canopy over the base smothering the weeds**
- Crop rotation-**some weed only grow well when in association with certain crops e.g. Striga grow only where some cereal crops and sugar cane are growing .when these crops are rotated with dicotyledonous crops, striga does not germinate**
- Timely planting**- If planted on time, the crops will establish faster before weeds germinate thus smothering them**
- use of clean seed**/planting material-prevents the introduction of weeds to the form land**
- Proper spacing**-helps to create little space for weed growth**
- Clean seedbed**-this starts off the crops on a clean bed so that they effectively compete with weeds**
- flooding**-mainly practiced in rice fields .The growth of non-aquatic weeds is completely discouraged in flooded fields**

41. List **four** cultural methods of weed control in a maize field.
- **Early/timely planting**
- **proper spacing**
- **use of certified seeds**
- **mulching**
- **Apply manure/fertilizer.**

42. State **two** Biological methods of weed control.
- **Moths used to control cactus**
- **Use weed eating fish for aquatic weeds**
- **Use livestock e.g. goats, to feed on weeds and control their growth**

43. Outline **two** limitations of legislative weed control method
- **Only sample specimen are checked while the bulk which might contain the weeds may escape official censorship**
- **Laxity in law enforcement may lead to prohibited plant material gaining access into the country**

44. Give **four** factors which contribute to the competitive ability of weeds.
- **Ability to produce large quantities of seeds.**
- **Weed seeds remain viable in soil for long period of time awaiting germination conditions.**
- **Most weeds seeds are easily and successfully dispersed i.e. some like black jack stick on animals and are easily disposed/some seeds are light therefore easily dispersed by winds.**
- **Some are vegetatively propagated i.e. by use of bulbs, rhizomes.**
- **Elaborate root system to support and for nutrient up take.**
- **Shoot life cycles – complete their life cycle within a short period**
- **Some easily regenerate when cut or underground/ vegetative structure difficult to remove.**
- **Ability to survive on poor soils.**
- **Short life cycle where rain season is short.**

45. **State three** excellent adaptations of weeds to the environment
- **Short life cycle**
- **Survive where the nutrients supply is limited**
- **Elaborates/extensive root system**

46. **At what** stage of growth of garden pea should mechanical weed control be avoided?
- **Flowering stage**

CROP PESTS AND DISEASES

A) CROP PESTS

1. What is a crop pest?
- **An organism which destroys crops directly or indirectly**

2. Give **three** harmful effects of pests in crop production.
- **Destroy crops in the fields/stores.**
- **Lower yields of crop**
- **Lower quality of produce.**
- **Some act as vectors to crop diseases.**
- **Their control using chemicals pollutes the environment.**
- **Increase production costs through their control.**
- **Some may cause irritation to workers.**

3. By use of examples state **four** harmful effects of crop pests
- **Some e.g. nematodes damage crop roots causing wilting and death of the plant**
- **Some like squirrels unearth planted seeds leading to low plant population**
- **Some destroy crop leaves lowering photosynthetic area-result to reduced yield e.g. locust**
- **Sucking pest deprive plants of food by sucking plants sap e.g. aphids**
- **Some pests attack fruits , berries and flowers lowering their quality and quantity e.g. mouse birds**
- **Some pests destroy embryo of seeds lowering their germination potential e.g. weevils**
- **Some transmit crop diseases e.g. leaf hoppers**
- **Some e.g. stalk borer eat the growing points causing retarded growth**
- **They lower marketability of crop produce by lowering quality**
- **Where the leaf is the major product pest damage lower the quality and quantity through defoliation e.g. moth**

4. State **four** harmful effects of crop pests in maize production.
- **Unearth sown seeds reducing germination percentage**
- **Damage roots e.g. Nematodes, Moles**
- **Destroy embryo of seeds**
- **Vector of various diseases e.g. viral diseases**
- **Destroy apical buds e.g. stalk borer**
- **Reduce market value of produce**

5. State **four** types of crop field pests that commonly affect crops.
- **Insects**
- **Nematodes**
- **Rodents**
- **Birds**
- **Mites**
- **Domestic Animals**

6. **a) Name two** classes of crop pests based on their feeding habits
- **Biting and chewing pests**
- **Piercing and sucking pests**

b) **State two** effects of weaver birds in maize crop while in the field
- **Damage the grains at milky / tough stage**
- **Open up the Ears**
- **Destroy the sills**

7. Name insect pests with biting and chewing mouth parts.
- **Locusts**
- **Grasshoppers**
- **Crickets**
- **Maize stalk borer**
- **Army worms**
- **Cut worms**
- **Boll worms**

- **Termites.**

8. Name **three** examples of insects with piercing and sucking mouth parts.
- **Aphids**
- **Cotton stainers**
- **Cotton leaf hoppers**
- **Thrips**
- **Mealy bug**

9. Name **three** birds which cause damage to grains.
- **Common weaver bird**
- **Domestic fowl**
- **Sudan dioch (*Quelea quelea ethiopica*)**

10. List **six** factors considered when classifying crop pests.
- **Where the pest is found i.e. field/storage**
- **Feeding habits/types of damages**
- **Scientific/biological classification**
- **Stage of development of pest at which it causes damage**
- **Stage of growth of the crop**
- **Part of crop attacked**
- **Crop attacked.**
- **Habitat of the pest.**

11. Mention factors that should be considered before embarking on the control of pests.
- **Biology of the pest**
- **Population of the pest**
- **Nature and consequence of damage caused**
- **Effect of weather and season on the pest**
- **Presence or absence of the pest predators or natural enemies**

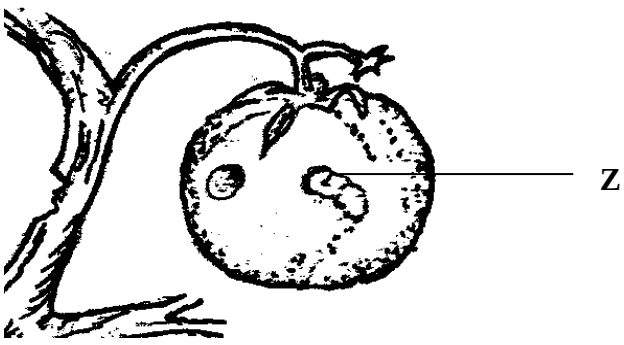
12. Mention **two** pests which attack tomatoes
- **American boll worm**
- **Cut worm**
- **Red spider mite**
- **Nematodes**

13. Name the chemicals used in control of the following crop pests.
(a) Insects **– Insecticides**
(b) Nematodes **– Nematicides**
(c) Mites **– Acaricides / Miticides.**

14. State **two** methods of controlling the following pests

Pest	control	
Sorghum shoot fly	-	**Early planting**
	-	**Close season**
	-	**Application of insecticides**
Stem borer	-	**Application of insecticides**
	-	**Proper disposal of crop remains after harvesting**
Aphids		**Application of insecticides**

15. Study the illustration below of a tomato fruit and answer the questions that follow



a) Name the pest labelled **Z**

- **American bollworm (*Heliothus armigera)***

b) i) State **two** characteristic symptoms of attack by the pest named in (a) above

- **Bores round holes on fruit walls**
- **Presence of refuse from feeding of the worm on the fruit surface.**

(**ii)** State the damage caused by the pest on the fruit.

- **Bore hole into the tomato fruit.**

(iii) Name **one** alternate host of the pest in the diagram.

- **Cotton, stems of maize, beans, sorghum and citrus fruits.**

c) State **two** control measures for the pest in **a**, above.

- **Crop rotation.**
- **Use of tolerant varieties.**
- **Spraying with suitable pesticides.**
- **Practicing field hygiene.**
- **Early planting.**

d) State **two** cultural control measures of the pest named in (**a**) above

- **Crop rotation**
- **Plant resistant varieties**
- **Close season**

e) Apart from pest **Z** identified above name two insect pests of tomatoes

- **Tomato aphids**
- **Tobacco white fly**
- **Leaf hoppers / miners**

16. State t**wo** ways in which pesticides kill crop pests

- **Some pesticides cause suffocation of pests by blocking respiratory surfaces**
- **Some pesticides are stomach poisons that kill pests by damaging the cells/ tissues**
- **Some pesticides damage the pest nervous system**
- **Some pesticides kill pests by destroying digestive system**

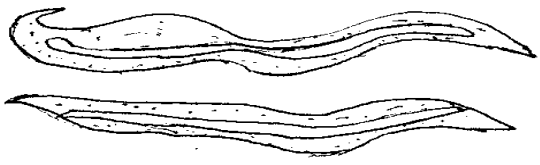
17. Give **two** symptoms of nematode attack on bananas.

- **Cause swellings called galls on the roots.**
- **Leads to blockage of the vascular vessels which transport materials within plants leading to wilting and stunting growth of the crops**

18. Give two signs of crop infestation by root knot nematodes.

- **Abnormal growth /formation of sacs /galls**
- **Retarded growth**
- **Wilting of plant**

19. Study the diagram bellow and answer the questions that follow.



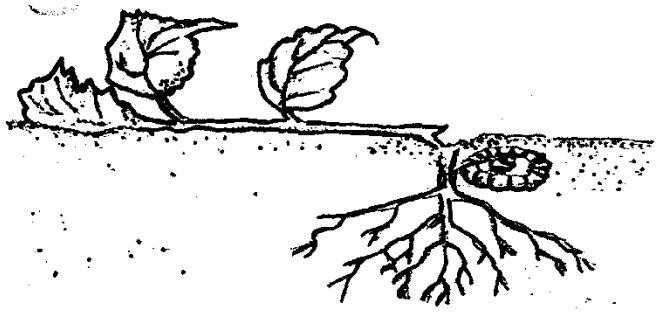
a) **Identify** the crop pest above

- **Nematode.**

(b)**State two** damages caused by the above pest on crops.
- **Inject toxic substances into plant tissue.**
- **They feed on plant roots causing root stunting.**
- **Cause wounds leading to secondary infections.**
- **Block xylem vessels causing wilting**

(c) **Give two** classifications of pesticides based on target pest.
- **Fungicides**
- **Rodenticides**
- **Insecticides**
- **Nematicides**
- **Molluscide**

20. Study the diagram below and answer the questions that follow.



A

(a) **Identify** the pest A.
- **Cut worm**

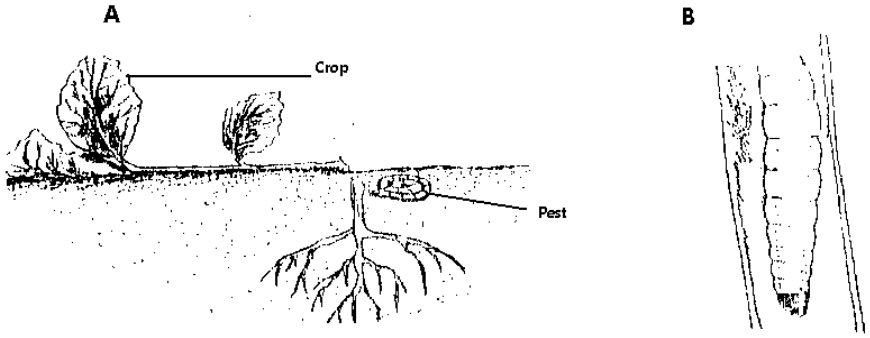
(b) At what stage of development is this pest destructive to crop.
- **Larval stage**

c) What damages does the pest cause to the crop?
- **Cuts the stem causing lodging**
- **Reduce plant population**

d) **State one** symptom of attack of this pest.
- **The stem of the seedling is cut at the ground level**

e) **Give two** methods that can be used to control the above pest.
- **Sprinkling an appropriate insecticide powder at the base of each seedling during planting.**
- **Spray insecticides on the plant around the roots at ground level.**
- **Where seedling has been cut dig out the cutworm and kill it physically.**
- **Early planting of the crop**
- **Apply chemical poison in the hole together with fertilizer during transplanting.**

21. The diagrams below **A** and **B** illustrates some field pests study them carefully and answer the questions that follow.



(a) **Identify** pests **A** and **B**.

A- Cutworm

B- Maize stalk borer.

(b) **State two** damages caused by pest **B** to a crop of maize.
- **Burrow tunnels in the stems and growing tips destroying transport system.**
- **Eats leaves and reduce photosynthetic surfaces.**
- **Bores holes on maize cobs reducing the yields.**

(c) **Give two** cultural practices carried out to control the pest in **A**.
- **Timely planting**
- **Crop rotation**
- **Close season**
- **Trap cropping**
- **Field hygiene.**

22. State **four** factors determining the efficiency of pesticides
- **Concentration of pesticides**
- **Methods of application**
- **Stages of development of pests**
- **Weather condition at the time of application**
- **Persistence of pesticides**
- **Resistance of pests**
- **Timing of application**

23. The diagram below labeled A and B illustrate field pests. Study the diagrams carefully and answer the questions that follow.

a) Identify the field pests illustrated in the diagrams **A** and **B**.
A- Cutworm **B-Rat/Mouse**

b) Classify the pests **A** and **B**
A-Insect with biting and chewing mouthpart
B-Rodent
c) State **one** control measure of pest **B**
- **Trapping**
- **Biological -use of predators (cats)**
- **Use of pesticides (Rodenticides)**
- **Destruction of crop residues/breeding places**

24. The diagrams labeled **A, B** and **C** below illustrates some vegetable pests. Study the diagrams carefully and then answer the questions that follow.

A **B** **C**

(a) Identify each of the pests illustrated in the diagrams **A, B** and **C**.

A - Cutworm

B- Mite.

C- Aphid

(b) State the damage caused by each of the pests labeled **A** and **B** on the host plants.

A

- **Cuts the stem causing lodging**
- **Reduce plant population**

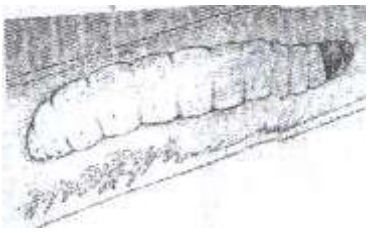
B

- **Puncture epidermis, suck plant leading to wilting**

(c) Give **one** cultural control measure for the pest labeled **C**.

- **Crop rotation.**
- **Mulching.**
- **Spraying with insecticides**

25. Study the diagram below and answer the questions that follow



a) Identify the pest in the diagram above

- **Stalk borer / maize borer / *Buseola fusca***

b) Classify the pest on the basis of its mouthparts

- **Biting and chewing mouth parts**

c) Give **two** damages caused by the pest identified in (a) above in maize

- **Boring the leaves causing windowing.**
- **Bores the cobs and stems**
- **Lower quality of maize grains**

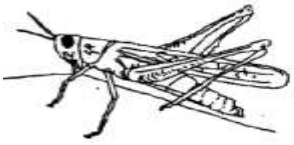
d) Give **two** control measures for the above pest

- **Destruction/ burning of the previous seasons crops residue**
- **Close season observation**
- **Practicing crop rotation**
- **Use of appropriate insecticides /dust down the funnel of each plant e.g. Endosulphan or Diazinon granules**
- **Rogueing**
- **Timely planting / early planting**
- **Intercropping / planting maize with crop that deter the pest e.g. onions , nappier grass etc**
- **Practice close spacing of at least two seasons**
- **Field hygiene**

26. State **three** method of controlling maize stalk-borers

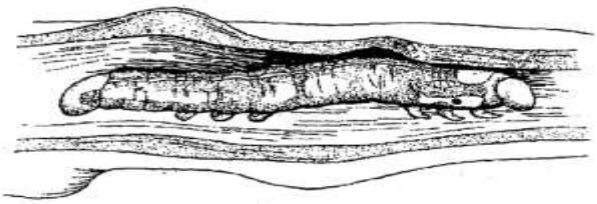
- **Destruction/ burning of the previous seasons crops residue**
- **Close season observation**
- **Practicing crop rotation**
- **Use of appropriate insecticides /dust down the funnel of each plant e.g. Endosulphan or Diazinon granules**
- **Rogueing**
- **Timely planting / early planting**
- **Intercropping / planting maize with crop that deter the pest e.g. onions , nappier grass etc**
- **Practice close spacing of at least two seasons**
- **Field hygiene**

27. Study the illustration given below representing pests of cultivated crops and answer the following questions.



A

B



C

a) Identify the pests represented in **A, B** and **C**

A-Locust/grasshopper
B- Cotton boll weevil
C- Maize stalk borer

b) (i) State the damage done by the pests represented in the illustrations.

- **Destruction of the vegetative material of the crop reducing the photosynthetic areas**

(ii) Give the reason for your answer in **b** (I) above

- **All have chewing mouth parts**

c) Which is the most devastating pests of the three indicated above.

- **A (locust/grasshopper) because they come in swam**

28. **Give two** methods of controlling pests in an established field of sorghum.

- **Timely harvestings**
- **Trap crop**
- **field hygiene/Sanitation**
- **Destruction of alternate host/weeding**

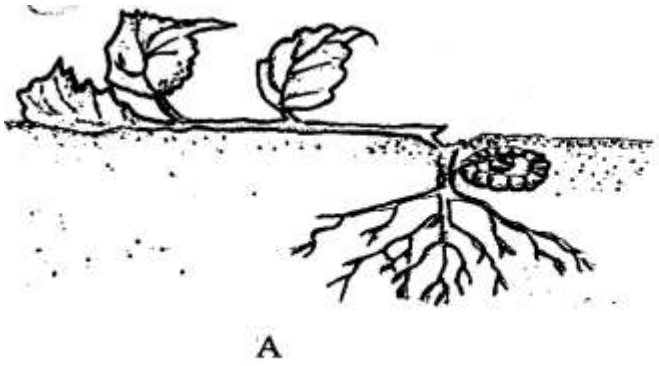
29. **State two** control measures of sorghum shoot fly.

- **Early planting**
- **Close season**
- **Apply appropriate insecticides**

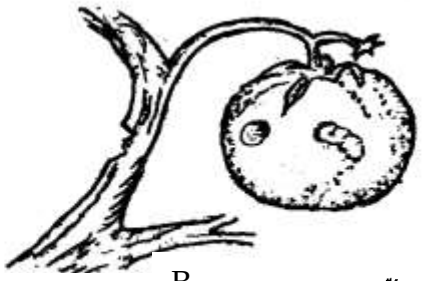
30. Give **two** methods used in controlling birds in a field planted with sorghum.

- **Planting resistant variety/Goose necked/bitter varieties**
- **Physical scaring/use of scarecrows/throwing earth**
- **Tying of glittering ribbons across the field to scare away birds**

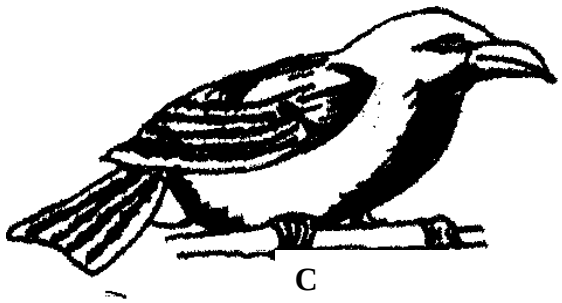
31. Study the illustrations given below and then answer the questions that follow:-



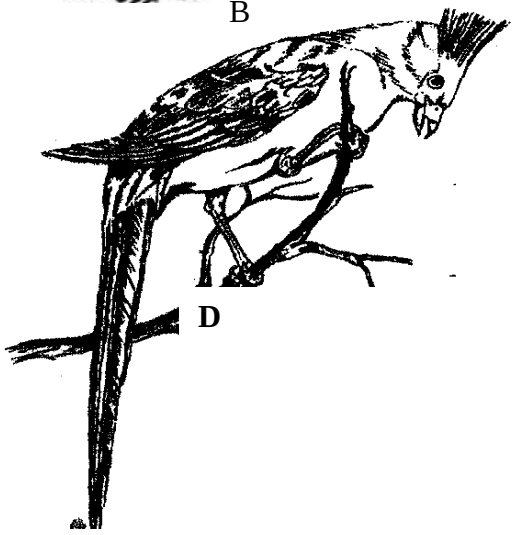
A



B



C



D

(a) Identify the pests shown by the illustrations **B, C** and **D**

B - American bollworm

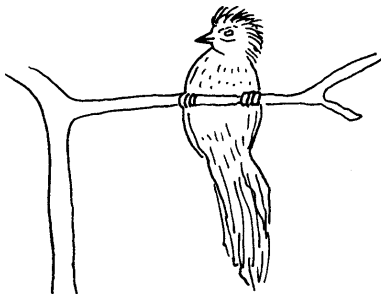
C - Weaver bird
D – Mouse bird

b) State **one** effective method of controlling the pest labelled **A**
- **Flooding with water**
- **Fumigation of the soil with Furadan**
- **Physical killing**

(c) Name the type of crop commonly attacked by the pest labelled **C**
- **Cereals e.g. maize grains ,sorghum ,millet**

32. Name **two** bird pests that a farmer should control in a field of Bulrush millet plantation.
- **Sudan Dioch (Quelea Quelea Ethiopica)**
- **The common weaver bird**
- **Domestic fowl**

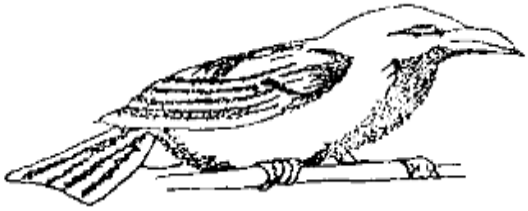
33. The diagram below shows a crop pest;



(a) Identify the crop pest
- **Mouse bird**

(b) State **two** damages the above pest would cause to crops
- **Defoliation of leafy vegetables e.g. kales**
- **Destroys fruits e.g. tomatoes**

34. Below is a diagram of a bird labeled A.



(i) Identify the pest
- **Weaver bird**

(ii) State **two** ways by which the bird causes loss in crops.
- **By eating the grains /Cause grains to fall down**
- **Opening the cob to water leads to rotting of the grains**
- **Defoliates plants**

(iii) State **four** methods, which are used to control the pests.
- **Use of scare crows /Scaring**
- **Poisoning**
- **Trapping and Physical killing**
- **Use of explosives/ Bombing**
- **Use of resistant varieties**
- **Destroying nests**

35. Study the illustration given and use it to answer the question that follow

i) Identity the storage pest illustrated
- **Rat / *Rattus norvegicus***

ii) Explain **two** types of damage they cause on produce.
- **Consume whole grain / crack grains**
- **Contaminate grains with their faeces / urine / presence of hair in the produce;**
- **Gnaw holes in the storage containers**

iii) **Name** the structural feature placed on the granary to prevent that pest
- **Rats guard / metal deflector**

iv) Other than the feature named in (iii) above, **state two** other control measures of that storage pest
- **Use of chemical / chemical baits**
- **Use of rat traps**
- **Use of cat / biological method**

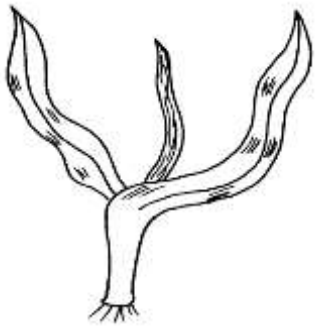
36. Use the diagrams below to answer the question that follow.

(a) Identify the crop pests labeled **M**, **N** and **P**
M – Hedgehog N- Squirrel P – Mole

(b) State **one** control measures of crop pests labeled **M**
- **Use dogs**
- **Use of poisoned baits**
- **Physically trapping**

(c) State the damage caused to crops by crop pest labeled **N**
- **Eat germinating maize/bean seedling**
- **Dig out and eat root crops e.g. cassava**

37. Below is a diagram of sorghum seedling that has been attacked by a certain pest.



(a) (i) Identify the pest.

- **Sorghum shoot fly**

(ii) State the damage that has been caused by the pest named in (a) (i) above.

- **Death of the shoot**

(b) Give **two** control measures that can be used to control the pest.

- **Early planting**
- **Close season.**
- **Application of insecticides**

38. Study the crop pest illustrated below.

(a) Identify the crop pest.

- **Maize weevil**

(b) State **two** effects of the above pest.

- **Makes tunnels beneath the seed coat**
- **Make circular holes on the surface of the grain**

(c) State **three** methods of controlling the pests.

- **Dusting maize cob with malathion**
- **Fumigate maize with methyl bromide**
- **Proper storage hygiene**
- **Ensure grains are stored at correct moisture content**

39. The list below shows some of the common bean pests. Use them to answer the questions that follow.

A – American boll worm (field pest)
B – Bean weevil (storage pest)
C – Bean bruchid (storage pest)
D – Bean aphid (field pest)

(a) Name the part and stage of the crops growth when the pests labelled A, B, C and D attack.

A – Attacks leaves at early stage of growth
- Fruits at fruiting stage
B – Attacks dry seeds in the field or storage
C – Attacks dry seeds in the field or storage
D – Attacks green leaves and pods in the field

(c) Give **two** methods of controlling B and C.

- **Drying the seeds properly before storage.**
- **Cleaning or winnowing seeds before storage.**
- **Cleaning and dusting the storage.**
- **Dusting the bean seeds with appropriate chemicals before storage.**

40. **a) State** any **four** non – chemical methods of controlling storage pests in a maize crop.

- **Make crib vermin proof.**
- **Clean store.**
- **Clear bushes around the store.**
- **Timely harvesting.**
- **Drying maize.**

- **Use cats to kill rats / use rat traps.**

b) Give any two factors that should be considered before deciding to use a chemical method of pest control in a grain store.
- **Cost of pesticide**
- **When the other methods are inadequate.**
- **Safety of pesticide to the user.**

41. State **two** effects of aphids on plants.
- **Sucking sap**
- **Spreading / transmitting viral disease**

42. State **four** disadvantages of using pesticides in control of pests in farms.
- **Pesticides are expensive.**
- **Pollute the environment/kill other useful organism.**
- **Some pests develop resistance to some pesticide.**
- **Some are toxic to man and livestock**
- **Require skill to apply.**

43. Give **two** advantages of biological method of controlling pests over chemical control.
- **Products have high demand**
- **Method is cheap in the long run.**
- **Sustainable**
- **Friendly to the environment**
- **Products are safe**

44. State two proper storage practices used in pest control.
- **Ensures grains are dried to the required Moisture content before storage;**
- **Proper crop handling and treatment before storage;**
- **Ensure the cleanliness of storage room;**

45. Give **five** cultural methods of pest control in stored grains
- **Use of clean planting materials.**
- **Timely planting.**
- **Proper seed bed preparation.**
- **Use of resistant crop varieties.**
- **Proper weed control/ destruction of alternate host.**
- **Observing field hygiene.**
- **Mulching.**
- **Use of close season**

46. Define the term 'economic injury level of a pest
- **A point at which damage caused by the pest is beyond the tolerance level of the crop and hence control measures must be taken**

47. What is integrated pest management
- **Combination of pest control methods which have least hazards to the user and to the environment.**

48. Differentiate the following terms as used in crop production.
(i) Economic injury level -**when pest population causes damage beyond tolerance**
(ii) Integrated pest management- **a combination of both chemical and cultural pest control methods.**

49. List **ten** cultural methods of pest control
- **Timely planting**
- **Early planting**
- **Timely harvesting**
- **Early harvesting**
- **Proper tillage**
- **Crop rotation**
- **Planting resistant varieties**
- **Field hygiene**
- **Alteration of environmental conditions**
- **Crop nutrition**
- **Destroying alternative host**
- **Use of clean planting material**

- **Proper spacing**
- **Use of organic manure**
- **Irrigation.**
- **Close season- period when that crop is not grown anywhere**

50. Describe the control of pests in coffee giving the examples of pests controlled.
- **Apply recommended pesticide to control various pests e.g. berry borer, antestia bugs**
- **Prune to open up the crop to reduce the heavy shade which may create a favourable microclimate for the pests e.g. antestia bugs**
- **Practice field hygiene/ remove any material that habour pests e.g. mealy bugs; leaf miners**
- **Use of predators/Biological agents; to control pests e.g. leaf miner;**
- **Regular picking; to control berry borer;**
- **Painting around the trunk to create a band which prevents climbing pests e.g. mealy bugs, scales;**
- **Mulching ; to prevent severe moisture stress to control thrips ;**

51. Explain the different physical methods used in crop pest control.
- **Use of lethal temperature-too hot or too cold conditions kill insects pests e.g. pink boll worm**
- **Proper drying of produce-drying grains makes them too hard for pests to penetrate and discourage built up of moulds**
- **Flooding – Drown underground pests e.g. moles and cuts worms.**
- **Physical destruction of pests by hand picking or trapping then killing e.g. giant loppers, moles, rats e.t.c**
- **Use of scare crows – For scaring large animals e.g. monkeys and birds from crop fields.**
- **Use of physical barriers – Barriers e.g. trenches, fences, rat guards prevent pests from getting into crop fields or stores.**
- **Moths are attracted by ultra-violet and aphids by yellow light then are destroyed**
- **Suffocation- Pumping carbon IV oxide into hermetic Cyprus bins deprives pests off oxygen.**
- **Use of electro- magnetic radiation. Radioactive radiations deactivate enzymes in some insects while others may be attracted then killed.**

52. Describe the cultural methods used in controlling crop pests.
- **Timely planting – early planted crops escape pest e.g. maize escape stalk borer attack than late planted ones.**
- **Timely harvesting – enables crop to escape attack by some storage pests e.g. maize to escape grain weevils.**
- **Proper tillage – exposes soil borne pests e.g. white grubs to predators e.g. birds/scorching effect of the sun.**
- **close season – a period when a susceptible crop is not grown in order to control a certain pest or group of pests e.g. to control pink worms in cotton**
- **Trap cropping – a crop planted before or together with the main crop for attracting pests before they attack. The pest is then killed by other means e.g. spraying etc. (e.g. sorghum round the maize plantation)**
- **Crop rotation – crops preferred by pests are rotated with crops not preferred, e.g. groundnuts and potatoes rotated with maize and beans this starves the pests to death.**
- **Planting resistant crop varieties – they have natural protective mechanisms against pest attack e.g. goose neck sorghum against birds ,tillering sorghum against shoot fly**
- **Field hygiene – keeping the field free from any plant materials harbouring pests e.g. by Rogueing ,removal of crop residues**
- **Alteration of environmental condition – creating micro-climates that are not conducive to some pests. e.g. open pruning, mulching for traps**
- **Crop nutrition – application of fertilizers and manures makes crops to grow strong and able to resist and escape pest attack**
- **Destruction of alternative host especially weeds that act as alternate hosts for pests e.g. Removal of mallow weeds help control cotton strainers.**
- **Use of clean planting materials – prevents introduction and spreading of crop pests e.g.in control of weevils use clean suckers**
- **Proper spacing – makes it difficult for pests to move from one plant to another e.g. close spacing in ground nuts controls aphids**
- **Use of organic manure – discourages eelworms.**
- **Irrigation – overhead irrigation to control aphids.**

53. List **four** cultural practices used in controlling crop pests
- **Timely planting**
- **Proper tillage**
- **Close season**
- **Trap cropping**
- **Timely harvesting**
- **Crop rotation**
- **Planting resistant varieties**
- **Field hygiene**

B) <u>CROP DISEASES</u>

1. Give **two** economic importance of crop diseases to a farmer
- **Lower quality of produce hence lower market prices**
- **Lower quantity of produce/lower yield**
- **Increases cost of production when controlling them**

2. Giving **one** example in each case, identify the various classes of crop diseases

- **Bacterial diseases e.g. Halo blight, Fusarium wilt, bacterial blight of coffee, black arm of cotton, black rot of cabbages**
- **Fungal diseases – e.g. Smuts (maize smuts) ,blasts e.g. rice blasts ,rusts (wheat rust), coffee Berry disease, panama disease, Late blight**
- **Viral diseases e.g. Mosaic disease, Rosette disease, maize streak virus, Ratoon stunting, Greening diseases, cassava mosaic, brown streak of cassava, potato leaf roll, tobacco mosaic, groundnut rosette**
- **Nutritional disorders- Disorders as a result of lack of one or more of the necessary plant nutrients e.g. blossom end rot in tomatoes**

3. State **four** symptoms of fungal diseases in crops

- **Leaf chlorosis**
- **Blight**
- **Blast**
- **Necrotic lesions**

4. State **two** common symptoms of viral infection in crops.

- **Mosaic**
- **leaf chlorosis**
- **Mottling**
- **Leaf curling.**
- **Stunting/Rosetting/short internodes**
- **Malformation/distortion of parts**

5. State **four** common methods of controlling bacterial diseases.

- **Crop rotation**
- **Field hygiene**
- **Planting resistant varieties**
- **Planting healthy plants**
- **Fumigating the soil**

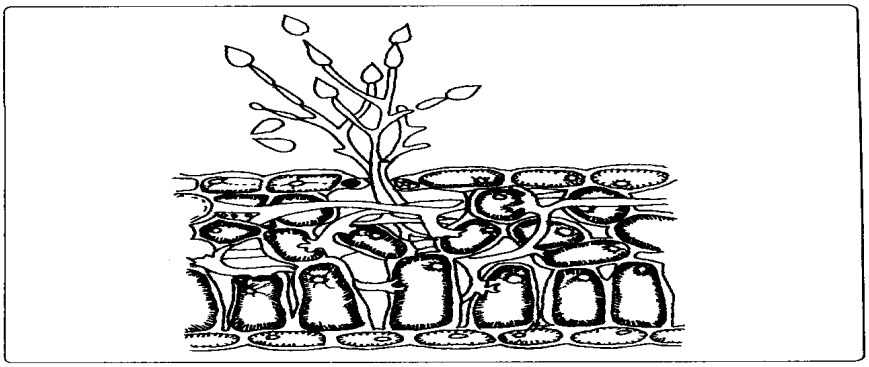
6. State **two** possible causes of swelling on the roots of legume crops

- **Infection by nematodes**
- **Nodulation/ nitrogen fixing bacteria**

7. What does the term 'close season' mean in crop production?

- **A period during which a particular crop is not supposed to be grown in a given areas so as to control disease build up in the soil**

8. The diagram below shows a fungal disease in a section of a potato leaf.



a) Identify the fungal disease indicated above.

- **Potato blight.**

(b) State the causal organism of the disease identified above.

- ***Phythophthora infestans.***

(c) Give **two** symptoms of the above disease.

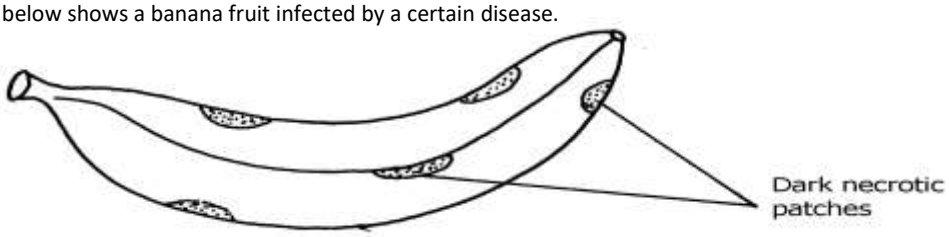
- **Dry patches – necrotic lesion on the leaves and fruits.**
- **White/grey mycelia outgrowth**

(d) State **one** control measure for the disease in the crop field.

- **Spraying with copper fungicides.**
- **Rogueing the affected crops**

- **Practice crop hygiene**

9. The diagram below shows a banana fruit infected by a certain disease.



(a) Identify the disease
- **Anthracnose of Bananas / Banana anthracnose**

(b) Suggest any **one** control measure for the disease you have named in **(a)**
- **Spray with (appropriate) fungicide**
- **Plant resistant varieties**

10. a)Name one banana disease
- **Leaf spot**
- **Panama disease**
- **Cigar end rot.**

b) State one method by which a farmer can control the diseases you have named in 10 (a) above.
- **Leaf spot –spray with mancozeb / fungicide.**
- **Panama disease –use disease free planting materials, Sterilize implements, Use resistant varieties, Destroy infected plants**
- **Cigar end rot - Remove dead floral remains of banana tips.**
- **Plant resistant varieties.**

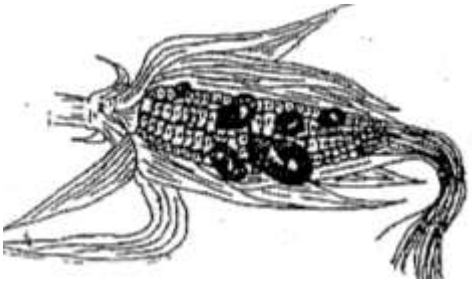
11. State **three** symptoms of coffee berry disease.
- **Flowers have dark brown blotch /streak on brown petals**
- **Green berry have small dark sunken patches/lesions**
- **Berry dry up and darken**

12. Which disease causes a mass of dark spores on flowering parts of maize?
- **Head smut**

13. State three cultural practices that a farmer may use to control maize streak disease in maize.
- **Use of resistant varieties**
- **Early planting.**
- **Rogueing**
- **Use of certified seeds**
- **Crop rotation**
- **Field hygiene**
- **Close season**

14. State **two** practices used to control maize streak in the field
- **Rogueing**
- **Use of certified seeds**
- **Early planting**
- **Control of vectors**

15. Below is an illustration of a maize cob attacked by smut disease. Study it carefully and answer the questions that follow:



a) Beside what is visible on the maize cob. State **two** other symptoms of the disease.

-Severe dwarfism
-Increased tillering

b) State **three** control measures of the above disease.
-Planting resistant varieties
-Use of certified seeds
-Field hygiene
-Crop rotation

16. Mrs. Wanjala noticed that her crops of maize had Interveinal chlorosis. What two possible causes of the conditions might she have suspected?
- **Maize streak virus disease.**
- **Deficiency of magnesium in soil.**

17. How does proper spacing reduce pests and diseases in crops?
- **Creates unfavorable micro- climate that is unsuitable for the pest survival or pathogen spread**

18. Study the diagram below and answer the questions that follow.

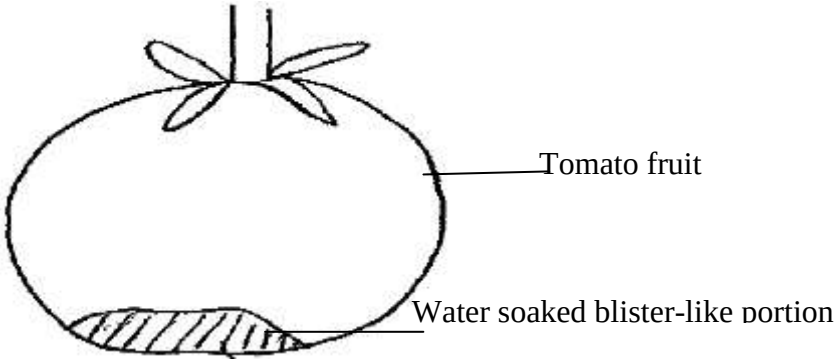
(a) **Identify** organism **M**.
- **Rhizopus /mycelium of Rhizopus**

(b) **Name** a disease in tomatoes that is caused by the organism in group **M**.
- **Early blight**
- **Late blight**

(c) **Identify** the disease condition illustrated by **N**.
- **Maize smut**

(d) **Give four** methods that can be used to control the disease named in **c** above.
- **Crop rotation**
- **Use of certified seeds**
- **Field hygiene /field sanitation**
- **Rogueing**

19. The diagram below shows a physiological disease in tomatoes. Use it to answer the questions that follow



a) Identify the disease illustrated above.
- **Blossoms end rot**

b) Give **three** causes of the condition shown above.
- **Excess nitrogen in the early stages of growth.**
- **Deficiency of calcium in young fruit.**
- **Irregular/Infrequent watering**

c) Suggest **two** control measures of the disease.
- **Addition of calcium containing fertilizers e.g. C.A.N**
- **Maintain regular watering**
- **Top dressing with proper amount of nitrogen**

d) Apart from the condition above, state **one** disease which affects tomatoes
- **Tomato blight disease**
- **Bacterial wilt**

20. State **two** cultural methods of controlling Downy mildew in cabbages.
- **Crop rotation**
- **Nursery hygiene**
- **Uprooting and burning infected plants / Rogueing**

21. Mr. Ogembo delayed to spray his crop of tomatoes against late blight. He realized the plants had been attacked by a disease and rushed to purchase a chemical which he sprayed but the disease kept spreading

a) Mention any **two** symptoms Mr. Ogembo may have noticed to conclude that the disease was late blight.
- **Dry brown lesions on stems , leave and fruits**
- **Rotten fruits**

b) Name any one chemical be may have purchased to control the disease
- **Dithane M45**
- **Ridomil**
- **Milraz**
- **Altracor**
- **Kocidelol**

c) What should be having done to control the disease before it struck?
- **Spray with appropriate fungicide weekly before the disease sets in**

22. a) What is the causal organism of anthracnose disease of beans?
- **A fungus known as-*Colletotrichum lindemuthianum*.**

b) **State three** control measures of the disease.
- **Spray weekly with fungicides during the wet season.**
- **Destroy infected crop residues**
- **Dress seeds well before planting**
- **Use clean seeds**
- **Grow resistant varieties e.g. Wairimu, K74 etc.**

23. Name any **two** diseases that affect bean production in the field.
- **Bacterial (Halo) blight.**

- **Anthracnose**
- **Bean rust.**
- **Angular leafspot.**
- **Bean mosaic.**

24. Name **four** diseases that attack oranges.
- **Tristeza**
- **Leaf spot**
- **Green mould**
- **Root rot**
- **Greening diseases**

25. a) List **two** symptoms of late blight in tomatoes.
- **Rapid drying of leaves**
- **Brownish dry rots of fruits**
- **Death of whole plant.**

b) State **two** ways of controlling late blight in tomatoes.
- **Regular spraying with fungicides**
- **Uprooting and destroying seriously affected plants;**

26. List **two** common sorghum diseases.
- **Leaf blight**
- **Sooty stripe**
- **Loose smut**
- **Head smut**

27. a) Describe the procedure which should be followed in spraying a crop of tomatoes using a fungicide in powder form, water and a knapsack sprayer.
- **Read the label/ the manufactures instruction**
- **Measure the required amount of fungicide**
- **Place it into a container and mix thoroughly**
- **When the powder has dissolved completely/ has formed slurry**
- **Pour the mixture into the knapsack sprayer through the sieve**
- **Spray the mixture onto the crop**

(b) Name **one** fungal disease of tomatoes that can be controlled using the above procedure.
- **Blight (late or early)**

(c) State **four** safety measures that should be taken while spraying the crop with the fungicide.
- **Spray following the direction of the wind**
- **Wear protective clothing**
- **Avoiding eating or smoking while handling fungicides**
- **Avoid spillage of the fungicide/ avoid contaminating the environment**
- **Do not suck/ blow a blocked nozzle**

28. State **two** methods of controlling damping off disease.
- **Removing shade**
- **Use less water to irrigate**
- **Thinning**
- **Use of copper fungicides**

29. Describe the physical measures of disease control in crops.
- **Use lethal temperatures – Hot water can be used to treat seeds against pests such as bollworms of cotton.**
- **Drying of seeds – Complete drying of grains make them difficult for pests to penetrate them**
- **Suffocation – Commonly used in Cyprus bins for control of storage pests e.g. Maize weevils, rats etc.**
- **Trapping and killing- Pests such as rats, birds, cutworms etc can be trapped and killed.**
- **Irrigation –Flooding helps to kill soil borne pests e.g. termites, army worms, moles, overhead irrigation can wash off pests e.g. aphids , mites etc**
- **Radiation – Low doses of x– rays / gamma rays can be used to control pests e.g. weevils, moths etc.**
- **Use of scarecrows-These can be erected at specific spots to scare away birds, wild animals etc from the farm.**

30. State management practices carried out by farmers to control pest and Diseases in a field crop
- **Close season to break life cycle of pests and diseases**
- **Planting certified seeds**
- **Practice crop rotation**
- **Early planting**
- **Planting resistant crops**
- **Using proper spacing**
- **Field hygiene**
- **Pruning**
- **Heat treatment e.g. sugarcane setts**
- **Weed control**
- **Proper plant nutrition**

31. Explain how various practices carried out in the field help to control crop diseases.
- **Crop rotation- helps to break the life cycles of disease-causing organisms.**
- **Rogueing/Destroying infected crop- stops the diseases from spreading.**
- **Planting disease free plants/use of certified seeds- planting clean material prevents introduction of pathogens into the field**
- **Closed season- helps to break life cycles of pathogens.**
- **Early planting/Timely planting- helps the crop to establish faster before attack/outbreak of diseases.**
- **Proper spacing- creates unfavourable micro-climate for some pathogens/prevents spread.**
- **Weed control – removes alternate hosts of some pathogens.**
- **Use of resistant varieties- prevents attack by pathogens.**
- **Application of appropriate chemicals- kills the pathogens.**
- **Use of clean tools and equipments – reduces chances of contaminating crops with pathogens.**
- **Quarantine- prevents introduction of pathogens into the farm/spread of pathogens.**
- **Heat treatment- kills micro organisms.**
- **Pruning- creates unfavourable micro climate for some pathogens/removes affected parts and stop spread.**
- **Destruction of crop residue –kills pathogens and destroys breeding grounds.**
- **Control of vectors- stop spreading of pathogens**
- **Proper nutrition (Proper fertilizer / manure application)- plants withstand disease/control/deficiency diseases.**

CROP PRODUCTION VI (FIELD PRACTICES for maize, millet, sorghum, beans and rice: harvesting of cotton pyrethrum, sugar cane coffee and tea)

1. List **four** management practices carried out in maize field at 45cm high
- **Weed control**
- **Thinning**
- **Farthing up**
- **Top dressing**
- **Pest and disease control**
- **Rouging**

2. What is a cultivar?
Any cultivated variety of any crop

3. Distinguish between the terms **hybrid** and **composite** as used in maize breeding
Hybrid- is bred by crossing inbred varieties under controlled pollination while
Composite- is bred by crossing a number of varieties under uncontrolled pollination

4. **What** do the figures 5 and 3 represent in the maize variety hybrid 53?
- **5:-altitude of 5000ft where the variety can be grown in and do well.**
- **3:-numbers of crossing that have been done on the seeds.**

5. Why is it not recommended to use sisal bags in handling cotton?
- **To prevent contamination of the cotton by the sisal strings**

6. State **two** qualities of soil that rice requires.
- **Should allow irrigation water to be retained for long time (high water holding capacity.)**
- **Should have high water table that will prevent water from draining fast (poorly drained).**

7. **State two** uses of flood water to rice fields apart from providing water to rice plants.
- **To suppress weeds**
- **To get even growth.**

- **To provide optimum environment for rice growth.**

8. State **two** reasons why rice should be spaced very closely.
- **To control the growth of weeds**
- **To avoid continuous tillering which results in different stages of ripening which make harvesting difficult.**

9. At what stage of growth should paddy rice be transplanted?
- **2 – 4 weeks old/6 – 20cm height, pencil high/4-6 leaves stage**

10. List **three** ways of controlling birds in a field of rice.
- **Scarecrows/use of explosives/use of dogs.**
- **Poisoning.**
- **Use of traps and killing.**
- **Plant resistant varieties.**

11. Describe the production of rice under the following sub-headings:-

(a) Land preparation
- **Land is ploughed /dug**
- **Ploughs/Jembes used for primary cultivation**
- **Use rotators or Jembes to prepare land**
- **The land is leveled and dykes (bond) constructed to control water.**
- **Bunds are constructed around the plots to control water**
- **The land is flooded up to a depth of 5cm**
- **The soil-water mixture should be worked on until a fine mud is produced**

(b) Water control
- **Bunds are constructed around the plots to control the water level**
- **The land is flooded with water to a depth of 5cm before transplanting**
- **The level of water is gradually increased to a height of 10cm by the time the rice crop is fully grown**
- **Water should be allowed to flow slowly through the field**
- **Old water should be drained and fresh one added where the flow of water is not possible**
- **Old water should be drained every 2-3weeks**
- **Supply fresh warm water to prevent the formation of empty heads.**
- **The field should be drained off 3weeks before harvesting**

(c) Fertilizer application

Sulphate of Ammonia is applied in the nursery before sowing
- **Sulphate of Ammonia s applied at the rate of 25kg for each nursery unit of 8.5m x 8.5m**
- **Sulphate of Ammonia is applied in two splits before transplanting and 40days after transplanting**
- **Sulphate of ammonia is applied at the rate of 25kg/ha before transplanting and 25kg/ha about 40days after transplanting**
- **Double super phosphate is broadcasted in the field before transplanting**
- **DSP is applied at the rate of 20kg/ha before transplanting**

12. Describe the field production of irrigated rice under the following subheadings.

(a) Nursery preparation and establishment.
- **Construct bund around the nursery.**
- **Cultivate nursery to a reasonable fine tilth.**
- **The seeds should be pre- germinated by soaking them for at least 24hours.**
- **Flood the nursery to a depth of 0cm**
- **Puddle the soil to a required tilth.**
- **Broadcast the seeds evenly.**
- **Nursery should be 8.5m by8.5m.**
- **Apply nitrogen fertilizer before sowing.**
- **Drag a board to obtain level nursery bed.**

(b) Field preparation.
- **The field should be cultivated to a fine tilth.**
- **Construct bund around the field**
- **Flood the field 4 days after transplanting**
- **Flood the field up to 10cm above the surface.**
- **Puddle the soil to the required tilth.**
- **Level the field by dragging a board to obtain level seedbed.**
- **Construct inlet and outlet.**

(c) Transplanting

- **Transplant seedlings in the main field at a spacing of 0cm by 0cm.**
- **Broadcast 00kg/hectare of DSP before transplanting.**
- **Uproot the seedlings carefully from the nursery bed.**
- **Drain water from the field to 5cm just before transplanting.**
- **Seedlings are ready when they have 4-6 leaves/3-5 weeks/5-20cm high.**

(d) Field management

- **Control weeds by uprooting /use of appropriate herbicide.**
- **Control birds by scaring or by destroying breeding colonies.**
- **Water should be changed every 2-3 weeks /let water flow slowly through the field.**
- **Drain water 3weeks before harvesting/ when heads turn down.**
- **Maintain level of water at 3cm height of plants until 3weeks before harvesting.**
- **Top dress with Sulphate of ammonia at 250kg/ha in two portions.**
- **Top dress just before transplanting and after 40days.**
- **Control diseases i.e. Anthracnose by growing resistant varieties, use clean seeds. And bacteria blight by uprooting and destroying infected plants or spray with colliar oxychrolide.**

(e)Weed control

- **Flooding action kills most weeds.**
- **Aquatic weeds should be uprooted**
- **Use herbicides 2 – 3 weeks after germination**

13. **State two** methods of utilizing Maize as forage crop.

- **Making silage.**
- **Cutting and feeding green fodder**
- **Crushed grains**

14. **Discuss** the management practices in the production of **maize** for grains from planting to harvesting.

- **Clear the land.**
- **Prepare land during dry season.**
- **Thoroughly control perennial weeds**
- **Carry out primary land preparation**
- **Carry out secondary cultivation /harrow the land.**
- **Obtain a medium tilth.**
- **Select seeds that are suitable for the ecological zone. i.e. Long term hybrid varieties / high altitude /614,622,625, 626, 627 are medium term hybrids/medium altitude /511, 512, 513, 514, 515, 516, composite:-Katumani hybrid, Makueni hybrid , Pwani hybrid - low rainfall areas**
- **Plant at the onset of rainfall of rains /just before the rains start.**
- **Dig holes**
- **Depth of holes 8 – 10cm deep.**
- **Spacing 90cm x 30cm. (2 seed per hole)/75cm x 25 cm (1seed per hole)**
- **Apply a handful of farm yard manure per hole/apply 10gm of DSP per hole**
- **Mix fertilizer and manure with the soil.**
- **Apply an appropriate pesticide during planting.**
- **Gap immediately after germination**
- **Control weeds through cultivation mulching or by use of appropriate herbicide.**
- **Weed two to three times if manually done**
- **Thin the seedlings at the height of 10cm – 15 cm**
- **At the height of 5cm, tillers should be removed**
- **Top dress using nitrogenous first at knee high 45cm height.**
- **Second top dressing at tarselling stage with nitrogenous fertilizer at another 100kgs / Ha**
- **Pests like maize stalk borer, e.t.c should be controlled using appropriate pesticides.**
- **Rogue the diseased plants**
- **Harvesting should be done after 3 ½ - 9 months depending on variety.**
- **Harvest when the crop is dry / moisture content of 5 – 20 % of grain.**
- **Harvesting is by hand in small scale / dehusking or use of combine harvesters in large scale.**
- **Cut and stook the maize to hasten drying if harvested manually.**
- **Dehusk and thresh.**
- **Dry to 12% moisture content and store.**

15. Describe production of **maize** under the following sub-headings

(a) Varieties

- **Kitale hybrids e.g. 62, 622 for high and medium altitudes**
- **Embu hybrids 5, 53 e.t.c. for medium altitudes**
- **Kenya flat complex**
- **Double comb variety**
- **Coast composites**
- **Katumani composite**

(b) Planting

- **Plant at the beginning of the rains /at the onset of rains**
- **Dry planting can also be done two weeks before the rains**
- **Space according to the cultivar/ variety/ plant at 75-90cm x23-30cm**
- **Plant to 2 seeds per hole**
- **Plant at a depth of 2.5 to 10cm depending on the soil moisture content**
- **Plant certified seeds from reliable dealers**
- **Place seeds more shallowly in moist soils and deeply in dry soils**
- **Plant by hand on small farms/ use tractor – drawn planters on large scale farms**
- **Use phosphatic fertilizers at planting time**
- **Planting with phosphatic fertilizers DAP, / S.S.P, / D.S.P / TSP at a rate of 20Kg/ ha**
- **Time of planting maize is very crucial as delayed planting always reduces yields**
- **Early planting also reduces attack by stalk borers**

(c) Pest and pest control

Pest	Control
Maize stalk borer	Early planting Rogueing, destroy crop remains, Apply appropriate pesticides (placed in cone)
Army worm	Use of recommended pesticides Early planting
Aphid	Spray with appropriate pesticides
Maize weevil	Proper drying and dusting with pesticides
Red flour beetle	Good storage
Rats	use rat proof stores, cats, traps or poison

d) Diseases and their control

Disease	Control
Leaf rust	Use appropriate chemicals Field hygiene
White blight	Use fungicides Field hygiene
Maize streak	Crop rotation Use of certified seeds Uprooting and burning affected crop/rogueing

16. Describe the field production of maize under the following sub headings

a) Ecological requirement

- **Altitude 0-2200m above sea level**
- **Temperature – 24° C / Medium / moderate**
- **Rainfall – range from 300mm – 800 mm per annum, spread throughout the growing season, more during silking and grain formation. Dry conditions required during maturity to facilitate drying and harvesting**
- **Soils- - Fertile alluvial or loam soil and well drained and aerated. Soil $_{P}$H 6.0 – 7.0, fertile Loamy / silty soils preferred**

b) Land preparation

- **Clear the land/all stumps remove**
- **Prepare the seed bed early during the dry season to kill weeds**
- **Plough deeply to eradicate weeds especially perennial grasses e.g. couch grass/ exposes pests.**
- **Do one or two primary cultivations**
- **Allow time for stubble to rot**

- **Harrow the land to a fair/ medium tilth**
- **Plough along the contours to reduce soil erosion**
- **Prepare the land using a tractor – drawn disc plough/ mould board plough**

c) Field practices

i) **Gapping should be done immediately after germination**
ii) **Thinning/ removal of tillers – Carry out thinning when maize is about 5cm tall**
iii) **Top dressing with nitrogenous fertilizers when maize is at knee high (45 – 60cm) at the rate of 200kg/ha**
iv) **Weed control**
- **Keep the field weed free during early stages**
- **First weeding is recommended when thinning**
- **Weeding can be done manually or using herbicides e.g. 2, 4 –D and MCPA**
- **Weed 2 to 3 times if done manually**

v) **Control pests such as maize stalk borer and army worms using appropriate insecticides**
vi) **Diseases and their control e.g. Leaf rust, white blight, maize streak virus etc.**
- **Control is through cultural, physical and chemical measures**
- **Uproot and destroy diseased plants to avoid spreading the disease to healthy ones**

viii. **Stalks are cut and stoked in the field**

d) Harvesting and storage

- **Harvest after 3 ½ - 9 months**
- **Harvest when the whole plant turns yellow and the ears are dry**
- **Harvest when the plants have a moisture content of 15-25%**
- **Harvest by hand if small scale/ use combine harvesters in large scale**
- **Cut and stook the maize for further drying if harvesting manually**
- **Remove the maize cobs from the husks by hand**
- **Shelling of cobs to separate grains from cobs**
- **Winnow and dry to a moisture content of 12% and bagging is then done before storing**
- **Yields-30-45 bag / ha.**
- **Storing in cool areas can be practiced**

17. Outline the procedure for planting maize manually once you get to the farm with all the materials and equipment required
- **Measure / estimate half the inter row spacing / 75- 90 cm from the edge of the farm**
- **Stretch out the garden line along this distance from the edge**
- **Dig holes along the stretched garden line at the appropriate intra- row spacing (20- 30 cm)**
- **Place appropriate amount of fertilizer per hole and mix with soil**
- **Place one seed per hole**
- **Cover with appropriate amount of soil**

18. State **two** precautions taken when harvesting cotton
- **Avoid mixing with foreign materials**
- **Avoid mixing the dry leaves and small twigs**
- **Harvesting during the dry weather**
- **During harvesting separate grade A and B**
- **Don't put in gunny/sisal bags**
- **Delay picking under wet conditions**

19. **Give two** factors that should be considered when sorting out cotton into grade A.
- **Clean / unstained**
- **Free from insect damage/ pest damage.**
- **Absence of foreign materials e.g. weeds soil etc.**

20. **Discuss** the harvesting of cotton under the following sub – headings.

(i) Stage of harvesting.
- **4 – 4 ½ months after planting when balls open.**
- **Start picking as soon as the st balls open.**
- **Do it on weekly intervals to prevent discolouration of lint.**

(ii) Method and procedure of harvesting.
- **Picking is done manually.**

- **The seed cotton is sorted into two grades AR- first grade free from inset damage and foreign matter and be clean white. BR- may not have all these qualities.**
- **The picker carries two containers while harvesting one for grade AR and the other for BR.**
- **The seed cotton is sorted into two grades AR (Safi) BR (Fifi)**

(iii) Precautions in harvesting.
- **Ensure no foreign matter such as leaves and twigs are mixed with seed cotton.**
- **Avoid picking when cotton is wet.**
- **Avoid handling harvested cotton using sisal bags since their fibres may mix with the seed cotton creating problems during ginning.**
- **Avoid mixing the dry leaves and small twigs**
- **Harvesting during the dry weather**
- **During harvesting separate grade A and B**

21. Describe the field production of **dry beans** in pure stand under the following sub- headings.

a) Land preparation
- **Clear the land using the appropriate implements e.g. a slasher and mower**
- **Land preparation done early / dry season.**
- **Eradicate perennial weeds such as couch grass.**
- **Carry out secondary cultivation to obtain moderate tilth**

b) Planting
- **Select a suitable variety suited to the ecological zone /Use certified seeds**
- **Plant at the onset of the rains**
- **Dry planting if in semi-arid areas**
- **Plant manually/use a planter if on large scale**
- **Plant at a spacing of 30-45cm x 15cm**
- **Plant 2-4 seeds per hole**
- **Plant at a depth of 3-5cm**
- **Use phosphatic fertilizer at planting time at a rate of 200Kg/ha.**
- **Mix the fertilizers thoroughly with the soil before planting**
- **The seeds can be inoculated with the right Rhizobium bacteria before planting**

c) Field management practices
- **Gap where seeds failed to germinate one week after planting.**
- **Control weeds before flowering.**
- **The weeds are controlled mechanically/ by use of appropriate herbicides or any other suitable method.**
- **Pests such as aphids, American ball worm, bean fly should be controlled using appropriate pesticides such as marshall, diadrin aldrin.**
- **Diseases such as rust, hallo- blight should be controlled using appropriate methods such as use of certified seeds, fungicides such as Mancob, copper fungicides, Benomyl, copper oxychloride.**
- **support indeterminate bean types to prevent pods touching the ground**
- **Avoid topdressing with nitrogen because it reduces nodulation**

d) Harvesting
- **Harvest when the pods have turned brown**
- **Harvest before pods start shattering**
- **uproot dry beans in the morning to reduce losses due to shattering**
- **Dry the harvested beans on bare ground, mats, sacks etc**
- **Thresh the beans by Beating with stick**
- **Remove haulms/stalks and pods by winnowing or by hand**
- **Dry the beans to a moisture content of about 0%**
- **Sort out to remove pest infested, damaged or rotten ones**
- **treat with appropriate pesticides and pack in bags**

22. **Describe** the field production of dry **beans** under the following sub headings.

(a) Ecological requirements.
- **Well drained, fertile soil and rich in organic matter**
- **Soil PH : 6 – 8**
- **Rainfall – 600mm – 1000mm per annum .Heavy rains is destructive during flowering stage**
- **Requires a dry spell during harvesting**
- **Altitude –1 000 –1200 m above the sea level**

(b) Varieties

- **Canadian wonder (Glp92)**
- **Rose coco (Glp2)**
- **Wairimu**
- **Mexican**
- **K47**
- **Mwitemania**
- **Mwezi moja (Glp585)**
- **Lazy wife**
- **Sasca**
- **Masterpiece**

(c) Pest Control

Pest	Control
spotted borer	**Spraying with Dimethoate and Endosuphur**
Bean fly	- **Seed dressing /Spraying with Dimethoate and Endosuphur** - **destruction of affected residues** - **crop rotation** - **early planting**
American bollworm	**Spraying with Dimethoate and Endosuphur**
Bean aphid	**Spraying with Dimethoate and Endosuphan**
Bean weevil and Bean bruchid	- **Drying the seeds properly before storage.** - **Cleaning or winnowing seeds before storage.** - **Cleaning and dusting the storage.** - **Dusting the bean seeds with appropriate chemicals before storage.** - **Spraying with various insecticides such as dieldrin, dimethoate, formathion or diazinon**

(d)Disease control

Disease	Control
Bacterial blight - (halo Blight)	**Planting healthy seeds, uprooting and destroying infected crops** **- rogueing and crop rotation** **- Spraying with copper oxychloride from emergence**
Anthracnose	- **Spray weekly during the wet season using benomyl, copper fungicide or mancozeb** - **Destroy infected crop residues** - **Dress seeds well before planting** - **Use clean seeds** - **Grow resistant varieties e.g. Wairimu, K74 etc.**
Halo blight	- **Field sanitation** - **Use of certified seeds** - **Crop rotation** - **Use of resistant varieties e.g. Banja 2**
Bean rust	- **Field sanitation** - **Use of resistant varieties e.g. Mexican 142** - **Spray using benomyl, copper fungicide or mancozeb**

23. **Describe** the field production of **Sorghum** under the following sub headings.

a) Seed bed preparation

- **Prepare the seedbed early during the dry season to kill weeds**
- **Prepare the land well to kill perennial weeds such as couch grass**
- **Do one or two primary cultivation**
- **Use ox –ploughs if on small scale/ use tractor drawn ploughs on large scale**
- **Harrow the land to a fine tilth**

b)Planting

- **Plant at the beginning of the rains**
- **Dry plant where possible**

- **Use certified seeds for planting**
- **Broadcast the seeds evenly and cover lightly with soil**
- **Row planting can be done**
- **Plant at a spacing of 45-90cm x0-60cm**
- **Plant at 2.5-5.0cm deep**
- **Wheat drills can be used for planting**
- **Use a seed rate of 2-5Kg/ ha**
- **Place an average of 3 seeds per hole**
- **Use single super phosphate at a rate of 00-200Kg/ ha**

c) Field management practices
- **Top dress with CAN at a rate of 000Kg/ ha**
- **Top dress three weeks after planting**
- **Control the weeds early before they establish**
- **Use mechanical weeding/ herbicides e.g. 2, 4 –D**
- **Control the witch weed before it flowers**
- **Thin the plants when 5cm tall**
- **Thin to 2 seedlings per hole**
- **Use resistant varieties/ bitter type/ goose neck type to avoid birds e.g. Quelea/ scare/ chase the birds**
- **Use crop hygiene and other appropriate cultural measures to control diseases such as smuts and anthracnose**

d) Harvesting
- **Takes about 2-9 months to mature**
- **Harvest when the moisture content is about 5% when the whole plant has completely dried**
- **Harvest manually by cutting heads with a sharp panga or knife**
- **Combine harvesters can be used on large scale**
- **Store before or after threshing**
- **Dry further to reduce the moisture content to 0-%**

24. Describe the field production of **Finger millet** under the following sub headings.

a) Varieties
- **Dobbs**
- **Serena**
- **Wirir**
- **Msumbiji**

b) Ecological requirements
- **Altitude- Below 500 mm a. s. l**
- **Temperature can tolerate high temp . hot weather due to B adaptions, they are drought resistant**
- **Rainfall – range of 420mm – 630mm / annum**
- **Sorts – Fairly fertile and well drained**

c) Seed bed preparation
- **Prepare the seed bed early during the dry season to control weeds**
- **Remove all perennial weed**
- **Prepare the land to a fine tilth/ harrow severally to obtain a fine tilth**
- **Incorporate large amounts of organic manure as you prepare the land**
- **Prepare the land using tractors/ ox – plough**
- **Ensure the organic manure is thoroughly mixed with the soil**

d) Planting
- **Plant early at the beginning of the rains**
- **Dry planting can be done the same month the rains are coming**
- **Broadcast by hand/ drill in shallow furrows**
- **Cover the seeds lightly with soil**
- **Ox – seeders can be used**
- **Space at 30-33cm x5cm/ 5.5-9.0 Kg/ ha seed rate/ broadcast at a rate of 35Kg/ ha of seeds**

e) Field management practice
- **Thin to 5cm apart if row planting was used**
- **Top dress with sulphate of ammonia**
- **Control weeds using an ox – weeder if planted in rows/ uproot any weeds that come up**
- **Apply sulphate of ammonia fertilizer at a rate of 25Kg/ ha**
- **Top dress when the crop is 5cm high with 250 kgs/ha of C.A.N**
- **Control Pests e.g. – Birds by scaring them off**

- **Stem borers**
- **Sorghum shoot fly**

- **Control disease e.g. leaf blight, Anthracnose, Head smut by plant resistant varieties**

f) Harvesting
- **Harvest when the crop and the head is dry**
- **Use small hand knives to cut off the heads**
- **Store the heads without threshing**
- **Combine harvesters can also be used if on large scale**

25. **Describe** the field production of **Finger millet and bulrush millet** under the following sub headings.

SUB HEADING	FINGER MILLET	BULRUSH MILLET
a) Varieties	**2- ultra lupin** **2- 5.8 oats**	**- H 26 /9, H269, 6A 2A, 3A x4**
b) Ecological requirement	**- Rainfall – 900mm** **- Altitude – 2400m** **- Soils – Fertile, drained** **- Temp. - warm**	**- Rainfall – 500- 600mm** **- Altitude – 200mm below** **- Soil – well drained fertile** **- Temp. - warm**
c) Seedbed preparation	**- Prepare to a fine tilth** **Reasons** **- Seeds are too small** **- Reduce weed competition** **- Firm the seedbed.**	**- Early seedbed preparation** **- Preparation to a fine tilth**
d) Planting	**- can be broadcast by hand /** **- Planted in drills (rows) 30-33 cm apart** **- grown in a pure stand**	**- Broad cast and cultivate Shallowly** **- Spacing of 60cm x 5cm in rows** **- grown in pure and mixed stands**
e) Field management practices	**-Thin to 5cm apart** **- Weed control – done by hand pulling** **- Fertilizer application e.g. SA-125 kgs /ha at 5cm high** **- Pest control – e.g. birds** **- Disease control e.g. head blast**	**- Weeding- hand weeding is done to keep the field free until tillering** **- Fertilizer – S.A at a rate of 200kgs per ha at 30cm high** **- Pest control – e.g. birds** **- Disease control – e.g. Rust, Ergot, downy mildew**

26. Name **two** disease of bulrush millet.
- **Downey mildew**
- **Rust**
- **Smuts**
- **Ergot**

27. a) Apart from damage by birds, name **two** other serious pests which can attack sorghum crop while still in the field.
- **Stalk borers**
- **Sorghum shoot fly**
- **Midges**

b) Give **two** methods used in controlling birds in sorghum field.
- **Planting resistant variety / planting bitter variety goose necked types**
- **Physically scaring / use of scare crow / chasing by throwing stones.**

28. State **two** precautions that must be observed when plucking tea leaves
- **Pluck the top two leaves and the bud**
- **Plucked tea leaves should be placed in woven baskets/ ventilated basket**
- **Do not compress tea leaves in the baskets since it leads to heat up and turn brown lowering the quality**
- **Plucked tea leaves to be kept under cool and shaded area.**
- **Taken to the factory within 24 hours/ same day it is harvested.**
- **Discard dormant tea shoots**
- **Plucking internal of 5-7 days in rains and 10-14 days in dry periods**

29. Why would plucked tea leaves be delivered to the factory as soon as they are plucked?
- **To avoid fermentation**

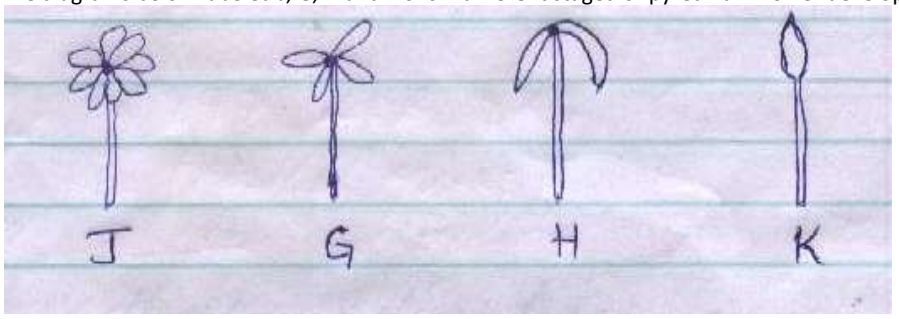
30. **Name** the apparatus used to harvest Tea
- **Woven basket.**
- **Open / well aerated.**

31. **a) How** can the stage of harvesting sugarcane be determined?
- **Age – when 1 8 -22 months old after planting or 6 -8 months for the ratoon crop.**
- **Uniformity of quality of cane from the base to the top**

b) Outline the procedure of harvesting sugar cane
- **Burn the cane to remove the leaves easen cutting**
- **Cut the cane as near to the ground as possible**
- **Cut off the top**
- **Strip off the unburnt leaves**
- **Cut cans manually using cane harvesting matchet**

c) List two reasons why sugarcane is cut at ground level
- **High yield**
- **Proper establishment of the ratoon crop.**

32. The diagrams below labeled J, G, H and K show different staged of pyrethrum flower development.



a) Re-arrange the labels J, G, H and K to show the correct sequence in which the pyrethrum flower develops.
- **K, G, J H**

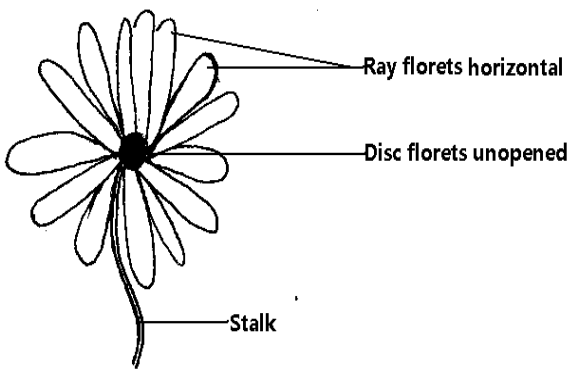
b) State **two** precautions that a farmer should take when harvesting to ensure flowers picked are of high quality.
- **Pick flower by twisting the head**
- **Put flowers in open baskets**
- **Avoid picking wet flowers**
- **Avoid any contamination**

33. Describe the harvesting of pyrethrum under the following subheadings.

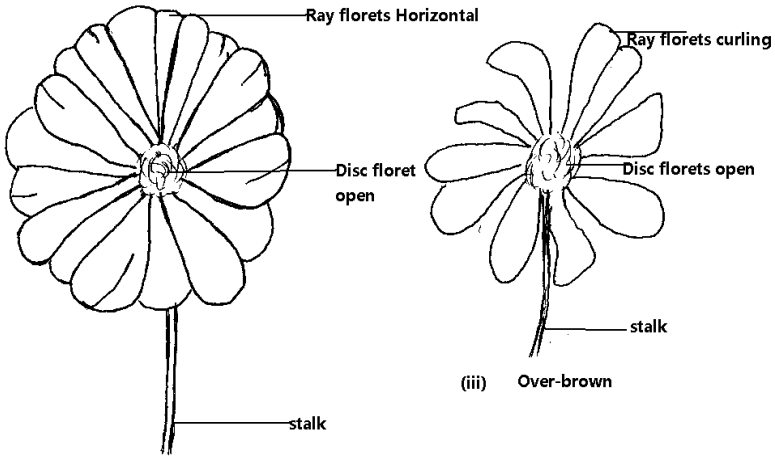
i) Stage of harvesting.
- **Are ready for harvesting 3 to 4 months after planting.**

ii) Method and procedure
- **Only those with horizontal petals are picked.**
- **Picking interval is 2-3 weeks.**
- **Flowers are picked by twisting the heads so that no stem is attached.**

34. **Explain** the harvesting practices of Pyrethrum on the farm.



1. Immature



(ii) Mature

(iii) Over-brown

Pyrethrum flower.

- **Ready for picking 3 – 4 months after transplanting**
- **Selectively pick flower with horizontal petals (see (ii) in the diagram above)**
- **Pick flowers by twisting the head.**
- **Put flowers in a woven basket for good ventilation.**
- **Avoid compaction during picking.**
- **Don't pick wet flowers.**
- **Do not compact the flowers in the basket**
- **Dry the flowers soon after.**

35. State **four** precautions undertaken while harvesting pyrethrum.
- **Flowers should be harvested in open baskets.**
- **Flowers should not be compacted in the basket.**
- **Avoid picking wet flowers.**
- **Picked flowers should be dried soon after harvesting**
- **Ensure flowers are picked without petioles/twigs.**
- **Pick flowers with horizontal petal and having two to three rows of disc florets open.**

36. Describe the procedure used during harvesting of sugarcane
- **Crop plant first take 18-22 months to mature**
- **Ratoon crop takes 2-8 months to mature**
- **Harvest sugar cane by cutting the stem just above the ground level to avoid loss of yield**
- **Use sterilized equipment / cutter**
- **Remove the tops and dry leaves /burn the field**
- **Strip off leaves from the stem**
- **Transport the cane to the factory immediately for processing within 48 hours.**
- **Use a panga /harvesting matchet /appropriate tools.**
- **Determine sugar content**

37. Describe **coffee** harvesting under the following sub headings

(i) Stage of harvesting
- **4 years after planting/transplanting.**
- **When the berries are red ripe.**

(ii) Procedure of harvesting.
- **Picking of ripe berries.**
- **Picking is done by hands.**
- **Picking should be done selectively.**
- **Hooked sticks are used to bend tall branches.**
- **Picking is done once a week.**
- **Spread out on sisal bags or polythene for sorting.**
- **Berries place in gunny bags.**

(iii) Precautions to be observed while harvesting coffee.
- **Only ripe berries should be picked**
- **Green and dry berries picked should be sorted out.**
- **Ripe cherries are delivered to the factory on the same day.**
- **Avoid picking berries because of low quality.**

38. Discuss the procedure for harvesting the following crops

i)Tea
- **Fine plucking removal of two upper most leaves and a bud interval**
- **Straight stick is used to guide on the plucking table**
- **Coarse plucking – removal of three leaves and a bud to give a longer plucking**
- **Hard plucking – tipping off shoots above the plucking table after harvesting two leaves and a bud**

ii) Sugar cane
- **Mature canes are cut at the ground level**
- **Green tops are removed**
- **Stripping of the leaves should be done to the varieties which are not self stripping**
- **Burning may be done to clear fields and to chase away dangerous animals**

iii) Cotton

- **Selective harvesting in done**
- **Pick only dry and fully open bolls**
- **Picked cotton is sorted out into two grades AR (Safi) and BR (fifi)**
- **Two containers we used to separate grades AR from BR**
- **Picking of the leaves should be avoided**

FORAGE CROPS

1. State **three** factors which affects the quality of standing forage given to livestock

- **Forage species**
- **Stage of harvesting**
- **Mode of feeding**

2. Give **four** factors that determine the nutrient content in hay

- **Weather conditions during dry process**
- **Length of the drying period**
- **Stage of growth at harvesting time/leaf-stem ratio of the plant species**
- **Type of forage crop used/species/nutritional composition**
- **Storage facilities/method of storage**
- **Period of storage**
- **Disease and pest attack on the crop**
- **Fertility of the soil**

3. Outline **four** factors that affect the quality of silage

- **Stage of harvesting of the crop**
- **Forage species used**
- **Contamination/amount of foreign materials**
- **Degree of damage of crop during preparation**
- **Moisture content of forage crop used**
- **Leaf to stem ratio**
- **Additives used e.g. Molasses, grains**
- **Rate of filling of the Silo**

4. Give **three** methods of practicing rotational grazing

- **Paddocking**
- **Strip grazing** .
- **Herding**

5. Give **five** advantages of rotation grazing.

- **Livestock make maximum use of pastures**
- **Reduces build up of parasites and diseases**
- **Animal waste evenly distributed evenly in all paddocks**
- **Pasture area given time to regenerate**
- **Possible to apply fertilizer in the parts of the pasture which are not in use**
- **Excess forage can be conserved/ sold**
- **Ensure even distribution of animal dung.**
- **Enhance various management practices to be carried e.g. re-seeding, weeding.**

6. a) Differentiate the following terms pure stand pasture and mixed stand pasture.

- Pure stand pasture **has either grass or legume on them while** mixed stand pasture **have both grasses and legumes grown together.**

(b) What are the advantages of mixed grass legume pasture over a pure grass pasture?

- **It is more palatable than pure grass**
- **Farmer has security against total loss due to attack by pests, diseases or bad weather**
- **Mixed pasture yields higher per unit area of land pure grass pasture**
- **It is more nutritious / has a higher nutritive value than pure grass**
- **Mixed pasture makes maximum use of soil nutrients because of different nutrient requirement.**

- **Mixed pasture reduces soil erosion because of good coverage.**
- **Mixed pasture has better weed control effect**
- **Mixed pasture increases soil fertility because of nitrogen fixation**
- **There is economy in use of fertilizer in mixed pastures**
- **There is better distribution of growth i.e. a mixture of early and late maturity species can be included in the mixture.**

7. State **two** advantages of grass-legume mixture
- **High nutritive value**
- **Higher yields of forage per unit area**
- **Improve soil fertility due to nitrogen fixation**
- **Relieve bloat**
- **Economy in use of nitrogen fertilizers**

8. State **two** causes of failure in pasture establishment
- **Poor seed germination due to wrong placement of seeds**
- **Poor inoculation of legume seeds**
- **Lack f nutrients in the soil**
- **Unfavourable chemical conditions in the soil**
- **Poor drainage**
- **Pest and disease attacks**

9. **Define** hay
- **These are pasture grasses and legumes planter by man purposely for livestock feeds/ arterial pastures**

10. Name **three** forms of conserving forage.
- **Silage**
- **Hay**
- **Standing forage.**

11. Mention **two** ways in which losses may be incurred during hay making.
- **When slow drying of hay is practiced**
- **When there's prolonged exposure of hay to sunlight /bleaching**
- **Respiration/oxidation**
- **Due to Breakages and loss of leaves**
- **When hay is rained on/when hay rots**

12. Describe the procedure of hay making
- **Cut the hay at least three days of continuous sunshine is expected**
- **Cut crop when 50% of the plants have flowered**
- **Hay is dehydrated (dried) to about 15-20% moisture content or less**
- **Spread out evenly on the ground to dry for 2-3 days depending on the environmental temperature**
- **Windrow and gather or bale the hay**
- **Store bale in a shed out of reach by rain water and sunshine**
- **Rapid drying is recommended for high quality hay**
- **Where occasional showers are expected the forage may be dried on tripods (stands)**

13. (a)What is topping in pasture management
- **It is the constant removal of the stemmy fibrous material left behind after continuous grazing**

b) Give **two** methods that can be used in carrying out topping in pasture field.
- **Slashing/mowing**
- **Overgrazing**
- **Burning**

14. Why are farmers encouraged to conserve excess forage in the farm?
- **Security against total pasture lose**
- **To feed animals during the dry seasons**

iii) Sorghum may be grown by dairy farmers as forage. Give **two** reasons why the crop should be harvested for making silage just before the flowering stage
- **It has the highest nutrient content at this stage**
- **Forage has high DM content hence high DM yield**

- **High cellulose content it is woody and fibrous**
- **High lignin, cutin, tannin and silica content**
- **Low crude protein content**
- **Has low leaf: stem ration**
- **Low dry matter digestibility**

15. Why is it necessary to allow freshly cut napier grass to wilt before ensiling
- **To reduce moisture content √ which can lead to rotting instead of formation during ensiling**

16. **State two** main loses of silage
- **Surface spoilage die to exposure and contact with soil**
- **Seepage if soil is not water fight**
- **Respiration spinally of carbohydrates**

17. **Give two** reasons why too much air in silo is undesirable during process of silage making.
- **It may cause decomposition**
- **It may cause overheating**

18. What is the effect of low pH is silage making.
- **Low PH inhibits bacterial growth and preserves the silage**

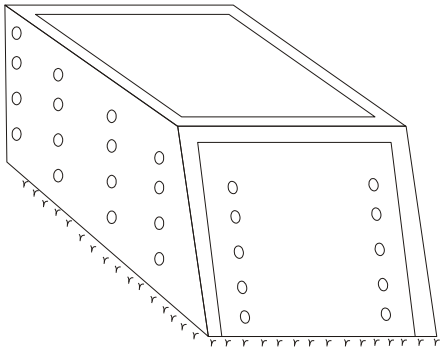
19. Give **one** reason why too much air in the silo is undesirable in the process of making silage.
- **Too much air may cause overheating**
- **Too much air may cause decomposition**

20. Outline the procedure of making silage
- **Prepare silo before harvesting depending on amount of forage to be ensilaged**
- **Cut the crop at appropriate stage / flowing stage**
- **Harvested silage crop is wilted for 6 – 12 hrs to reduce moisture content (depending on weather conditions)**
- **Wilted material is chopped into small pieces and put into the silo by compacting it every 12cm layer**
- **Fill the silo compacting after every 10-12 cm layer**
- **Fill the silo as rapidly as possible /within 1-4 days**
- **Temperature is checked and if more than 37.5^{0}C. Should be reduced by adding water and if below it should be compacted rapidly or dry materials added.**
- **Maintain the temperatures at an average of 31^{0}C**
- **Should be covered with a polythene sheet or dry grass against air and water**
- **Should have a ridge when ensiling is completed by covering with thick soil layer**
- **A trench is dug all around to drain of water.**

21. Give **two** factors that determine the size of a pit for silage making.
- **No. of animals to be fed.**
- **Length of dry season the material is intended to cater for.**
- **Bulkiness of the materials**
- **Amount of plant material available for ensiling.**

22. Outline **four** qualities of good silage.
- **Have more lactic acid /5 – 9% to butyric acid.**
- **Free of moulds and bad odours.**
- **Be green to yellow in colour with no slimness.**
- **Have a pH of 4.2 or below.**

23. The diagram shows a method of conserving forage.



(a) Identify the structure shown above
- **Clamp silo**

(b) Outline **two** qualities of a good quality silage
- **Be from high quality**
- **Have a PH of 4.2 or below**
- **Have 5-9% lactic Acid**
- **Be free from moulds / bad odour such as ammonia and butyric acid**
- **Be greenish to yellow colour / not brown**
- **Have a fine texture**

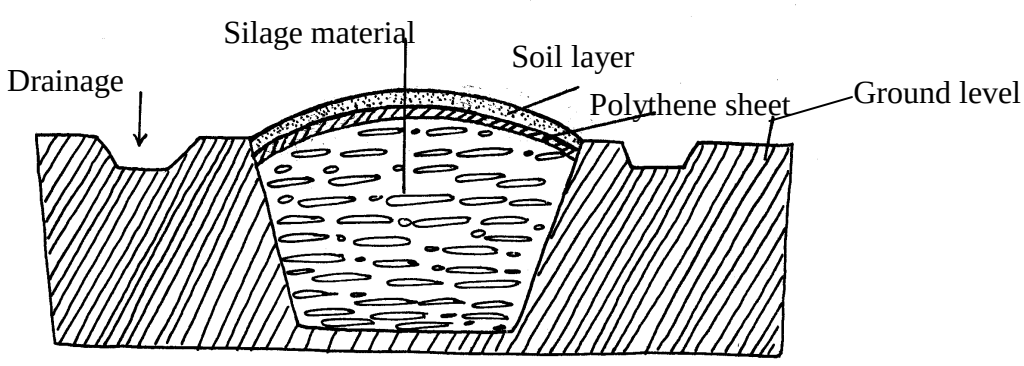
(c) Briefly explain the **three** main categories of silage losses
- **Surface spoilage**
- **Up to 20% loss due to exposure with soil**
- **Seepage losses**
- **Occurs if silo is not water tight**
- **Gaseous losses**
- **Respiration resulting to loss of carbohydrates inform of carbon (iv) oxide**

24. Name **four** practices used by farmers to reduce the temperature of a silo during silage making.
- **Increase the speed of ensiling**
- **Add succulent materials**
- **Increase rate of compaction**
- **Sprinkle/add water**

25. Give **two** reasons why maize should be harvested at milky stage for silage making.
- **Succulent / high moisture content**
- **High dry matter / high nutrient content**
- **Good leaf: stem ratio**
- **Has soluble carbohydrates that encourage fermentation**

26. State **two** roles of additives in silage making.
- **To increase palatability**
- **To increase nutrient value of silage/nutrient quality of silage**
- **To restrict the growth of undesirable microbes/micro-organisms, but encourage growth of desirable microbes**
- **To increase carbohydrate supply for proper fermentation**

27. Study the diagram on silage making shown below and answer the questions that follow.



a) Identify the silage preparation method shown above.
- **Trench silo**

b) State **three** precautions taken when ensiling high quantity silage
- **Compact the material after every 10 to 12cm layer**
- **Fill the silo rapidly preferably in less than 2 days**
- **The ensiled material should have a "ridge" shape or humped appearance when ensiling in complete.**
- **Check temperature if higher than 32.2% water should be added and compaction reduced but if the temperature is below 32.2% compaction should be increased and dry material or molasses added.**

- **Ensiled material should be covered with a polythene sheet or a layer of dry grass to protect it from water and air.**
- **The silo is covered with a thick layer of soil maintaining the ridge appearance**
- **Dig a trench all around the silo to drain off access rain water.**

c) State **two** advantages of this method of forage conservation over other methods.

- **Few field losses**
- **More nutrients are preserved**
- **Can be preserved for a long period of time**
- **No storage problem**
- **Does not depend much on weather conditions**
- **Does not entirely require liquid additives**
- **Suitable for a slightly sloping ground to ensure proper drainage**

28. Distinguish the following terms as used in pasture management.

Intensity of defoliation

- **Proportion of herbage removed through grazing and that of residual forage**

Frequency of defoliation

- **How often forage stand is grazed / cut for feed**

29. **Describe** the establishment and management of a grass pasture from land preparation to the time the pasture is ready for grazing

(i) Land preparation.

- **Clear land and remove the stumps**
- **Cultivate and harrow land to fine tilth**
- **Prepare land early / during the dry season / before rains.**
- **Ensure that land is free from weeds**
- **Firm the seed bed using rollers before planting**
- **Select desirable variety of seed grass for the ecological zone of the area.**

(ii) Planting

- **Use certified seeds/ healthy seeds**
- **Plant / sow the seeds at the onset of rains just before rains / during planting / early planting.**
- **Apply phosphatic fertilizer at planting time at appropriate rates.**
- **Drill or broadcast the seeds evenly on the seed bed.**
- **Use a recommended seed rate for the variety chosen.**
- **Bray twigs or gunny bags to cover the seeds.**
- **Lightly with soil or plant 3-5 times the diameter of seeds.**
- **Firm the seed using rollers after sowing / planting seeds.**

(iii) Field management practices

- **Control weeds by uprooting or applying appropriate herbicides.**
- **Apply nitrogenous fertilizers about 6 weeks after germination in split application.**
- **carry out reseeding**
- **Avoid grazing when pasture is too young.**
- **Irrigate in dry season.**
- **Cut back / practice light grazing in the initial phase of establishment to encourage lateral growth.**
- **To control pests e.g. moles.**
- **Use the correct stocking rate to avoid overgrazing.**

30. Give **two** ways of forage utilization.

- **Stall feeding / cut and carry/ zero grazing**
- **Rotational grazing**
- **Herding**

31. **List three** pasture Legumes grown in medium altitude zones

- **Lucerne /Alfafa/ medicago sativa**
- **Stylo /s. gracilis.**
- **Green leaf desmodium/ D. infortum**
- **Silver leaf desmodium / D. ucinatum**

32. Name three pasture legumes found in low altitude zones.

- **Stylo**
- **Glycine**
- **Centro**

33. Classify the following pasture legumes based on altitude: desmodium, centro, clover, vetch, siratro, glycine

- **Low altitude pasture: Centro, Glycine**
- **Medium altitude pasture: Desmodium Siratro**
- **High altitude pasture: Clover Vetch**

34. **Define** the following terms as used in pasture management.

(i)Topping

- **Removal of stemy fibres materials left over after a period of pasture grazing**

(ii)Defoliation

- **Grazing on pastures**

35. Give **four** practices that should be carried out to improve grass pastures.

- **Top dress with nitrogenous fertilizers occasionally.**
- **Control weeds.**
- **Re-seeding when necessary.**
- **Irrigate where possible.**
- **Practice controlled grazing to avoid denudation.**
- **Control pests**

36. State **four** effects of late defoliation.

-Forage has high DM content
-Has high cellulose content/fibrous
-Has high lignin, chitin, tannin and silica hence indigestible
-Low leaf stem ration
-Low dry matter digestibility
-Low crude protein

37. State **two** ways of increasing carrying capacity of pasture.

- **Application of manures / fertilizers**
- **Weeds control**
- **Irrigation**
- **Control of pests in pasture**
- **Supplementary feeding**
- **Defoliation at the right growth stage**
- **Grazing different categories of animals**
- **Forage conservation in the form of hay, silage or standing forage.**

38. A cow weighs 350kg. she requires 3kg of Dry matter for every 100kg 0f body weight Per day. **Calculate** the amount of Dry matter that she requires for a period of 30 days.(Show your working) (1½mks)

$$= \left(\frac{350}{100} \times 3\right) = 10.5kg\ 1\ day$$

$$\therefore 30\ days = (30 \times 10.5) = 315kg\ of\ D.M$$

39. **Give four** methods of utilizing sorghum crop as a forage crop.

- **Grazing**
- **Fodder**
- **Making silage**
- **Cutting and feeding green/ silage/cut and carry**

40. Give **two** effects of overstocking on soil

- **It leads to depletion of pasture leaving the soil bare thus prone to erosion**
- **It encourages destruction of soil structure / soil capping leading to loss of nutrients.**

41. State **two** characteristics of high altitude pastures

- Vigorous growth throughout the year
- Are ever green

42. Describe the procedure of under sowing Rhodes grass in a field of maize.

- **Maize is planted according to the recommended spacing.**
- **After 2 – 3 weeks weeding is done**
- **Pasture seeds are mixed with phosphate fertilizer and broadcast**
- **No fertilizer weeding should take place and maize is harvested early to expose young pasture.**

43. Explain the following terms as used in pasture establishment

(a) Seed inoculation

- **Dressing of legumes with nitro-culture in order to improve nitrogen fixation in the root nodules.**

(b) Over sowing

- **Is the introduction of pasture legume in an existing grass pasture**

44. State **three** factors that influences the carrying capacity in pasture management

- **Soil fertility**
- **Pasture persistence to grazing pressure**
- **Rainfall amount**
- **Foliage productivity**
- **Type of pasture either mixed or pure**

45. (a)Discuss Desmodium production under the following subheadings

i. varieties

- **Green lead Desmodium**
- **Silver leaf Desmodium**

ii. land preparation

- **clear the land**
- **Land prepared early during the dry season.**
- **Remove all perennial weeds.**
- **Ploughed and hallow land to fine tilth.**

iii. utilization

- **Hay**
- **Cut and feed to livestock while green.**
- **Direct grazing.**

(b) (i) Explain the advantages of grass legume pasture

- **More palatable**
- **Farmer has security against total loss due attack by pest, disease or bad weather.**
- **High yields per unit area**
- **Has a better weed control affect.**
- **Has good soil erosion control due to good coverage of soil.**
- **Economy in use of fertilizers**
- **Increases soil fertility due to nitrogen fixation**
- **More nutritious**

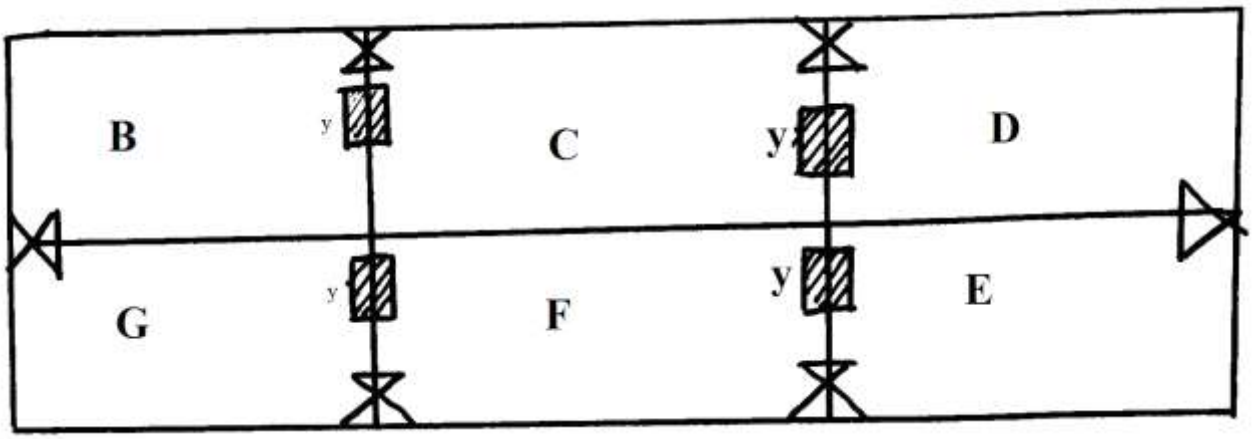
(ii) List the methods of sowing pasture seeds

- **Direct sowing**
- **Under sowing**
- **Over sowing.**

46. Name two reasons why sorghum is a drought resistant crop.

- **Well developed rooting system**
- **Rolling of leaves**

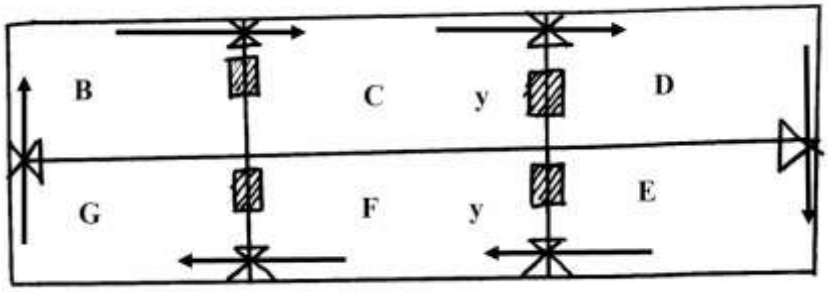
47. Study the illustration below and use it to answer the questions that follow:



(a) Identify the grazing system.

- **Rotational grazing/puddocking**

(b) With the help of arrows, indicate the movement of livestock from one section to the next on the illustration above.



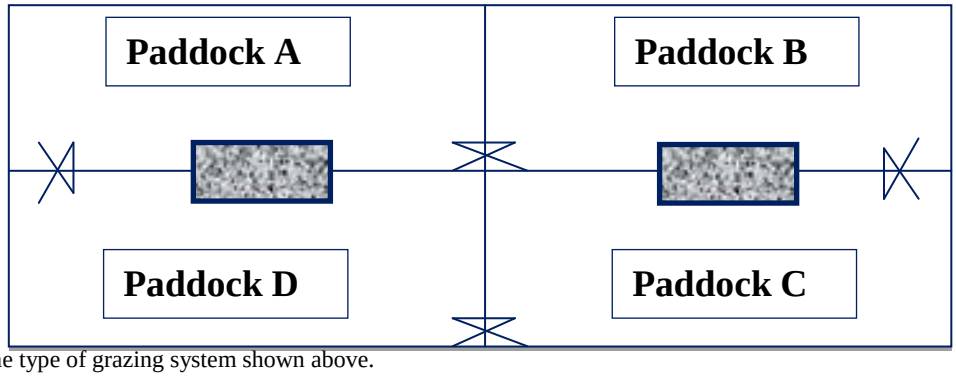
(c) What is the use of the parts labeled Y.

- **It contains water for animals/water trough**

(d) State **two** advantages of the grazing system.

- **Ensure maximum use of pasture**
- **Reduces build up of pests and diseases**
- **Gives pasture time to regrow.**
- **Allows enough time for weeding and re-seeding**

48. The diagram below shows a system of grazing. Study it and answer questions that follow



a) Identify the type of grazing system shown above.

- **Paddocking**

b) Identify the points shaded in the above diagram.

- **Water trough**

c) State **three** importance of zero grazing.

- **Minimized spread of pests and diseases**
- **There is accumulation of manure**

- **Increased production since animals have minimized movements.**

49. State **four** reasons why farmers conserve forage.
- **Distribute forage throughout the year.**
- **Provide food in dry season**
- **Sale the excess forage**
- **For better and fully utilization of available land.**

50. Explain the management practices which should be carried out to maintain pasture productivity in a field.
- **Weed control – to reduce effects of weeds on pastures by uprooting, slashing use of herbicides.**
- **Top dressing – Apply fertilizer to improve quality, herbage yield etc**
- **Topping – Removal of stemmy fibrous material to stimulate new growth.**
- **Re-seeding – Refilling gaps to achieve correct crop population.**
- **Control grazing – Done through paddocking, strip grazing or tethering to avoid over grazing.**
- **Pest control – Avoid effect of pests for higher and quality yield.**

51. State **four** practices that should be carried out to maintain grass pastures.
- **Top dress with Nitrogen fertilizers/ occasionally apply manure**
- **Control weeds.**
- **Practice controlled grazing.**
- **Cut back dry and unpalatable stems to encourage fresh growth/topping.**
- **Irrigate where necessary.**
- **Control pests e.g. moles, locusts, termites.**

52. Give **three** effects of overstocking in pasture management.
- **Insufficient re-growth period for the forage.**
- **Overgrazing and loss of soil cover leading to soil erosion.**
- **Invasion of un desirable plant species e.g weeds/shrubs.**

53. List **three** reasons f or forage conservation.
- **To avoid wastage of pasture.**
- **Excess pasture may be sold for income.**
- **For better and full utilization of available land.**
- **To ensure even supply of feed to livestock throughout the year.**

54. Differentiate between oversowing and undersowing.
- **Over sowing is planting of legume crop/pasture/ high quality crop in an already existing pasture field/grass pasture while under sowing is the establishment of pasture crop under an existing nurse crop/cover crop i.e maize, sunflower, wheat or barley**

55. Describe pasture establishment using seeds starting from land preparation to the time it is ready for utilization.
- **Seed bed preparation**
- **Clearing the land**
- **Primary cultivation**
- **Secondary cultivation to a fine tilth because the seeds are very small**
- **Done during dry seasons**
- **Select seeds of high germination percentage free from impurities**
- **Planting is done at the beginning of the rains**
- **Seed rate depends on purity of seed, pasture species and whether pure or mixed stand**
- **Apply phosphatic fertilizer when planting and top dress with nitrogenous fertilizer**
- **Methods of sowing are direct sowing under sowing or over sowing**
- **Re-seeding or gapping is done if the grass is completely denuded**
- **Control of weeds by slashing, uprooting and mowing**
- **Fertilization of pastures done by manures and nitrogenous fertilizers**
- **Topping-removal of stemmy fibrous material left behind after grazing**
- **Control of pests by trapping use of pesticides and biological means**
- **Pastures should be utilized at maturity when nutritive value is high**
- **It is utilized by direct grazing or zero grazing**
- **Utilized at about 6-8weeks or 1m-1.5m in height**

56. Describe the establishment of grass pasture from the time the land is ploughed using a mould board plough to the time the pasture is ready for grassing
- **Harrow during the dry or before the rains**

- **Harrow the land to a fine filth**
- **Make the seed be weed – free / ensure clean seed bed**
- **Firm the seed bed using rollers after sowing**
- **Select a desirable variety of seed for the ecological zone,**
- **Use certified seeds/ healthy seeds.**
- **Sow seeds at the onset rains/ early planting**
- **Apply phosphatic fertilizers / SSP. DSP, TSP at appropriate rate of 200 – 300 kg/ ha at planting time**
- **Drill or broadcast the seeds evenly**
- **Use a recommended seed rate for the variety / seed rate of 1.5 – 2.0 kg/ha pure seeds**
- **Bury seeds at 2 ½ times their diameter/ Drag a twig or gunny bag to cover the seeds lightly**
- **Control weeds by uprooting/ apply a suitable herbicide**
- **Apply nitrogenous fertilizers about 6 weeks after germination in split application.**
- **Avoid grazing when the pasture is too young.**
- **Practice light grazing in field in the initial phase of pasture establishment.**

57. Discuss the production of Guatemala grass (*Trypsacum Laxum*) under the following headings

a) Ecological required

- **Altitude - 2000 m above sea level**
- **Soils - well drained deep fertile**
- **Rainfall High rainfall above 900mm per annum Well distributed throughout the growing period**

b) Land preparation

- **Prepare land early enough/ during dry season/ before onset of rains**
- **Carry out primary cultivation appropriately**
- **Harrow to a medium tilth**
- **Remove all perennial weeds**

c) Planting

- **Establishment from stem cutting or splits or seeds makes furrows at a spacing 1m apart. Plant the grass 0.5m apart within the rows. Holes may also be used**
- **Planting is done on the onset of long rains**
- **Phosphate fertilizers are used as planting fertilizers**
- **DAP fertilizer is applied at the rate of 100 – 150kg/ ha**
- **Organic manure is applied at the rate 10 tones/ ha**

d) (i) Utilization and defoliation

Utilization **– chopped and fed to livestock as green fodder**

Defoliation **– can be harvested when it is over 8 – 12 weeks**

ii) Discuss **six** effects of late defoliation of fodder

- **Forage has high DM content hence high DM yield**
- **High cellulose content hence it is woody and fibrous**
- **High lignin cuten lannin and silia content which are all indigestible**
- **It has low crude protein content**
- **It has low leaf stem – ratio**
- **It has low dry matter digestibility**

58. (a)**Describe** the establishment of grass pasture from the time the land is ploughed using mould board plough to the time the pasture is ready for grazing.

- **Harrow the land to fine tilth**
- **This should be done during a dry season before rain.**
- **A clean seedbed/ weed free seedbed is desirable**
- **Firm the seedbed using rollers (before or after planting)**
- **Select the desirable varity of seed grass for the ecological zone of the area**
- **Plant seeds at the onset of rains or just before the rains/ early planting.**
- **Apply phosphatic fertilizer / SSP,DSP or TSP at planting time at appropriate rate i.e. 200-300kg /ha.**
- **Drill / broadcast the seeds evenly**
- **Use a recommended seed rate for the varity or 1.5 – 2 m kg / ha of PGS or 15-10 kg/ha of non –PGS**
- **Drug a twig or gunny bag to cover the seeds lightly /plant at 3-5 times the diameter of the seeds**
- **Control weeds by uprooting / applying a suitable herbicide.**
- **Apply nitrogenous fertilizers about 6 weeks after germination in split application**
- **Cut back / practice light grazing in the initial phase of establishment to encourage lateral growth.**
- **Avoid grazing when pasture is too young**

- **Use certified seeds /healthy seeds**

59. **Describe** the different methods of pasture conservation and utilization
- **Hay making i.e. dried forage e.g. pasture grasses and legumes**
- **Silage making, anaerobic fermenting of succulent fodders**
- **Standing forage i.e. set aside for dry season feed**
- **Defoliation to store in stores**
- **Paddocking i.e. grazing animals in one paddock then move to the next one**
- **Strip grazing i.e. allowing animals to graze on restricted areas**
- **Tethering**
- **Continuous grazing i.e. pasture not allowed any resting period**
- **Zero grazing i.e. defoliate and feed directly to animals**

60. (a)Describe the establishment of grass pasture from the time the land is ploughed using a mouldboard plough to the time the pasture is ready for grazing.
- **Harrow the land to fine tilth**
- **Before onset of rains**
- **Clean seedbed / weed free**
- **Select desirable variety**
- **Plant at onset of rains**
- **Apply phosphatic fertilizers**
- **Drill/ broadcast seeds evenly**
- **Use a recommended seed rate for the variety**
- **Drug a twig/ gunny bag to cover the seeds**
- **Control weeds by uprooting/ applying a suitable herbicide**
- **Apply nitrogenous fertilizers about 6wks after germination**
- **Cut back/ practice light grazing**
- **Avoid grazing when pasture is too young**
- **Use certified seeds/ healthy seeds**

61. (a) **Describe** the establishment of grass pasture from the time the land is ploughed using a disc plough to the time the pasture is ready for grazing.
- **Harrow the land to a fine tilth.**
- **This be done during dry season /before rains**
- **A clean seedbed / a weed free seedbed are desirable.**
- **Firm the seedbed using rollers.**
- **Select a desirable variety of grass for the ecological zone of the area.**
- **Plant seeds at onset of rains/before the rains / early planting.**
- **Apply phosphate fertilizers at an appropropriate rate i.e. 200-300 kg ssp/ ha.**
- **Drill /broad cast the seeds evenly**
- **Use recommended seed rate for the variety / e.g. low quality seed5- 10kg /ha of ≤ 12.5% PGS. High quality seeds 1.5 – 2.0 kg /ha of 13-25% PGS.**
- **Drag a twig /gunny bag to cover the seeds lightly i.e. at depth 3- 5 time the diameter of seeds.**
- **Control weed by uprooting / applying a suitable herbicide / keep the seedbed weed free,**
- **Apply nitrogenous fertilizer about 6 weeks after germination in split application.**
- **Cut back / practice light grazing in initial phase of establishment.**
- **Avoid grazing when pasture is too young.**

62. Describe the establishment of grass pasture from the time the land is ploughed using a mould board plough to the time the pasture is ready for grazing
- **Harrow the land to a fine filth**
- **Harrow during the dry or before the rains**
- **Make the seed be weed – free / ensure clean seed bed**
- **Firm the seed bed using rollers after sowing**
- **Select a desirable variety of seed for the ecological zone,**
- **Sow seeds at the onset rains/ early planting**
- **Apply phosphatic fertilizers at appropriate rate of 200 – 300 kgs/ ha at planting time**
- **Drill or broadcast the seeds evenly**
- **Use a recommended seed rate for the variety / seed rate of 1.5 – 2.0 kh/ha pure seeds**
- **Bury seeds at 2 ½ times their diameter**
- **Control weeds by uprooting/ apply a suitable herbicide**
- **Apply nitrogenous fertilizers about 6 weeks after germination in split application.**
- **Avoid grazing when the pasture is too young.**

- **Practice light grazing in the field phase of pasture establishment.**

(ii) Preparation of Hay

- **Cut the grass /legume in the field when 50% of it is starting to flower**
- **The cut forage is spread in the field for four continuous days (sunny days)**
- **The cut forage is turned daily for even for four uniform drying**
- **Gather the dried material in a central spot**
- **Bale the material**
- **Properly store the baled hay**

63. Discuss the production of Napier grass under the following sub-headings:

(a) Seedbed preparation

- **Should be done early**
- **Clear the vegetation**
- **Carry out primary cultivation**
- **Carry out secondary cultivation**
- **The seedbed should be of medium tilth**
- **Clear all perennial weeds**
- **Make the hole at appropriate spacing and depth**
- **Spacing should be 90-100 between the rows where cuttings are planted and 90-100x50 for splits**

(b) Planting

- **At onset of rains /early planting**
- **Select the suitable variety of Napier grass for the ecological zone of the area**
- **Use healthy planting materials**
- **Place planting materials in the furrows /holes at the recommended spacing**
- **Cover the planting material with soil in an appropriate depth.**
- **Use cuttings/ splits**
- **Select cuttings from mature stems /canes**
- **Cuttings should have 3 -5 nodes**

(c) Fertilizer application

- **Apply phosphatic fertilizers at appropriate rate at planting time.**
- **Top dress Nitrogen and potassium fertilizers six – eight weeks after planting**
- **Apply FYM /compound manure before planting**
- **Amount of manure should be 10 tonnes per hectare**
- **Apply organic manure after harvesting and dig it in after a year.**

(d) Weed control

- **Dig to control weeds.**
- **Uprooting weeds**
- **By slashing**
- **By use of suitable herbicides**
- **By interplanting with legumes which cover the ground e.g. mucuna beans and Desmodium.**
- **Weed control practices should be carried up early during the establishment stage.**

64. Explain Napier grass production under the following sub-headings

a) Seedbed preparation

- **Done during dry period/ done early**
- **Clear vegetation/ remove stumps**
- **Carry primary cultivation/ harrowing to**
- **Make furrows/ holes**
- **Spacing 90cm x 50cm for cutting and 90cm x 50cm for splits**

b) Planting

- **At on set of rains/ early planting/ irrigate if necessary**
- **Select variety for ecological condition of the area**
- **Use health planting material**
- **Place the planting material in holes/ furrows**
- **Cover the planting material with soil to an appropriate depth**
- **Use cuttings or splits**
- **Select cutting from mature cane/ stems**
- **Cutting should have 3-5 nodes**

c) Fertilizer application

- **Apply phosphatic fertilizer at planting 200kg/ha**
- **Apply manure before planting, 7-10 tonnes/ha**
- **Top dress phosphorous fertilizer after 8 weeks after planting**
- **Apply manure after harvesting and dig it**

d) Weed control

- **Cultivation/ tillage/ mechanical**
- **Uprooting**
- **Slashing**
- **Suitable herbicide application**
- **Inter-planting legumes as cover crops e.g. Desmodium,**

e) Utilization

- **Cut and take to animals when proportion of leaf is higher than the stem/ 3-5 months after planting/ frequency 8 weeks**
- **Cut down excess foliage to conserve as silage or hay**
- **Cut and sold**
- **Cut when mature to get stem cuttings for planting**
- **Cut stems at 2.5 – 5cm above the ground surface**
- **Use a sharp panga for harvesting**
- **Chop forage into small pieces before feeding**
- **Na[pier grass is cut, dried and used as mulching material**

AGRICULTURAL ECONOMICS III (PRODUCTION ECONOMICS)

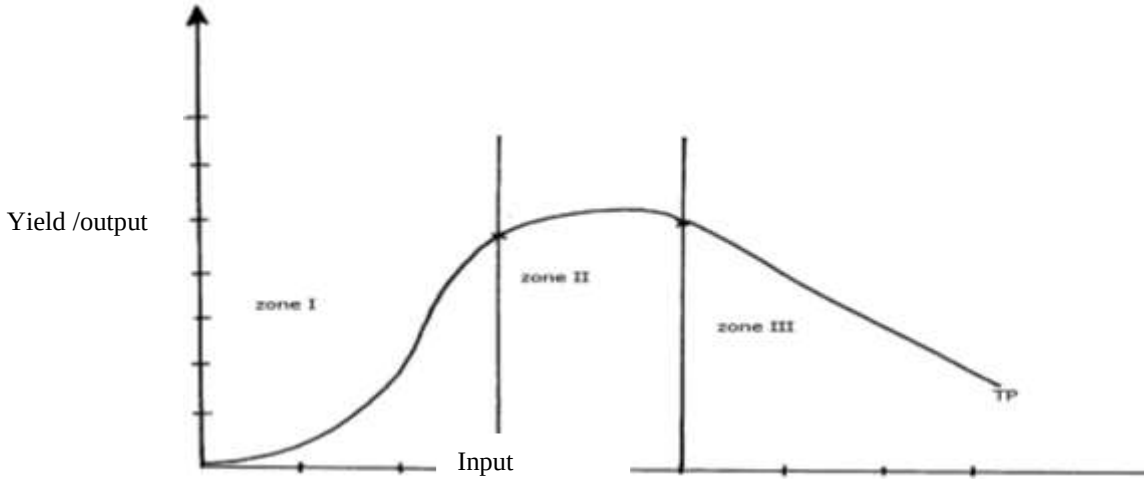
1. **What** is a production function?

- **The physical relationship between inputs and output which shows the quantity of output that may be expected from a given combination of inputs.**

2. **Name three** types of production functions.

- **Increasing Returns production function.**
- **Decreasing Returns production function**
- **Constant Returns production function**

3. **a) Draw** a general production function curve



b) State three things that happen in **Zone III** of a production function curve

- **Total product declines**
- **Marginal product becomes negative**
- **Over-utilization of the resource factors**

4. What is production economics?

- **It's a branch of economics which deals with how resources (factors of production) are combined in a production process.**

5. **What** is increasing returns in a production function?

- **This is production in which each additional unit of input results in decrease of output than proceeding unit of input.**

6. At what point in production economics is profit maximized?

- **At the point where MR=MC**

7. Give **three** types of product-product relationships in production economics.

- **Competitive products**
- **Joint products**
- **Supplementary products**
- **Complementary products**

8. Explain what is meant by "Marginal product" in production economics.

- **Marginal product means additional product got when additional unit of input is added to fixed inputs.**

9. Distinguish between the terms variable costs and fixed costs as used in production economics.

- Variable costs **are costs of inputs that vary with level of production and can be foregone if enterprise is discontinued,** while fixed **costs are costs of inputs that do not vary with level of production and cannot be forgone.**

10. State **four** ways of increasing labour efficiency on the farm

- **Assigning specific tasks according to skills and specialization**
- **Educating and training the labourers**
- **Provision of proper tools & equipment to the labour force.**
- **Proper supervision of farm labour**
- **Mechanization of farm operations**
- **Good operator - worker relationship/Promote good human relation between management and farm workers**

11. Describe the various ways used to improve labour production

- **Training; through formal or informal to acquire the necessary knowledge and skills for various agricultural principles and practices**
- **Farm mechanization – perform work faster and more efficient**
- **Labour supervision –monitors and advices for efficiency of productivity to avoid absenteeism, malingering , theft ,dishonesty and disputes**
- **Assigning specific tasks- to tap the various talents/ Job specialization that is completed before embarking on another.**
- **Giving incentives and improving terms and conditions of service to motivate labour to work hard and efficient e.g.**
  - **Provision of good and competitive salaries to employees.**
  - **Provision of good working conditions e.g. healthy environment & proper protective clothing.**
  - **Giving reasonable lengths of working period**
  - **Promoting individual qualities of farm workers**

12. State **four** charges that would indicate improvement of labour efficiency in a farm.

- **Amount of work done**
- **Duration of work**
- **Labour regulations/market rates**
- **Nature of work**
- **Quality of work/skilled labour**

13. State **four** ways a farmer may use to improve production efficiency without incurring extra cost

- **Efficient use of labour**
- **Adopting new production technologies and methods.**
- **Organizing marketing activities.**
- **Selecting proper enterprises**
- **Raising the farm plans as may be deemed necessary.**
- **Mechanization of farm operation.**
- **Following proper production practices.**

14. a) What is marginal rate of substitution

- **Marginal rate of substitution is how much of one resource factor can be replaced by one unit of another factor maintaining the same level of production i.e.**

$$\textbf{MRS} = \frac{\textbf{Change of input being replaced}}{\textbf{Change of input being added}}$$

b) Farmer using 60kg of maize grain and 40kg of wheat decides to change to 50kg of maize grain and 47kg of wheat to prepare a ration, calculate the marginal rate of substitution

MRS = Change of input being replaced

Change of input being added
= Change in maize grain
Change in wheat grain
= 60-50
47-40
= 10
7
= 1.42

15. a) state **five** factors considered when planning a farm

- **Size of the farm**
- **Farmers' objectives and preferences**
- **Existing market conditions**
- **Expected returns**
- **Government policy**
- **Security**
- **Communication and transport facilities**
- **Current trends in labour market.**
- **Environmental factors.**
- **Availability and cost of farm inputs. /Available resources**
- **Possible production enterprises-consider the requirement of the various enterprises**

(b) **State two** pieces of information that a dairy farm manager would collect for planning purposes.

- **Marketing information**
- **Prevalence of pests & diseases**
- **Capital available**
- **Climatic condition**

16. a) Describe the steps farmers should follow when planning a farm business.

- **Determination of the farmer's objectives and preference in order to eliminate those production possibilities that are unsuccessful**
- **Determination of available resources to the farmer in order to establish his/her abilities and limitations.**
- **Determination of possible productive enterprises**
- **Determination of tentative budget/ translation of physical plan into a financial**
- **Determination of yield for various enterprises**
- **Development of financial flow in order to establish the capital requirements**
- **Examination of the plan to ensure that it is consistence, workable and desirable**
- **Determination of government policies and regulation to make the plan realistic.**

(b) Under what conditions is partial budget an appropriate tool for planning.

- **While expanding an enterprise/changing the size of an enterprise**
- **When changing the production techniques**
- **When changing the size of land under a crop**
- **When changing an enterprise**

17. State **three** advantages of planning in farm business

- **Helps in decision making**
- **Predict future returns**
- **Avoid incurring losses**
- **Enable the farmer to secure a loan**
- **It helps in periodic analysis**
- **It is a form of farm record**
- **It pin points the efficiency or weakness in the farm**

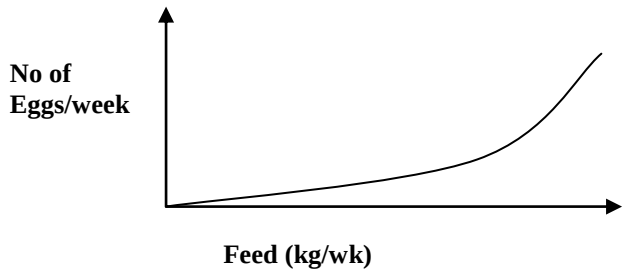
18. Outline **four** management guideline questions which assist a farm manager in making accurate farm decisions

- **What product to produce?**
- **How much to produce?**
- **What to produce?**
- **For whom to produce?**

19. The table shows egg production from individual birds with varying amounts of layers mash

100 layers (Fixed number)	Layers mash Kgs/week	Total egg production per week	Marginal production /week
100	0	140	0
100	10	155	15
100	20	180	25
100	30	240	60
100	40	340	100
100	50	470	130

(a) Sketch a graph representing the total egg production per week against amount of feed given



(b) Identify the type of production function represented by the graph in (a) above

- **Increasing returns production function.**

20. List **four** agricultural support services available to a **crop** farmer in Kenya

- **Banking**
- **Extension and training**
- **Credit facility**
- **Agricultural research**
- **Marketing**
- **Farm input supplies**
- **Tractor hire service**
- **Input supply services.**

21. **List four** agricultural support services available to **livestock** farmers.

- **Extension services**
- **Research services**
- **Training services.**
- **Credit facilities**
- **Marketing services**
- **Tractor hire services**
- **Banking services**
- **Insurance services**
- **Artificial insemination (AI)**
- **Veterinary services.**
- **Input supply services.**

22. State and explain **five** agricultural services offered to farmers.

(i) **Training and extension services – Informal education given to the farmers through the field extension officers at divisional levels and chief's Baraza by the government and other non-government organisation**

(ii) **Banking services-This includes savings and credit schemes, loans etc. farmers can have savings or current a/c. The banks also offer advisory services on credit facilities and investments**

(iii) **Credits services (loans) – Farmers can borrow working capital and pay it with interest. Farmers may offer security items as collateral against the credit.**

(iv) **AI (Artificial Insemination) - These can be offered by the government and other private organization. His enables farmers to breed high quality livestock**

(v) **Agricultural research. This is scientific research leading to new and better production techniques in crop and livestock production. The research which is done by the government and other organization is passed to farmers through the extension services system**

(vi) **Marketing- The farmers are facilitated to move their goods and services from their points of production to consumption organization such as K.C.C, K.T.D.A, K.P.C.U, help farmers to market their farm produce**

(vii) **Veterinary services –They are services that help farmers to keep healthy animals through control and treatment of parasites, and diseases**

23. Give **four** ways of improving labour productivity
- **Training**
- **Farm mechanization**
- **Labour supervision**
- **Giving incentives and improving terms and conditions of service**
- **Assign specific tasks**

24. Name any **three** types of agricultural services available to the farmer
- **Credit facilities**
- **Extension and training**
- **Agricultural research**
- **Banking**
- **Artificial insemination**
- **Veterinary**

25. List **four** variable inputs in sorghum production
- **Fertilizers**
- **Seeds**
- **Pesticides**
- **Casual labor**

26. Define the following as used in Agricultural economics:-

(a) Gross domestic product (GDP
- **The sum total of goods and services produced by a country within a period of one year**

(b) Per capita income
- **Per capital income: Is the gross national income divided by the number of people living in a country**

27. a) State the difference between Gross National production (GNP) and Gross Domestic Production (GDP)
- **GDP is the total of goods and services produced by a country within a period of one year.**
- **GNP-is the total output from resources owned by the nationals of a country wherever these resources happen to be located**

(b) Explain how farmers overcome **risks** and **uncertainties** in a farming business.
- Diversification- **growing a variety of crop or having various enterprises so that if one fails has something to rely on.**
- Insurance against losses- **taking insurance policy for farming activities so that in case of failure the enterprises are covered.**
- Inventory marketing- **strategic farming/ keeping farm product and selling when prices are favorable**
- Flexible enterprises **-engaging in enterprises that can be stopped or started early as condition change.**
- Rationing of inputs- **using just sufficient inputs such that in case of losses the cost are not too high**
- Using more certain husbandry practices- **using practices that the farmer is sure of and has used in the past.**
- Hedging/contract marketing making- **arrangements with marketing agencies in advance so that changes in price after the arrangement do not change the price of the farmer's produce.**
- Selecting more certain enterprises- **selection of enterprises that have more steady flow of income though less profitable than choosing more profitable enterprises which has high degree of income variation**

28. State **six** ways in which a farmer can adjust to **risks** and **uncertainties**.
- **Insurance against losses.**
- **Contracting/hedging against price fluctuation.**
- **Diversification of enterprises/variety of enterprises.**
- **Input rationing in the production process.**
- **Selecting enterprises that have done well in the area**
- **Engaging in enterprises which can be stopped or started as conditions change/flexibility.**
- **Adopting modern in methods of production e.g. Irrigation, vaccination**
- **Maintain liquidity – for use in case of any eventuality.**
- **Using more certain husbandry practices**
- **Inventory marketing/strategic farming.**

29. List down **four** ways in which the government may use to help the farmer adjust to risks and uncertainty.
- **Forecasting the weather**
- **Subsidizing input prices**
- **Regulate market**
- **Research and extension services**

30. How does the government control prices of essential farm produce?

- **Giving subsidies by reducing the cost of production inputs**
- **Fixes prices of the related products**

31. The table below represents the yield of maize in 90kg bags in response to application of different quantities of planting fertilizer

(i) Fill in the blank spaces

Input 50kg bag fertilizer	Output 90kg bag maize	Average product (AP)	Marginal product (MP)
0	6	-	-
1	10	-	-
2	24	-	-
3	31	-	-
4	36	-	-
5	40	-	-
6	43	-	-
7	43	-	-
8	40	-	-

Input 50kg bag fertilizer	**Output 90kg bag maize**	**Average product (AP)**	**Marginal product (MP)**
0	**6**	**-**	**0**
1	**10**	**10**	**4**
2	**24**	**12**	**14**
3	**31**	**10.33**	**7**
4	**36**	**9**	**5**
5	**40**	**8**	**4**
6	**43**	**7.18**	**3**
7	**43**	**6.14**	**0**
8	**40**	**5**	**-3**

(ii) Suggest the best level of production in relation to the inputs and output

- **The best level of production in relation to the inputs and output is level 3**

32. A farmer is considering undertaking the production of either maize or beans. Study the following information about the two crops then answer the questions that follow:

(i) Maize

Yield per hectare 5,500 kg
Price 15 per kg
Cost of cultivation Kshs. 3000/ha
Amount of seeds/ha 25kgs
Cost of DAP fertilizer/bag Kshs.1500
Amount of DAP fertilizer/ha 3bags
Cost of seeds/kg Kshs.100
Labour requirements/ha50 man days
Cost of labour Kshs.150 per man day
Amount of CAN fertilizer/bag 3 bags
Cost of CAN fertilizer/bag Kshs.1000

(ii) Beans

Yield per hectare 5000kg
Price 50per kg
Cost of cultivation / ha KShs.3600
Labour requirements/ha 75 man days
Cost of labour Kshs. 200 per man day
Cost of DAP fertilizer/bag Kshs. 1500
Amount of DAP fertilizer/ha 2 bags.
Cost of seeds/kg Kshs.800
Amount of seed/ha 20kg
Amount of C.A.N fertilizer / ha. 1 bag
Cost of CAN fertilizer/bag Kshs.1000
Cost of sprays Kshs.3, 000

a) Calculate the gross margins for each crop

(i) Maize

Value of maize/income	**5,500 x 15 = 82,500/=**
Cost of labour	**50x 150 = 7,500/=**
Cost of cultivation /ha	**1 x 3,000 = 3,000/=**
Cost of seed	**25 x 100 = 2,500/=**
Cost of DAP fertilizer	**3 x 1,500 = 4,500/=**
Cost of C.AN fertilizer	**3 x 1000 = 3,000/=**
Total variable costs	**20,500/=**
GM for maize	**82,500 – 20,500 = 62,000**

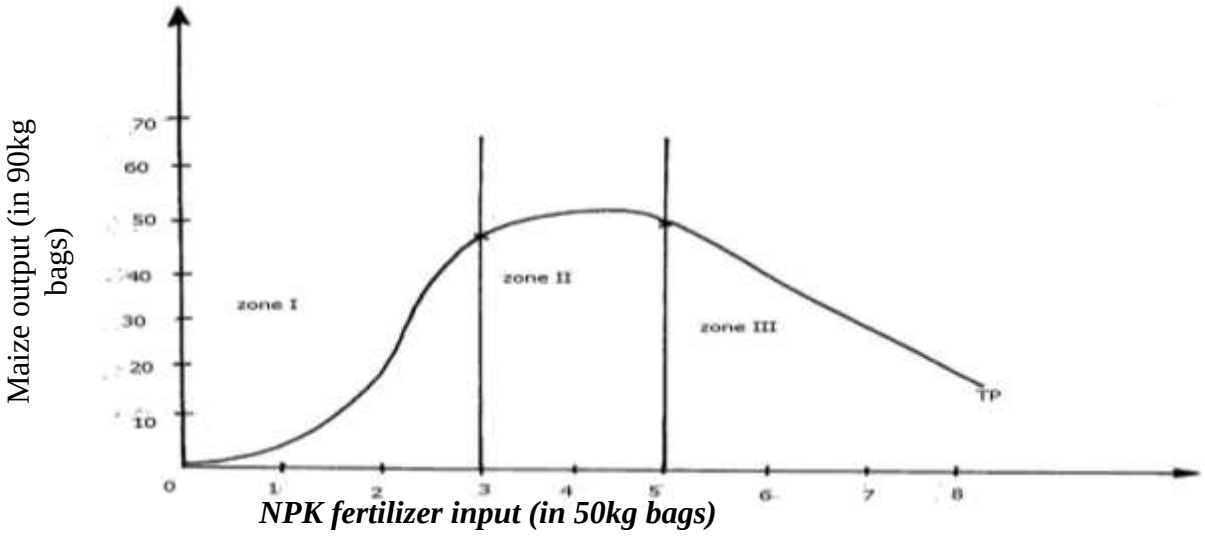
(ii) Beans

Value of beans/income	**5,000 x 500 = 250,000/=**
Cost of labour	**75 x 200 = 15,000/=**
Cost of cultivation /ha	**1 x 3,600 = 3,600/=**
Cost of seed	**20 x 80 = 1,600/=**
Cost of DAP fertilizer	**2 x 1,500 = 3,000/=**
Cost of C.AN fertilizer	**1 x 1000 = 1,000/=**
Total variable costs	**27,200/=**
GM for beans	**250,000 – 27,200 = 222,800**

(ii) From your calculation, which crop is profitable to grow?

- **It is more profitable to grow beans than maize**

33. Below is a graphical representation of the law of diminishing returns.



(a) Explain what happens in each of the three zones marked I and III in relation to the output of maize and the NPK fertilizer input

ZONE I

- For each additional unit of input applied the output of maize increased at an increasing rate because the fertilizer resources are underutilized

ZONE II

- For each additional unit of input applied the output of maize increased at a decreasing rate because the resources are used to the maximum

ZONE III

- For each additional unit of input applied the output of maize decreases because the fertilizer/ resources are excessively applied

b) Which of the **three** is a rational zone of production

- **ZONE II**

34. A farmer has the following yield from a two hectare millet crop enterprise at Mwea irrigation schemes. Study it and prepare his gross margin. Is it profitable to grow millet? He spent the following in his operations

Weeding 800/=
Seeds 20kg/ha
Irrigation 600/=/ha
Ploughing 500/=/ha
Clearing the land 1200/=
Cost of seeds 300/= /10kg bag
Planting 400/= /ha
Harvesting 1200/= /ha
Yield 32bags
DAP fertilizer 2 bags at 10 000/= /50kg bags
CAN fertilizer 2 bags at 700/= /50kg bags
Gunny bags 40/= /bag
Transport to market 2000/=
The price per 90kg bag is 1,200/=

ITEM	QUANTITY	NO. OF UNITS	COST PER UNIT	TOTAL VARIABLE COST
Weeding	**-**	**-**	**-**	**800 00**
Seeds	**20kg**	**2**	**300**	**600 00**
Irrigation	**-**	**2ha**	**600**	**1200 00**
Ploughing	**-**	**2ha**	**500**	**1000 00**
Clearing land	**-**	**-**	**-**	**1200 00**
Planting	**-**	**2ha**	**400**	**800 00**
Harvesting	**-**	**2ha**	**1 200**	**2400 00**
DAP fertilizer	**2bags**	**2**	**10 000**	**20 000 00**
DAN fertilizer	**2bags**	**2**	**700**	**1400 00**
Gunning bags	**32**	**32**	**40**	**1280 00**
transport	**-**	**-**	**-**	**2000 00**
Total variable cost				**32 680 00**
Income	**32bags**	**1200**	**38 400 00**	

Gross margin=total revenue-total variable cost
= 38,400-32,680
= 5,720.00, yes it is profitable

35. What is profit maximization in agricultural economics?
- **Is the level at which profit is maximum/ level at which marginal revenue is equal to marginal cost/point where net revenue is at its maximum**

36. Using the data provided in the table below, make an interpretation and advice the farmer on which crop to grow ;

Type of crop	Gross margin (KSh)
Cotton	18,400
Ground nuts	20,050

- **The farmer should grow groundnuts**
- **The crop has a higher gross margin than cotton**

37. State **four** benefits of budgeting to a farm manager.
- **To estimate future profitability.**
- **To estimate capital requirement.**
- **Used while seeking credit facilities from lending institutions.**
- **Submitting tenders for farm tenancy or sale.**
- **Estimating and determining future taxes.**
- **Estimating labour requirements.**

38. A farmer has 1 Ha piece of land on which he grows maize. His farm record on maize production for nine years is as shown in the table below:

Year	Fertilizer applied (bags)	Total output of maize (bags)
1995	0	4
1996	2	10
1997	4	28
1998	6	42
1999	8	52
2000	10	60
2001	12	66
2002	14	66
2003	16	64

a) Calculate the farmer's marginal products and average products for the years

Year	Fertilizer applied (bags)	Maize output (bgs)	Marginal product	Average product
1995	**0**	**4**	**-**	**-**
1996	**2**	**10**	**6**	**5**
1997	**4**	**28**	**18**	**7**
1998	**6**	**42**	**14**	**7**
1999	**8**	**52**	**10**	**6.5**
2000	**10**	**60**	**8**	**6**
2001	**12**	**66**	**6**	**5.5**
2002	**14**	**66**	**0**	**4.7**
2003	**16**	**64**	**-2**	**4**

b) From the data given, what rate of fertilizer application would the farmer choose if he wanted to grow maize in 2004?
4 bags

c) Give an explanation for your choice in (b) above
- **MP is maximum**
- **AP is maximum**

(d) Assuming that the average price of fertilizer over the years recorded was shs. 1,200/= per bag and the price of maize was ksh.1000/= per bag: Calculate the gross income for the years 2002 and 2003
Gross income = Total output x price per unit
In 2002; 66 x 1000 = 66000/=
In 2003; 64 x 1000 = 64000/=

e) Calculate the net income for the year 1999. (Assume no other costs were incurred)
Net income = Total income – Total cost
In 1999: Total income was 52 x 1000 = 52000/ and total cost was 8 x 1200 = 9,600/=
Hence 52000 - 9600 = Kshs. 42,400/=

39. Name **five** types of costs incurred in a farming business
- **Fixed costs (F.C)**
- **Variable costs (V.C)**
- **Total costs (T.C)**
- **Average costs (A.C)**
- **Marginal costs (M.C)**

40. List any **four** sources of credit to farmers.
- **Co-operative societies**
- **Crop boards**
- **Commercial banks**
- **Agricultural finance corporation (A.F.C)**
- **Settlement fund trustees**
- **Hire purchase companies**
- **Insurance companies.**

41. List **three** ways in which labour peaks can be overcome in the farm

- **Overtime working for casual labourers**
- **Greater use of casual workers**
- **Mechanization**
- **Use of contractors who may be engaged to do some work at a fee**
- **Cropping system devised such that ripening of crops could be at different times**
- **Work study to devise new techniques of doing work more quickly and efficient**

42. Baraka farm manager plans to grow Irish potatoes or maize for grains. Study the information below and answer the questions that follow:

Irish potatoes

Cost of fertilizers/ha_____ Kshs 10,000.
Labour requirements/ha _____ Kshs 50 man - days
Yield /ha _____ 10,000kg
Seed potato/ha _____Kshs20, 000
Cost of labour _____ Kshs 200 per man day
Cost of fungicides_____ Kshs 5000
Cost of ploughing_____ Kshs 4000
Selling price of potatoes per kg _____ Kshs 30.

Maize

Yield per hectare _____Kshs.7, 500kg
Selling price of maize per kg _____Kshs 20.
Cost of ploughing /ha _____Kshs.4000
Seed maize/ha _____Kshs.3000
Labour requirement /ha _____ 200 man days.
Cost of fertilizers /ha _____Kshs 10,000
Cost of top dressing fertilizers _____Kshs 4,800
Cost of labour _____Kshs 150 per man - day

(i) What is gross margin?

- **Gross margin is variable cost – total revenue**

(ii) Calculate the gross margin of each of the crops

Gross margin of Irish potatoes

Cost of fertilizer =Kshs 10000 x 5 = 50000
Cost labour requirement = 50 x 200 x 5 = 50,000
Cost of seed potatoes 20,000 x 5 = 100000
Cost of fungicides 5000 x 5 = 25000
Cost of ploughing 400 x 5 = 50,000
Total variable cost shs.145, 000
Total revenue = shs.50, 000 x 50 = shs.1, 500, 000
Gross margin =Kshs. 1,500,000 – shs.145, 000 =shs.1, 255,100

Gross margin of Maize

Cost of fertilizer. Kshs 10000 x 5 = shs.50000
Cost of fertilizer. Kshs. 4800 x 5 = shs.24000
Cost of maize seed shs.3000 x 5 = shs.15000
Cost f labour shs.200 x 150x 5 = shs.150000
Cost of ploughing shs.4000 x 5 = shs.20000
Total cost = shs.259000
Revenue 750000 X 5 X 20= Shs.750000
Gross margin = 750000 - 259000 = Shs.481000

(iii) From the calculation above which crop should the farm grow?

- **He should grow potatoes**

43. Explain the functions of co-operatives.

- **Provide services such as transport ,storage and processing**
- **Eliminate unnecessary middlemen, hence reduce costs and increase profits to farmers.**
- **Educating the members on farming related issues**
- **Negotiating for fair prices for the farmers**
- **Marketing farmers produce**
- **Keeping correct records on all co-operative activities**
- **Paying dividends to farmers**
- **Giving loans to members**
- **providing inputs to members**

(b) Arogo farm intends to increase its dairy herd from two to four cows. Considering the following specifications, determine whether the change is profitable.

- The acreage under maize is reduced by one hectare to cater for the extra two cows. Each cow requires the purchases of a replacement heifer each year at Kshs. 3500, while the cull price per cow is Kshs. 2500.
- Milk yield for each cow is 3500kg per cow per year, price of milk is KSh. 25 per kg.

- Each cow gives birth to a calf worth Kshs. 5000 every year.
- Veterinary service charge per cow is Kshs. 600, while the cost of concentrates and minerals per cow is Kshs. 1500 per year.
- The seedbed preparation cost for maize production is Kshs. 2400 per hectare. Planting and fertilizer cost of maize are Kshs. 2400 per hectare and 2600 per hectare respectively.
- Pest control cost for stalk borer is Kshs. 300 per hectare, weeding cost is Kshs. 2600 per hectare,
- Gunny bags for packing maize are purchased at Kshs. 40 each. Maize shelling is Kshs. 40 per bag. Maize yield is 60 bags per hectare. The maize price is Kshs. 1500 per bag **PARTIAL**

BUDGET FOR AROGO FARM

Debit (-)	Kshs	Ct	Credit (+)	Kshs	Ct
EXTRA COSTS			**COST SAVED**		
Replacement heifers 3500 x2	**7000**	**00**	**Seedbed preparation**	**2400**	**00**
Veterinary charge 600x2	**1200**	**00**	**Planting**	**2400**	**00**
Concentrates 1500x2	**3000**	**00**	**Fertilizer**	**2600**	**00**
			Stalk borer dust	**300**	**00**
			Weeding cost	**2600**	**00**
			Harvesting cost	**2600**	**00**
REVENUE FOREGONE			**Gunny bags (60x40)**	**2400**	**00**
Income of maize 1500x60	**90000**	**00**	**Shelling (60x40)**	**2400**	**00**
			EXTRA REVENUE		
			Sale of milk 3500x2@ 25	**175,000**	**00**
			Sale of extra calves 5000x2	**10,000**	**00**
			Cull prize 2500x2	**5000**	**00**
TOTAL	**101,200**	**00**	**TOTAL**	**207,700**	**00**

Total gains = Extra revenue + cost saved
Total cost = Extra costs + revenue forgone
Net gain/ loss = Total gains – Total cost
= 207,700-101,200 = 106,500
∴ It is advisable to reduce the acreage under maize and replace it with dairy cows since a profit of 106,500/= is realized.

44. A farmer in Mosocho division wishes to change from arable farming to dairy goat production. In arable farming he has been spending kshs.400 on weeding maize and Kshs 200 on weeding cabbages. He spends ksh.500 and Kshs 300 on harvesting maize and cabbages respectively. He buys the following inputs; DAP fertilizer at Ksh.1000, cabbage seeds for Kshs 400, maize seeds for Kshs 600. Pesticides cost ksh800. He also spends Kshs. 300 on shelling of maize.

The change in enterprise will have the following implications; He will buy 5 dairy goats at ksh.2000 each; pay milk man ksh.3000; control diseases at a cost of ksh.1500. Fencing of the farm will be done at a cost of ksh.1500.

The revenue he gets when growing maize is ksh.10000 and cabbages is ksh.4000. In dairy goat production, he will get Kshs 20,000 from sale of milk and Kshs 1000 from sale of manure

a) Prepare a partial budget and advise the farmer whether the change is worthwhile or not.

PARTIAL BUDGET

DEBIT (-)	KSHS.	CTS	CREDIT (+)	KSHS.	CTS.
Extra costs incurred			**Extra revenue**		
Cost of 5 dairy goats	10000	00	Milk sales	20000	00
Salary of milk man	3000	00	Manure sales	1000	00
Disease control	500	00			
Fencing	1500	00	SUB TOTAL	21,000	00
SUB TOTAL	15000	00			
			Costs saved		
Revenue forgone			Weeding maize	400	00
maize	10000	00	Weeding cabbages	200	00
Cabbages	4000	00	Harvesting maize	500	00
	14000	00	Harvesting cabbages	300	00
			DAP fertilizers	1000	00
			Maize seeds	600	00
			Cabbage seeds	400	00
			Pesticides	800	00
			Shelling maize	300	00
				4500	00
TOTAL	29000	00	TOTAL	25,500	00

(Extra revenue + cost saved) - (Extra costs incurred + revenue forgone)

=25,500-29,000

=-3,500

This indicates a loss hence the change is not worthwhile. He should not change the enterprise 1

b) State **four** factors that determine the choice of a farming enterprise (system)

- **Taste and preference of the consumer**
- **Availability of capital/resources**
- **Cultural/ traditional/ religious beliefs**
- **Knowledge of the farmer about the enterprise**
- **Government policy**
- **The enterprise itself**
- **Climatic factors**
- **Farmers choice**

45. Prepare a partial budget for Wanjala farm using the information given below. Mr. Wanjala has 10 hectares of which 4 hectares is planted with permanent cash crop (tea) , of the remaining six hectares , at least one half must be rested at any one time . This year he intends opening 3 hectares for cotton production. With previous cotton crops hired casual labour at the rate of 100 man – days per hectare at KSh 10 per man- day. He is considering replacing casual labour with hired tractor doing the work for KSh 275 per hectare. The farmer anticipates using the tractors will cause an increase in average cotton field from 800kg to 900kg seed cotton per hectare worth 1.10 per kg from better cultivation and timelier planting. Harvesting costs are shs.22 per kg seed cotton. Prepare a partial budget and advice the farmer whether the change is worthwhile or not.

APARTIAL BUDGET FOR WANJALA'S FARM

DEBIT (-)	KSh	Cts	CREDIT (+)	KSh	Cts
Extra cost incurred			**Extra revenue**		
Tractor cultivation @ 275 per Hectare for 3 hectares = (3 x 275)	825	00	Extra cotton – 100kg/ ha for 3 h at KSh 1.10 = 300 x 1.10	330	00
Harvesting labour 100kg seed cotton per hectare at @22 = 22 x 3	66		**Costs saved** Labour cost 100man day / ha i.e. 100 x 3 x 10 =	3000	00
Total extra cost = 825 +66	891				
Revenue foregone = 0					
Total Kshs	891		Total	330	00

(Extra revenue + cost saved) – (extra cost + Revenue foregone)

= Kshs 3330 – 891 = 2439

- **This shows that the change is worthwhile**

46. Give **two** examples of joint products in livestock production.

- **Wool and mutton**
- **Mutton and skin**
- **Milk and butter**
- **Beef and hides**
- **Honey and wax**

47. Name **two** types of credit given to farmers in Kenya.

- **Short term**
- **Medium term**
- **Long term**

48. A farmer, Alice has 6 hectares of arable land. The land is subdivided as follows:
Coffee 2 ha
Tea 2 ha
Cabbage 1 ha
Tomatoes 1 ha
She wishes to know whether replacing horticultural crops with dairy farming would be worthwhile.
The table below shows the expenditure of the farm during the year

Type of crop	Labour	Cost(Kshs)	Other inputs	Cost (Kshs)
Coffee	Weeding	5,000/-	Fertilizer	3,000/-
	Pruning	4,000/-	-	
	Picking	5,000/-	-	
Tea	Weeding	-	Fertilizer	1,000/-
	Pruning	2,000/-	-	
	Plucking	4,000/-	-	
Cabbage	Weeding	200/-	Fertilizer	1,000/-
	Harvesting	400/-	Seeds	100/-
Tomatoes	Weeding	400/-	Chemicals	2,000/-
	Pruning	700/-	Seeds	80/-
	Harvesting	800/-		

The output realized from the above is as follows:-
Coffee 10,000 kg at 5/= per kg.
Tea 5,000 kg at 6/= per kg.
Cabbage 2,000 kg at 4/= per kg.
Tomatoes 1,500 kg at 5/= per kg.

If she replaces horticultural crops with dairy cattle, she would have the following expenditure:

- Buy two lactating cows at Kshs 20,000/= each.
- Disease and parasite control at kshs800/= per animal.
- Employ a milk Man at kshs2, 000/= per month.
- Fencing at a cost of Kshs. 10, 000/=.

The two cows would be producing 10,000 litres of milk per year. The price of milk would be 40/= per litre.
She expects to sell manure at 4,000 in the first year.
(i) Draw a partial budget for the farmer for the first year

PARTIAL BUDGET FOR ALICE'S FARM

Debit(-)			Credit (+)		
	Kshs.	**Cts.**		**Kshs**	**Cts.**
(i) EXTRA COSTS			**(II) EXTRA REVENUE**		
Lactating cows – 2 x 20,000/=	**40,000/=**	**00**	**Milk yield 40/= x 10,000**	**400,000/=**	**00**
Disease and parasite labour control 2 x			**Manure sales**	**4,000/=**	**00**
800/=	**1,600/=**	**00**	**SUB TOTALS**	**404,000/=**	**00**
Labour/Milk Man 12 x 2,000/=	**24,000/=**	**00**			
Fencing	**10,000/=**	**00**	**Costs saved**		
Sub total	**75,600/=**	**00**	Cabbage		
			Weeding	**200**	**00**
Revenue forgone			**Fertilizer**	**1,000**	**00**
Cabbage 4/= x 2000Kg	**8,000/=**	**00**	**Seeds**	**100**	**00**
Tomatoes 5/= x 1500Kg	**7,500/=**	**00**	**Harvesting**	**400**	**00**
Sub totals	**15,500**	**00**			
			Tomatoes		
			Weeding	**400**	**00**
			Pruning	**700**	**00**
			Chemicals	**2,000**	**00**
			Seeds	**80**	**00**
			Harvesting	**800**	**00**
			SUB TOTALS	**5,680**	**00**
TOTALS	**91,100**	**00**	**TOTALS**	**409,680**	**00**

(ii) Advice the farmer if it is worthwhile to effect the change.

- **The proposed change is worthwhile**

(iii)Give a reason for the advice in (b) above.

- **In the prevailing circumstances, this change represents a net gain of Kshs.308,580/=**

49. The table below shows output of maize in response to increase in D.A.P fertilizers on one hectare of land.

Fixed input land (in ha)	Variable input D.A.P in 30kg-bag	Total product maize yield in 90-kg bag	Average product (AP) maize in 90kg bag	Marginal product (M.P) in 90kg bag
1	0	2	-	-
1	1	5	-	-
1	2	14	-	-
1	3	21	-	-
1	4	26	-	-

a) Fill in the table for average product (A.P) and marginal products (M.P)

Variable input fertilizers	**Average product(maize in 90kg bag**	**Marginal product m.p in 90kg bags**
0	**0**	**0**
1	**5**	**3**
2	**7**	**9**
3	**7**	**7**
4	**6.5**	**5**

50. a) Differentiate between a partial budget and complete budget.

- **Partial budget – show minor changes on the farm on income and expenditure.**
- **Complete budget–show major changes on the farm**

51. Give **two** examples of fixed costs and of variable costs in the production of maize.

Fixed costs

- **Depreciation costs of farm machinery**
- **Land rent /Lease**
- **Salaries of regular labour**
- **Interest on borrowed capital (loans)**
- **Insurance**
- **Standing charges of telephone, electricity water**
- **Road licenses and other licenses on the farm operation**

Variable cost

- **Cost of maize seeds**
- **Cost of fertilizer**
- **Wages of casual labour**
- **Cost of pesticides-**
- **Cost of herbicide/weeding**
- **Cost of harvesting**

Cost of fuel

52. Give **two** examples of fixed cost in agricultural production.

- **Machinery.**
- **Farm structures**
- **Farm tools and equipment**
- **Land.**
- **Irrigation systems.**
- **Water supply**

53. The table below shows the output of maize at different levels of DAP fertilizer application in one hectare.

DAP fertilizer 50kg Units	Maize output (90 kg bags)	Marginal product (90 kg bags)	Average product (90 kg bags)
1	5	-	5
2	22	17	11
3	37	-	-
4	51	-	12.8
5	58	7	-
6	60	-	10
7	60	0	-
8	55	-	-
9	47	-8	5.22

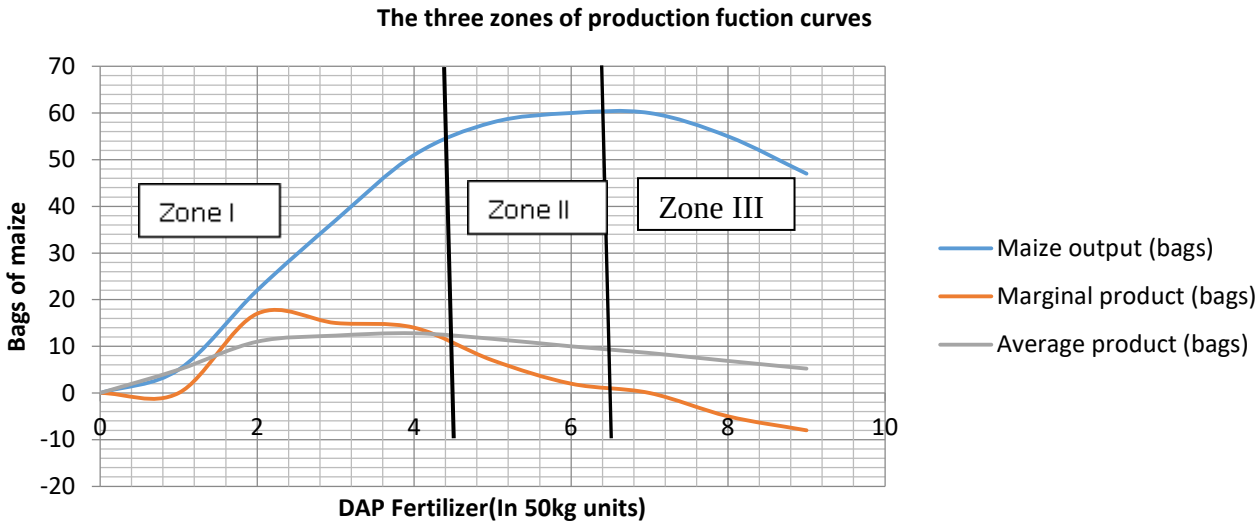
a) **Fill in the blank spaces** on the table to show marginal product and average product.

DAP fertilizer 50 units	**Maize output (bags)**	**Marginal product (bags)**	**Average product (bags)**
1	**5**	**-**	**5**
2	**22**	**17**	**11**
3	**37**	**15**	**12.3**
4	**51**	**14**	**12.8**
5	**58**	**7**	**11.6**
6	**60**	**2**	**10**

7	**60**	**0**	**8.57**
8	**55**	**-5**	**6.87**
9	**47**	**-8**	**5.22**

b) On the graph paper provided and on the same axes **draw three** graphs to show:

i. Total Physical Product (TPP)
ii. Average Product (AP)
iii. Marginal Product (MP)



c) **Draw two** perpendicular lines on the graph to show the **three zones** of production and label them.

54. **Define** the term Utility of a commodity as used in agricultural economics.

- **Use of commodity/Satisfaction one gets by use of a commodity**

55. **What** is Working capital in a farming Situation?

- **Raw materials used up in the process of production e.g. fertilizers, seeds ,etc**

56. **Define** the following terms as used in agricultural economics.

(a) Firms.

- **An industry**

(b) Opportunity cost.

- **The best alternative forgone**

57. What do you understand by the following terms :

(i) Per capital income

- **Per capital income is the average income of the citizens of a country**

(ii) Opportunity cost

- **Opportunity cost refers to the value / returns from the best alternative foregone.**

58. **Define** the following terms as used in Agricultural Economics

(i) Gross national income

- **The monetary terms of the gross Nation product**

(ii) Gross Nation product

- **The total output from resources owned by the Nationals of a Country wherever these resources happen to be located i.e. GDP +(Income inflow- Income outflow)**

59. A pig farmer could combine sow and weaner meal and home-made feeds to obtain 60kg of bacon on mature pig as shown below.

Sow and weaner meal in kg	Home-made feed in kg	Marginal rate of substitution (MRS)	**Total cost in shillings**
5	58		
6	52		
7	47		
8	41		
9	40		
10	39		

(a) **Fill** in the blank spaces.

Sow and weaner meal in kg	**Homemade feed in kg**	**Marginal rate of substitution (MRS)**	**Total cost in shillings**
5	**58**	**-**	**(5x1) + (0.5x58) = 34.00**
6	**52**	**6**	**(6x1) + (0.5x52) = 32.00**
7	**47**	**5**	**(7x1) + (0.5x47) = 30.50**
8	**41**	**6**	**(8x1) + (0.5 x41) = 28.50**
9	**40**	**3**	**(9x1) + (0.5x40) = 29.00**
10	**39**	**1**	**(10x1) + (0.5x39) =29.50**

(b) Given that the price of sow and weaver meal is Kshs 1.00 per kg and that of home-made feed is 50 cents per kg. **Calculate** the least cost combination.

- **least cost combination is achieved when using 8kg of sow and weaner meal and 41kg of homemade feed of Kshs 28.50**

60. State the **four** questions a farm manager formulates in preparing a partial budget.

- **What extra cost is to be incurred as a result of the proposed change?**
- **What revenue is to be foregone as a result of the proposed change?**
- **What extra revenue is to be earned from the proposed change?**
- **What costs are to be saved as a result of the proposed change?**

61. Differentiate between marginal revenue and Net revenue.

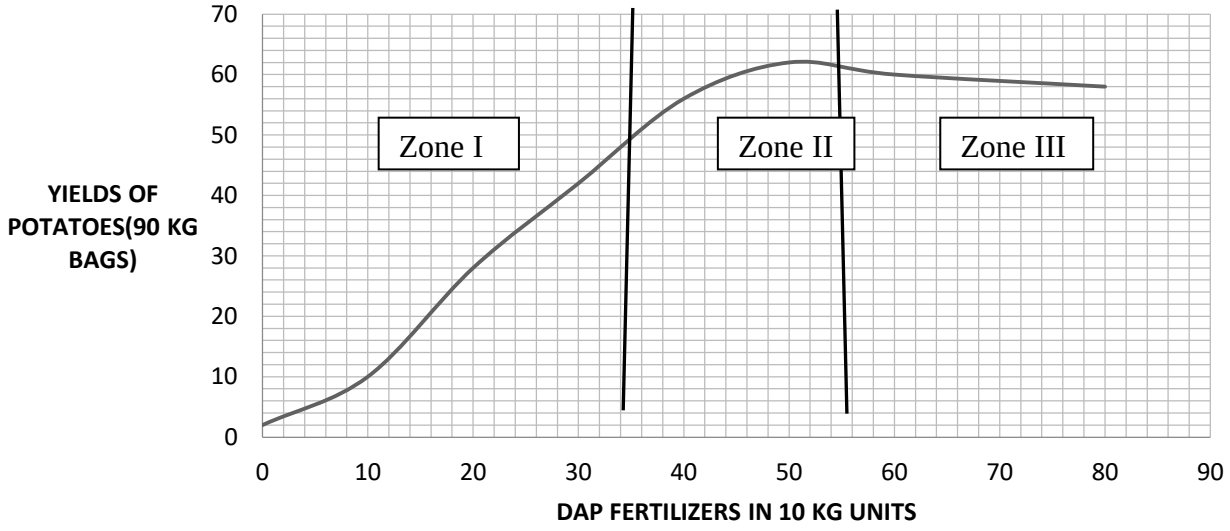
- **Marginal revenue – is the extra income obtained from the sale of one additional unit outputs**
- **Net revenue- is the difference between the total revenue and the total costs of production**

62. A farmer planted potatoes in successive years on his one hectare of land using Diammonium phosphate fertilizer. The quantities of fertilizers used and yield of potatoes are as shown in the table below.

Land size in hectare	DAP used in 10 kg units	Yield of potatoes in 90kg bag
1	0	2
1	10	10
1	20	28
1	30	42
1	40	56
1	50	62
1	60	60
1	80	58

(i) Using the graph paper provided **draw** a graph to show the relationship between the inputs and output.

Production function Graph



(ii) **Show** the three zones of production on the graph.

- **Zone I; Zone II; Zone III as shown on graph**

(iii) **Which** is the rational zone of production?

- **Zone II**

(iv) **Give a** reason which makes this region a rational zone of production.

- **Output of maize increase at a decreasing rate**

63. Name **four** factors of production in Agriculture

- **Land**
- **Capital**
- **Labour**
- **Management**

64. State the principle of equimarginal return.

- **It state that limited amount of resources should be allocated in such a way that the marginal returns is the same in all alternatives to which they are put.**

65. The table below shows the production of maize at various levels of N.P.K fertilizer application. Study it carefully and answer the questions that follow.

Fixed factor of land (1ha)	Variable input (NPK in kg)	Total product (maize in90kg bags)	Marginal product (maize in 90kg bags)	Average product (maize in 90kg bags)
1	50	10	0	10
1	100	27	a	f
1	150	42	15	14
1	200	56	b	14
1	250	63	7	12.6
1	300	65	c	g
1	350	65	d	9.3
1	400	60	-5	7.5
1	450	52	e	w
1	500	42	-10	4.2

a) Complete the table above

a- 17
b- 1
c- 3
d- 0
e- 8
f- 13.5
g- 10.8
h- 5.8

66. Discuss the factors to consider when drawing a farm plan.

(i) Existing market conditions- farmer to have a market for the produce in mind.
(ii) Possible production enterprises -consider the requirement of the various enterprises e.g. price trends.
(iii) Security-establish those enterprises which require special attention around the homestead e.g. poultry house, calf pen etc.
(iv) Communication and transport facilities. - Farming as business requires efficient and reliable means of transport and communication.
(v) Farmer's objectives and preference. –The farmer is the main operator so his wishes should be considered for a benefit in psychological effect for their success.
(vi) Current trend in labour market.-Labour availability is a fundamental need for the success of enterprises.
(vii) Size of the farm-This dictates the scale of production e.g. small or large scale farming.
(viii) Environmental factors. - Determine specific locations of enterprise on the farm e.g. topography, soil PH etc.
(ix) Availability of capital.-Financial strength/ ability of the farmer are crucial for a type of enterprises to be started.
(x) Government policy

67. Explain the ways in which **input factors** are combined by farmers to maximize profits.

- Fixed proportion- **No substitution of input involved i.e. both inputs should be present.**
- Constant rate of substitution-**Input factors substitute one another at a constant rate for each level of production regardless of the ratios used.**
- Varying rate of substitution-**Inputs substitute one another at varying rate e.g. feeding hay and grains to livestock.**

68. Per capital income is one of the measures of a countries development what does it mean?

- **It is the average income of the citizens of a country Gross national income divided by the population of the country**

69. Explain the difference between **liquid capital** and **working capital** in an agricultural production.

- **Liquid Capital is money which can flow and be used in acquisition of any real capital assets**
- **Working capital are raw materials used in production**

70. Name four sources from which a farmer may obtain capital.

- **Personal savings / earning**
- **Through inheritance of Assets**
- **Banks /commercial banks**
- **Loaning /credit institutions e.g. AFC, banks, co-operative societies.**
- **Gifts/ grants/ donations from charitable organizations**
- **Hire purchase companies**
- **Borrowing from friends/individual /fellow farmers.**
- **Money lenders**
- **Insurance companies**
- **Crop marketing boards e.g. KTDA**
- **Settlement trust funds**

71. What are the **two** factors one must consider in calculating gross margin?

- **Total output**
- **Total variable costs**

72. Outline **four** problems associated with credit facilities to farmers

- **High interest rates**
- **Lack of security/collaterals**
- **Farmer may misuse the credit/use for unintended purposes**
- **Auction of security in case of default in repayment**
- **Lack of necessary information in financial management**
- **Poor returns from agricultural investment**
- **Rigid payment schedules regardless of level of production**

73. List down **two** determinants of national income

- **Per capita income**
- **Gross domestic product (GDP)**
- **Gross national product (GNP)**

74. A farmer can combine dairy meal and homemade feeds in order to obtain 40kg of milk from lactating cow, as shown in the table below.

Dairy meal	Homemade feed	Marginal rate of substitution
1	48	0
2	39	V
3	32	7
4	27	W
5	23	4
7	21	X
8	20	1
9	19	Y

(a)Given the information above, calculate the marginal rate of substitution and give the value of V, W, X and Y.

$$V = \frac{48-39}{2-1} = 9$$

$$W = \frac{32-27}{4-3} = 5$$

$$X = \frac{23-21}{6-5} = 2$$

$$Y = \frac{20-19}{9-8} = 1$$

(b) Given that the price of dairy meal is Kshs. 8.00 per kg and that of homemade feed is Kshs. 2.00 per kg, calculate the least cost combination. (Show your working)

Dairy meal	**Homemade feed**	**LCC (least cost combination)**
1	**48**	**(1x8)+(48x2)=104**
2	**39**	**(2x8)+(39x2)=94**
3	**32**	**(3x8)+(32x2)=88**
4	**27**	**(4x8)+(27x2)=86**
5	**23**	**(5x8)+(23x2)=86**
7	**21**	**(7x8)+(21x2)=98**
8	**20**	**(8x8)+(20x2)=104**
9	**19**	**(9x8)+(19x2)=110**

Thus, LCC is 4kg of dairy meal combined with 27Kg of Homemade feed/5Kg of a dairy meal combined with 23kg of homemade feed

75. The table below shows maize production in 90kg bags from varying amounts of NPK fertilizer on one hectare of land.

Year	NPK fertilizer in 30kg bags	Total maize production
1998	0	5
1999	30 kg	12
2000	60 kg	28
2001	90kg	47
2002	120kg	59
2003	150kg	65
2004	180kg	68
2005	210kg	70
2006	240kg	70
2007	270kg	68

a) Calculate the farmer's marginal product for the year 2001.

47-28=19 bags

b) Calculate the average product for the year 2003.

$$\frac{65}{5}$$

= 13 BAGS

c) Assume the average price of fertilizer over the years recorded was Kshs.1600 per 30kg bag and the price of maize Kshs.2000 per bag. Calculate the net revenue for the year 2006.

Total revenue = 70x2000 = 140,000/=

Total costs = $\frac{240}{30} X 1600$ **= 12800**

Net revenue = 140,000 – 12800

=Kshs. 127,200

76. Give five functions of a farm Manager.

- **Acquiring information/ knowledge relevant to farm business.**
- **Analyzing the information / knowledge**
- **Formulation of a farm plan**
- **Bearing the risks/taking responsibility.**
- **Implementing the farm plan.**

77. Give **five** qualities of a good farm manager.

- **Should have knowledge about specific agricultural principles, Marketing and accounting.**
- **Hardworking and time conscious.**
- **Should have practical farming skills.**
- **Should be flexible in decision making.**

78. Give **four** examples of fixed cost in coffee farming

- **Lease/ rent of the farm**
- **Rates of the plot / land**
- **Salaries of permanent workers**
- **Insurance depreciation costs of farm machinery**
- **Standing charges of telephone, electricity water**
- **Road licenses and other licenses on the farm operation**

79. State **three** objectives of Agricultural Research

- **Improves the quality of product**
- **To increase production – Increase resistance to diseases in crops/produce crops that are disease resistant**
- **Improve adaptability to the local climate**
- **Produce new varieties and breeds.**

80. Using the data below answer the questions that follow.

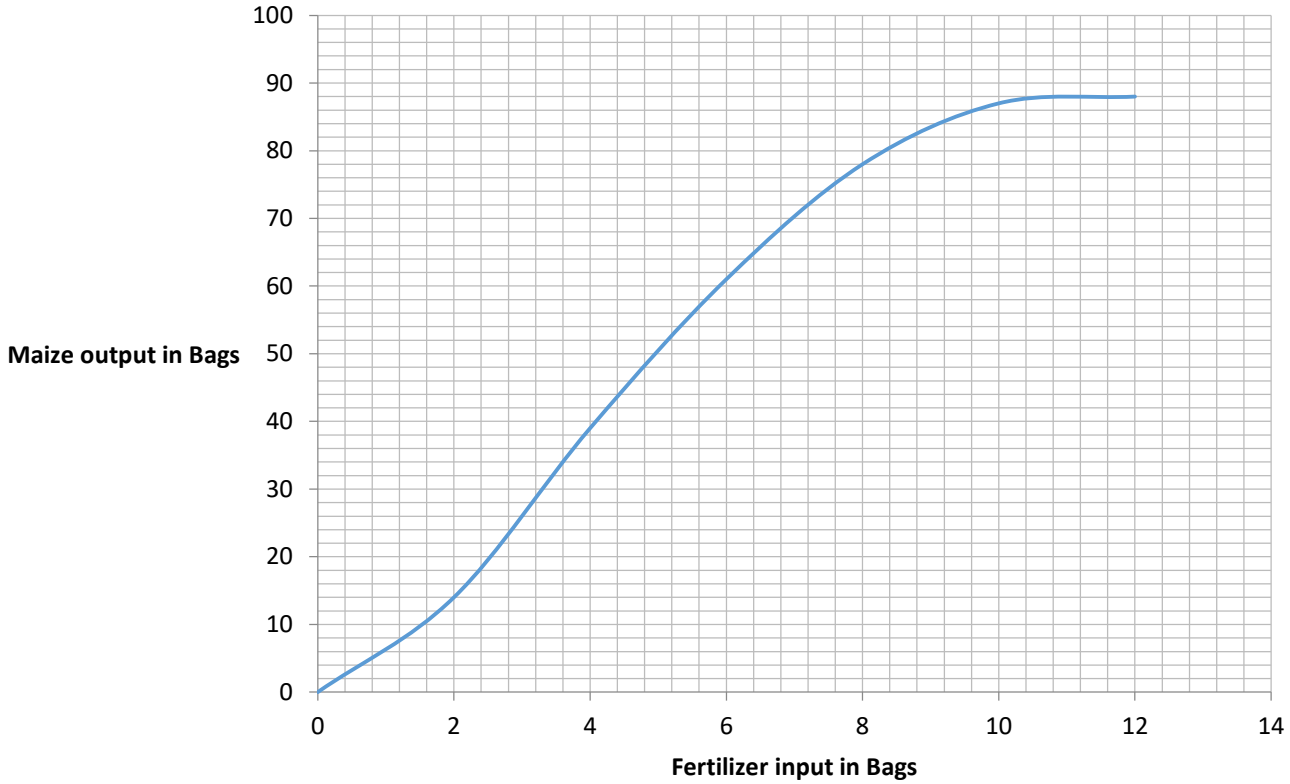
Fertilizer input (Bags)	Maize output (Bags)	Total Revenue Kshs.	Total Cost Kshs.	Marginal Revenue Kshs.	Marginal Cost Kshs.	Net Revenue (Kshs)
0	0	0	0	0	0	0
2	14	28000	5600	-	-	-
4	39	78000	11200	-	-	66800
6	61	122000	16800	42000	-	-
8	78	156000	22400	-	-	-
10	87	174000	28000	-	-	-
12	88	176000	23600	-	56000	136400

a) Work out the Marginal revenue, Marginal cost and Net revenue at all levels of production and complete the table.

Marginal revenue	Marginal cost	Net revenue
28,000	**5,600**	**22,400**
50,000	**5,600**	**103,200**
34,000	**5,600**	**13,600**
18,000	**5,600**	**144,000**
2,000	**5,600**	

b) On the graph paper provided, draw a graph of output against input.

Graph showing the relationship between output and inputs



c) From the graph, work out the maize output at the input levels 3 and 9.

Level 3 = 26 bags

Level 9 = 83 bags

d) State the level of input where maximum profit is realized and give a reason.

- **Level – 10 units of fertilizer (input)**
- **Reason – Highest net revenue**

81. Give **two** characteristics of fixed inputs.
- **The quantity used does not vary with the level of production.**
- **They are not allocated to specific enterprise**
- **The cost value is not used in calculation of gross margin.**

82. a) Give **three** sources where farmers may get tractor hire service.
- **Government tractor hire service**
- **Private contractor.**
- **Individual farmers**
- **Co-operative societies**
- **Individual farmers.**

(b) State **two** disadvantages of tractor hire service to farmers.
- **May not be available to farmers when needed.**
- **Farmers may be overcharged for the hire.**

83. Outline **four** roles of household and firm relationship to the economy of the country.
- **Income generation.**
- **Create employment.**
- **Expansion of industries.**
- **Income for the government through taxation.**

84. State any **four** economic laws and principles in agricultural economics.
- **Law of diminishing returns.**
- **Law of substitution.**
- **Principle of equimarginal returns.**
- **Principle of profit maximization**

85. a) State the law of diminishing returns in a production process.
- **The law state that "if successive units of one input are added to fixed units of other inputs, a point is eventually reached where additional output per additional unit of input will decline"**

(b) Use the information in the table below to answer the questions that follow

Fertilizer inputs (units)	Maize yield (bags)	Marginal production (bags)
0	50	12
1	62	12
2	66	4
3	68	2
4	69	1
	69	0

The cost of fertilizer is Kshs 1500 per unit and the price of maize is Kshs 1200 per bag.

(i) At what unit of fertilizer input should the farmer be advised to stop applying any more fertilizer to the maize?
- **At the end of the third unit of fertilizers application**

(ii) Give a reason for your answer in (b) above.
- **This is the least profitable unit of fertilizer application beyond which there would be a loss**

(iii) Calculate the marginal return at the point of optimum production

Marginal returns (MR) at the point of optimum production
MR = Kshs 1200 x 2 = 2400/=

86. a) Give **two** uses of Gross margin analysis in farming.
- **To compare performance of the form and another.**
- **To compare the performance of the form between one season and another.**

- **To compare the contribution of one enterprise and another in the same farm.**
- **To act as a measure of profit in a farm.**

87. List **three** ways in which labour peaks can be overcome in the farm.

- **Overtime working for casual labourers**
- **Greater use of casual workers**
- **Mechanization**
- **Use of contractors who may be engaged to do work at a fee**
- **Cropping system devised such that ripening of crops could be at different times**
- **Work study to device new techniques for doing work more quickly and efficiently**

88. Outline **five** methods through which extension advice and information can reach farmers.

- **Radio, television and cinemas**
- **Newspapers ,magazines, posters and circular letters**
- **Agricultural shows**
- **Demonstrations**
- **Tours, fieldtrips, field days**
- **Workshops, seminars and meetings**
- **Public lectures**
- **Conferences and in-service training**
- **Projects and farm visits**

89. Prepare a partial budget using the following information:

Mr. Wafula is a mixed farmer. He has 16 hectares of land, of which 6 hectares are under permanent pasture, He plans to grow 6 hectares of beans. In the previous seasons, he hired casual workers at the rate of 80 man-days per hectare. The cost was Ksh.30 man-day. This season, instead of employing casual workers, he intends to hire a tractor to open the land at the cost of Kshs 600 per hectare.
Mr. Wafula thinks that using a tractor will increase bean production from 800 to 1200kg/ha. Harvesting will cost Kshs. 6 per kg of bean seed and the price of beans will be 60ksh/kg what advice can you give Mr. Wafula.

Title: MR WAFULA'S PARTIAL BUDGET.

Debit (-)			**Credit (+)**		
	Kshs.	**Cts.**		**Kshs.**	**Cts.**
Extra cost:-			**Cost served:**		
i) Tractor hire (600x 6)	**3,600**	**00**	**i) Labour costs (80x 30x 6)**	**14,000**	**00**
ii) Harvesting costs(1200 x 6)	**7,200**	**00**			
			Extra revenue:		
Revenue forgone (800 x 60)	**48,000**	**00**	**ii) Sales of beans. (1,200x 60)**	**72,000**	**00**
	58,800	**00**		**86,400**	**00**

Advice: MR. WAFULA can make the proposed change because he stands to make a profit/gain of Kshs. 86,400 – 58, 000 = 27, 600

90. What is a farm budget?

- **An estimate of the future incomes and expenses of a proposed farm plan.**

91. Carefully study the table below and then answer the questions that follow.

Changes in output resulting from increase in labour

Land (ha)	Labour (man-days)	Total Product(bags)	Marginal product (bags)	Average product (bags)
1	1	3	-	3
1	2	7		
1	3	12		
1	4	16		
1	5	19		
1	6	21		

(i) Name the variable input in the table.

- **Labour**

(ii) Name the fixed input.

- **Land**

(iii) Fill in the column for marginal products and average product in the table above.

Marginal product (bags)	**Average product (bags)**
-	**3**
10	**3.5**
19	**4**
28	**4**
35	**3.8**
41	**3.5**

92. Name **two** examples of working capital in wheat production.
- **Seeds, fertilizers, pesticides, fuel,**
- **Hired equipment for production e.g. tractor**

93. **Outline** the factors to consider when selecting a farm enterprise.
- **The period the enterprise will take to mature.**
- **The availability of market for the produce.**
- **The prevailing climate.**
- **The size of land available for the enterprise.**
- **The common pests and disease that may hinder the enterprise implementation.**
- **Technical skills required to manage the enterprise**
- **The profit margin in relation to the price fluctuation at different times of the season.**
- **Availability of infrastructure to allow good communication**
- **Availability of proper security for the enterprise.**
- **Availability of enough capital**
- **Availability of inputs.**
- **Suitability of the soil to the enterprise.**
- **Land tenure system.**
- **Social cultural factors.**
- **Topography of the land.**
- **Tastes and preference of the farmer.**
- **Availability of labour according to the requirements of the enterprise in question.**
- **The current government policy relating to the enterprise**

94. a) Define the cost of production in agricultural production.
- **Cost of production is obtained by multiplying the price of each unit of input by the number of units Production cost = Q1 XP1**

b). State **two** uses of production costs in agricultural production.
- **It relates to the production of a given quality of a product in a given period of time**
- **When costs are analyzed and converted into monetary value they help to indicate the most profitable point of production**
- **They are used to calculate profits.**

AGRICULTURAL ECONOMICS IV (FARM ACCOUNTS)

1. Differentiate between financial statement and financial document.
- **Financial statement: a statement prepared at the end of business year to give financial position**
- **Financial document: business issue by buyer of seller to give legal transaction made**

2. Give **two** financial statements a farmer may prepare on a well organized farm.
- **Balance sheet**
- **Profit and loss account**
- **Cash analysis**
- **Cash book**

3. List any **four** financial documents used in the farm
- **Invoice**
- **Receipt**
- **Delivery note**
- **Purchase order**
- **Statement of account**

4. Define the following financial documents and state the use of each.

(a) Invoice.
- **Financial document issued by a seller to a buyer when goods /services are delivered on credit.**
- **It's used to show the cost / price per unit of goods and the total amount of money the buyer should pay for the goods.**

(b) Delivery Note
- **Document issued by the supplier to the buyer to accompany goods on physical delivery**
- **It acts as evidence that goods have been physically delivered from the supplier to the seller.**

(c) Receipt.
- **A document issued by the seller to the buyer when payment is made for delivered goods / services rendered**
- **It serves as evidence that payment has been made.**

5. Name **two** examples of liabilities in a balance sheet
- **Bank overdraft**
- **Bank loans**
- **Debts payable**
- **Tax payable**
- **Unpaid expenses e.g. .rent, water, electricity bills, telephone bills, et cetera**
- **Creditors**

6. **List four** types of financial books a farmer should keep.
- **Journal**
- **Ledger**
- **Cash book**
- **Inventory.**

7. **State four** uses of gross margin analysis in farm business.
- **To compare the performance of one farm and another.**
- **To compare the performance of the farm between one season and another**
- **To compare the contribution of one enterprise and another in the same farm.**
- **To acts a measure of profit in the farm.**

8. When is a firm said to be insolvent?
- **A firm is insolvent when and if all the assets are sold the produce cannot pay for the liabilities and have a balance.**

9. a) **What** is opening valuation as used in farm accounts?
- **A financial statement showing the worth of all one has at the beginning of the accounting period.**

(b) In which farm account should opening valuation be posted?
- **In the profit and loss account.**

10. a) What is a balance sheet?

- **A balance sheet is a financial statement drawn to show the financial position of a business as at a particular date.**

b) Outline **three** uses of a balance sheet in farm accounts.

- **Reveals assets and liabilities.**
- **Useful in income assessment.**
- **Shows whether farm is solvent or insolvent/financial status of a farm business.**
- **Assists in farm valuation.**
- **Used to compare the liquidity of various firms**
- **It assists the farmer to secure loan from credit financial institutions i.e. banks.**
- **Assist potential investors in decision making i.e. when investors need to buy the business.**

11. What is the importance of taking inventory?

- **In order to show what there is or what is lost in the farm**

12. Outline **four** advantages of farm accounts in farming.

- **To keep check on income and expenditure.**
- **To know which activities are financially viable/weakness and strength of the business.**
- **To obtain knowledge of total value of farm/value of assets and abilities.**
- **For farm planning.**
- **To assess credit worthiness.**
- **Provide information for tax purposes.**

13. State the importance of a journal as a financial book of accounting

- **Records information on credit of capital equipments**
- **Records the sale on credit of capital investments**
- **Rectification or cancellation of errors or old entries respectively made in other books**
- **Transfers from one account to another in the ledger**
- **Opening entries in new books**

14. List **two** types of inventories used in farm accounts.

- **Permanent goods inventory.**
- **Consumable goods inventory.**

15. Highlight **four** importance of farm accounts.

- **Show progress of individual or combined enterprises in the farm**
- **Help in planning, budgeting and decision making in the farm**
- **Used to claim compensation from insurance firms**
- **Assist in sharing profits and dividends among partners and shareholders respectively**
- **Reflect the actual income of the farmer hence preventing over or under taxation**
- **Help farmers to calculate profits or losses of a farm at the end of financial period**
- **Assist in servicing loans and bank overdraft from financial institutions**
- **Show debtors and creditors, hence assist in settling and collecting of debts**

16. State the functions of the following financial documents.

(i) Invoice

– Help the credit buyer to know the amount due for payment and date.

(ii) Receipt

– Evidence to show that the buyer has paid for the goods or services received.

(iii) Delivery note

- **Evidence to show that goods ordered for by the buyer have been supplied.**

(iv) Purchase order

– Used as a contract document between the buyer and the supplier of goods only if it has been honoured.

17. What is ledger in Farm accounts

- **Ledger is a principal book in accounting where all the farm accounts are kept**

18. Differentiate between a cashbook and a ledger book

- **Cashbook is a book in which all trans actions involving receiving and paying of cash are recorded whereas a ledger is the principal book of account containing all entries**

19. Give any **four** details contained in a purchase order.
- **Types of good required**
- **Quantities of the goods**
- **Date of order**
- **Date when order is to be delivered**
- **Name of the buyer and seller.**
- **Purchase order serial number.**

20. List **three** uses of a farm inventory
- **Show what the farm owns/Assets**
- **Used in preparation of financial statements**
- **Used in disposing uneconomical assets**
- **Control theft in the farm**

21. Differentiate between a partial and a complete budget.
- **Partial budget is a financial plan which affects minor changes in a farm business e.g. size of dairy herd. Complete budget is a financial plan which affects major changes in the farm business e.g. starting a new enterprise.**

22. Differentiate between opening and closing valuation in a farm account.
Opening valuation: An account showing the value of the farm at the beginning of the financial year.
Closing valuation: An account showing the value of the farm at the end of financial year

23. The following transactions were extracted from Mr. Tomboy's financial books for the year ending 31st Dec 2003.study and answer the questions that follow:

Particulars	**cost (Ksh)**
Milk sale	8 000
Goat sale	500
Purchase of farm tools	1 000
Construction of zero grazing unit	10 000
Depreciation of machinery	800
Closing valuation	16 000
Veterinary bills	400
Interest payable	750
Wages	4 800
Sales of cabbages	750
Sales of tea	4 700
Opening valuation	12 000
Sales of heifers	9 400
Purchase of pesticides	300

(a)Prepare a profit and loss account for Mr. Tomboy's farm for the year ending 31st Dec. 2003

PROFIT AND LOSS ACCOUNT FOR MR. TOMBOY FARM FOR THE YEAR ENDING 31ST DEC 2003					
Purchases and Expenses	**Kshs**	**Cts**	**Sales and Receipts**	**Kshs**	**Cts**
Opening stock	**12000**	**00**	**Milk sale**	**8000**	**00**
Purchase of farm tools	**1000**	**00**	**Sale of goats**	**500**	**00**
Zero grazing unit construction	**10 000**	**00**	**Cabbage sale**	**750**	**00**
Machinery depreciation	**800**	**00**	**Sale of heifers**	**9400**	**00**
Interest payable	**750**	**00**	**Sale of tea**	**4,700**	00
Pesticide purchase	**300**	**00**	**Closing valuation**	**16 000**	**00**
Veterinary bills	**400**	**00**			
wages	**4800**	**00**			
TOTAL	**30 050**	**00**			
Net profits	**9 300**	**00**			
Total	**39 350**	**00**	**Total**	**39 350**	**00**

(b) Calculate the percentage profit or loss made by the farm

% profit = Income-Expenditure x 100
Expenditure
= 9 300 x 100
30 050
= 31%

24. The following accounts information is from Mr. Wanyonyi's farm for the year ending 31-12- 2006.

Opening valuation	Kshs. 6,000
Paid wages	Kshs. 5,000
Bought equipment worth	Kshs. 8,000
Bought pig feeds worth	Kshs. 4,000
Sold manure pigs worth	Kshs. 7,000
Bought drugs worth	Kshs. 3,200
Sold vegetables worth	Kshs. 3,000
Sold piglets worth	Kshs. 4,000
Closing valuation	Kshs. 4,000

(i) Using information above, prepare a profit and loss account for Mr. Wanyonyi's farm.

PROFIT AND LOSS ACCOUNT FOR MR WANYONYI'S FARM FOR THE YEAR ENDING 31ST DEC2006

PURCHASES AND EXPENSES			SALES AND RECEIPTS		
	KSh.	Cts		KSh.	Cts
Opening valuation	**6,000**	**00**	**Sales of manure**	**7,000**	**00**
Wages	**5,000**	**00**	**Piglet sales**	**4,000**	**00**
Equipment	**8,000**	**00**	**Vegetable sales**	**3,000**	**00**
Pig feeds	**4,000**	**00**	**Closing valuation**	**4,000**	**00**
Drugs	**3,200**	**00**	**Total**	**18,000**	**00**
			Loss	**8,200**	**00**
TOTAL	**26,200**	**00**	**TOTAL**	**26,200**	**00**

(ii) From the calculations in (i) above, state whether Mr. Wanyonyi made a profit or a loss.

- **Mr. Wanyonyi made a loss**

25. The following information was obtained from Langat's farm records for the year ending December, 2004. Study it and answer the questions that follow:-

Goats	4,000
Poultry	15,000
Causal workers	12,000
Opening valuation	150,000

His sales and receipts were as follows:

Mohair	75,000
Rabbits	3,600
Eggs to hotel	15,000
Closing valuation	200,000

(a) Prepare the profit and loss Account of Langat's farm

PROFIT AND LOSS ACCOUNTFOR LANGAT'S FARM FOR THE YEAR ENDING 31ST DECEMBER, 2004

Purchases & Expenses			Sales & receipts		
	Kshs.	Cts		Kshs.	Cts
Opening valuation	**150,000**	**00**	**Mohair**	**75,000**	**00**
Goats	**4,000**	**00**	**Rabbits**	**3,600**	**00**
Poultry	**15,000**	**00**	**Eggs to hotel**	**15,000**	**00**
Casual worker	**12,000**	**00**	**Closing valuation**	**200,000**	**00**
Subtotal	**181,000**	**00**			
Net profit	**112,600**	**00**			
TOTAL	**293,600**	**00**	**TOTAL**	**293,600**	**00**

(b) State the benefit of a profit and loss account to Mr. Langat

- **Helps the farmer to detect whether he has loss or profit**
- **Helps in tax assessment to avoid over taxation**
- **Acts as evidence when a farmer requires a loan**

26. a) Prepare a profit and loss account for Mr. Ogembo's farm for the year ending 31st Dec. 2012, given the following information:-

Sale of milk	Kshs.10,000
Sold two heifers	Kshs.10,000
Cabbage sold	Kshs. 20,000
Debts payable	Ksh.4,200
Sold tomatoes	Kshs. 3,000
Veterinary bills	Kshs.2,500
Bought livestock feeds	Kshs.2,500
Purchase fertilizers	Kshs.5,000
Bought seeds	Kshs. 4,000
Debts receivable	Kshs.20,000
Opening valuation	Kshs.150,000
Closing valuation	Kshs.200,000

PROFIT AND LOSS ACCOUNT FOR MR. OGEMBO'S FARM AS AT 31ST DEC, 2012

Purchases and expenses			**Sales and receipt**		
	Kshs	**Cts**		**Kshs**	**Cts**
Opening stock	**150,000**	**00**	**Sale of milk**	**10,000**	**00**
Veterinary bills	**2,500**	**00**	**Sale of cabbages**	**20,000**	**00**
Livestock feeds	**2,500**	**00**	**Sale of two heifers**	**10,000**	**00**
Fertilizer	**5,000**	**00**	**Sale of tomatoes**	**3,000**	**00**
Seeds	**4,000**	**00**			
Debts payable	**4,200**	**00**	**Debts available**	**20,000**	**00**
TOTAL	**168,200**	**00**			
Profit	**94,800**	**00**	**Closing valuation**	**200,000**	**00**
TOTAL	**263,000**	**00**	**TOTAL**	**263,000**	**00**

(b) Did the farm make a profit or a loss? Calculate the percentage profit or loss made by the Farm

- **It made profit of Ksh. 94,800**
- **% profit = (Income – Expenditure) x 100**

  Expenditure

  = 94,800 x100

  168,200

  = 56 %

27. Below is a transaction showing Mrs. Okello's financial position in her business for the year 2009

-Purchase of pesticides	3,000
-Milk sales	8,000
-Sales of goats	5,000
-Construction of store	10,000
-Closing valuation	16,000
-Depreciation of machinery	3,000
-Interest payable	1,750
-Purchase of farm tools	800
-Veterinary bills	1,400
-Sales of tomatoes	1,750
-Wages	10,000
-Sales of heifer	10,000
-Opening valuation	12,000
-Sales of coffee	5,000

i) Prepare a profit and loss account for Mrs. Okello's farm

PROFIT AND LOSS ACCOUNT FOR MRS.OKELLO'S FARM FOR THE YEAR ENDING 31ST DEC 2009

Purchase and expenses			Sales and receipts		
	Kshs	Cts		Kshs	Cts
Opening valuation	12,000	00	Milk sales	8,000	00
Pesticides	3,000	00	Sales of goats	5,000	00
Construction of store	10,000	00	Sales of tomatoes	1,750	00
Depreciation of machines	3,000	00	Sales of heifers	10,000	00
Interest payable	1,750	00	Sales of coffee	5,000	00
Purchase of tools	800	00	Closing valuation	16,000	00
Veterinary bills	1,400	00			
Wages	10,000	00			
Total	41,950				
Net profit	3,800	00			
TOTAL	45,750	00	TOTAL	45,750	00

ii) Calculate the percentage profit or loss that Mrs. Okello made during the year 2009

- **It made profit of Ksh. 3,800**
- **% profit = (Income – Expenditure) x 100**

  Expenditure

  = (45750-41950) x100

  41950

  = 3800 x100

  41,950

  = 9.06%

28. a) Define the term profit and loss account.

- **Financial statement showing whether the business made a profit or a loss**

b) **Prepare** a profit and loss account for Mr. Kosgei's farm for the year ending 31st Dec, 2007 given the following information Opening valuation was 1,615,500, paid wages amounting to Ksh. 505,000, bought tools worth Kshs. 82,700, bought cattle feed worth Ksh. 52,000 and sold cattle worth Kshs 80,000, sold milk worth Kshs. 432,500. The cost of agro-chemicals was Ksh.32, 000 and sold milk worth 320,000. His closing valuation was Ksh. 1,432,000.

PROFIT AND LOSS ACCOUNT FOR MR. KOSGEI'S FARM FOR THE YEAR ENDED 31ST DECEMBER 2007

Expenditure (purchase and expense)			Income (sales and receipts)		
	Kshs	Cts		Kshs	Cts
Opening valuation	1, 615,000	00	Sales of cattle	80,000	00
Wages	505,000	00	Sales of milk	432,500	00
Tools	82,700	00	Sales of milk	320,000	00
Cattle feed	52,000	00	Closing valuation	1432,000	00
Agrochemicals	32,000	00	Total	2,264,500	00
Total	2,286,700	00			
Net profit	22,200	00			
Total	2,264,500	00	Total	2,264,500	00

c) Did the farm made a profit or a loss? And of how much?

- **The farm made a loss of Kshs. 22,200**

29. a) State the use of a profit and loss account.

- **It's a financial statement showing whether the farm business has made profit or loss.**

b) The owner of Kibet farm made the following purchases during the year 2007.

Feeds	2,000/=
Seeds	1,000/=
Fertilizer	1,300/=
Fuel	1,500/=
Disc plough	100,000/=

During the year the farmer sold wheat to KFA worth 40,000/=, cabbages too a local market for 35,000/= and milk to neighbours farm for 10,000/=. The farm also expected 6,000/= from a neighbouring farm as payment for firewood delivery. The opening valuation was 120,000/= and the closing valuation was 160,000/=

(i) **Prepare** a profit and loss account for Kibet farm for the year ending December 2007.

PROFIT AND LOSS ACCOUNT FOR KIBET FARM FOR THE YEAR ENDING 31ST DEC 2007[1]

Expenditure (Purchases & expenses)			**Receipts (sales & income)**		
	Kshs.	**Cts**		**Kshs.**	**Cts**
Opening Valuation	**120,000**	**00**	**Wheat**	**40,000**	**00**
Feeds	**2,000**	**00**	**Cabbages**	**35,000**	**00**
Seeds	**1,000**	**00**	**Milk**	**10,000**	**00**
Fertilizer	**1,300**	**00**	**Debts receivable**	**6,000**	**00**
Fuel	**1,500**	**00**	**Closing valuation**	**160,000**	**00**
Disc plough	**100,000**	**00**			
Total	**225,800**	**00**		**251,000**	**00**
Net profit	**25,200**	**00**			
TOTAL	**251,010**	**00**	**TOTAL**	**251,000**	**00**

(ii) Did the farm made a profit or loss.

- **The farm made profit of 25,200/=**

30. a) **Define** the following terms.

(i) Local purchase order.

- **A request to a trader or business firm to supply goods on credit.**

(ii) Profit and loss account.

- **Financial statement showing whether the business has made a profit or loss during the Accounting period.**

b) Use the information below to prepare a profit and loss account for Macheneri's enterprise for the year ended 31st December 2006 the farm manager bought the following items at the price indicated.

Item	**Kshs**
Maize seeds	10, 0 00.00
DAP fertilizer	25, 000.00
Tractor disc plough	50,000.00
Diesel fuel	12,000.00
Dairy meal	20,000.00
Milk can	2,500.00
Knapsack sprayer	6,500.00
Vet drugs	5000.00
Herbicides	18,000.00

During the year the farm manager sold the follow items.

Item	**Kshs**
Maize to NCPB	210,000
Milk sales	500,000
Weaners	35,000

The following information was also indicated in the farm managers' book of accounts.

Item	**Kshs**
Opening valuation	300,000.00
Closing valuation	600,000.00
Debts receivable for Tractor service fees	28,000.00
Depreciation on machinery	7,500.00

PROFIT AND LOSS ACCOUNT FOR MACHENERI'S FARM FOR THE YEAR ENDING 31ST DEC 2006.

EXPENSES AND PURCHASES	Ksh	Cts	SALES AND RECEIPTS	Ksh	Cts
Opening valuation	300,000	00	Sale of milk	500,000	00
Purchase of maize	10,000	00	Wearers	35,000	00
D.A.P Bert	25,000	00	Debt receivable	28,000	00
Tractor diesel	50,000	00	Closing value	600,000	00
Diesel fuel	12,000	00			
Dairy meal	20,000	00	Total	1,373,000	00
Milk cans	2,500	00			
Knap sack sprayer	6,500	00			
Vet drugs	5,000	00			
Herbicide	18,000	00			
Interest payable	3,000	00			
Machinery degree	7,500	00			
Total	459,000	00			
Profit	913,000	00			
TOTAL	1,373,000	00	TOTAL	1,373,000	00

(a) Did the farm make a profit or loss?

- **Made a profit**

(b) How much profit /loss were made by the farm?

- **Made profit of 913,500**

(d) **Calculate** the percentage profit or loss made by the farm.

% profit = profit x100
Expenditure
= 913,500 x 100
459, 000
=199%

31. The following is a list of financial transactions and position of Mosocho farm extracted from the farm's financial documents on 31-12-2010.

	Kshs.
Coffee sales	17000.00
Sale of sheep	10300.00
Closing valuation	15000.00
Purchase of fertilizer	2600.00
Veterinary bills	1300.00
Milk sales	3000.00
Wages	2400.00
Opening valuation	12000.00
Interest payable	650.00
Depreciation of machinery	2700.00
Purchase of panga	1000.00
Construction of crush	3500.00
Interests receivable	850.00
Purchase of dairy meal	2400.00
Sale of steers	25000.00

i) Prepare a profit and loss account for Mosocho farm

PROFIT AND LOSS ACCOUNT FOR MOSOCHO FARM FOR THE YEAR ENDING 31ST DEC 2010

Purchase and Expenses			Sales and Receipts		
	Kshs	Cts		Kshs	Cts
Opening valuation	12,000	00	Coffee sales	17,000	00
Purchase of fertilizer	2,600	00	Sheep sales	10,300	00
Veterinary bills	1,300	00	Milk sales	3,000	00
Wages	2,400	00	Interest receivable	850	00
Interest payable	650	00	Sale of steers	25,000	00
Depreciation of machinery	2,700	00	Closing valuation	15,000	00
Purchase of pangas	1,000	00			
Construction of crush	3,500	00			
Purchase of dairy meal	2,400	00			
Total	27,550	00			
Profit	43,600	00			
TOTAL	71,150	00	TOTAL	71,150	00

ii) Did the farm a make profit or loss? Calculate the percentage profit or loss that the farm made during the financial year.

- **Yes- the farm made a profit of Kshs.43, 600**
- **% profit = (Income – Expenditure) x 100**
  Expenditure

= 43,600 x 100
27,550
= 158.3%

iii) Prepare a profit and loss account for Mosocho farm

PROFIT AND LOSS ACCOUNT FOR MOSOCHO FARM FOR THE YEAR ENDING 31ST DEC 2010

Purchase and Expenses			Sales and Receipts		
	Kshs	Cts		Kshs	Cts
Opening valuation	12,000	00	Coffee sales	17,000	00
Purchase of fertilizer	2,600	00	Sheep sales	10,300	00
Veterinary bills	1,300	00	Milk sales	3,000	00
Wages	2,400	00	Interest receivable	850	00
Interest payable	650	00	Sale of steers	25,000	00
Depreciation of machinery	2,700	00	Closing valuation	15,000	00
Purchase of pangas	1,000	00			
Construction of crush	3,500	00			
Purchase of dairy meal	2,400	00			
Total	27,550	00			
Profit	43,600	00			
TOTAL	71,150	00	TOTAL	71,150	00

iv) Did the farm a make profit or loss? Calculate the percentage profit or loss that the farm made during the financial year.

- **Yes- the farm made a profit of Kshs.43, 600**
- **% profit = (Income – Expenditure) x 100**
  Expenditure

= 43,600 x 100
27,550
= 158.3%

36. Study the information provided carefully and use it to prepare a profit and loss account for Mr. Moi's farm for the year ending 31st December 2009.His purchases and expenses were as follows:

	Kshs		
Goats	4,000		

Poultry	15,000	Mohair	75,000
Dairy meal	25,000	Rabbits	36,000
Pasture seeds	50,000	Pigs	70,000
Transportation of farm produces	15,000	Groundnuts	100,000
Casual workers	12,000	Orange	20,000
Ox-plough	10,000	Eggs	15,000
Opening Valuation	150,000	Closing valuation	200,000

His sales and Receipts.

e) Prepare profit and loss account

PROFIT AND LOSS ACCOUNT FOR MR. MOI'S FARM FOR THE YEAR ENDING 31ST DEC 2009

Purchase and expenses	Kshs	Cts	Sales and receipt	Kshs	Cts
Opening valuation	**150,000**	**00**	**Mohair**	**75,000**	**00**
Goat	**4,000**	**00**	**Rabbits**	**36,000**	**00**
Poultry	**15,000**	**00**	**Pigs**	**70,00**	**00**
Dairy meal	**25,000**	**00**	**Groundnuts**	**100,000**	**00**
Pasture seeds	**50,000**	**00**	**Oranges**	**20,000**	**00**
Transportation of farm			**Eggs**	**15,000**	**00**
produce	**15,000**	**00**	**Closing valuation**	**200,000**	**00**
Casual workers	**12,000**	**00**			
Ox plough	**10,000**	**00**			
Sub-total	**281,000**	**00**			
Net profit	**235,000**	**00**			
Total	**516,000**	**00**	**Total**	**516,000**	**00**

f) Did Mr. Moi make a profit or loss?

- **Profit**

g) How much was the profit or loss?

- **Kshs 235,000**

h) Calculate the percentage profit or loss. (Show your working)

- **% profit = (Income – Expenditure) x 100**
  Expenditure

$$= \frac{516{,}000 - 281{,}000}{281{,}000} \times 100$$

= 83.63%

37. The information below was obtained from Mr. Mogaka's farm for the year ending 31st Dec 2009. Use the information to **prepare** a profit and loss account for the farm.

During the year the farm made the following transactions, maize seeds Ksh.10,000, D.A.P fertilizer Ksh.25000, tractor disc plough Ksh.50,000, fuel for tractor Kshs 12,000, Dairy meal Kshs 20,000, Milking cans Ksh.2000, Knapsack sprayer Ksh.6,500, Herbicides Ksh.18000.

The farm also made the following sales maize to N.C.B.P worth Ksh.210,000,milk to K.C.C Ksh.500,000 and weaners Kshs 35,000.

Other information from the books of records showed that the farm had an opening valuation of Ksh.300, 000 and closing valuation of Kshs 600,000.

Other extra information given was debts receivable for tractor services were Ksh.28, 000. Interest payable to the bank Ksh.3000 and Depreciation of machinery worth Kshs. 7,500

PROFIT AND LOSS ACCOUNT FOR MOGAKA FARM FOR THE YEAR ENDING 31ST DEC.2009

EXPENSES & PURCHASES	Kshs	Cts	SALES & RECEIPTS	Kshs	Cts
Opening valuation	300,000	00	Sale of maize	210,000	00
Maize seed	10,000	00	Milk sales	500,000	00
D.A.P fertilizer	25,000	00	Sale of weaners	35,000	00
Disc plough	50,000	00	Debts receivable	28,000	00
Diesel fuel	12,000	00			
Dairy meal	20,000	00	Closing valuation	600,000	00
Milk cows	2,500	00			
Knapsack sprayer	6,500	00			
Veterinary drugs	5,000	00			
Herbicides	18,000	00			
Interest payable	3,000	00			
Depreciation of machinery	7,500	00			
Total	459,500	00			
Profit	913,500	00			
Total	1,373,000	00	Total	1,373,000	00

38. For the year ended 31/12/2005 Soi farm recorded the following:

Perennial crops		250,000
Bank loans		30,000
Cash at hand		5,000
Bank overdrafts		15,000
Land		350,000
Unpaid wages		3,000
Debts receivable		20,000
Stocks in store		25,000
Livestock	200,000	
Bank balances		100,000

(c) Prepare a balance sheet as at 31/12/2005

SOI FARM
BALANCE SHEET AS AT 31ST DEC2005

LIABILITIES (Dr)			ASSETS (CR)		
	SHS	CTS		SHS	CTS
Current liabilities			Current assets		
Overdraft	15,000	00	Debt receivable	20,000	
Unpaid wage	3,000	00	Stocks	25,000	00
	18,000	00	Bank balance	100,000	00
Long term liabilities				145,000	00
Bank loan	30,000	00	Fixed assets		
Total liabilities	48,000		Perennial crops	250,000	00
			Land	350,000	00
Net worth	897,000	00	Livestock	200,000	00
			Total fixed assets	800,000	00
			Total assets	945,000	00
TOTAL	945000	00	TOTAL	945000	00

(b) Did Soi farm qualify for a loan and why?

- **Yes, He qualified for a loan because it was solvent i.e. has more assets than liabilities**

39. The information below is on the financial and Asset valuation of school Farm at the end of the year 2002

Debts Payable	80,000/=	Cattle feed in store	4,000/=
Dairy cattle	55,000/=	Office Equipment	1,400/=
Maize in store	19,000/=	Tools in store	10,000/=
Buildings	125,000/=	Bank Deposit	50,000/=
Beans in store	4,000/=	Debts receivable	11,000/=
Calves	5,000/=	KFA Loan	210,000/=
Mature sheep	7,000/=	Bank Loan	100,000/=
50 ha of land	260,000/=	Wages	41,200/=
Machinery	180,000/=	Electricity/Telephone/Rent Bills	100,500/=

a) Draw up a balance sheet for the farm as at 31st Dec. 2002 using the above information.

SCHOOL FARM

BALANCE SHEET AS AT 31ST DEC 2002

LIABILITIES	Kshs	Cts.	ASSETS	Kshs	Cts.
Current Liabilities			***Current Assets***		
Wages	41,200	00	Bank deposit	50,000	00
Elect, Tel, Rent	100,500	00	Debts receivable	11,000	00
Debts payable	80,000	00	Maize in store	19,000	00
			Beans in store	4,000	00
Long Term			Cattle feed in store	4,000	00
Liabilities				88,000	00
KFA loan	210,000	00	***Fixed Assets***		
Bank Loan	100,000	00	Tools in store	10,000	00
			Office equipment	1,400	00
			Mature sheep	7,000	00
			Calves	5,000	00
			Dairy cattle	5,500	00
			Machinery	180,000	00
			Building	125,000	00
Total Liabilities	531,700	00	50 ha of land	260,000	00
Owners equity	150,200	00		**593,900**	00
TOTAL	**681,900**	**00**	**TOTAL**	**681,900**	**00**

b) Determine the solvency of the farm, giving reasons.

- **The farm is solvent. Assets can be sold to pay for the liabilities and have a balance**

40. a) Prepare a balance sheet for Mr. Tum who is a farmer and wishes to borrow a loan from the bank to develop his farm. Mr. Tum obtained a bank overdraft, of Kshs. 15,000/= previously he had a loan of Kshs. 50,000/= which enabled him to construct a modern milking shed and also did some permanent improvement in the farm. The inventory of the farm as at 3 1 / 1 2/05 is as shown

Value of land	Kshs. 40,000/ =
Machinery and Equipment	Kshs. 35,000/ =
Buildings	Kshs. 45,000/ =
Cattle	Kshs 20000/ =
Sheep	Kshs. 5,000/ =
Coffee	Kshs. 45,000/ =
Debt available from Co-operative Society	Kshs.2,000/ =
Cash in bank	Kshs. 8,000/ =

MR. TUM FARM

BALANCE SHEET AS AT 31ST DEC 2005

LIABILITIES	Kshs	Cts	ASSETS	Kshs	Cts
Current liabilities			***Current Assets***		
			Cash at bank	8,000	00
Bank overdraft	15,000	00	Debts receivable	2,000	00
Total C.L	**15,000**	**00**	Cattle	20,000	00
			Sheep	5,000	00
Long term liabilities				***35,000***	**00**
Loans -Bank	50,000	00			
	50,000	**00**	***Fixed assets***		
			Machinery and Equipment	35000	00
	65,000	**00**	Building	45,000	00
			Land	40,000	00
Net worth	135,000	00	Perennial crops	45,000	00
				165,000	00
Total	**200,000**	**00**		**200,000**	**00**

(b). If Mr. Tum applied for a loan of Kshs. 100,000/= from the bank would he qualify for the loan? Give a reason for your answer.

- **Mr.Tum would qualify for a loan in the bank**
- **Reason: The net worth is more than the loan applied for**

41. Prepare a balance sheet for Mr. Onyancha's farm for year ending 31st Dec. 2006.
Mr. Onyancha's farm owed Kshs. 13,000 from KFA, Kshs5, 000 for drugs and fertilizer from Unga Limited. Overdraft from Co-operative bank of Kshs.10, 000 to build a milking shed payable in three years. He had not been paid ksh.2, 500 for milk delivered to KCC. The unpaid salaries stood at Kshs.5000.
The farm inventory as at 31st Dec. 2006 is as shown below.

Value of land	KSh. 50,000
Equipment	KSh. 20,000
Buildings	KSh. 35,000
Cattle	KSh. 25,000
Coffee	KSh. 38,000
Goats	KSh. 5,000
Poultry	KSh. 2,000
Poultry feed	KSh. 500
Drugs	Ksh.500
Cash at hand	Ksh.1500

MR. ONYANCHA'S FARM

BALANCE SHEET FOR THE YEAR ENDED 31ST DEC. 2006.

LIABILITIES			ASSESTS		
	Kshs	**Cts**		**Kshs**	**Cts**
Long term liabilities			**Fixed Assets**		
Overdraft	**10,000**	**00**	**Land**	**50,000**	**00**
			Building	**35,000**	**00**
			Equipment	**20,000**	**00**
Current liabilities			**Coffee plant**	**38,000**	**00**
KFA	**13,000**	**00**			
Unga	**5,000**	**00**	**Current Assets**		
Unpaid salaries	**5,000**	**00**	**Cattle**	**25,000**	**00**
			Goat	**5,000**	**00**
	33,000		**Poultry**	**2,000**	**00**
			Feeds	**500**	**00**
			Drugs	**500**	**00**
			Cash	**1,500**	**00**
			KCC	**2,500**	**00**

Owner's equity	**147,000**	**00**			
TOTAL	**180,000**	**00**	**TOTAL**	**180,000**	**00**

b) What is the financial state of Onyancha's farm as at 31st Dec. 2006?

- **Onyancha's farm is financially solvent with net worth of 147,000/=**

42. a) What is a balance sheet?

- **A balance sheet is a financial statement drawn to show the financial position of business as at a particular date.**

b) Mr. Rotich is a medium scale farmer in Trans- Nzoia District. He wishes to borrow a loan from Kenya commercial bank to develop his farm. Using the information given below, prepare a balance sheet for Rotich as at 31st Dec 2006.

Bank overdraft	Kshs 150,000/=	Dairy cattle	Kshs 200,000/=
Outstanding bank loan	Kshs 500,000/=	Sheep	Kshs 50,000/=
Value of land	Kshs 400,000/=	Coffee farm	Kshs 450,000/=
Machinery and Equipment	Kshs 350,000/=	Debts receivable from co-op.	Kshs 20,000/=
Buildings	Kshs 450,000/=	Cash in bank	Kshs 80,000/=

MR. ROTICH'S FARM
BALANCE SHEET AS AT 31ST DEC 2006

LIABILITIES	Kshs	Cts	ASSETS	Kshs	Cts
Current liabilities			**Current assets**		
Bank overdraft	**150,000**	**00**	**Cash at bank**	**80,000**	**00**
Total	**150,000**	**00**	**Debts receivable**	**20,000**	**00**
Long term liabilities			**Livestock-cattle**	**200,000**	**00**
Loans (banks)	**500,000**	**00**	**-sheep**	**50,000**	**00**
Total liabilities	**650,0000**	**00**	**Total current assets**	**350,000**	**00**
			Fixed Assets		
			Machinery + Equip	**350,000**	**00**
Net worth	**1,350,000**	**00**	**Buildings**	**450,000**	**00**
			Land	**400,000**	**00**
			Coffee	**450,000**	**00**
			Total Fixed Assets	**1,650,000**	**00**
			Total Assets	**2,000,000**	**00**
Total	**2,000,000/=**	**00**	**Total**	**2,000,000**	**00**

c) If Rotich applied for a loan of Kshs 200,000/= from the bank, would he quality to obtain it?

- Rotich **will obtain the loan of Kshs 200,000**

d) Give **one** reason for your answer in (c) above.

- **The net worth is more than the loan applied for**

43. The inventory for Wanjala's farm as at 31st December, 2006 was as follows:

Layers	30,000.00
Dairy cattle	120,000.00
Calves	15,000.00
Beans in store	7,000.00
Machinery	95,000.00
Building	75,000.00
Land	200,000.00
Cash at hand	5,000.00

The following information was also obtained from the farmers records.

Vegetable sales		5,000.00
Egg sales on credit	10,000.00	
Milk sales on credit	13,000.00	
Wages payable		5,600.00
Taxes payable		750.00
Interests payable		2,000.00

Farm input purchased on credit		19,800.00
Bank loan	213,000.00	
Cash in Bank		20,000.00

a) Prepare a balance sheet for the farm.

MR. WANJALA'S FARM
BALANCE SHEET AS AT 31ST DECEMBER 2006

Liabilities (Dr)	Kshs	Cts	Assets(Cr)	Kshs	Cts
Long term liabilities			**Fixed assets**		
Bank loan	**213,000**	**00**	**Land**	**200,000**	**00**
			Buildings	**75,000**	**00**
			Layers	**30,000**	**00**
			Machinery	**95,000**	**00**
			Dairy cattle	**120,000**	**00**
			Calves	**15,000**	**00**
Current liabilities			**Current assets**		
Farm inputs	**19800**	**00**	**Beans in store**	**7000**	**00**
Wedges	**5600**	**00**	**Egg sales**	**10,000**	**00**
Taxes	**750**	**00**	**Milk sales**	**13,000**	**00**
Interests	**2000**	**00**	**Vegetable sales**	**5000**	**00**
			Cash at hand	**5000**	**00**
Total liabilities	**241,150**	**00**	**Cash in bank**	**20,000**	**00**
Net worth/capital	**353,850**	**00**	**Total assets**	**595,000**	
Total	**595,000**	**00**	**Total**	**595,000**	**00**

44. Study the following information extracted from MR. Joseph's farm records on 31/12/2009 and answer the questions that follow

Loan payable	300, 000	Cattle feeds in store	10, 000
5 milking cows	250, 000	Animal drugs in store	4, 000
400 layers	80, 000	Debts receivable	18, 000
20 goats	30, 000	Cash at hand	20, 000
Debts payable to co-op	20, 000	Breakages to repair	30, 000
Buildings	600, 000	Cash in bank	30, 000
Bonus payable to works	19, 000	Spray equipment	12, 000

a) i) Prepare a balance sheet for Mr. Joseph's farm using the information above.

MR. JOSEPH'S FARM
BALANCE SHEET AS AT 31ST DEC 2009

Liabilities (Dr)	Kshs	Cts	Assets(Cr)	Kshs	Cts
Current liabilities			**Current assets**		
Debts to coop	**20, 000**	**00**	**Cattle feeds**	**10, 000**	**00**
Bonuses payable	**9, 000**	**00**	**Animal drugs**	**4, 000**	**00**
Breakages and repairs			**Debts receivable**	**18, 000**	**00**
	30, 000	**00**	**Cash at hand**	**20, 000**	**00**
Long term liabilities	**69, 000**	**00**	**Cash in bank**	**30, 000**	**00**
Bank loan			**Total Current assets**	**82, 000**	**00**
	300, 000	**00**			
Total liabilities			**Fixed assets**		
	369, 000	**00**	**Buildings**	**600, 000**	**00**
			5 cows	**250, 000**	**00**
			400 layers	**80, 000**	**00**
			20 goats	**30, 000**	**00**
			Sprayer equipment	**12, 000**	**00**
Net worth			**Total fixed assets**	**972, 000**	**00**
	685, 000	**00**			
Total	**1, 054, 000**	**00**	**Total**	**1, 054, 000**	**00**

ii) Was Mr. Joseph's farm business solvent or insolvent? Give reason.

- **Mr. Josephs' farm was solvent because assets are more than liabilities**

45. **Study** the following information which was extracted from Mr. Vincent's farm records on 31-12-2006 and answer the questions below.

Loans payable to bank		300,000
Five milking cows	250,000	
400 layers		80,000
20 goats		30,000
Debts payable to co-op society		20,000
Building and structures		600,000
Bonus payable to workers		19,000
Cattle feed in store	10,000	
Animal drugs in store		4,000
Debts receivable		18,000
Breakages to repair	30,000	
Cash at hand		20,000
Cash in bank		30,000
Spray equipment	12,000	

a) **Prepare** a balance sheet for Mr. Vincent's farm using the information above

MR. VINCENT'S FARM BALANCE SHEET AS AT 31ST DECEMBER 2006

ASSETS(CR)			**LIABILITIES(DR)**		
	Kshs	**Cts**		**Kshs.**	**Cts.**
Fixed assets			**Long term liabilities**		
Building and structures	**600,000**	**00**	**Loan payable bank**	**300,000**	**00**
5 cows	**250,000**	**00**			
400 lagers	**80,000**	**00**			
20 goats	**30,000**	**00**	**Current liabilities**		
spray equipment	**12,000**	**00**	**Debts to co-operative society**	**20,000**	**00**
total	**972,000**	**00**	**Bonus payable to Worker**	**19,000**	**00**
			Breakages and repair	**30,000**	**00**
current assets					
cattle feed in store	**10,000**	**00**	**Total Current liabilities**	**69,000**	**00**
animal drugs in store	**4,000**	**00**			
debts receivable	**18,000**	**00**	**Total liabilities**	**369,000**	**00**
cash at hand	**20,000**	**00**			
cash in bank	**30, 000**	**00**			
			Net worth equity net/ capital/ owner's	**685,000**	**00**
total current assets	**82,000**	**00**	**capital**		
Total	**1054,000**		**Total**	**1054,000**	**00**

b) Was Mr. Vincent's farm business solvent or insolvent?

- **Solvent**

46. Study the following illustration of a financial document and use it to answer the questions that follow

From…….. NO……

P.O Box…… Date……..

To……..

P.O Box……

Please supply the following goods on or before

Items No	Units	Description	Unit price
1	2 bags	Dairy meal	Shs.2800.00
2	1 (25kg) bag	Maize seed (614)	Shs.3000.00
3	1 (50kg) bag	DAP fertilizer	Shs.2400.00

Official rubber stamp

Ordered by…….. Signature……..

Authorized by…….. Signature……

a) Identify the financial document illustrated.

- **Purchase order**

b) **State** the use of the financial document identified in (a) above

- **Used by the purchaser to request for supply of goods by the seller**

47. On 1st June 2007 Soi farm purchased on credit the following items from valley agro-vet

15 bag of sow and weaner meal 100kg each KSh 1350 per bag.
20 bags of finisher meal 70kg each KSh 800 per bag
14 bag D.S.P fertilizer 50kg each KSh. 1800 per bag
20 bags of seed maize 10kg each KSh 1050 per bag
2 milking churns 50 liters each KSh 3,500 per can
4 pruning knives (medium sized) KSh 400per knife

(i) Prepare the purchase order that Soi farm made to valley agro-Vet.

PURCHASE ORDER

SOI FARM **NUMBER……**

TO VALLEY AGRO-VET SHOP **Date ……..**

Please supply the following

Item No.	Description	Unit	Quantity
1	**Sow and weaner meal**	**100Kg**	**15bags**
2	**Finisher meal**	**70Kg**	**20 bags**
3	**D.S.P fertilizer**	**50Kg**	**14 bags**
4	**Seed maize**	**10litres**	**20 bags**
5	**Milking churn**	**50 litres**	**2 cans**
6	**Pruning knives**	**size**	**4 knives**

Official rubber stamp

Ordered by ……signature…….

Authorized by ……signature……..

48. Below is an extract of a cash sale receipt. Study it and answer the questions that follow.

a) Define the document below

CASH SALE

Phone : 05221 **P. O. Box 2004, KISII**

Date: ……

From ……

To M/S ……				
Qty	Particulars	@	Kshs	Cts
Goods once sold are not returnable				

- **The document is one which a buyer receives from a seller after goods and services have been sold and payment made in cash.**

b) Moses bought goods from Kisii Traders on July 2nd 2007, as below.
3kgs of sugar at Kshs. 75 each, cooking fat ½ kg at Kshs. 120 per kg, 20kgs of Rice at Ksh.40 per kg 4packets of 2kg wheat flour each at Kshs. 75 per packet, 2 packets of baking powder at Kshs. 20 per packet and 3kgs minced meat each at Kshs. 150.Post this information in cash sale above

CASH SALE				
Phone : 05221	**P.O Box 2004, Kisii**			
	Date: 2/7/07			
From : Kisii traders				
To: Mrs. Moses				
Qty	**Particulars**	**@**	**Kshs.**	**Cts**
3kgs	**Sugar**	**75**	**225**	**00**
1/2 kg	**Cooking fat**	**120**	**60**	**00**
20 kgs	**Rice**	**40**	**800**	**00**
4 pkts	**Wheat flour**	**75**	**300**	**00**
2 pkts	**Baking powder**	**20**	**40**	**00**
3 kgs	**Minced meat**	**150**	**450**	**00**
E & O.E	**No 1203**	**TOTAL**	**1875**	**00**
Goods once sold are Not returnable.				

b) Suppose Moses bought the commodities above on credit, name the document that could have been used in such a transaction.
- **An invoice.**

AGROFORESTRY

1. What is Agro forestry?
- **The growing of crops, keeping of livestock and growing of trees/ shrubs on the same piece of land**

2. State any **two** types of nurseries under agro-forestry.
- **Direct nurseries. /Swaziland beds/bare root nurseries**
- **Containerized nurseries.**

3. State **four** methods used for collecting agroforestry seeds for planting.
- **Shaking the tree**
- **Gathering from under the tree**
- **Lopping of the tree**
- **Climbing on the trees**
- **Hooking method**

4. **Outline** seed preparation practices carried out in preparing agro-forestry seeds.
- **Extraction: seeds are first soaked in water to depulp /Seed pod that split like acacia species are threshed inside a sack.**
- **Cleaning : Seeds must be cleaned**
- **Sorting: mature seeds, rotten seeds or broken seeds are removed.**
- **Seed testing: this is to verify the seed quality for purity percentage**
- **Storage: should be stored at room temperature of about 28^0C / depends on trees species**
- **Treatment to break seed dormancy**

5. State **two** reasons for seed treatment of tree species before planting
- **Break dormancy**
- **Control pests and diseases**

6. State **four** ways by which Re-afforestation help in land reclamation

- **Add organic matter from falling leaves**
- **Control soil erosion**
- **Improve drainage of swampy areas**
- **Play part in hydrological cycle**

7. List **four** advantages of agro-forestry

- **Source of wood fuel (energy)**
- **Source of income**
- **Conserve environment/reduce soil erosion/improve water catmint**
- **Source of food /fruits**
- **Medicine/value**
- **Aesthetic value**
- **Feed for livestock**
- **Labour saving**
- **Crop products have no inorganic chemical residues**
- **Affordable and cost effective**
- **Improves soil structure**
- **Provides food to soil microbes**

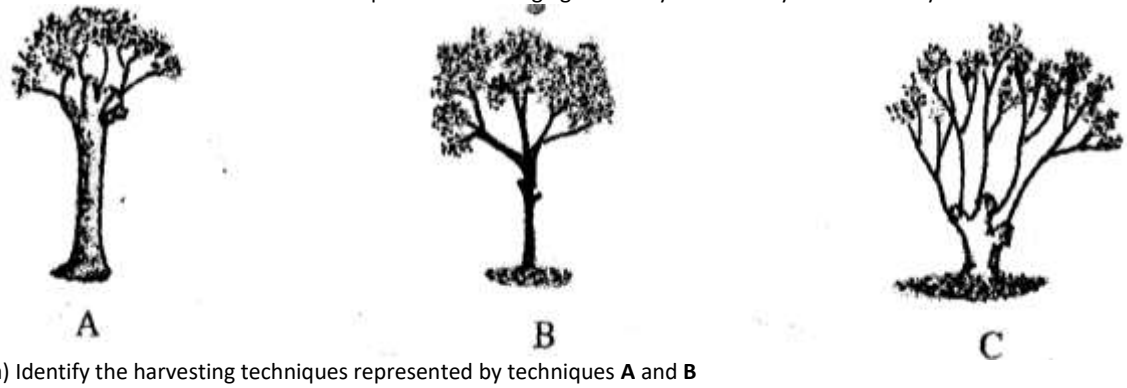
8. a) State **four** benefits of agro-forestry trees **on terraces**.

- **Tree roots stabilize soil**
- **Conserve soil and water**
- **Modify micro-climate**
- **Nutrients released on decomposition**
- **Tree shelter crops from wind damage**
- **Diversity products from terraces by including fruits and fodder**

b) Give **three** importance of Agro-forestry in the conservation of soil and water.

- **Maintenance of soil fertility**
- **Protect soils from wind and rain drops that trigger soil erosion**
- **Improves water catchment**

9. The illustrations below are techniques of harvesting agroforestry trees. Study them carefully and then answer the questions below:-



a) Identify the harvesting techniques represented by techniques **A** and **B**

A – Pollarding technique

B – Coppicing

b) Give an example of a tree species suitable for technique **B** and **C** as a method of harvesting

- **Calliandra calothyrus**
- **Markahmia lutea**
- **Psidum guajava**
- **Croton macrostachyus**
- **Grevillea robusta**
- **Calliandra calothyrsus**
- **Croton cacrostachyus**

10. Give the characteristics of ideal Agro-forestry tree species

- **Fast growth rate**
- **Nitrogen fixing/leguminous**
- **Good in by product production e.g. timber, fruits and poles**
- **Deep rooted and have a narrow root zone**
- **Nutritious and palatable for livestock feeds**
- **easily coppiced /have the ability to grow back after cutting**
- **Non-competitive ability with main crop/desired crops**
- **Highly vegetative**
- **Grow tall/ avoid competing with crops for light**
- **Multipurpose nature e.g. free wood, fodder, timber green leaf manure**
- **Appropriate canopy to allow sunlight penetration**
- **Should have low nutrient and water demand**
- **Should be easy to weed, prune thin or pollard**
- **Should not have similar pests and diseases to the main crop**

11. Differentiate between afforestation and re-afforestation
- **Afforestation- Planting of trees where they have never existed before**
- **Re-afforestation- Planting of trees where they have been cut**

12. a) What is multi-storey cropping?
- **Growing of trees of different heights in a plantation of coffee or tea bushes**

(b) State **two** benefits of multi-storey cropping
- **Trees act as wind break for crops**
- **Creates suitable micro climate for the crops**
- **Source of timber and firewood**
- **Provision of fruits**

13. State the reasons for root pruning in agro forestry seedlings.
- **For seedlings to develop strong, short root system**
- **For easier lifting of seedlings for out planting/ transplanting**
- **To minimize seedling damage during transplanting / out planting**

14. What is pollarding in crop production.
- **Cutting of tree branches at specific points to attain the desired shape**

15. Name the main **forms** of Agro-forestry land use systems.
- **Silvopastoral /Trees grown in association with pastures or livestock**
- **Agrosilvopastoral /Trees in association with crops and livestock or pastures**
- **Agrosilviculture/ Trees grown in association with crops**

16. List **four** sites on which agroforestry trees can be established on a farm
- **Farm boundaries.**
- **Homesteads.**
- **Steep slopes/slopes**
- **Within pasture land**
- **Between crop rows**
- **Along the river banks to protect catchment areas**
- **On terraces to stabilize the terraces and provide organic matter**
- **On steep slopes to create barrier against erosion**

17. Name any **two** types of agro forestry trees.
- **Calliandra /Calliandra calothyrsus**
- **Leucaena**
- **Grevillea robusta**
- **Prunus africana.**
- **Markahmia lutea**
- **Psidum guajava**
- **Croton macrostachyus**
- **Grevillea robusta**
- **Croton cacrostachyus**
- **Sesbania**

18. Mention **four** management practices that are carried out on agro forestry trees from transplanting to maturity

- **Protecting – Erecting sticks around the seedling/ Effecting barriers**
- **Pruning to grow wide**
- **Training to direct growth pattern**
- **Grafting of the old trees**
- **Spraying**
- **Shading**

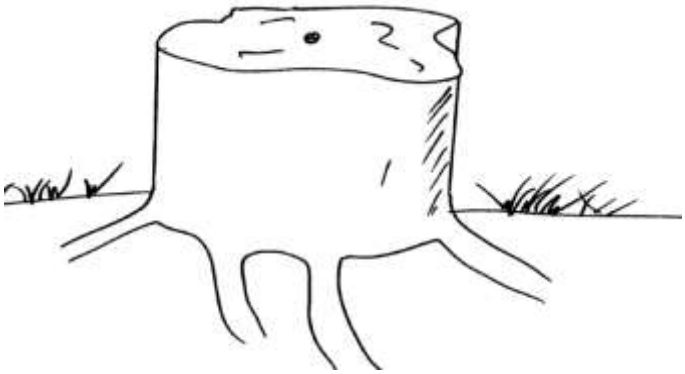
19. State **four** methods of harvesting trees in agro-forestry

- **Pruning**
- **Lopping**
- **Pollarding**
- **Coppicing**
- **Thinning**

20. State **four** advantages of alley cropping

- **Controls soil erosion**
- **A source of fodder**
- **Enables nutrients recycling**
- **Helps suppress weeds**
- **Legumes regenerate soil fertility / improve soil fertility**

21. Below is a diagram of a tree harvesting method.



a) Identify the tree harvesting method shown in the diagram above.

- **Coppicing**

b) Name other tree harvesting methods apart from the one shown above.

- **Lopping**
- **Pollarding**

c) State how the tree harvesting method above is carried out.

- **A young tree is cut 30cm above the ground.**

22. Explain the common agroforestry practices on arable land.

- **Alley cropping – growing of multipurpose trees together with other crops.**
- **Multistory cropping – growing of trees and crops which firm different levels and look like storeys.**
- **Wood lots – plots of land set a side for trees only.**
- **Border planting.**
- **Homestead tree planting.**
- **Wide row planting.**
- **Hedgerow.**

23. Outline **two** benefits of hedgerow intercropping as an agroforestry practice.

- **Improves soil fertility through nitrogen fixation**
- **Provision of green manure**
- **Used as a fence and mark boundaries**
- **Acts as wind breakers**
- **Suppress weeds**
- **Source of timber and fuel wood**

24. Discuss the following

a) Alley cropping /hedge row/ intercropping

- **This is the growing of multipurpose trees together with other crops in the farm**
- **Crops benefit from trees in several ways**
- **Trees are harvested regularly**

b) Multi storey cropping

- **Trees and fruits are grown together**
- **Trees and crops from different conspires**

c) Woodlots farm forests

- **These are plots of land set aside for tree growing**
- **Trees are grown in unsuitable parts of the land eg steep slopes**
- **Trees control soil erosion**