SECOND TERM E-LEARNING NOTE

SUBJECT: AGRICULTURAL SCIENCE **CLASS: SS 2**

WEEK	SCHEME OF WORK
1-2	Pasture and Forage Crops
3	Forest Management
4	Floriculture
5-6	Diseases of Crops
7-8	Pests of Crops
9	General Prevention and Control of Crop Pests
10	Revision
11-12	Examination

TEXT BOOKS

1. Essential Agricultural Science for Senior Secondary Schools by O. A Iwana
2. Prescribed Agricultural Science for Senior Secondary School.
3. WAEC Past Questions and Answers Booklet

WEEK ONE AND TWO **Date: _____**
TOPIC: PASTURE AND FORAGE CROPS
CONTENT

- Meaning, uses and types
- Factors affecting the distribution
- Management, practices of pastures

MEANING OF PASTURES AND FORAGE CROPS
Pasture: This is a piece of land on which forage crops grow.

Forage Crops: These are plants cultivated (or growing naturally) whose vegetative parts (leaves and stem) are fed on by livestock.

USES OF FORAGE CROPS

1. They are used as livestock feeds
2. They are used as cover crops which conserve soil moisture.
3. They help in discouraging weed growth
4. Some are leguminous in nature which enrich soil nutrient.
5. For prevention of erosion
6. Used as green manure

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7. Used for roofing farm steads
8. As bedding materials

TYPES OF PASTURES

A. Natural pasture: also called natural grassland or rangeland is piece of land on which grasses and legumes grow naturally on their own and are fed upon by farm animals

CHARACTERISTICS OR FEATURES OF NATURAL PASTURE

1. It contains poor quality grasses and legumes.
2. It contains soil types that are low in fertility or nutrients.
3. It contains wide varieties of grasses and legumes, some of which may not be eaten by livestock.
4. It has good regenerative ability.
5. Crops here can withstand trampling.

EVALUATION

1. What are pastures and forage crops?
2. List five uses of forage crops.

B. Artificial pastures: this is also referred to as established or sown pasture is a piece of land that is where grasses and legumes are cultivated and managed by man to be fed by livestock.

CHARACTERISTICS FEATURES OF ARTIFICIAL PASTURES

1) It contains high quality grass and legumes
2) It contains no weed.
3) Selected grasses and legumes are grown in adequate proportion
4) Have high regenerative ability
5) Can withstand trampling by farm animals.

QUALITY OF A GOOD PASTURE PLANT

1. Ability to regenerate fast after being browsed
2. Ability to withstand trampling
3. It must be highly palatable
4. It must possess high value of nutrients
5. Ability to withstand extreme climatic condition
6. It should have moderate moisture content or succulent
7. It must have high leaf to stem ratio

EVALUATION

1. List five characteristics of a natural pasture.

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2. List five characteristics of artificial pasture.

COMMON GRASSES AND LEGUMES OF LIVE STOCK

GRASSES

COMMON NAME	BOTANICAL NAME
1. Elephant grass	Pennisetum purpureum
2. Guinea grass	Panicum maximum
3. Giant star grass	Cynodon plectostachyum
4. Carpet grass	Axonopus compressus
5. Spear grass	Imperata cylindrical
6. Bahama grass	Cynodon dactylon
7. Northern gamba	Andropogon gayanus
8. Southern gamba	Andropogon tectorum

LEGUMES

COMMON NAME	BOTANICAL NAME
1. Centro	Centrosema pubescens
2. Stylo	Stylosanthes gracilis
3. Kudzu or puero	Pueraria phaseoloides
4. Calapo	Calapogonium mucunoides
5. Mucuna	Muccuna utilis
6. Sun hemp	Crotalaria juncea

FACTORS AFFECTING THE DISTRIBUTION OF PASTURE

1. Climatic factors
2. Soil or edaphic factors
3. Biotic factors

CLIMATIC FACTORS

The type of climate in an area influences the type of vegetation in the particular area e.g. Sudan type of climate will favour the growth of grass and legume while equatorial climate does not. The elements of climate which affects the distribution of pastures are rainfall, wind, temperature, relative humidity etc.

EDAPHIC FACTORS

This refers to the level of fertility of the soil. Fertile soil enhances pasture growth and vice versa. Edaphic factors include soil PH, soil texture, soil structure, soil topography etc.

BIOTIC FACTORS

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Biotic factors like diseases, pests, parasites, predators generally influence the distribution of pasture. Also human and animal activities such as bush burning and overgrazing will affect the distribution of pastures.

EVALUATION

1. List four grasses and their botanical name
2. List four legumes with their botanical name

FACTOR AFFECTING THE PRODUCTIVITY OF PASTURES

1. Persistence: ability to survive and spread by vegetative means.
2. Aggressiveness: ability to compete favourably with other weeds.
3. Resistance to trampling.
4. Seed viability or profuseness or ease of propagation.
5. Resistance to drought.
6. Absence of pest and diseases.
7. Good management.
8. Adequate stocking.

ESTABLISHMENT OF PASTURES

Before pasture can be established, the following factors should be considered

1. Adaptation of species
2. Palatability
3. compatibility
4. time of maturity: should be short
5. lifestyle of the species

STEPS IN ESTABLISHING A PASTURE

1. Site selection.
2. Clearing of land.
3. Removal of debris
4. Cultivation of site (land preparation).
5. Planting of pasture crop.
6. Supplying.
7. Promotion of tillers (more point of growth).
8. Weeding.
9. Fertilizer application.
10. Irrigation.
11. Paddocking.

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CLASS ACTIVITY
Example 1 page 184 of Essential Agricultural Science by O. A Iwena.

MANAGEMENT PRACTICES IN PASTURE

1. Burning (when forage becomes fibrous to ensure regrowth of lush forage).
2. Fencing to discourage overgrazing or facilitate rotational grazing.
3. Fertilizer application or manuring.
4. Regular weed control.
5. Adequate pest and disease control.
6. Irrigation.
7. Adequate stocking.

GENERAL EVALUATION

1. List three pasture grass and their botanical names.
2. List three pasture legumes and their botanical names.
3. List three factors affecting the distribution of pastures.
4. List five factors affecting the productivity of pastures.
5. List five management practices in pasture.

PROJECT
Produce a forage album containing no less than twelve mixtures of grasses and legumes to be submitted before sixth week.

READING ASSIGNMENT
Revision questions 4, 6 and 7 in Essential Agricultural Science for Senior School, chapter 17, page 185.

WEEKEND ASSIGNMENT
SECTION A

1. Which of the following is not a climatic factor affecting pasture distribution? A. Temperature B. Light C. Humidity D. Soil PH
2. The following are edaphic factors except A. soil PH B. soil texture C. soil structure D. relative humidity
3. Diseases, pests, predators and parasites are ____ factors. A. biotic B. abiotic C. edaphic D. climatic
4. The act of re-planting pastures that fail to germinate is _____. A. thinning B. supplying C. weeding D. mulching
5. The following are legumes except _____. A. Centro B. stylo C. calapo D. gamba

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SECTION B

1. A. What is pasture?
   B. Briefly discuss three factors affecting the productivity of pasture.
2. A. Explain what is meant by natural grassland?
   B. List five grasses and legumes each with their botanical names.

WEEK: THREE **Date: _____**

TOPIC: FOREST MANAGEMNT

CONTENT

- Meaning of forest
- Forest reserve in Nigeria
- Importance or uses of the forest
- Management of the forest

FOREST

Forest can be defined as a large area of land covered with trees and bushes, either growing wild or planted for some purposes which serves as habitat to various kinds of animals.

Forestry is the management of forest and forest resources.

Silviculture is the growing and cultivation trees.

Forest ecology is the scientific study of interrelated organisms in the forest.

COMMON FOREST TREES

Common forest trees found in the forest are Iroko, Obeche, Mahogany, Nigerian walnut, Ebony, Camwood, Opepe, Afara, Teak and Abura.

FOREST RESERVES IN NIGERIA

Forest reserves are large areas of land where plants, either growing naturally or planted are specially preserved for specific purposes.

SOME FOREST RESERVES IN NIGERIA

1. Mamu River Forest Reserve in Anambra State.
2. Omo Forest Reserve in Ogun State.
3. Afi River Forest Reserve in Cross Rivers State.
4. Okomu Forest Reserve in Edo State.
5. Shasha River Forest Reserve in Ogun State.
6. Zamfara Forest Reserve in Zamfara state.

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7. Sanga River Forest Reserve in Plateau state.

EVALUATION

1. What is Forest?
2. List five common forest trees

IMPORTANCE OF FOREST AND ITS RESOURCES

The following are ways in which the forest and its resources are important to us. They are as follows:

1. Provision of food.
2. Provision of fuel.
3. Provision of medicinal herbs.
4. Provision of employment (lumbering).
5. Forest serves as wind break.
6. Formation of rain.
7. Prevention of soil erosion.
8. Addition of nutrients to soil.
9. Home of wild animals.
10. Forest serves as tourist centre.
11. Provision of foreign exchange.
12. It beautifies the environment and serves as tourist sites.
13. Reduction of atmosphere pollution.
14. Sources of raw materials such as pulp, timber, dye, gum latex etc.

MANAGEMENT OF THE FOREST

The following are management practices that will ensure a constant supply of timber in the forest:

1. FOREST REGULATION:

These are laws promulgated by government in the form of edicts, decrees and bye laws to prevent people from exploiting or indiscriminate tapping of forest resources.

a. The prohibition of bush burning
b. Ban on indiscriminate cutting of timber trees
c. Encouraging people to plant trees
d. Ban or collection of leaves and firewood from the forest
e. Ban or farming in forest reserves
f. Ban or cutting down of under aged trees
g. People are to obtain licences so as to secure the permission to enable them cut down trees for human needs.

2. SELECTIVE EXPLORATION

This is the process of cutting or harvesting only mature trees in the forest

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ADVANTAGES OF SELECTIVE EXPLORATION

a. It ensures the concentration of selected species of timber in the forest
b. It protects soil from erosion
c. It ensures continuous supply of timber
d. It serves as revenue base for the government
e. It prevents indiscriminate felling of timber

3. DEFORESTSATION

This is the continuous or indiscriminate removal of trees without replacing them.

CAUSES OF DEFORESTATION

a. Unfavourable climatic factors such as draught, wind blast etc
b. Man's farming activities such as bush burning, shifting cultivation etc.
c. Timber exploitation
d. Mining/industrialization
e. Natural disasters
f. Bad government policies

EFFECTS OF DEFORESTSATION

a. It encourages soil erosion.
b. It leads to reduction in fertility of soil.
c. It reduces the amount of rainfall in an area
d. It reduces soil moisture content
e. It increases leaching of plant nutrient
f. It destroys the microclimate and warms up the environment
g. It may lead to desert encroachment

EVALUATION

1. List five importance of forest
2. Explain selective exploration

4. REGENERATION

Regeneration is the process of forest re-growth after it has been exploited. It is a deliberate effort to grow trees.

TYPES OF REGENERATION

a. Natural Regeneration: in this type there is re growth of new plants from the old stump
b. Artificial regeneration: this involves the planting of new forest seedlings in a deforested area.

ADVANTAGES OF NATURAL REGENERATION

i. It is less expensive when compared with the artificial regeneration

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ii. It does not require formal stages in plantation establishment
iii. It brings about the stabilization of natural ecosystem
iv. It does not require special management skill

5. AFORESTATION

This is the process of establishing forest plantations in any area.

ADVANTAGES OF AFORESTATION

1. It leads to addition of organic matter
2. It provides regular supply of raw materials e.g. timber for industries
3. It prevents desert encroachment
4. It increases forest fauna (wild life) in the area concerned
5. It prevents leaching of plants nutrient
6. It increases soil moisture retention
7. It increases the amount of rain fall
8. It improves the soil structure

6. TAUNGYA SYSTEM

Taungya system is defined as the planting of arable crops at early stage of forest establishment and the arable crops are harvested before the trees form canopies.

CONDITION NECESSARY FOR THE PRACTICE OF TAUNGYA SYSTEM

The conditions which may favour the practice of taungya system include:

i. Scarcity of land
ii. Over population
iii. Unemployment
iv. Government policies
v. Low standard of living

ADVANTAGES OF TAUNGYA FARMING

i. Varieties of crops are harvested
ii. There is availability of crop produce throughout the year
iii. When leguminous crops are used they fixed nitrogen to the soil
iv. Solves the problem of land scarcity
v. It increases the income of the farmer

DISADVANTAGES OF TAUNGYA FARMING

i. Reluctance in releasing fertile soil
ii. Cultivation of selected crops
iii. Competition between crops and trees

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iv. Inability of some crops to survive

GENERAL EVALUATION

1. Define Taungya farming
2. List three advantages of Taungya farming
3. What is regeneration?
4. List the types of regeneration
5. List the causes of deforestation

RESEARCH

Find out the botanical names of ten common forest trees.

READING ASSIGNMENT

Revision questions 6 and 7 in Essential Agricultural Science for Senior Secondary Schools chapter 23, page 228

WEEKEND ASSIGNMENT

SECTION A

1. The indiscriminate removal of trees is called____. A. aforestation B. deforestation C. taungya farming D. weeding
2. The following are forest trees except ____. A. iroko B. obeche C. hibiscus D. ebony
3. Process of establishing a forest plantation is called ____. A. afforestation B. deforestation C. taungya D. weeding
4. The process of cutting only matured trees in a forest is called _____. A. selective exploitation B. selective exploration C. taungya D. aforestation
5. The best soil for Agriculture is _____. A. loamy soil B. sandy soil C. clay soil D. silt soil

SECTION B

1. A. Define forest
   B. List ten uses of forest
2. A. Define deforestation
   B. State five effect of deforestation

WEEK: FOUR **Date: _____**

TOPIC: FLORICULTURE

CONTENT

- Meaning of floriculture
- Importance of ornamental plants
- Common species of ornamental plants

FLORICULTURE

Floriculture: is a discipline of horticulture that is concerned with the production and management of ornamental plants.

Ornamental plants are beautiful trees or shrubs which can be used to decorate our environments.

IMPORTANCE OF ORNAMENTAL PLANTS

1. Sources of employment e.g. florists.
2. Serves as source of income.
3. For expression of love and as gift on special occasions.
4. For decoration.
5. For fencing.
6. For medicinal preparation.
7. Sources of food.
8. Purification of the air.
9. For teaching and learning purposes.
10. Provision of shades.
11. Serves as wind breaks.
12. Beautification of the environment.
13. Sources of livestock feed.
14. Serves as tourist centres.
15. Source of revenue to the government.
16. For preparation of dyes.

EVALUATION

1. What is floriculture?
2. List seven uses of ornamental plants.

COMMON SPECIES OF ORNAMENTAL TREES, SHRUBS AND FLOWERS

A. ORNAMENTAL TREES

1. Frangi pani
2. Neem cassia
3. Royal palm
4. Balsam
5. Flame of forest
6. India almond
7. Casuarinas
8. Delonix

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B. ORNAMENTAL SHRUBS

1. Allamanda
2. Crotons
3. Ixora
4. Cauliflower
5. Acalypha
6. Hibiscus
7. Wild rose
8. Bougainvillea
9. Zinnia
10. Dutchman's pipe

C. ORNAMENTAL FLOWERS

1. Justicia
2. Cana lily
3. Morning glory
4. Crotalaria
5. Water lettuce
6. Lantana
7. Sun flower
8. Marigold
9. Commelina
10. Clitoria

CULTIVATION OF ORNAMENTAL PLANTS

The cultivation of ornamental flower includes:

1. Selection of site that is well drained and easily accessible.
2. Choice of planting materials which can be seeds or vegetative parts such as stems, roots, leaves (e.g. bryophylum) and stolons
3. Methods of cultivation
   (a) Use of prepared bed
   (b) Direct sowing to the soil
   (c) Use of nylon bag
   (d) Use of pots
4. Provision of shades
5. Organic manuring
6. Regular weeding
7. Regular watering

EVALUATION

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1 List two each of ornamental shrubs, trees and flowers
2 List three propagative material in cultivating flowers.

SOURCES OF PLANTING MATERIALS

The planting materials such as seeds, cut stems, leaves, stolon or rhizomes can be obtained from;

i. Established private horticultural gardens
ii. Higher institution botanical garden
iii. Government owned horticultural centres
iv. Private houses and offices
v. Imported ornamental trees and flowers
vi. Resort or recreational centres

MAINTENANCE OF HORTICULTURAL PLANTS/FLOWERS

1. Provision of shades
2. Regular watering
3. Regular weeding
4. Fertilizer application
5. Fencing
6. Regular pruning

GENERAL EVALUATION

1. What are ornamental plants?
2. List five examples of ornamental flowers
3. List five examples of ornamental shrubs
4. List five uses of ornamental plants
5. Explain five maintenance practice in planting of ornamental crops.

READING ASSIGNMENT

Revision questions 5 and 6 in Essential Agricultural Science for Senior Secondary Schools Chapter 25, page 236

WEEKEND ASSIGNMENT

SECTION A

1. The following are ornamental trees except _____. A. frangi poni B Balsam C. royal palm D. ixora
2. Which of the following is not an ornamental shrubs? A. allamenda B.crotons C. hibiscus D.casuarinas
3. The following are ornamental flowers except ____. A.justicia B. carnality C. crotalaria D. balsam
4. The following are legumes except _____. A. centro B. stylo C. calapo D. panicum maximum

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5. _____ are cultivated purposely for feeding animals. A. arable crops B. ornamental crops C. forage crops D. farm trees

SECTION B

1. A. What is Floriculture
   B. State four ways in which ornamental plants is beneficial to man
2. A. List eight species of ornamental
   B. State five effects of deforestation on the environment

WEEK: FIVE AND SIX **Date: _____**

TOPIC: DISEASES OF CROPS

CONTENT

- Meaning and causes of diseases
- Details of selected diseases

MEANING AND CAUSES OF DISEASE

A crop is a plant cultivated by man for a specific purpose. A plant disease is a deviation of the plant from the normal state of health, presenting outward visible signs. Diseases are caused by pathogens and enhanced by some physiological factors.

CAUSES OF DISEASE

Plant diseases are caused by pathogens. Pathogens are disease causing organism which passes through a regular cycle of development and reproduction. Examples of pathogens that cause plant disease are viruses, bacteria, fungi, parasitic worms and rarely protozoa. Some of these pathogens are carried by vectors and other agents.

Physiological factors such as nutrient deficiency in the soil, heat, presence of inorganic salts in the soil and soil moisture content has a major role to play in influencing plant susceptibility to diseases.

SELECTED DISEASE OF CROPS

Name	Casual organism	Method of transmission	Symptoms and economic importance	Prevention and control measure
Maize Smut	Fungus (Ustilago medic)	Fungus spores deposited on fruits	(i) Reduced yield (ii) Galls on ears, leaves and tarsels which later turn black	(i) Destroy diseased plant. (ii) Use resistant varieties. (iii)Seed treatment.
Rice Blight	Fungus (Piricularia oryzae)	Airborne spores on leaves	(i) Small longitudinal red spots on leaves	(i) Use clean seeds (ii) Avoid heavy use of nitrogen fertilizers.

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			which turn grey or brown (ii) Reduced yield	(iii) Use resistant varieties
Maize Rust	Fungus (Puccinis polysora)	Airborne spores deposited on leaves	(i) Red spots on leave. (ii) Reduced yield (iii) Death of crop.	(i) Early planting (ii) Crop rotation (iii)Use resistant varieties.
Cercopora a Leaf spot of Cowpea	Fungus	Through Wind	(i) Reddish brown spots on leaves (ii) Lesions on leaves (iii) Chlorosis (iv) Dropping or falling of leaves.	(i) Spray with fungicides (ii) Crop rotation (iii) Plant resistant varieties.
Rosette disease of Groundnut	Virus	By piercing and sucking insect (Aphid)	(i) Yellow leaves with mosaic mottling. (ii) Stunted plant with curled leaves. (iii) Wilting and death of plant. (iv) Shortening of the internodes.	(i) Early planting (ii) Crop rotation (iii) Use insecticides (iv) Uproot and burn infected plants. (v) Use resistant variety.
Cassava Mosaic	Virus	(i) Through piercing and sucking insect (whitefly) (*Bemisia nigerensis*) (ii) Infected plant cutting	(i) Mottling of leaves or leaf curl (ii) Distortion of leaves and stems. (iii) Vein clearing (iv) Stunted growth (v) Development of yellowish pale areas alternating with green patches on the leaves or mosaic pattern on the leaves	(i) Use resistant varieties (ii) Uproot and burn infected plant (iii) Spray with insecticide to kill vector (iv) Use disease-free stem cuttings (v) Farm sanitation.
Leaf blight of Cassava	Bacterium	(i) Infected cuttings	(i) Blighting of leaves (ii) Wilting of plant	(i) Use resistant varieties

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	Xanthomonas manihotis	(ii) Rain splashing (iii) Insects (iv) Tools	(iii) Falling off of leaves (iv) Reduced yield (v) Cabker of stem (vi) Die-back of stem	(ii) Use disease free cuttings (iii) Early planting (iv) Practise crop rotation
Cocoa black pod disease	Fungus Phytophthora palmivora	(i) Rain splash (ii) Insects	(i) Brown spots on pod (ii) Rottening of pods (iii) Entire pod turns black (iv) Low yield	(i) Remove and destroy infected pods (ii) Regular weeding (iii) Spray with fungicides e.g. Bordeaux mixture (iv) Avoid overcrowding of cocoa plants.
Coffee Leaf rust	Fungus	(i) By wind (ii) By rain splash	(i) Yellow or brown spot on leaves (ii) Orange powdery mass on the leaf (iii) Reduction in yield (iv) Dropping of leaves	(i) Plant seeds from healthy plants (ii) Use resistant varieties. (iii) Spray with copper fungicides.
Black arm (bacterial Blight of cotton)	Bacterium	(i) Through leaves (ii) Stems near the ground	(i) Angular spot on leaves (ii) Boll rot (iii) Exudates from affected leaves (iv) Retarded growth and death of plant.	(i) Seed dressing (ii) Uproot and burn infected plants
Root Knot of Tomatoes/ Okra	Nematodes	Nematodes in soil	(i) Knotting or galling of roots (ii) Retarded growth (iii) Early death of plant (iv) Reduction in yield	(i) Soil sterilization (ii) Crop rotation (iii) Use resistant varieties (iv) Uproot and burn infected plants
Damping off Disease of Okra	Fungus	Infected soil	(i) Retarded growth (ii) Cells become water logged	(i) Spray with copper fungicide (ii) Use resistant varieties

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			(iii) Gradual wilting of plant (iv) Death of plant	(iii) Sterilization of soil
Onion Twister Disease	Fungus	(i) Infected soil (ii) Water splash (iii) Infected bulb	(i) Twisting of leaves (ii) Grey patches on leaves (iii) Reduction in yield (iv) Death of plant	(i) Crop rotation (ii) Use resistant varieties (iii) Spray with fungicides (iv) Early planting
Stored produce mould fungicides	Fungus	(i) Infected seeds or fruits. (ii) High humidity (iii)By Soil	(i) Black mould on seeds and fruits (ii) Pungent smell. (iii) Sour taste (iv) Decay of seeds and fruits in store.	(i) Proper drying of seed before storage (ii) Spray with (iii) Maintain low humidity in store (iv) Remove contaminated seeds before storage.

EVALUATION

1. What is plant disease?
2. List four common disease causing organisms.

GENERAL EFFECTS OF DISEASE ON CROP PRODUCTION

1. Disease generally reduce the yield of crops
2. They reduce the quality of crops
3. They can cause malformation of parts of plants
4. They can kill or cause death of a whole plant
5. They cause reduction in the income of a farmer

WAYS BY WHICH DISEASE SPREADS ON CROP FARM

1. By rain splash
2. Through the use of contaminated equipment
3. The use of infected planting materials
4. Wind blowing pathogens to other crops
5. Through animals
6. Through insect vectors
7. Through visitors to the farm
8. Through weeds

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GENERAL CONTROL OF CROP PLANT DISEASES

1. Cultural method: the use of crop rotation, planting of resistant varieties, tillage practice, regular weeding, pruning etc. to control or prevent disease
2. Biological control: this is the use of the natural enemy of the disease to reduce or totally eliminate the disease
3. Chemical control: this involves the use of pesticides such as fungicides, nematicides, insecticides to prevent disease or control disease.

GENERAL EVALUATION

1. What are pathogens?
2. List two examples of pathogens.
3. List three physiological factors that makes plants susceptible to diseases.
4. List five air borne disease of crops.

READING ASSIGNMENT

Revision question 6 and 9 in Essential Agricultural Science for Senior Secondary Schools by O. A Iwena chapter 26, page 247.

WEEKEND ASSIGNMENT

SECTION A

1. The following are pathogens except _____. A. viruses B. bacteria C. fungi D. algae
2. Maize rust is caused by _____. A. bacteria B. fungi C. virus D. nematodes
3. Rosette disease of groundnut is caused by ____. A. fungus B. virus C. bacteria D. nematodes
4. Cocoa blackpod disease is caused by _____. A. virus B. bacteria C. fungi D. nematodes
5. Root knoll of tomato is caused by _____. A. nematode B. fungus C. bacteria D Virus

SECTION B

1 A. What is disease?
B. List disease pathogens

2 Discuss briefly the cassava mosaic disease under the following headings
A. Casual organism B. Transmission C. Symptoms D. Control

WEEK SEVEN AND EIGHT **DATE: _____**

TOPIC: PESTS OF CROPS

CONTENT

- Meaning of crop pest
- Types of crop pest
- Classification of insect pest

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MEANING OF CROP PEST

A crop pest can be defined as any organism capable of causing damage to the crop.

TYPES OF CROP PEST

Important crop pest are grouped in to the following classes;

a. Insects
b. Birds
c. Rodents
d. Monkeys
e. Man
f. Nematodes

CLASSIFICATION OF INSECT PEST

1. Biting and chewing insects: they possess strong mandible and maxillae (mouth parts) which enable them to bite and chew plant parts e.g. termites, grasshoppers, leaf worm, mantids, locusts and beetles.
2. Piercing and sucking insects: they possess strong mouthparts called proboscis which enable them to pierce through plants and suck liquid materials from them. Examples are aphids, cotton strainers, mealy bugs, scale insects, capsids, mirids and white flies.
3. Burrowing insects: they and their larva stage are capable of burrowing the tissue of the plant parts or fruits or seeds. Examples are bean beetles, stem borers, maize weevils and rice weevils.

EVALUATION

1. What are crop pests?
2. List the three classes of insect pests.

IMPORTANT PESTS OF MAJOR CROPS

Pest	Crops Attacked	Natures of Damages and Economic Importance	Prevention and Control Measures
Stem burrower	Cereals e.g. rice, maize, guinea corn.	(i) Larvae bore holes into stems (ii) They eat up the tissues (iii) They weaken the plant	(i) Uproot and burn infected plant (ii) Spray with insecticides e.g. Gammalin 20 (iii) Reduced growth and yield (iv) Early planting (v) Crop rotation
Army Worm	Cereals e.g. maize	(i) Larvae invade and eat up leaves and stem	(i) Hand picking

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		(ii) Reduce photosynthesis (iii) Retarded growth (iv) Reduced yield	(ii) Spray with insecticides. E.g. DDT
Pod burrower	Legumes e.g. cowpea, soyabeans	(i) Larvae bore into the pod (ii) They eat up the seeds (iii) Reduced yield	(i) Crop rotation (ii) Early harvesting (iii) Spray with insecticides (iv) Introduce diseases.
Aphids	Legumes e.g. cowpea, soyabeans	(i) Stunted growth (ii) Galls on leaves (iii) Vectors of disease e.g. rosette, mosaic disease of cowpea	(i) Spray with insecticides to kill vector (ii) Uproot and burn infected plant
Leaf beetle	Legumes e.g. cowpea, soyabeans	(i) They eat up the leaves (ii) Reduce photosynthesis (iii) Reduced yield	(i) Spray with insecticides (ii) Use pest-resistant varieties.
Cocoa mirids (capsids)	Beverages e.g. Cocoa	(i) They inject toxic saliva into plant (ii) Transmits fungal diseases (iii) Reduced yield (iv) Stunted growth	(i) Spray with insecticides e.g. Gammalin 20 (ii) Regular Weeding
Yam beetles	Tubers e.g yam	(i) Boreholes into yam tubers (ii) Reduced yield (iii) Reduction in quality and market value	(i) Dust yam setts with Adrin dust before planting (ii) Crop rotation
Cassava Mealybugs	Tubers e.g cassava	(i) Twisting of stem and reduced internodes (ii) Swelling of shoots (iii) Reduced yield	(i) Early planting (ii) Use pest-resistant varieties. (iii) Cutting treatment (iv) Spray with insecticides
Green Spidermite	Tubers e.g cassava	(i) They feed on the leaves (ii) Reduce rate of photosynthesis (iii) Reduced yield	(i) Use biological control (ii) Spray with insecticides
Variegated Grasshopper	Tubers e.g Cassava, yam	(i) Adults and larvae eat up the leaves and stem (ii) Reduce the rate of photosynthesis (iii) Reduced growth (iv) Reduced yield	(i) Hand picking (ii) Spray with insecticides e.g. Adrex 40

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Cotton Stainer	Cotton	(i) They pierce and suck sap from plants (ii) Produce toxic saliva (iii) Transmit diseases (iv) Reduce quality of boll (v) Leaf distortion	(i) Hand picking (ii) Spray with insecticides
Cotton bollworm	Cotton	(i) Larvae feeds on the seeds of cotton (ii) Crop rotation (iii) Destroy the lint and reduce its quality (iv) Premature fall of cotton boll	(i) Spray with insecticides to kill insects (ii) Burn cotton plant debris after harvesting.
Thrips	Vegetables e.g. Onion, tomato	(i) Browning of leaves (ii) Wilting of plant (iii)Reduced yield	(i) Spray with insecticides
Leaf rollers	Vegetable	(i) Rolling and twisting of leaves (ii) Reduction in rate of photosynthesis (iii)Reduced yield	(i) Spray with insecticides e.g. Vetox 85
Leaf beetle	Vegetables e.g. pepper, okra and tomato	(i) They eat up leaves and stems (ii) Reduced photosynthesis (iii) Reduction in yield and quality	(iv) Spray with appropriate insecticides e.g. Vetox 85
Bean beetle, grain weevils	Stored produce e.g. rice, cowpea and maize.	(i) Boreholes into grains and eat them up (ii) Reduce the quality of stored produce (iii)Reduced farmer's income (iv)Reduce the market value of grains (v) Reduce viability of infested grains	(i) Early harvesting (ii) Proper storage of produce (iii) Proper cleaning and fumigation of store with phostoxin tablets or with lindane dust. (iv) Store grains over fire places (v) Proper drying of seeds to reduce moisture content and kill the eggs and larva of pests.
Birds	Rice, maize, millets and sorghum	(i) Feed on grains in the field	(i) Use of bird scarer or scare crow (ii) Use of cage traps with baits

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		(ii) Reduction in quality and yield (iii)Reduction in income of farmers	(iii) Shooting with catapult (iv) Drumming or noise making on the farm (v) Use of explosive mechanism at regular intervals (vi) Use of avicides (vii) Fencing /Screening farms in greenhouse
Rodents e.g. bush rabbit, rats and squirrel	Rice, yam, cassava and fruits	(i) They feed on crops (ii) Destroy whole plant (iii) Reduction in yield (iv) Increase in cost of production	(i) Trapping with braits. (ii) Use of rodenticides (iii) Use of string/wire traps (iv) Use of predators e.g. dogs and cats (v) Clean weeding of farms (vi) Shooting and fencing (vii) Use of pit traps
Monkeys	Cocoa mango, banana, and orange	(i) They eat up the fruits (ii) Reduce the quality of fruits (iii) Losses to the farmer	(i) Use traps (ii) Shooting with gun where possible.

EVALUATION

1. List two ways of controlling cocoa mirids
2. List two ways of controlling monkeys

ECONOMIC IMPORTANCE OF INSECT PESTS IN CROP PRODUCTION

1. They destroy crops in the fields through their biting, chewing, boring, sucking and defoliation activities.
2. They cause reduction in viability of stored produce
3. Spot of injuries by insect pests predispose crops to pathogen attack
4. They increase the cost of production as they are being controlled
5. They render vegetables and fruits unattractive and unmarketable
6. Some are of vectors of disease
7. The profits of farmers are reduced
8. They reduce the quality of produce either in the store or in the field
9. They generally reduce the yield of crops
10. They can also cause total death of crop plants.

GENERAL EVALUATION

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1. What are pathogens?
2. List five pathogens you know
3. List four economic importance of insect pest

READING ASSIGNMENT
Revision questions 3 and 8 Essential Agricultural Science for Senior Secondary Schools Chapter 26, page 247

WEEKEND ASSIGNMENT
SECTION A

1. _____ is responsible for damages in crops. A. weeds B. water C. air D. pests
2. The following are rodents except _____. ?A. rat B. grass cutter Squirrel Monkey
3. The following are bitting and chewing insect except ____. A. termites B. capsids Locust D. beetles
4. Stem burrowers will attack A. cereals B. legumes C. tubers D. spices
5. Cotton strainers and meleabugs are examples of _____ insects. A. biting B. chewing C. piercing D. burrowing

SECTION B

1. A. What are pests
   B. List the five types of pests
2. A. List five effects of pests in crop production
   B. List three control measures of plant disease

WEEK NINE **DATE: _____**
TOPIC: GENERAL PREVENTION AND CONTROL OF CROP PESTS
CONTENT

- Physical control
- Chemical control
- Biological control
- Cultural control

METHODS OF PEST CONTROL
Crop pests can be prevented or controlled through the following methods:

1. Physical control
2. Cultural control
3. Biological control
4. Chemical control

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PHYSICAL CONTROL

This involves the physical removal of pests by:

a. Hand picking of insects and larvae
b. Setting traps to catch rodents
c. Shooting rodents with gun
d. Fencing round the farm with wire nets.
e. Use of scarecrow.

EVALUATION

1. List the methods of pest control
2. List three ways by which pests can be removed physically

CULTURAL CONTROL

This method involves the use of farm practices to prevent or control pests, examples of cultural control are:

1. Practicing crop rotation
2. Use of pest resistant varieties of crops
3. Appropriate tillage operations
4. Burning crop residues
5. Timely planting of crops
6. Proper weeding or sanitation
7. Timely harvesting
8. Close season practices (no living plant is allowed for a certain period).

BIOLOGICAL CONTROL

This involves the introduction of natural enemies of pests to control or keep the pest's population under control. Such enemies eat up or feed on these pests, thereby reduce the population of the pests.

EVALUATION

1. List two cultural control of pests
2. Explain biological pest control

CHEMICAL CONTROL

This involves the use of chemical called pesticides to control pest of crop plants. Examples of pesticides are insecticide, rodenticide, avicide etc.

Examples of chemicals used to control pests are:

I. Insecticides – for controlling insect pest e.g. grasshopper
II. Rodenticides – chemical control for rodents such as rats
III. Avicides – for controlling bird pest

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IV. Nematicides – chemical used to control nematodes. E.g worms

FORMS OR GROUPS OF INSECTICIDES

The four groups and the mode of action are:

Group	Mode of action
1. Powder	Contact
2. Liquid	Systemic
3. Granules	Stomach (Ingestion)
4. Gas	Fumigation

SIDE EFFECT OF THE VARIOUS PREVENTIVE AND CONTROL METHOD OF DISEASE AND PEST OF CROPS

Use of these control methods have their effect, these effects includes

1. Death of some beneficial insect and soil organism, toxic exposure to animals and man, chemical residue in the environment, washing away of chemicals into aquatic life e.t.c when chemical control method is employed.
2. Organisms introduced may attack cultivated crops or stored grains, predators might not feed on targeted pest and deviate to feeding on beneficial organisms, the activities of new organism might cause an ecosystem imbalance when biological control method is employed.
3. When cultural control method is employed, the use of bush burning method might get out of hand thereby destroying soil structure, spread to other farms, loss of organic matter and lead to death of beneficial microbes.

GENERAL EVALUATION

1. What are insecticides?
2. List the three forms of insecticides and their mode of action
3. What are avicides, rodenticide and nematicides are used to control
4. List five economic importance of crop pests.

READING ASSIGNMENT

Revision question 10, 14 and 16 Essential agricultural science for senior secondary schools chapter 26, pages 247-248.

WEEKEND ASSIGNMENT

SECTION A

1. Avicides are used to control _____. A. rodents B. birds C. insects D. pests
2. The mode of action of liquid insecticide is_____. A. contact B. systemic C. stomach D. fumigation
3. Weevils are _____ insects. A. biting B. chewing C. burrowing D. piercing
4. The following are pests except. A. rodents B. earthworm C. monkeys D. nematodes

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5. The following are biting chewing insects except _____. A. butterfly B. locust C. grasshopper D. cricket

SECTION B

List two side effects each of using

a. Cultural control of pests
b. Biological control of pests
c. Chemical control of pests
d. Physical control of pests

WEEK TEN
REVISION

WEEL ELEVEN
EXAMINATION

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