# WASSCE AGRICULTURAL SCIENCE 2 (ESSAY): QUESTIONS ONLY

## JUNE 2015

1(a) Differentiate between land ownership by leasehold and land ownership by freehold.

(b) Mention five ways in which non-governmental organisations contribute to agricultural development in West Africa.

(c) State four ways in which rural-urban migration has hindered agricultural development in West Africa.

(d) Mention three socio-economic uses of land.

(e) Explain two ways by which each of the following environmental factors affects agricultural production: (i) Soil organisms (ii) Soil texture

2(a) State two advantages and two disadvantages of using biogas as a source of farm power.

(b) Mention eight simple farm tools.

(c) List two common storage structures and two processing structures that could be found on a farmstead in West Africa.

(d) Explain the term denitrification.

(e) Describe the following components of the soil: (i) mineral matter (ii) organic matter

3(a) Describe the cultivation of cowpea under the headings: (i) soil requirement (ii) method of propagation (iii) spacing

(b) Name one disease and the field pests of cowpea.

(c) State four cultural methods of controlling crop pests.

(d) State four human activities that promote deforestation in West Africa.

(e) Describe each of the following agro-forestry practices: (i) alley cropping (ii) ley farming

4(a) In an incubator, 1,500 eggs were arranged on the tray for incubation. During candling, 25 eggs were discovered to be unfertilized. At hatching, 475 chicks were male and the remaining were female. Calculate the percentage of: (i) unfertilized eggs (ii) fertilized eggs (iii) male chicks (iv) female chicks

(b) State four signs that indicate the approach of parturition in a

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cow.

(c) Mention four vegetative materials that could be used in propagating ornamental plants.

(d) State four advantages of grafting.

5(a) Mention three functions of a farm manager.

(b) Use the information in the demand schedule below to answer the questions that follow.

| **Price of cowpea (Le)** | **200** | **160** | **120** | **80** | **40** |
|---|---|---|---|---|---|
| **Quantity demanded (kg)** | 5 | 10 | 15 | 20 | 25 |

(i) Draw a demand curve from the schedule. SEE DIAGRAM

(ii) Use the demand schedule to explain the relationship between quantity demanded and price.

(c) State three advantages of the wholesaler in marketing of agricultural produce.

(d) Discuss the rinderpest disease under the following headings: (i) two farm animals affected (ii) causative agent (iii) two symptoms (iv) one mode of transmission (v) one preventive measure

6(a) State four reasons why prices of most agricultural produce are unstable in West Africa.

(b) Explain the following agricultural extension methods: (i) method demonstration (ii) agricultural shows

(c) Discuss the Cercospora leaf spot disease under the following headings: (i) crop affected (ii) causative agent (iii) mode of transmission (iv) two symptoms (v) one preventive measure

(d) State four advantages of selection as a method of crop improvement.

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## JUNE 2016

1(a) In a tabular form, state five differences between subsistence and commercial agriculture.

(b) Suggest two possible solutions to each of the following problems of agricultural development in West Africa: (i) inadequate land (ii) inadequate finance (iii) incidence of diseases

(c) What is agricultural ecology?

(d) State five sources of pollution of agricultural lands and fishponds.

2(a) What is farm surveying?

(b) State four disadvantages of electrical power.

(c) Give four reasons why farm machines should be maintained.

(d) Define the term land as used in agriculture.

(e) Explain briefly how each of the following factors affects land availability for agriculture: (i) population pressure (ii) mining (iii) topography

3(a) Explain the term staking in yam cultivation.

(b) Describe the nursery practices in cocoa cultivation.

(c) State five reasons for parboiling paddy rice.

(d) State three advantages and two disadvantages of taungya farming.

4(a) Explain briefly three systems of mating in livestock management.

(b) Draw and label the digestive tract of a hen.

(c) Give five reasons why ornamental plants are important.

5(a) What is agricultural insurance?

(b) Explain briefly the following types of insurance policies for agricultural production: (i) specific enterprise insurance (ii) fire disaster insurance (iii) life insurance

(c) Discuss the process of egg formation in a hen.

6(a) Mention three print and three electronic media used in disseminating agricultural extension messages.

(b) State four advantages of the group method of agricultural extension.

(c) Explain the term assembling as a marketing function.

(d) State one symptom and two control measures of each of the following crop diseases: (i) maize streak (ii) groundnut rosette

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## JUNE 2017

1(a) List five non-government agricultural organisations in West Africa.

(b) State four ways in which agriculture and industry are interrelated.

(c) Give one function of each of the following parts of a disc plough: (i) disc (ii) beam (iii) furrow wheel (iv) disc scraper (v) hitch.

(d) State four disadvantages of animal power.

2(a) State five factors that should be considered in choosing an irrigation system in West Africa.

(b) Mention four problems associated with irrigation in West Africa.

(c) A rectangular-shaped farmland has a length of 0.4 km and a breadth of 2,400 m. Calculate the area of the farmland in hectares.

(d) List one primary and three secondary tillage implements.

3(a) Draw a well labelled diagram of the water cycle. SEE DIAGRAM

(b) Mention two deficiency symptoms of phosphorus in crops.

(c) Using a table, classify the following insect-pests according to their modes of feeding: (i) Weevil (ii) Locust (iii) Scale insect (iv) Armyworm (v) Earworm (vi) Cotton stainer (vii) Green spider mites (viii) Thrips (ix) Capsids (x) Yam beetle.

4(a) Discuss maize smut disease under the following headings: (i) Causal organism (ii) Mode of transmission (iii) Two symptoms (iv) Two cultural control measures.

(b) Enumerate four forest management practices in West Africa.

(c) (i) State four classes of farm animals based on their uses. (ii) Give one example of each class stated in 4(c)(i).

5(a) Discuss anthrax disease under the following headings: (i) Causal organism (ii) Mode of transmission (iii) Two Symptoms (iv) Two Prevention and control measures.

(b) (i) List four sources of plant protein in livestock feeds. (ii) Give three examples of forage legumes that could be found in rangelands in West Africa.

(c) Mention five characteristics of labour as a factor of agricultural production.

6(a) Explain briefly each of the following economic concepts: (i) Scarcity (ii) Scale of preference.

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(b) Give four reasons why agricultural insurance is important.

(c) State five fishery regulations in West Africa.

(d) Give five reasons why beekeeping is important.

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## JUNE 2018

1(a) Explain four ways in which each of the following factors hinders agricultural development in West Africa: (i) Basic amenities (ii) Farm inputs

(b) State three uses of each of the following farm machinery: (i) tractor (ii) bulldozer

(c) State four daily maintenance practices carried out on a tractor.

2(a) State four functions of soil water to crops.

(b) Outline five factors that could cause low soil pH.

(c) Explain the life cycle of liver fluke.

3(a) Discuss the cultivation of cassava under the following headings: (i) Soil requirements (ii) Land preparation (iii) Propagation

(b) Complete the table below on diseases of farm animals:

| Disease | Causal organism | Farm animal affected | Symptom | Control |
|---|---|---|---|---|
| **Coccidiosis** | (i) | (ii) | (iii) | (iv) |
| **Rinderpest** | (v) | (vi) | (vii) | (viii) |

4(a) Explain the term land tenure system.

(b) Define the term weed.

(c) Discuss groundnut rosette disease under the following headings: (i) Causal organism (ii) Mode of transmission (iii) Two symptoms (iv) Two control measures

(d) State four characteristics of each of the following factors of production: (i) Land (ii) Capital

5(a) Explain the term colostrum.

(b) Draw and label the structure of a chicken egg.

(c) Study and complete the table below which illustrates the law of diminishing returns.

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| Fixed Factor (Land) (ha) | Variable Factor (Fertiliser) (Bag) | Total Product (kg) | Marginal Product (kg) |
|---|---|---|---|
| **2** | 1 | 1 | (i) |
| **2** | 2 | 4 | (ii) |
| **2** | 3 | (iv) | (iii) |
| **2** | 4 | (v) | 13 |
| **2** | 5 | 15 | 12 |
| **2** | 6 | 48 | (vi) |
| **2** | 7 | 49 | (vii) |
| **2** | 8 | 49 | (viii) |

6(a) State four management practices carried out in poultry production.

(b) Give four advantages of dehorning in cattle production.

(c) Mention five marketing services in agricultural production.

(d) Outline five problems of agricultural marketing in West Africa.

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## JUNE 2019

1(a) List and explain four roles of government in agricultural development.

(b) What are the general problems of the land tenure system in agricultural development in West Africa?

(c) List three each of farm machinery and implements.

2(a) Complete the table below on weeds:

| S/N | Weed | Botanical name | Method of dispersal |
|---|---|---|---|
| **1** | Goat Weed | | |
| **2** | Siam Weed | | |
| **3** | Water leaf | | |

(b) List three physical and economic factors affecting land availability for agriculture.

(c) Explain four effects of pollution on agricultural lands and ponds.

(d) Explain two ways of minimising land and pond pollution.

3(a) Classify the following crops based on their life cycle: (i) Mango (ii) Rice (iii) Groundnut (iv) Cotton (v) Pepper (vi) Soya bean (vii) Oil palm (viii) Yam (ix) Tomato (x) Rubber (xi) Ginger (xii) Cocoa (xiii) Carrot (xiv) Cowpea.

(b) State the percentage composition of a typical soil with their percentage volume.

(c) List three methods of applying inorganic fertilisers to the soil.

4(a) Distinguish between spacing and thinning in crop production.

(b) Discuss the cultivation of oil palm under the following headings: (i) Botanical name (ii) Varieties (iii) Method of propagation (iv) Soil requirement (v) Spacing on the field (vi) Diseases.

(c) Explain six ways in which forest resources are important to the economy of West Africa.

(d) What is the meaning of apiculture?

5(a) Explain the following terms used in animal production: (i) Flushing (ii) Castration (iii) Culling.

(b) What are the disadvantages of the terms in 5(a)?

(c) State the functions of the following survey equipment: (i)

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Prismatic Compass (ii) Measuring tape.

(d) Differentiate between floriculture and aquaculture.

6(a) Explain the following terms: (i) Demand schedule (ii) Supply curve.

(b) State five agricultural extension agencies in West Africa.

(c) Explain any four ways through which soils are enriched with nitrogen.

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## JUNE 2020

1(a) Suggest two possible solutions to each of the following problems of agricultural development in West Africa: (i) Poor transportation (ii) Environmental degradation

(b) State three precautions that should be taken when using each of the following types of farm power: (i) Animal power (ii) Electrical power

(c) Give six reasons for maintaining farm tools and implements.

2(a) Explain each of the following terms used in agricultural ecology: (i) Soil texture (ii) Soil structure (iii) Soil profile

(b) (i) State three advantages of grafting. (ii) Name two tree crops that could be propagated by grafting.

(c) List three cultural practices that could be used to replenish nutrients in the soil.

(d) Give four measures that farmers could adopt to control pests in grain stores.

3(a) Discuss the cultivation of Citrus spp under the following headings: (i) Method of propagation (ii) Spacing in the field (iii) Nursery practices (iv) Pests (v) Diseases

(b) Define each of the following terms: (i) Surface irrigation (ii) Surface drainage

(c) Give three advantages of each of the terms in 3(b).

4(a) With the aid of a diagram, describe the life cycle of the variegated grasshopper.

(b) State five ways through which diseases are spread on crop farms.

(c) State six characteristics of a good layer.

5(a) Describe these farm animal diseases (I Brucellosis, II Aspergillosis) under the following headings: (i) Causal organism (ii) Farm animal affected (iii) Symptoms (iv) Control

(b) State five advantages of the battery cage system in poultry production.

(c) Give five reasons why some agricultural extension programmes are not successful in West Africa.

6(a) (i) Prepare a balance sheet for Newlife Farms for the year ended 31st December 2016 using the information below:

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Closing Valuation ₦600,000.00

Cash in bank ₦250,000.00

Loan payable to Cooperatives ₦250,000.00

Debt payable to feed millers ₦100,000.00

Debt receivable from egg sellers ₦100,000.00

(ii) State two reasons why the balance sheet is important to a farm manager.

(b) List five sources of agricultural loans in West Africa.

(c) Give three reasons why the floor of a deep litter house is preferably covered with wood shavings instead of saw dust.

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## JUNE 2021

1(a) State the roles of the government of West African Countries in agricultural development on: (i) Agricultural finance (ii) Agricultural education (iii) Agricultural extension services (iv) Agricultural policies and programmes

(b) State the structural differences between disc plough and disc harrow.

(c) State the effects of the frequent use of disc plough on the soil.

2(a) State the roles played by the following factors in soil formation: (i) Time (ii) Rainfall (iii) Parent material

(b) State four principles which should be followed in a good crop rotation plan.

(c) Give five uses of forage crops.

3(a) (i) Explain what is meant by selective exploitation in forest management. (ii) State three advantages of selective exploitation.

(b) Distinguish between field pests and storage pests of crops.

(c) Give two examples each of insect pests of forest trees (i) Storage crops (ii) Field crops

(d) State three ways of conserving water in the soil.

4(a) State three reasons for each of the following farm operations:

(i) Pruning of cocoa trees (ii) Parboiling of paddy rice

(b) List five ways of eradicating guinea grass in a farmland.

(c) Give five uses of ornamental plants.

5(a) (i) List the main agricultural extension methods that could be used to create awareness of the disease(s) among poultry farmers.

(ii) Which of the methods listed in 5(a)(i) is most appropriate to create awareness of the disease(s) among poultry farmers? (iii) State the reason for the choice in 5(a)(ii).

(b) Give four problems faced by farm managers.

(c) List six breeds of goat found in West Africa.

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## JUNE 2022

1(a) State three ways in which science and technology have contributed to agricultural development through each of the following: (i) Crop protection (ii) Climatology and meteorology

(b) Give two functions of each of the following farm machines and implements: (i) Bulldozer (ii) Combined harvester (iii) Tractor (iv) Sprayer (v) Planter

2(a) Mention two sources of irrigation water.

(b) Enumerate two advantages and two disadvantages of irrigating farmlands.

(c) List two ways by which the soil loses nutrients.

(d) Give two reasons for manuring in crop production.

3(a) Name four breeds of rabbits.

(b) Give two reasons why oestrus detection is important in farm animals.

(c) State four functions of each of the following hormones in farm animals: (i) Androgen (ii) Oestrogen

(d) (i) List two viral diseases of poultry. (ii) List two ecto-parasites of poultry.

4(a) State two ways by which each of the following environmental factors affect agricultural production: (i) Temperature (ii) Wind (iii) Soil micro-organisms

(b) List four ways by which diseases are spread on a crop farm.

(c) State three symptoms and three control measures of each of the following diseases: (i) Onion twister (ii) Root-knot of tomato

5(a) State three functions of a farm manager.

(b) Explain the following terms used in Agricultural Economics: (i) Appreciation (ii) Salvage value (iii) Farm budget (iv) Farm inventory

(c) State five qualities of a good agricultural extension agent.

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## JUNE 2023

1(a) Differentiate between Credit and Subsidy in agricultural finance.

(b) Name five agricultural inputs that are subsidised by the government.

(c) Mention six periodic maintenance practices on a tractor.

(d) State five precautions that should be taken when operating farm machinery.

2(a) Explain each of the following terms: (i) Agricultural ecology (ii) Ecosystem

(b) State: (i) two biotic components of a farm ecosystem (ii) three abiotic components of a farm ecosystem

(c) State five precautions that should be taken during storage of bags of maize in a store.

(d) Give four examples of bedding plants.

3(a) Discuss the root knot disease of tomato plants under the following headings: (i) Causal organism (ii) Mode of transmission (iii) Two symptoms (iv) Two prevention and control measures

(b) Describe three effects each of the following farming practices on the soil: (i) Fertiliser application (ii) Clean clearing (iii) Overgrazing

(c) Mention three agricultural uses of land.

4(a) Outline four steps involved in the planting of cassava stem cuttings.

(b) State three uses of cassava tubers.

(c) If yam is cultivated at a spacing of 100 cm by 100 cm on 1.5 hectares of farmland and each yam tuber weighs an average of 3.5 kg after harvesting, calculate the: (i) expected number of yam plants on the farmland (ii) total weight of yam tubers harvested in kilograms

(d) Distinguish between diet and ration in animal nutrition.

5(a) Copy and complete the table below on diseases of farm animals:

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| Symptoms | Diseases | Prevention and Control |
|---|---|---|
| **Constant cough and production of stringy sputum with blood or pus in pigs** | (i) | (ii) |
| | | (iii) |
| **(iv)** | Ringworm | (v) |
| | | (vi) |
| **Blood-stained diarrhoea** | (vii) | (viii) |
| **Pale comb in poultry** | (ix) | (x) |

(b) State two functions each of the: (i) Queen bee (ii) Worker bee in a bee colony

(c) Give five reasons why a compost pit should be covered during composting.

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## JUNE 2024

1(a) Mention three ways each by which the following agricultural programmes and institutes have contributed to agricultural development in West Africa: (i) Cooperative farming (ii) Farm settlement scheme (iii) Agricultural research institute

(b) Name one tractor-mounted implement each that could perform a similar function as the following farm tools: (i) Dibber/Dibberish (ii) Hoe (iii) Sickle (iv) Wheelbarrow (v) Watering can

(c) State two: (i) advantages of using the mouldboard plough (ii) disadvantages of using the mouldboard plough

2(a) With the aid of a pH scale, explain the term pH. SEE DIAGRAM

(b) (i) What are Cover Crops? (ii) Mention five advantages of planting cover crops on the farm.

(c) Complete the table below:

| Weed | Botanical name |
|---|---|
| **(i) Wild marigold** | |
| **(ii) Spear Grass** | |
| **(iii) Stubborn Grass** | |
| **(iv) Pig weed** | |
| **(v) Carpet Grass** | |

3(a) Give one function each of the following bacteria in the nitrogen cycle: (i) Rhizobium (ii) Nitrosomonas (iii) Pseudomonas (iv) Nitrobacter

(b) A farmer discovered that aphids have invaded a cowpea farm. (i) State three effects of aphids on the cowpea plants. (ii) Mention four cultural ways by which the farmer could control aphids on the cowpea farm.

(c) (i) Explain the term forestry. (ii) Name five products that could be obtained from forests.

4(a) A farmer intends to cultivate sorghum on a farmland measuring 300 m by 150 m at a seed rate of 60 kg per hectare. If sorghum requires NPK 15:15:15 fertilizer at the rate of 20 kg per hectare, calculate the: (i) area of farmland in hectares (ii) quantity

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of sorghum seeds required for planting (iii) quantity of fertiliser required

(b) (i) State two differences between budding and grafting in vegetative propagation. (ii) Mention four crops that could be propagated by budding.

(c) Name two groups of farm animals each that should be fed with: (i) production ration (ii) maintenance ration

5(a) Give two reasons each for carrying out the following management practices in fishponds: (i) removal of excessive vegetation (ii) removal of silt (iii) supplementary feeding (iv) fertiliser application

(b) Mention five conditions that could necessitate culling of farm animals.

(c) State five effects of excess nitrogen in the soil on crops.

6(a) What is agricultural insurance?

(b) Define each of the following terms in agricultural insurance: (i) insurance policy (ii) insurance premium

(c) An agricultural extension agent organised a meeting with the groundnut farmers in a village in order to introduce a disease-resistant variety of groundnut to them. (i) State four advantages of the agricultural extension method employed by the extension agent. (ii) Mention three other ways by which the information could be disseminated to the group of farmers.

(d) Enumerate five operations involved in the processing of rice after harvesting.

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## MARKING SCHEME

## 2015 — AGRICULTURAL SCIENCE ESSAY

1(a) Differences between land ownership by leasehold and freehold

Leasehold involves payment of fees for land used over a stated period or under agreed conditions. Freehold involves outright purchase and permanent ownership.

Under leasehold, use is for a specified period. Under freehold, ownership is permanent.

Permanent structures cannot be erected on leasehold land. Permanent structures can be erected on freehold land.

Leasehold land cannot be sold to another person. Freehold land can be sold if the owner wishes.

The land/title under leasehold cannot be used as collateral for a loan. Freehold land can be used as collateral to obtain bank loans.

1(b) Ways in which NGOs contribute to agricultural development in West Africa

Providing processing facilities for farmers.

Developing improved farming systems.

Providing storage facilities and tools.

Providing vaccines, drugs and farming inputs.

Carrying out research to develop new crop varieties.

Funding agricultural extension projects.

Providing credit facilities.

Conducting research to improve animal breeds.

Providing social amenities in rural areas.

1(c) Ways rural–urban migration has hindered agricultural development in West Africa

Poor adoption of agricultural innovations due to an ageing farming population.

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Poor quality of labour in rural areas, resulting in low productivity.

Scarcity of farm labour.

High cost of farm labour.

Inadequate supply of raw materials to agro-industries.

Decrease in exports.

Food scarcity.

1(d) Socio-economic uses of land

Residential houses and estates.

Markets for various sectors of the economy.

Roads and railways.

Seaports and airports.

Health centres.

Establishment of industries.

Establishment of religious centres.

Mineral exploration.

Cemeteries and burial grounds.

1(e) Ways environmental factors affect agricultural production

(i) Soil organisms

Improve soil structure.

Improve soil aeration.

Enhance water percolation.

Enhance decomposition of organic matter.

Improve soil fertility.

"Reduce the quantity and quality of nematodes in crops."
[Wording as printed in the source.]

(ii) Soil texture

Soil texture plays a vital role in determining:

The form of tillage practice.

The quantity of moisture in the soil.

Soil aeration.

Water-holding or retention capacity.

The type of crop to be grown.

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Nutrients available in the soil.

2(a) Biogas as a source of farm power

Advantages:

Animal dung is inexpensive.

Biogas gives economic value to animal waste.

It can be used for different farm operations.

It reduces environmental pollution.

It is easy to operate.

Disadvantages:

Maintenance is not easy.

It requires considerable technical knowledge.

It is not widely used and is limited to areas with abundant animals.

2(b) Simple farm tools

Hand trowel.

Cutlass.

Shovel.

Shears.

Spade.

Secateurs.

Hoe.

Watering can.

Garden fork.

Tapping knife.

Rake.

Sickle.

Axe.

Dibber.

Headpan.

Budding knife.

Mattock.

Pickaxe.

Garden line.

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Go-to-hell.

Hand fork.

2(c) Storage and processing structures on a farmstead in West Africa

Storage structures:

Cold store or cold room.

Farm store or warehouse.

Silos.

Cribs.

Barns.

Drums and bins.

Bags and baskets.

Cages and rhumbu.

Underground pits.

Processing structures:

Shelling barn.

Milk-pasteurising shed.

Meat/fish-smoking shed.

Cassava mill.

Rice mill.

Oil mill.

Abattoir.

Tobacco-curing house.

2(d) Denitrification

Denitrification is the process whereby soil nitrates are converted into nitrogen gas or nitric oxide through the activities of denitrifying bacteria.

2(e) Soil components

(i) Mineral matter

Mineral matter forms the solid part of the soil and is derived from weathered rocks. It represents about 45% of a soil sample by volume.

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It holds water and air for plant use, supplies plant nutrients and provides anchorage for plants.

(ii) Organic matter

Organic matter is a mixture of plant and animal materials at different stages of decomposition. It represents about 5% of a soil sample by volume.

It improves soil structure, binds soil particles together and supplies plant nutrients after decomposition.

3(a) Cultivation of cowpea

Soil requirement: Sandy loam.

Method of propagation: Seeds.

Spacing: “2–50 cm within rows; 75–100 cm between rows.” [Spacing reproduced as printed.]

3(b) Diseases and field pests of cowpea

Diseases:

Bacterial blight.

Root-knot.

Mosaic.

Damping-off.

Cercospora leaf spot.

Field pests:

Bean beetles.

Leafhoppers.

Monkeys.

Aphids.

Pod borers.

3(c) Cultural methods of controlling crop pests

Early planting.

Planting pest-free crops.

Appropriate tillage operations.

Crop rotation.

Adequate flooding.

Adequate spacing, drainage, weeding and pruning.

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Planting pest-tolerant varieties.

Early harvesting and controlled burning.

3(d) Human activities that promote deforestation in West Africa

Road construction.

Arable or continuous cropping.

Estate development.

Cutting timber for paper, furniture and other products.

Mining and energy projects, such as hydroelectric dams, requiring extensive land clearance.

Fuelwood collection and charcoal production.

Human-caused fires used to clear land for farming or settlement.

3(e) Agroforestry practices

(i) Alley cropping

Alley cropping is an agroforestry practice in which annual or forage crops are grown in wide spaces, called alleys, between rows of trees or shrubs.

The alleys are sufficiently wide to allow farm machinery to move through during the growing season. It combines fast-growing, shallow-rooted annual crops with slow-growing, deep-rooted woody plants; for example, maize or soybeans grown with nut or timber trees.

(ii) Ley farming

Ley farming is a crop-rotation system alternating food or cereal crops with temporary pastures of grasses, legumes or herbs.

Food crops are grown for a few years, after which grasses and legumes are planted and left as pasture for one to five years. Grazing animals enrich the soil through manure, urine and their physical activity before the cycle restarts.

4(a) Egg and chick calculations

Total number of eggs = 1,500.

Number of unfertilised eggs = 25.

Number of hatched eggs = 1,475.

Number of male chicks = 475.

Number of female chicks = 1,000.

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(i) Percentage of unfertilised eggs:

25 ÷ 1,500 × 100 = 1.67%

(ii) Percentage of fertilised eggs:

1,475 ÷ 1,500 × 100 = 98.33%

(iii) Percentage of male chicks:

475 ÷ 1,500 × 100 = 31.67%

(iv) Percentage of female chicks:

1,000 ÷ 1,500 × 100 = 66.67%

[The supplied solution uses 1,500 as the denominator for all four calculations.]

4(b) Signs indicating approaching parturition in a cow

Loss of appetite.

Swelling of the vulva with discharge.

Frequent urination.

Widening of the cervix.

Contraction of the uterine wall.

Restlessness.

Self-isolation.

Enlargement of the mammary glands and secretion of milk.

4(c) Vegetative materials for propagating ornamental plants

Leaves, such as Bryophyllum.

Stems or stem cuttings.

Roots, such as slips.

Rhizomes.

Tubers.

Corms.

Stolons.

Buds.

Runners.

Suckers.

4(d) Advantages of grafting

Propagating plants whose cuttings are difficult to establish.

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Providing disease resistance to a susceptible but desirable cultivar.

Rapidly increasing desirable cultivars.

Changing plant form.

Determining whether a plant is free from viruses.

Propagating plants that cannot be propagated by seeds.

Shortening the period before fruiting.

Repairing damaged plant parts.

Virus indexing.

5(a) Functions of a farm manager

Recruits staff.

Evaluates and budgets the farm's finances.

Plans farm operations.

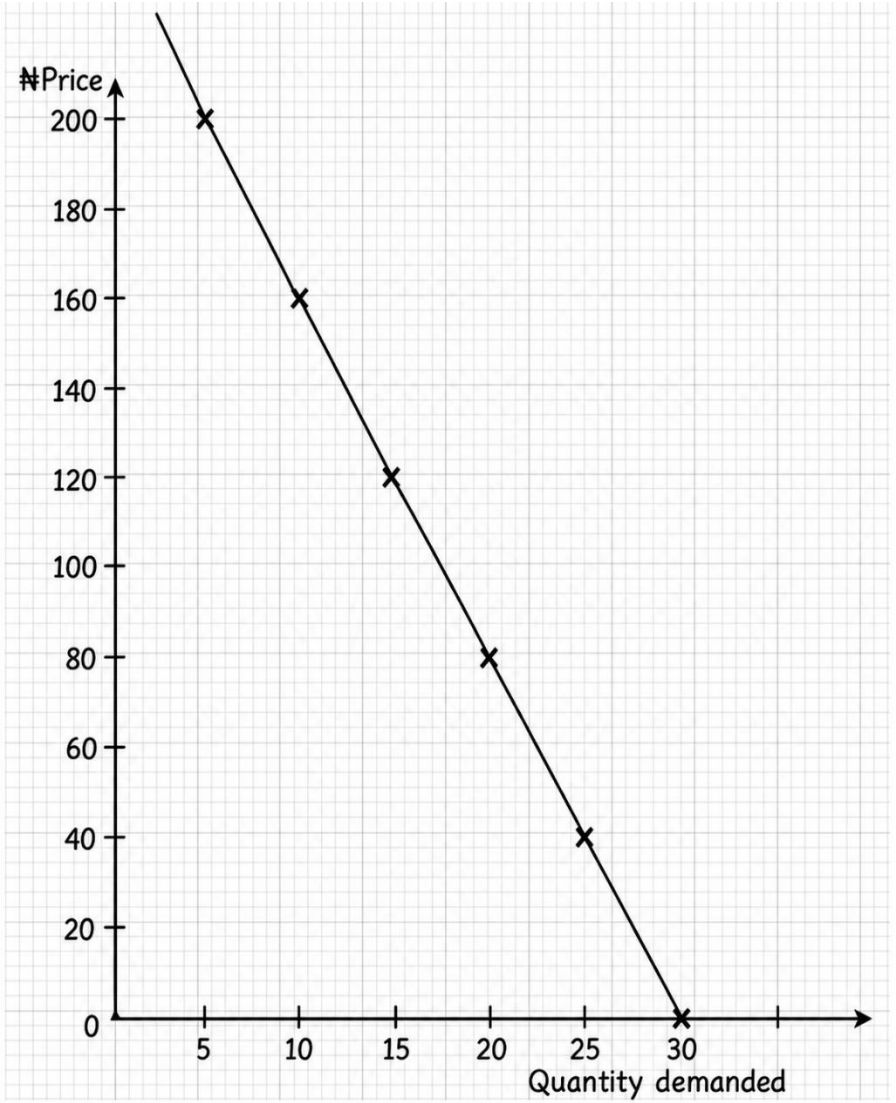
Markets farm produce.

Makes short-term and long-term decisions.

Organises, coordinates and supervises farm operations.

5(b)(i) Demand curve

5(b)(ii) Relationship between price and quantity demanded




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The lower the price, the higher the quantity demanded. A decrease in price brings about an increase in quantity demanded.

5(c) Advantages of wholesalers in marketing agricultural produce

Buy large quantities at once, reducing the farmer's need to find individual buyers.

Store and preserve produce in warehouses.

Arrange transportation to urban markets and rural areas.

Link consumers and retailers with farmers.

Provide financial support to farmers and credit to retailers.

Move surpluses from producing regions to areas with shortages, helping to stabilise prices.

5(d) Rinderpest disease

(i) Animals affected: Cattle, sheep and goats.

(ii) Causative agent: Virus.

(iii) Symptoms:

High fever.

Reduced milk yield.

Difficulty breathing.

High mortality.

Bloody diarrhoea.

Lesions on the tongue.

(iv) Transmission:

Direct contact with infected animals.

Inhalation of virus-containing expired air at close range.

Contaminated equipment, clothing, housing and other objects.

Contaminated food and water.

(v) Preventive measures listed:

Routine vaccination.

Culling and destroying infected animals.

6(a) Reasons agricultural produce prices are unstable in West Africa

Seasonal gluts at harvest.

Unreliable transport networks.

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Poor storage facilities.

Seasonal production and dependence on rainfall.

Macroeconomic pressures and importation associated with currency depreciation.

Unpredictable pests and diseases causing poor yields.

6(b) Agricultural extension methods

(i) Demonstration

A teaching method showing farmers how to perform agricultural tasks or adopt technologies.

It can demonstrate a particular task, such as grafting a fruit tree or planting seeds. It can also demonstrate the results of a recommended practice by comparing it with a traditional method—for example, comparing yields from fertilised and unfertilised plots.

(ii) Agricultural shows

Public exhibitions bringing farmers, researchers, practitioners and suppliers together to share agricultural knowledge and technology.

Farmers, universities, research institutes and agribusinesses display crops, livestock, machinery and modern techniques. These shows create awareness and stimulate interest in innovations.

6(c) Cercospora leaf spot disease

(i) Crops affected:

Sugar beet and table beet.

Groundnut.

Soybean.

Carrot.

Spinach.

Pepper and eggplant.

(ii) Causative agent: Ascomycete fungi, including:

Cercospora canescens in legumes.

Cercospora coffeicola in coffee.

Cercospora carotae in carrot.

(iii) Transmission:

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Wind dispersal.

Rain splash and irrigation.

Seed transmission.

Mechanical movement.

Spores move from infected plant debris or neighbouring plants.

(iv) Symptoms:

Small circular leaf spots with light-grey or dark-brown centres and reddish-purple or yellow borders.

Small round or oval flecks appearing initially.

Spot centres becoming light grey or white as tissue dries.

Premature defoliation; leaves turn yellow or brown and fall.

Elongated or elliptical lesions on leaf stalks and stems.

Small circular spots on developing fruits or pods.

(v) Preventive measures listed:

Apply fungicides containing chlorothalonil, mancozeb or copper-based compounds at the first sign of disease.

Remove and destroy heavily infected leaves.

Spray the upper and lower leaf surfaces thoroughly.

Water at the plant base using drip irrigation.

Remove fallen leaves and plant debris at the end of the season.

Space plants and prune crowded branches to improve airflow.

Practise crop rotation.

6(d) Advantages of selection in crop improvement

Promotes superior crop varieties.

Eliminates undesirable traits.

Identifies and propagates crops resistant to local pests and diseases.

Enhances uniformity, including through pure-line selection.

Enables seeds from healthy plants to be collected for distribution.

Is cost-effective; methods such as mass selection require relatively little technical equipment.

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# 2016 — AGRICULTURAL SCIENCE ESSAY

1(a) Differences between subsistence and commercial agriculture

| Subsistence agriculture | Commercial agriculture |
|---|---|
| **Mixed cropping is usually practised.** | Monocropping is usually practised. |
| **Low environmental degradation.** | High environmental degradation. |
| **Small area cultivated.** | Large area cultivated. |
| **Production mainly for family consumption.** | Production mainly for sale. |
| **Fertilisers rarely used.** | Fertilisers commonly applied. |
| **Environmental pollution not usually experienced.** | May cause environmental pollution. |
| **Simple storage facilities.** | Modern storage facilities. |
| **Little or no formal education required.** | Technical skills and formal education required. |
| **Pests and diseases not easily controlled.** | Pests and diseases controlled. |
| **No specialisation of operations.** | Encourages specialisation. |
| **Little capital investment.** | Large capital investment. |
| **Unskilled or family labour.** | Skilled or hired labour. |
| **Low yield.** | High yield. |
| **Crude tools and simple implements.** | Farm machines and implements. |
| **Usually practised by poor farmers.** | Mostly practised by rich farmers. |

1(b) Solutions to problems of agricultural development in West Africa

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(i) Inadequate land

Establish farm settlements to facilitate land acquisition.

Form cooperatives to pool resources and acquire large areas.

Reduce land rates and rents for agricultural purposes.

Make agricultural insurance available.

Provide low-interest commercial-bank loans.

Provide grants and credit facilities.

Establish agricultural banks offering loans with minimal collateral.

Form cooperatives to improve access to credit.

(iii) Incidence of diseases

Produce livestock vaccines locally.

Adopt cultural measures for controlling crop diseases.

Excessive herbicide application.

Improper disposal of industrial waste.

Oil spills.

Review land-tenure laws to improve farmers' access.

(ii) Inadequate finance

Provide government subsidies.

Use extension workers to assist in detecting and controlling diseases.

Provide veterinary services.

Develop and adopt disease-resistant crops and animal breeds.

1(c) Agricultural ecology

The study of relationships and interactions between crops and animals and the biotic and abiotic components of their environment.

1(d) Sources of pollution of agricultural land and fish ponds

Excessive fertiliser application.

Improper disposal of toxic waste.

Excessive pesticide application.

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Improper sewage disposal.

Improper disposal of livestock waste.

2(a) Farm surveying

The process of measuring and mapping the position, topography, size and boundaries of farmland.

2(b) Disadvantages of electrical power

Supply can be erratic.

Limited use in field operations.

High maintenance costs.

Fluctuations can damage equipment and cause fires.

Dangerous if carelessly handled.

High generation costs.

2(c) Reasons for maintaining farm machines

Ensure efficient operation.

Avoid frequent breakdown.

Extend useful life.

Prevent accidents.

Improve salvage value and reduce rusting.

Reduce depreciation.

2(d) Land in agriculture

The surface of the earth and all natural resources on and beneath it.

2(e) Factors affecting agricultural land availability

(i) Population pressure

Population growth increases demand for houses, roads, industries, social amenities and infrastructure, reducing land available for agriculture.

(ii) Mining

Mineral extraction reduces agricultural land. Improperly disposed mining waste can also make land unsuitable for farming.

(iii) Topography

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Flat or gently sloping land is suitable because it is less prone to erosion. Steep or undulating land requires greater expenditure on erosion control.

3(a) Staking in yam cultivation

Using long poles or sticks to support yam vines and training the vines to climb them. It exposes leaves to sunlight for photosynthesis and helps increase yield.

3(b) Nursery practices in cocoa cultivation

Fill polythene bags or pots with loamy soil mixed with organic manure.

Sow fresh seeds.

Place the bags under shade.

Water daily.

Remove weeds around seedlings by hand.

Nursery management lasts about five months.

Seeds are usually sown between October and November in West Africa.

3(c) Reasons for parboiling paddy rice

Improve resistance to storage pests.

Harden the grains.

Improve storability.

Enable absorption of vitamin B and protein from the bran during soaking.

Loosen the husk.

Reduce breakage during milling.

Make dehusking easier.

3(d) Taungya farming

Advantages:

Effective weed control.

Increased farmer income.

Harvesting of different crops.

Young forest trees receive attention from farmers.

Employment creation.

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Improved soil fertility where legumes are planted.

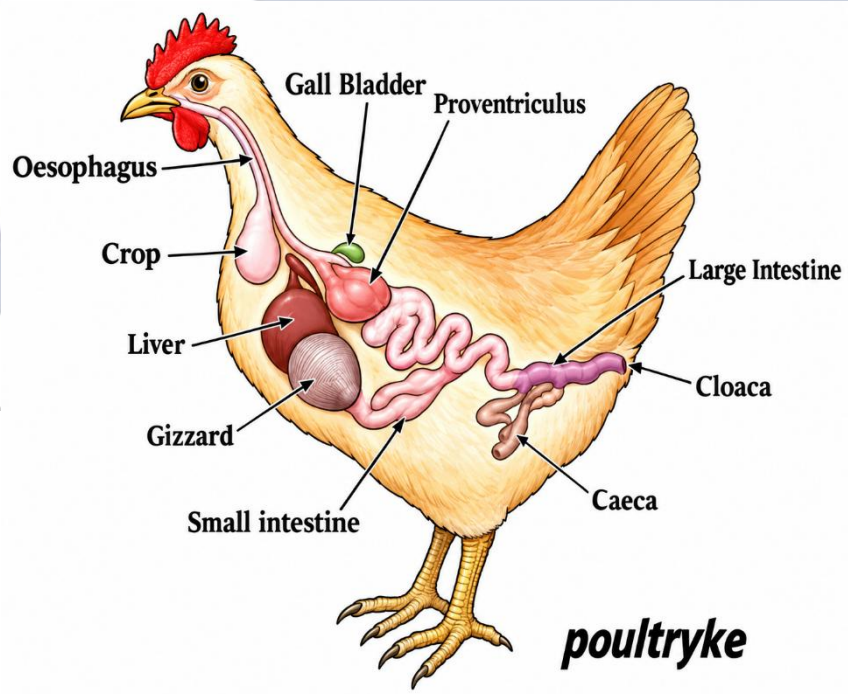
Increased farmer income. [Repeated in the source.]

Disadvantages:

Trees may harbour crop pests and pathogens.

Forestry authorities may be reluctant to release fertile land.

Labour-intensive because mechanisation is difficult.




Crop choice is restricted to arable crops.

Crops and trees compete for space, light, water and nutrients.

4(a) Systems of mating in livestock management

(i) Stud or hand mating: A proven sire is kept separately. A female on heat is brought for mating and removed afterwards.

(ii) Pen mating: A group of females on heat is brought into the male's pen for mating.

(iii) Pasture or flock mating: Males and females move together and mate freely.

4(b) Digestive tract of a hen

4(c) Importance of ornamental plants

Flowers of some plants are used to prepare dyes.

Beautify the environment.

Have medicinal value.

Provide shade and reduce noise.

Earn foreign exchange.

Produce pleasant fragrances.

Supply bouquets, garlands and wreaths.

Support education and research.

Promote tourism.

Express affection or love.

Demarcate boundaries and support landscaping.

Generate government revenue through taxation.

5(a) Agricultural insurance

The source defines agricultural insurance as a risk-management mechanism compensating farmers for losses due to declines in agricultural commodity prices.

5(b) Types of insurance policies

(i) Specific enterprise insurance: Covers a particular farming enterprise against crop or livestock losses caused by disasters.

(ii) Fire disaster insurance: Protects farmers, workers and the farmer's household against losses from fire.

(iii) Life assurance: Covers farm workers and their households in the event of death.

5(c) Egg formation in a hen

The yolk forms in the ovary and is released into the infundibulum.

Fertilisation occurs in the infundibulum.

The egg moves into the magnum.

Albumen is secreted around the yolk and the chalaza forms.

The egg's shape and two shell membranes form in the isthmus.

The shell forms and minerals are added before passage into the vagina.

The egg is laid through the cloaca.

6(a) Media for agricultural extension messages

Print media:

Posters and bulletins.

Handbills and fliers.

Newspapers and magazines.

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Billboards and banners.

Pamphlets, journals and periodicals.

Electronic media:

Television.

Radio.

Film shows.

Websites.

Telephone.

Projected visuals.

6(b) Advantages of group extension methods

Farmers learn from one another.

Attention is directed towards shared problems and solutions.

Reluctant farmers are encouraged to adopt innovations.

Many farmers can be reached simultaneously.

It is cost-effective and facilitates faster learning.

6(c) Assembling as a marketing function

Gathering small quantities of a commodity from different farms into large quantities. It provides a central source of produce for retailers and consumers and is usually performed by farmers and middlemen.

6(d) Symptoms and control measures

(i) Maize streak

Symptoms:

Yellow streaks on leaves parallel to the veins.

Stunted growth or deformed plants.

Control:

Early planting.

Uprooting and burning infected plants.

Resistant varieties.

Insecticides to control insect vectors.

(ii) Groundnut rosette

Symptoms:

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Yellow leaves with green patches.

Distorted leaves with outward-rolling margins.

Control:

Crop rotation.

Insecticides against aphids.

Uprooting and burning infected plants.

Early planting.

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# 2017 — AGRICULTURAL SCIENCE ESSAY

1(a) Non-governmental agricultural organisations listed in the source

International Centre for Research in Agroforestry — ICRAF.

International Livestock Research Institute — ILRI.

West African Rice Development Agency/Association — WARDA.

International Institute for Tropical Agriculture — IITA.

International Livestock Centre for Africa — ILCA.

International Fund for Agricultural Development — IFAD.

Catholic Relief Services — CRS.

Adventist Relief Agency — ADRA.

International Crop Research Institute for Semi-Arid Tropics — ICRISAT.

1(b) Interrelationship between agriculture and industry

Agriculture supplies industrial raw materials.

Agriculture provides food and clothing for industrial employees.

Agriculture provides a market for industrial products.

Agriculture supplies industrial labour.

Industries process, package and transport agricultural produce.

Seed industries supply high-yielding, viable seeds.

Agrochemical industries supply fertilisers, pesticides, fungicides, herbicides, drugs and feed additives.

1(c) Functions of parts of a disc plough

Disc: Cuts and turns the soil.

Beam: Supports the disc standards.

Furrow wheel: Maintains stability and keeps the furrow wall clean.

Disc scraper: Removes soil from the discs.

Hitch: Attaches the implement to the tractor.

1(d) Disadvantages of animal power

Low power output.

Cannot perform certain harvesting and processing operations.

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Animals are susceptible to disease and death.

Use is restricted to certain climatic zones.

Poor handling reduces performance.

Unsuitable for large-scale production.

Animals become tired.

2(a) Factors in choosing an irrigation system

Soil type.

Water availability.

Cost.

Topography.

Crop type.

Farm size.

2(b) Irrigation problems in West Africa

Inadequate technical knowledge.

High equipment costs.

High maintenance costs.

High humidity favouring disease-causing organisms.

Introduction of salts toxic to crops.

[The source sentence is garbled after this point.]

Some systems obstruct farm machinery.

2(c) Area of farmland

Length = 0.4 km = 400 m.

Breadth = 2,400 m.

Area = 400 × 2,400 = 960,000 m².

1 hectare = 10,000 m².

Area in hectares = 960,000 ÷ 10,000 = 96 hectares.

2(d) Tillage implements

Primary:

Mouldboard plough.

Disc plough.

Chisel plough.

Secondary:

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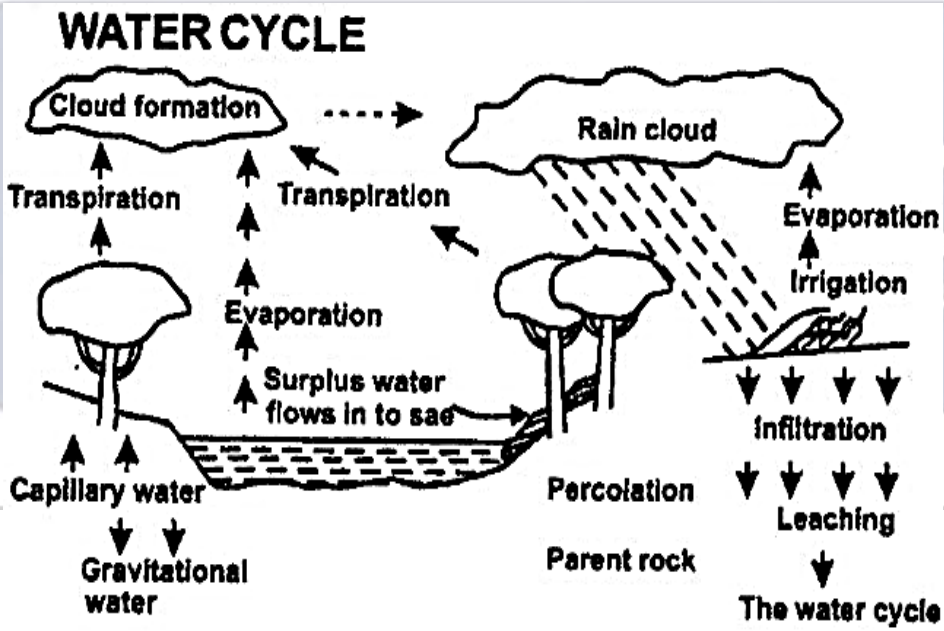
Disc harrow.

Ridger.

Cultivator.

Rotavator.

3(a) Water cycle




3(b) Phosphorus deficiency symptoms

Poor root development.

Inhibited seed formation.

Stunted growth.

Purple leaf colouration from the tip backwards.

Inhibited flowering.

3(c) Classification of insect pests by feeding mode

Biting and chewing: Armyworm; locust.

Boring: Yam beetle; weevil; earworm.

Piercing and sucking: Cotton stainer; capsids; green spider mites; thrips; scale insects.

4(a) Maize smut disease

(i) Causal organism: Fungus, Ustilago maydis.

(ii) Transmission: Airborne spores deposited on crop leaves.

(iii) Symptoms:

Grains covered with a large mass of spores.

Dwarfing of affected plants.

Galls on ears, leaves and tassels that later turn black.

(iv) Cultural control:

Uproot and burn diseased plants.

Plant early.

Plant resistant varieties.

Practise crop rotation.

Use clean seeds.

4(b) Forest management practices listed

Afforestation.

Deforestation.

Regeneration.

Selective exploitation.

Alley cropping.

Ley farming.

Taungya system.

4(c) Classes of farm animals and examples

Food production: Poultry, rabbits, sheep, goats and cattle.

Work or draught: Cattle, bulls, oxen, donkeys and camels.

Sports or recreation: Horses, rams, bulls and cattle.

Pets: Cats, dogs, pigeons and parrots.

Protection: Dogs, bees, geese and turkeys.

5(a) Anthrax

(i) Causal organism: Bacillus anthracis, a bacterium.

(ii) Transmission:

Direct contact with infected animals or through open wounds.

Contaminated water, feed or equipment.

(iii) Symptoms:

Sudden death.

High fever.

Loss of weight and appetite.

Staggering and depression.

Swelling of the neck, genital region and lower abdomen.

(iv) Prevention and control listed:

Isolation of infected animals.

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Good sanitation.

Disinfection after an outbreak.

Regular vaccination.

5(b)(i) Plant-protein sources in livestock feeds

Leguminous forage.

Cashew-nut meal.

Copra cake.

Groundnut cake.

Cowpea fodder.

Palm-kernel cake.

Soybean cake or meal.

Sunflower-seed cake or meal.

Cottonseed cake or meal.

5(b)(ii) Forage legumes

Tropical kudzu — Pueraria phaseoloides.

Centrosema — Centrosema pubescens.

Mucuna — Mucuna utilis.

Calopo — Calopogonium mucunoides.

Alfalfa — Medicago sativa.

5(c) Characteristics of labour

Mobile.

Has feelings.

Ownership cannot be separated from its use.

Perishable if not used at a particular time.

Its quantity and quality influence output.

A variable asset.

Subject to diminishing returns.

May be skilled or unskilled.

Appreciates through training and development.

6(a) Economic concepts

(i) Scarcity: Limited resources relative to demand.

(ii) Scale of preference: A list of wants arranged in order of priority.

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6(b) Importance of agricultural insurance

Protects farmers' income against losses from natural disasters.

Guards against failure.

Prevents the collapse of farm businesses.

6(c) Fishery regulations listed in the source

These are laws and regional arrangements intended to prevent overfishing, protect young fish and stop illegal fishing.

Ban small, substandard nets that catch immature fish.

Prohibit industrial vessels, except local canoes, from fishing within the first two nautical miles of the territorial continental shelf.

Prohibit toxic chemicals, explosives and poisons.

Restrict fishing during specified periods.

Require licences for motorised boats and levy landing taxes according to catch volume and size.

6(d) Importance of beekeeping

Pollinates crops, improving yield and quality.

Supports wild plants and local ecosystems.

Produces honey, beeswax and pollen used in food, medicine and cosmetics.

Provides income and food security.

Contributes to the agricultural economy through pollination and honey production.

Supports wildlife habitats through wildflower pollination.

Creates employment and financial security.

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# 2018 — AGRICULTURAL SCIENCE ESSAY

1(a) Factors hindering agricultural development

(i) Basic amenities

Inadequate processing facilities cause wastage.

Lack of potable water for livestock and households.

Inadequate education for farmers' children and dependents.

Poor storage causes produce losses.

Inadequate electricity for farm operations.

Poor healthcare reduces productivity.

Inadequate recreation encourages rural–urban migration.

Insufficient irrigation water.

Poor rural–urban roads hinder produce distribution.

(ii) Farm inputs

Adulterated or poor-quality fertilisers and seeds.

Inadequate supply of improved animal breeds.

Untimely input supply leading to "timely planting of crops."

[The source appears to contain a typo here.]

Limited access to modern tools and machinery.

Poor technical knowledge of input use.

High costs of seeds, fertilisers and agrochemicals.

1(b) Uses of farm machinery

Tractor:

Lifting implements.

Powering stationary equipment such as grinders and shellers.

Generating electricity.

Transporting loads.

Powering ploughing, ridging, planting and harrowing.

Bulldozer:

Removing stumps.

Clearing bush.

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Removing obstacles.

Moving earth.

Constructing roads.

1(c) Daily tractor maintenance

Check brake-fluid level.

Check engine oil.

Check nuts and bolts.

Clean after use.

Check and adjust tyre pressure.

Check and top up radiator water.

2(a) Functions of soil water

Maintains plant-cell turgidity.

Dissolves nutrients.

Cools plants through transpiration.

Supports metabolic reactions.

Supplies water for photosynthesis.

Enables germination.

Transports manufactured food.

2(b) Causes of low soil pH

Aluminium hydrolysis.

Acidic parent materials.

Acid rain.

Removal of basic cations.

Sulphur-based agrochemicals.

Erosion.

Leaching.

2(c) Life cycle of liver fluke

Eggs pass from the adult's uterus into the host's bile duct.

Eggs move into the intestine.

Eggs leave the host in faeces deposited on pasture.

Eggs hatch into miracidia.

Miracidia enter a water snail, the secondary host.

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Sporocysts develop into rediae through cell division.

Rediae develop into cercariae.

Cercariae leave the snail.

Livestock eat encysted cercariae with pasture.

Metacercariae develop into young liver flukes.

The young flukes move from the intestine to the liver and bile duct; the source describes this as movement through the bloodstream.

3(a) Cassava cultivation

(i) Soil: Well-drained sandy loam or clay loam.

(ii) Land preparation:

Clear, stump, plough and harrow.

Make ridges or mounds.

Cassava can also be planted on flat land.

(iii) Propagation:

Stem cuttings.

Plant cuttings at about 45°, in a slanting position, or lay them flat.

Use cuttings with several nodes.

Seeds may also be used.

(iv) Spacing: 1 m × 1 m or 90 cm × 90 cm.

(v) Weed control:

First weeding approximately three weeks after planting, using hoes or cutlasses.

Hand-pull weeds on small plots.

Further weeding depends on weed growth.

(vi) Fertiliser:

NPK 15:15:15 or 10:10:20.

Potassium fertiliser, such as muriate of potash.

(vii) Harvesting:

Matures between 6 and 15 months after planting.

Uproot manually or mechanically.

(viii) Storage:

Process into flour, chips or gari.

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Peel and keep in deep freezers.

Place tubers in pits and cover with earth.

3(b) Farm-animal diseases

Coccidiosis

(i) Causal organism: Protozoan, Eimeria species.

(ii) Animals affected: Goats, sheep, rabbits and poultry.

(iii) Symptoms:

Hair loss or alopecia in rabbits.

Increased body temperature.

Foul-smelling droppings.

Bloody diarrhoea.

Emaciation.

Droopiness.

(iv) Control:

Footbaths at poultry-house entrances.

Regular litter changes.

Coccidiostats.

Clean water and feed.

Rinderpest

(v) Causal organism: Virus.

(vi) Animals affected: Sheep, goats and cattle.

(vii) Symptoms:

Difficulty breathing.

Reduced milk yield.

High fever.

Bloody diarrhoea.

High mortality.

(viii) Control listed:

Routine vaccination.

Culling and destroying infected animals.

4(a) Land-tenure system

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The system through which individuals or groups acquire land for temporary or permanent use.

4(b) Weed

A plant growing where it is not wanted.

4(c) Groundnut rosette

(i) Causal organism: Virus.

(ii) Transmission: Aphid vectors.

(iii) Symptoms:

Closely packed, curled leaves.

Stunted growth.

Yellow leaves with mosaic mottling.

(iv) Control:

Resistant varieties.

Insecticides against aphids.

Uprooting and burning infected plants.

Early planting.

4(d) Characteristics of factors of production

Land:

Immobile or fixed in supply.

Appreciates over time.

A free gift of nature.

Subject to diminishing returns.

A fixed asset.

Reward is rent.

Value depends on location.

Measured in acres or hectares.

Capital:

Used to acquire other factors of production.

“It can depreciate or depreciate.” [As printed.]

Takes different forms.

Man-made and accumulated over time.

Reward is interesting.

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May be fixed or working capital.

5(a) Colostrum

The first milk produced by a dam within the first five days after parturition.

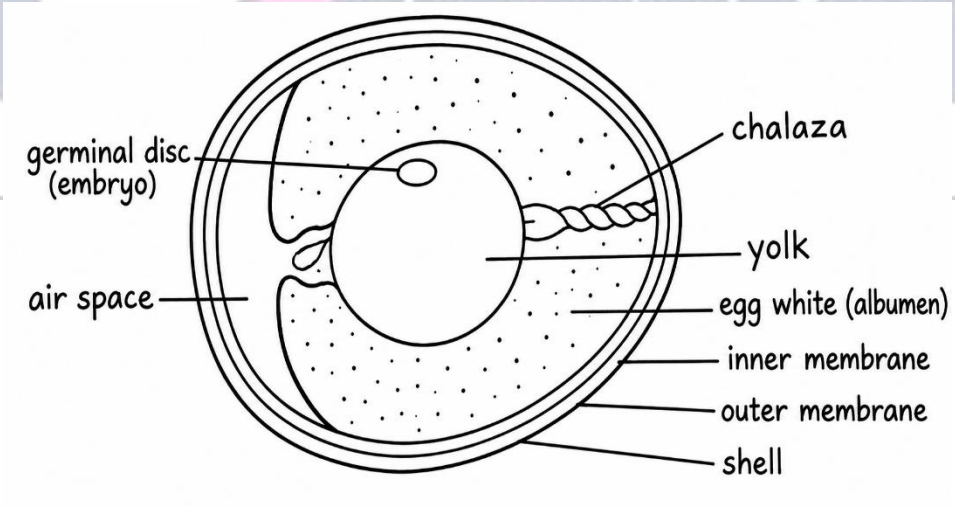
Rich in antibodies and nutrients.

Yellowish.

Has laxative properties.

5(b) Structure of a chicken egg

5(c) Completed diminishing-returns entries




(i) —

(ii) 3 kg

(iii) 11 kg

(iv) 28 kg

(v) 40 kg

(vi) 1 kg

(vii) 0 kg

6(a) Poultry-management practices

Candling.

Incubation.

Brooding.

Feeding.

Watering.

Debeaking.

Sexing.

Vaccination.

Egg handling.

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Litter management.

Caponisation.

Housing.

Hatching.

Sanitation.

Disease control.

6(b) Advantages of dehorning cattle

Easier transportation.

Conserves feeding space.

Improves appearance and sale value.

Reduces injuries to handlers and animals.

Makes handling easier.

6(c) Agricultural marketing services

Distribution.

Assemblage.

Processing.

Grading.

Storage.

Packaging.

Financing.

Insurance.

Advertising.

Transportation.

6(d) Agricultural marketing problems

Inadequate market research.

Poor transportation.

Inadequate storage and processing.

Perishability.

Unstable prices.

Adulteration.

Poor marketing skills.

Inadequate finance.

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Non-uniform weights and measuring devices.

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# 2019 — AGRICULTURAL SCIENCE ESSAY

1(a) Government roles in agricultural development

(i) Pest and disease control

Provide vaccines and animal drugs.

Provide pesticides, fungicides and herbicides.

Provide veterinary services.

Provide quarantine services at airports, seaports and borders.

Train farmers in pest and disease control.

Subsidise agrochemicals.

(ii) Marketing agricultural produce

Provide rural roads.

Establish a commodity-exchange commission.

Encourage exports.

Establish produce markets.

Provide storage.

Reduce taxation on agricultural produce.

1(b) Problems associated with land tenure

Discourages large-scale farming.

Concentrates production at subsistence level.

Requires travel between scattered plots.

Restricts outsiders' access to land.

High acquisition costs.

Makes improved farming systems difficult to plan.

Makes land difficult to use as loan collateral.

1(c) Farm machinery and implements

Machinery:

Combine harvester.

Bulldozer.

Lawn mower.

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Sheller.

Power tiller.

Tractor.

Mist blower.

Incubator.

Milking machine.

Dryer.

Tree puller.

Implements:

Boom sprayer.

Rotavator.

Knapsack sprayer.

Ridger.

Mower or slasher.

Plough.

Planter or seed drill.

Harrow.

Cultivator.

Baler.

2(a) Weeds, botanical names and dispersal

| Weed | Botanical name | Dispersal |
|---|---|---|
| **Goat weed** | Ageratum conyzoides | Wind and animals |
| **Siam weed** | Chromolaena odorata | Wind |
| **Waterleaf** | Talinum triangulare | Explosive mechanism |

2(b) Factors affecting land availability

Physical factors:

Soil type.

Soil pollution.

Soil fertility.

Topography.

Soil properties, including texture.

Land degradation.

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Economic factors:

Market construction.

Industrial expansion.

Recreational centre construction.

Population pressure.

Mineral exploitation.

Transportation.

2(c) Effects of pollution on land and ponds

Crop failure or death.

Death of aquatic organisms.

Disruption of ecological balance.

Water contamination.

Crop contamination.

Increased production costs.

2(d) Minimising pollution

Fence ponds.

Control fertiliser application.

Dispose of animal waste properly.

Control herbicide application.

Dispose of sewage properly.

Maintain oil pipelines to prevent spills.

3(a) Classification of crops by life cycle, as supplied

| Crop | Classification |
|---|---|
| **Mango** | Perennial |
| **Rice** | Annual |
| **Groundnut** | Annual |
| **Cotton** | Annual |
| **Pepper** | Annual |
| **Soybean** | Annual |
| **Oil palm** | Perennial |
| **Yam** | Annual |
| **Tomato** | Annual |
| **Rubber** | Perennial |
| **Carrot** | Annual |

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| Crop | Classification |
|---|---|
| **Cowpea** | Annual |
| **Ginger** | Annual |
| **Cocoa** | Perennial |

[These classifications reproduce the supplied answer, including its classification of carrot as annual.]

3(b) Percentage composition of soil

Organic matter: 5%.

Air: 25%.

Water: 25%.

Mineral matter: 45%.

3(c) Inorganic fertiliser application methods

Broadcasting.

Drilling.

Ring application.

Top dressing.

Side placement.

Foliar application or spraying liquid fertiliser.

4(a) Spacing and thinning

Spacing is the distance between crop stands. Thinning is removing excess seedlings from a stand.

4(b) Oil-palm cultivation

(i) Botanical name: Elaeis guineensis.

(ii) Varieties: Dura, Tenera and Pisifera.

(iii) Propagation: Seeds.

(iv) Soil:

Loamy soil rich in organic matter.

Slightly acidic soil.

(v) Field spacing: Typically, 9 m × 9 m, triangular arrangement.

(vi) Diseases:

Anthracnose.

Blast.

Galadema.

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Brown germ.

Red-ring disease.

Freckle.

Orange spotting.

Necrotic spot.

Algal spot.

Vascular wilt.

4(c) Economic importance of forest resources

Food, including fruits, vegetables and bushmeat.

Wood for furniture.

Income.

Watershed protection.

Tourism.

Fuelwood.

Improved soil structure.

Wildlife habitat.

Control of wind erosion.

4(d) Apiculture

The keeping and management of bees for commercial purposes, particularly honey and wax production.

5(a) Animal-production terms

(i) Flushing: Feeding female animals good-quality feed.

(ii) Castration: Removing the testes or rendering them unproductive by cutting off their blood and nerve connections.

(iii) Culling: Removing unproductive, diseased or aggressive birds from a flock.

5(b) Benefits listed for the practices in 5(a)

Flushing:

Helps females withstand pregnancy.

Increases chances of multiple births.

Improves health for conception.

Castration:

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Prevents sexually transmitted diseases.

Improves meat quality.

Prevents indiscriminate mating.

Removes unpleasant male odour from meat.

Improves feed conversion and carcass weight.

Culling:

Removes unproductive birds.

Reduces disease spread.

Creates space for productive birds.

Removes aggressive birds.

Reduces feed wastage.

5(c) Functions of surveying equipment

Prismatic compass:

Measures angular distances.

Determines bearings.

Determines positions and displacement of objects or landmarks.

Measuring tape:

Measures horizontal and vertical distances.

Marks right angles and triangles during farm layout.

Determines definite points on straight lines.

5(d) Floriculture and aquaculture

Floriculture is the production and management of ornamental trees, shrubs and flowers.

Aquaculture is the production of fish and other aquatic animals in water bodies.

6(a) Economic concepts

(i) Demand schedule: A table showing the relationship between a commodity's price and quantity demanded.

(ii) Supply curve: The source states that it shows the relationship between price and quantity "demanded."
["Demanded" is an apparent source error in this definition.]

6(b) Agricultural extension agencies

Cooperative societies.

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Agricultural Development Programmes.

Farm settlement schemes.

Research institutes.

Universities of agriculture.

Colleges or faculties of agriculture.

Ministries of agriculture.

NGOs.

Agro-service centres.

Marketing boards.

6(c) Ways soils are enriched with nitrogen

Nitrification.

Ammonification or decomposition of organic matter.

Lightning.

Symbiotic fixation associated with legumes.

Organic manure.

Non-symbiotic nitrogen fixation.

Inorganic fertilisers.

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# 2020 — AGRICULTURAL SCIENCE ESSAY

1(a) Solutions to agricultural-development problems

(i) Poor transportation

Provide maintenance services at reduced cost.

Reduce transport costs.

Repair existing roads.

Reduce petrol and diesel prices.

(ii) Environmental degradation

Prevent deforestation.

Construct drainage ditches to control erosion.

Enact laws discouraging bush burning.

1(b) Precautions when using farm power

Animal power:

Feed animals adequately.

Handle them properly to prevent aggression.

Avoid overworking them.

Fit a muzzle.

Electrical power:

Rectify identified electrical faults promptly.

Use voltage regulators.

Observe electrical safety precautions.

Switch off appliances when not in use.

1(c) Reasons for maintaining tools and implements

Prevent rust and deterioration.

Extend useful life.

Prevent food contamination from dirty or rusty equipment.

Maintain good working conditions.

Reduce replacement costs.

Reduce operating time.

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Prevent frequent damage.

2(a) Soil concepts

(i) Soil texture: The relative proportions of sand, silt and clay, determining the soil's fineness or coarseness. It influences drainage and air retention.

(ii) Soil structure: The arrangement of particles into aggregates and the pores between them. It influences infiltration and percolation.

(iii) Soil profile: A vertical section showing soil layers differentiated by colour, texture and organic matter. The listed layers include bedrock, weathered material, subsoil and topsoil.

2(b)(i) Advantages of grafting

Repairs damaged plant parts.

Produces true-breeding, uniform plants.

Changes plant form.

Accelerates maturity.

2(b)(ii) Tree crops that can be grafted

Rubber.

Cashew.

Apple.

Guava.

Coffee.

Moringa.

Kola.

Avocado.

Breadfruit.

2(c) Practices for replenishing soil nutrients

Fertiliser application.

Crop rotation.

Cover cropping.

Organic manure.

Liming.

Fallowing.

Mulching.

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2(d) Pest control in grain stores

Inspect stores regularly.

Dry grain properly.

Remove infested grain.

Provide adequate ventilation.

Apply pesticides and insecticides.

3(a) Citrus cultivation

(i) Propagation:

Seeds.

Budding.

Grafting.

(ii) Field spacing:

7 m × 7 m.

8 m × 8 m.

(iii) Nursery practices:

Weeding.

Watering.

Shading.

Budding or grafting seedlings.

(iv) Pests:

Aphids.

Thrips.

Capsid bugs.

Citrus moth.

Mealybugs.

Fruit borers.

Scale insects.

Caterpillars.

(v) Diseases:

Citrus scab.

Damping-off.

Black spot.

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Root rot.

Gummosis.

Tristeza.

3(b) Definitions

(i) Surface irrigation: Artificial application of water to the soil surface for crop use.

(ii) Surface drainage: Removal of excess water from the soil surface.

3(c) Advantages

Surface irrigation:

Requires little labour.

Cheap to construct.

Easy to construct.

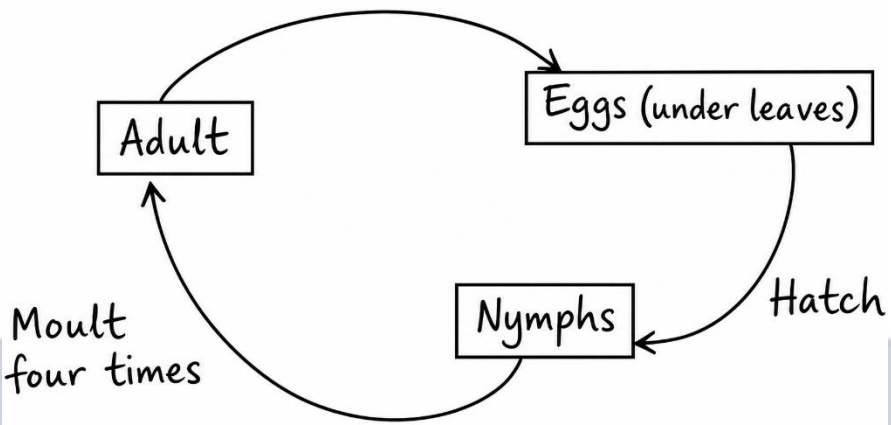
Surface drainage:

Improves germination.

Easy to practise.

Cost-effective.

4(a) Life cycle of a variegated grasshopper




Adult males and females' mate.

The female lays eggs "underneath leaves." [As printed in the source.]

Eggs hatch into nymphs around the beginning of the dry season.

During the fourth instar, nymphs migrate into farms and continue feeding until adulthood.

Development involves incomplete metamorphosis.

4(b) Spread of diseases on crop farms

Dew.

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Rain splash.

Contaminated irrigation water.

Weeds harbouring pathogens.

Soil-borne pathogens.

4(c) Characteristics of a good layer

Bright eyes.

Broad breastbone.

Flexible pelvic bones.

Large, bright-red comb.

5(a) Animal diseases

I. Brucellosis

(i) Causal organism: Brucella abortus, a bacterium.

(ii) Animals listed: Camels, cattle, pigs, donkeys, sheep, horses and goats.

(iii) Symptoms:

Reduced milk production.

Inflammation of the womb.

Infertility or sterility.

Retained after birth.

Abortion.

(iv) Control measures supplied:

Proper litter disposal.

Adequate ventilation.

Spraying pens with fungicide before stocking.

Good sanitation.

[The control list is reproduced from the source and appears inconsistent with the stated bacterial disease.]

II. Aspergillosis

(i) Causal organism: Aspergillus fumigatus, a fungus.

(ii) Animals listed: Cattle, pigs and poultry.

(iii) Symptoms:

Weight loss.

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Nervousness.

Skin irritation.

High temperature.

Weakness.

(iv) Control:

Adequate ventilation.

Proper litter disposal.

Good sanitation.

Keeping litter dry.

5(b) Advantages of the battery-cage system

Saves space.

Makes egg collection easier.

Reduces egg cracking and breakage.

Saves labour.

Reduces feed consumption.

5(c) Problems hindering agricultural extension

Poor transport networks.

Inadequate rural amenities.

Inadequate extension facilities.

Farmer conservatism.

Government policies and bureaucracy.

Poor rural communication networks.

6(a)(i) Newlife Farms balance sheet for the year ended 31 December 2016

Assets:

Closing valuation: ₦600,000.

Cash in bank: ₦250,000.

Debt receivable from sellers: ₦100,000.

Total assets: ₦950,000.

Liabilities:

Loan payable to cooperative: ₦250,000.

Debt payable to feed miller: ₦100,000.

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Total liabilities: ₦350,000.

Net capital:

₦950,000 − ₦350,000 = ₦600,000.

Total liabilities and net capital = ₦950,000.

6(a)(ii) Importance of a balance sheet

Tax purposes.

Information on owner's equity.

Planning.

Budgeting.

6(b) Agricultural loan sources

Commercial banks.

Agricultural banks.

Cooperative societies.

Microfinance banks.

6(c) Reasons for using wood shavings rather than sawdust in deep-litter houses

Wood shavings absorb litter better than sawdust.

Fine sawdust particles can be inhaled by chickens.

Sawdust decays easily.

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# 2021 — AGRICULTURAL SCIENCE ESSAY

1(a) Government roles in agricultural development

(i) Agricultural finance

Provide credit and loans.

Provide subsidies.

Provide agricultural credit guarantees to banks.

Provide agricultural insurance.

(ii) Agricultural education

Establish research institutes.

Establish agricultural universities and colleges.

Train young people in agriculture.

(iii) Extension services

Employ extension personnel.

Train farmers in techniques developed by research institutes.

(iv) Policies and programmes

Formulate agricultural policies and regulations.

Establish programmes such as the Green Revolution and farm settlements.

Implement agricultural programmes.

1(b) Structural differences between disc plough and disc harrow, as supplied

| **Disc plough** | **Disc harrow** |
|---|---|
| **Few discs.** | Many discs. |
| **Large discs.** | Small discs. |
| **Shaft connects discs into a single gang.** | Shaft connects discs into gangs, with one or two pairs working in opposite directions. |
| **Discs widely spaced.** | Discs closely spaced. |
| **Scraper present.** | Scraper absent. |
| **Furrow wheel present.** | Furrow wheel absent. |

1(c) Effects of frequent disc-plough use

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Destruction of soil structure.

Formation of clods.

Exposure to erosion.

Reduced aeration.

Poor drainage.

Leaching and increased percolation.

2(a) Soil-formation factors

Time:

Determines rock disintegration.

Determines organic-matter decomposition.

Determines mineral leaching.

Determines soil development.

Determines whether soil is mature or immature.

Rainfall:

Hydrolyses minerals.

Influences rock weathering.

Increases soil-particle deposition.

Running water disintegrates rocks.

Parent material:

Determines soil type.

Determines texture.

Determines chemical composition.

Determines structure.

Determines fertility.

Its hardness influences the rate of soil formation.

2(b) Principles of crop rotation

Do not grow shallow-rooted crops successively.

Include a fallow period.

Avoid successive crops from the same family.

Include legumes.

Avoid successive crops susceptible to the same diseases.

Avoid successive crops attacked by the same pests.

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2(c) Uses of forage crops

Erosion control.

Green manure.

Moisture conservation.

Livestock feeding.

Roofing material when dry.

Animal bedding.

Cover cropping.

3(a)(i) Selective exploitation

Cutting only mature forest trees according to criteria such as girth and species. Older trees are harvested while younger trees remain as cover until maturity.

3(a)(ii) Advantages

Protects soil from erosion.

Encourages selected tree species.

Prevents indiscriminate timber felling.

Allows younger trees to mature.

3(b) Field pests and storage pests

Field pests reduce the quantity or quality of produce before harvesting.

Storage pests reduce the quantity or quality of harvested produce in storage.

3(c) Insect-pest examples supplied

Storage pests:

Maize weevil.

Bean weevil.

Rice weevil.

Field pests:

Kola-nut weevil.

Granary weevil.

Sorghum weevil.

Grain moth.

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[The source's "field pests" list includes pests commonly associated with stored grain.]

3(d) Soil-water conservation

Strip cropping.

Mulching and terracing.

Adding humus or organic manure.

Reducing surface runoff.

4(a) Importance of farm operations

(i) Pruning cocoa

Increases yield.

Improves pod formation.

Improves light penetration.

Maintains suitable shape and height.

Helps disease control.

Improves nutrient use.

Improves air circulation.

(ii) Parboiling paddy rice

Hardens grains.

Improves resistance to storage pests.

Reduces milling breakage.

Makes dehusking easier.

Improves grain quality.

4(b) Eradicating guinea grass

Slashing.

Chemical control.

Ploughing.

Hoeing.

Mulching and burning.

Flooding.

4(c) Uses of ornamental plants

Income.

Windbreaks.

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Employment.

Medicines and herbs.

Noise reduction.

Food, including fruits and seeds.

Shade.

Livestock feed.

Improved fertility where plants are legumes.

Fencing.

Compost materials.

5(a)(i) Extension methods for disease awareness

Group method.

Mass method.

Individual method.

5(a)(ii) Most appropriate method

Mass method.

5(a)(iii) Reasons

Can educate illiterate farmers.

Reaches many farmers simultaneously.

Quickly communicates agricultural emergencies.

Saves time.

Cost-effective.

5(a)(iv) Problems with the mass method

Farmers may not be able to ask questions immediately.

Many cannot read newspapers or magazines.

Some cannot afford television or radio.

Power outages interrupt communication.

Immediate feedback is limited.

5(b) Problems faced by farm managers

Administrative problems.

Financial problems.

Marketing problems.

Unstable policies.

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Inadequate inputs.

Natural hazards.

Inadequate information or communication.

5(c) Goat breeds listed

Sokoto Red.

Bornu White.

Borno Red.

Sahel.

Boer.

Nubian.

Angora.

Jamunapari.

Anglo-Nubian.

Bantu.

Kano-Brown.

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# 2022 — AGRICULTURAL SCIENCE ESSAY

1(a) Contributions of science and technology

(i) Crop protection

Equipment for applying herbicides and pesticides.

Fungicides and insecticides.

Pesticides.

Nematicides.

Herbicides.

(ii) Climatology and meteorology

Forecast rainfall to determine planting and harvesting dates.

Monitor wind speed and direction.

Forecast temperature and predict pest or disease outbreaks.

Monitor cloud seeding for rainfall.

1(b) Functions of machines and implements

Bulldozer:

Levels land.

Fells trees.

Uproots stumps.

Moves large quantities of earth.

Combine harvester:

Harvests cereals.

Winnows grains.

Threshes cereals.

Bags harvested grain.

Tractor:

Powers stationary equipment.

Generates electricity.

Transports people.

Pulls ploughs and harrows for land preparation.

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Sprayer:

Applies fungicides, herbicides and insecticides.

Applies liquid fertiliser.

Applies plant hormones.

Planter:

Sows seeds.

Applies fertilisers.

Applies pesticides and nematicides.

2(a) Irrigation-water sources

Lakes.

Ponds.

Rivers.

Boreholes.

Reservoirs.

Streams.

Springs.

Dams.

Wells.

Brooks.

2(b) Irrigation advantages and disadvantages

Advantages:

Enables year-round production.

Encourages microbial decomposition.

Lowers soil temperature.

Enables early planting.

Supplies water for growth.

Helps crops survive drought.

Softens soil for tillage.

Disadvantages:

Flooding and erosion.

Increased weed growth.

Expensive equipment.

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Obstruction of machinery.

Leaching.

Disease spread.

2(c) Ways soil loses nutrients

Overgrazing.

Erosion and leaching.

Burning and clean clearing.

Oxidation and reduction.

Continuous cropping and harvesting.

“Concentration of other nutrients and chelation.” [As printed.]

2(d) Reasons for manuring

Improve aeration.

Improve water retention in sandy soil.

Help control nematodes.

Increase cation-exchange capacity.

Improve structure.

Encourage soil organisms.

Regulate soil temperature.

Improve infiltration in clay soil.

Increase fertility.

3(a) Rabbit breeds

New Zealand Red.

New Zealand White.

Giant Flemish.

California White.

English Spot.

Chinchilla.

Angora.

Dutch.

Checkered Giants.

Beveren.

3(b) Importance of oestrus detection

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Enables proper animal management.

Allows preparation for pregnancy.

Helps determine when animals should be serviced.

3(c) Hormone functions

Androgen:

Promotes sex-gland growth.

Reduces fat deposits.

Promotes libido.

Stimulates muscular and skeletal growth.

Develops male secondary sexual characteristics.

Initiates spermatogenesis.

Supports sperm survival in the epididymis.

Oestrogen:

Develops female secondary sexual characteristics.

Promotes egg production.

Stimulates multiplication of vaginal epithelium.

Increases ciliary activity and mucus secretion in the fallopian tubes.

Prepares the uterine lining for a fertilised ovum.

Stimulates mammary-duct growth.

3(d)(i) Viral poultry diseases

Newcastle disease.

Fowlpox.

Bird flu.

Marek's disease.

Gumboro disease.

3(d)(ii) Poultry ectoparasites

Lice.

Ticks.

Mites.

Fleas.

4(a) Environmental factors affecting production

Temperature:

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High temperatures may kill animals.

Influences fruit ripening and maturity.

Influences microbial activity and organic substances.

Affects labour productivity.

Influences crop and animal distribution.

Influences germination.

High temperatures reduce livestock performance.

Wind:

Influences transpiration.

Disperses spores and diseases.

Causes mechanical crop injury.

Aids pollination.

Causes soil-water evaporation.

Causes lodging.

Disperses fruits and seeds.

Soil microorganisms:

Cause crop diseases.

Decompose plant material into humus.

May reduce yield quantity and quality.

Nitrogen-fixing bacteria associated with legumes enrich plants and soil.

4(b) Spread of crop diseases

Rain splash.

Contaminated equipment.

Infected planting material.

Windborne pathogens.

Animals during feeding.

Insect vectors.

Weeds harbouring pathogens.

Irrigation water.

4(c)(i) Onion twister

Symptoms:

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Curling and twisting leaves.

Twisted leaves changing from dark green to yellowish green.

Narrow, elongated bulbs.

Rapid rotting in storage.

Control:

Early planting.

Removal and destruction of infected plants.

Fungicide application.

Good sanitation.

4(c)(ii) Tomato root-knot disease

Symptoms:

Knots on roots.

Yellow leaves.

Stunted growth.

Numerous secondary roots.

Control:

Weed control.

Removing crop residues.

Burning residues and weeds.

Soil treatment with nematicides.

Resistant tomato varieties.

5(a) Farm-manager functions

Plans operations.

Markets produce.

Makes short-term and long-term decisions.

Organises and directs operations.

Coordinates and supervises work.

Evaluates and budgets finances.

Recruits staff.

5(b) Agricultural-economics terms

(i) Appreciation

An increase in asset value over time.

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Examples listed:

Growing crops.

Young animals.

Lactating animals.

(ii) Salvage value

Money received from disposing of a fixed asset after its normal useful life.

Assets may depreciate until they attract little value and are sold as scrap. Examples include machinery, vehicles, equipment and implements.

(iii) Farm budget

Estimated future income and expenditure for farm operations. It helps select profitable alternatives and assess the profitability of changes to a farm plan.

(iv) Farm inventory

A list of farm assets and their monetary values, generally prepared at the beginning and end of a farming season.

Entries include quantity, purchase or transaction date, price and other relevant information.

5(c) Qualities of a good extension agent

Problem-solving ability.

Friendliness and good listening skills.

Exemplary leadership.

Subject knowledge.

Innovation and ability to organise programmes.

Honesty and transparency.

Patience and tolerance.

Clear communication in the people's language.

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# 2023 — AGRICULTURAL SCIENCE ESSAY

1(a) Credit and subsidy

Credit consists of loans that borrowers must repay.

A subsidy is a government grant or payment supporting agricultural projects without repayment.

1(b) Agricultural inputs and support subsidised by government

Fertilisers.

Seeds.

Livestock feed.

Crop insurance.

Research and development.

Energy.

Training and education.

Labour.

Machinery.

Pesticides and herbicides.

1(c) Periodic tractor maintenance

Inspect tyres.

Maintain the hydraulic system.

Change engine oil.

Inspect and adjust belts.

Grease and lubricate moving parts.

Inspect and tighten nuts and bolts.

Replace fuel filters when necessary.

1(d) Machinery-operating precautions

Read the operator’s manual.

Conduct pre-operation checks.

Wear protective equipment.

Check water level.

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Use guards and shields.

Clear the work area.

Avoid loose clothing and jewellery.

2(a) Definitions

(i) Agricultural ecology: Interactions between agricultural systems and the natural environment, including ecological processes and relationships within agricultural landscapes.

(ii) Ecosystem: An interconnected system involving crops, soil, livestock, water and associated biological, physical and chemical processes.

2(b) Farm-ecosystem components

Biotic:

Livestock.

Crops.

Earthworms.

Birds.

Insects.

Soil microorganisms.

Abiotic:

Water.

Temperature.

Air.

Sunlight.

Topography.

Rocks and minerals.

2(c) Precautions when storing maize

Use high-quality airtight bags.

Dry maize properly.

Keep the store clean, dry and free from pests or contamination.

Inspect regularly for spoilage, mould and pests.

Provide ventilation to prevent moisture accumulation.

Avoid extreme heat and direct sunlight.

Use effective pest-control measures.

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2(d) Bedding plants

Iris.

Lily.

Tulip.

Rose.

Hibiscus.

Sunflower.

Dahlia.

3(a) Tomato root-knot disease

(i) Causal organism: Nematode.

(ii) Transmission: Nematodes present in the soil.

(iii) Symptoms:

Premature plant death.

Stunted growth.

(iv) Prevention:

Crop rotation.

Resistant varieties.

Clean nursery seedlings.

Weed removal.

Nematicides during land preparation.

Additional control measures listed:

Rotate with non-host crops.

Clean tools, equipment and machinery.

Solarise moist soil under clear polythene during hot weather.

Plant resistant tomato varieties.

Use nematicides as pre-plant fumigants.

3(b) Effects of farming practices on soil

(i) Fertiliser application

Adds nitrogen, potassium and phosphorus.

Improves fertility and yield.

Improves structure and water retention.

Continuous use may lower soil pH.

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Unabsorbed fertilisers and other chemicals cause leaching.

(ii) Clean clearing

Causes erosion.

Removes organic matter.

Heavy equipment compacts soil, reducing pore space, infiltration and root growth.

Causes nutrient depletion and leaching.

Destroys soil structure.

(iii) Overgrazing

Breaks down structure and increases density.

Increases erosion.

Reduces infiltration.

Reduces microbial activity.

Encourages desertification through reduced moisture retention.

3(c) Agricultural uses of land

Crop production.

Livestock rearing and grazing.

Fish ponds.

Wildlife conservation.

Forestry for timber, pulp and medicinal plants.

4(a) Planting cassava stem cuttings

Clear the land.

Till the soil.

Make ridges.

Plant the cuttings.

4(b) Uses of cassava tubers

Human food.

Livestock feed.

Processed foods such as flour; the source also lists “salad.”

Starch for biodegradable packaging.

Textile sizing.

The source additionally lists cassava plants for erosion control.

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4(c) Yam calculations

(i) Expected number of plants:

100 × 100 × 1.5 = 15,000 plants.

(ii) Total harvested weight:

15,000 × 3.5 kg = 52,500 kg.

4(d) Diet and ration

Diet is the composition and combination of feeds an animal consumes over a period.

Ration is the specific quantity supplied during a feeding event or specified period.

5(a) Completed animal-disease entries, exactly as supplied

[This table contains apparent errors in the supplied document. The disease entries below have not been corrected.]

First row

Symptoms: Constant cough and sputum containing blood or pus in pigs.

(i) Disease: “Newcastle/Pneumonia.”

(ii) Prevention/control: Good hygiene; vaccination.

(iii) Prevention/control: Burn and bury infected animals.

Second row

(iv) Symptom: Skin irritation.

Disease: Ringworm.

(v) Control: Dip animals in fungicide.

(vi) Control: Disinfect pens.

Third row

Symptoms: Blood-stained diarrhoea and pale comb in poultry.

(vii) Disease entry: “Bacteria.”

(viii) Prevention/control: Vaccination.

(ix) Prevention/control: Isolate affected animals.

5(b) Bee functions

Queen bee:

Lays eggs.

Maintains colony cohesion and communication.

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Regulates the hive by preventing workers from producing rival queens under normal conditions.

Worker bees:

Clean and polish brood cells.

Remove debris, waste and dead bees.

Feed developing brood with royal jelly, nectar and pollen.

Produce wax and build comb.

Process food.

Guard and defend the colony.

5(c) Reasons for covering a compost pit

Effective decay.

Easier fermentation.

Preventing pest entry.

Encouraging bacterial activity.

Easier decomposition.

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# 2024 — AGRICULTURAL SCIENCE ESSAY

1(a) Contributions of agricultural programmes and institutions

(i) Cooperative farming

Trains members.

Enables joint processing.

Inform members what, when and how to produce.

Provides access to low-interest credit.

Assists marketing.

Obtains input at reduced prices.

Assists with produce storage.

(ii) Farm settlement schemes

Promote commercial agriculture.

Provide processing facilities.

Improve productivity.

Develop rural areas.

Provide supervised credit.

Provide storage.

Make inputs available.

Discourage small holdings.

Attract young people to agriculture.

(iii) Agricultural research institutes

Develop cultural practices and farming systems for higher yields.

Develop better pest- and disease-control methods.

Develop crop varieties and animal breeds.

Improve storage and processing.

Develop pest- and disease-resistant crops and animals.

1(b) Tractor-mounted equivalents of farm tools

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| Farm tool | Corresponding implement |
|---|---|
| **Dibber/dibberish** | Seed drill or planter |
| **Hoe** | Plough, harrow, ridger or cultivator |
| **Sickle** | Mower, harvester or slasher |
| **Wheelbarrow** | Bucket loader, trailer, wagon or cart |
| **Watering can** | Boom sprayer or sprinkler |

1(c) Mouldboard plough

Advantages listed:

Suitable for soils free of stumps.

Suitable for light temperate soils.

Buries weeds deeply.

Improves drainage.

Destroys soil pests.

Cuts deeply.

Disadvantages listed:

Reduces aeration.

Unsuitable for tropical soils.

Destroys structure.

Share point is easily damaged by obstacles.

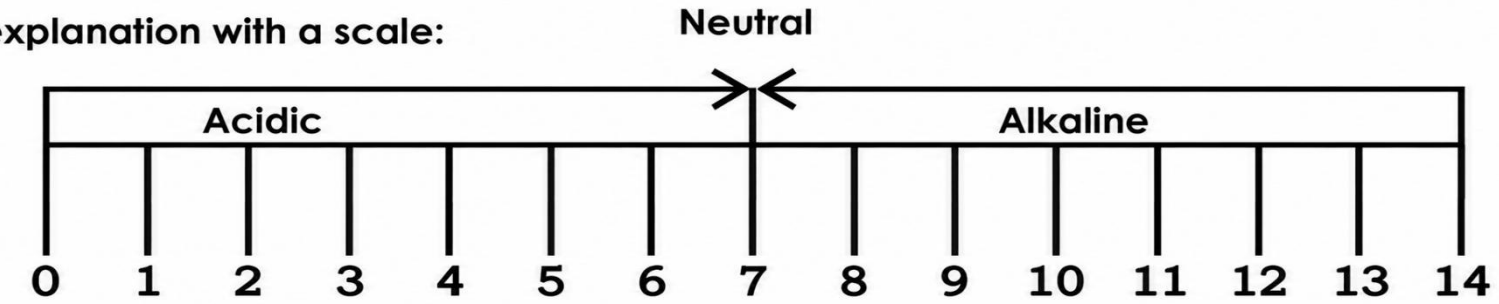
Promotes erosion.

Frequent use causes compaction.

2(a) Soil pH

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**2 (a) Soil pH explanation with a scale:**




Soil pH measures the degree of soil acidity or alkalinity. The source describes it as a measure of hydrogen-ion or hydroxyl-ion concentration.

The scale ranges from 0 to 14:

Below 7: Acidic.

7: Neutral.

Above 7: Alkaline.

2(b)(i) Cover crops

Crops grown specifically to cover soil and protect it from erosion and leaching for a period.

2(b)(ii) Advantages of cover crops

Control erosion.

Control diseases and pests.

Improve the soil microclimate.

Supply green manure when incorporated.

Supply livestock forage.

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Improve fertility.

Reduce compaction.

Improve structure.

Provide food, such as vegetables.

2(c) Weeds and botanical names

| Weed | Botanical name supplied |
|---|---|
| **Wild marigold** | Aspilia africana |
| **Spear grass** | Imperata cylindrica |
| **Stubborn grass** | Eleusine indica |
| **Pigweed** | Amaranthus spp. / Boerhavia diffusa |
| **Carpet grass** | Axonopus compressus |

3(a) Functions of bacteria in the nitrogen cycle

Rhizobium: Fixes nitrogen in legume root nodules.

Nitrosomonas: Oxidises ammonium compounds into nitrites.

Pseudomonas: Reduces nitrates to gaseous nitrogen through denitrification.

Nitrobacter: Oxidises nitrites into nitrates.

3(b)(i) Effects of aphids on cowpea

Lodging.

Disease transmission.

Reduced yield.

Stunted growth.

Reduced seed quality.

Reduced seed viability.

Plant death.

Yellowing.

3(b)(ii) Cultural control of aphids

Resistant varieties.

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Early harvesting.

Insect-free seeds.

Weed control.

Uprooting and burning infected plants.

Early planting.

Crop rotation.

Interplanting.

3(c)(i) Forestry

The study and management of forests and forest resources; the science of managing trees, forests and forest products for human use.

3(c)(ii) Forest products

Latex.

Yam.

Bushmeat.

Gum.

Cocoyam.

Bamboo.

Fibre.

Honey.

Mushrooms.

Wood pulp.

Resin.

Chewing sticks.

Kola nuts.

Dye.

Wild fruits.

Palm wine.

Snails.

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Long poles.

Palm oil.

Wax.

Vegetables.

Timber.

Wood pulp. [Repeated in the source.]

Firewood.

4(a)(i) Farm area in hectares

Area = Length × Breadth.

300 m × 150 m = 45,000 m².

45,000 ÷ 10,000 = 4.5 hectares.

4(a)(ii) Sorghum seed requirement

Seed rate = 60 kg/ha.

4.5 × 60 = 270 kg.

4(a)(iii) Fertiliser requirement

4.5 × 20 = 90 kg.

4(b)(i) Budding and grafting

| Budding | Grafting |
|---|---|
| **Small scion.** | Larger scion. |
| **T-shaped or inverted-T cut usually made on the stock.** | Slanting or V-shaped cuts are commonly made on stock and scion. |
| **A bud serves as the scion.** | A stem section serves as the scion. |
| **Commonly performed during active growth.** | Usually performed when the stock is dormant. |
| **Stock and scion need not be the same age or size.** | Stock and scion should be approximately the same age and size. |

4(b)(ii) Crops propagated by budding

Almond.

Apple.

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Rubber.

Mango.

Cherry.

Peach.

Cashew.

Cocoa.

Tea.

Avocado pear.

Citrus.

Ornamental plants.

4(c) Animals requiring different rations

(i) Production ration

Beef cattle.

Pregnant animals.

Newborn animals.

Dairy cows.

Growers.

Broilers.

Layers.

Breeding males and females.

Weaned animals.

Fatteners.

Wool-producing sheep.

Lactating animals.

(ii) Maintenance ration

Old animals.

Culled animals.

Dry cows.

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Non-breeders.

Spent layers.

Non-lactating animals.

5(a) Reasons for fish-pond management practices

(i) Removing excessive vegetation

Provides a hygienic environment.

Prevents disease breeding.

Allows sunlight penetration for phytoplankton growth.

Prevents pest breeding.

Maintains dissolved oxygen.

(ii) Removing silt

Allows free fish movement.

Maintains dissolved oxygen.

Improves clarity and reduces turbidity.

Maintains pond depth.

Reduces accumulated uneaten feed.

(iii) Supplementary feeding

Improves fish health.

Increases food availability and reproduction.

Promotes rapid growth.

Provides varied feeds.

(iv) Fertiliser application

Improves fish growth.

Encourages phytoplankton.

Provides nutrients.

5(b) Conditions requiring culling

Reproductive failure.

Cannibalism.

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Egg pecking.

Poor mothering.

Disease.

Low productivity.

Poor feed conversion.

Severe injury.

Aggressiveness.

Lameness.

Parturition problems.

Piglet eating.

5(c) Effects of excess soil nitrogen

Reduced disease resistance.

Reduced yield in some crops.

Reduced reproductive growth.

Lodging.

Excessive vegetative growth.

6(a) Agricultural insurance

A policy providing financial protection against specified risks arising during agricultural production.

6(b) Insurance terms

(i) Insurance policy: A document in which an insurer agrees to compensate the insured farmer for losses from specified agricultural risks.

(ii) Insurance premium: The amount paid by the farmer to the insurance company for coverage.

6(c)(i) Advantages of the agricultural extension method described

Encourages local leaders.

Directs attention to group problems and solutions.

Saves time and money.

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Reaches many farmers.

Encourages information exchange.

Encourages farmers to try new methods.

Supports local-leader training.

Develop interest in innovations.

6(c)(ii) Other ways to disseminate information to farmers

Workshops.

Agricultural shows.

Discussions.

Lectures and debates.

Symposia and seminars.

Field trips and excursions.

Demonstrations.

6(d) Rice-processing operations after harvesting

Sorting or destoning.

Milling or dehusking.

Threshing and polishing.

Cleaning and drying.

Grading and packaging.

Parboiling and winnowing.

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