



SECOND TERM E-LEARNING NOTE

SUBJECT: AGRICULTURAL SCIENCE

CLASS: SS 1

SCHEME OF WORK

WEEK	TOPIC
1.	Revision of Last Term Work
2-3.	Cultural Practices: Pre-planting, Planting and Post-Planting Operations
4-5.	Husbandry and Cultivation of Some Selected Crops
6.	Agricultural Ecology
7.	Rock Formation and Types
8.	Rock Weathering and Process of Rock Weathering
9.	Factors of Soil Formation
10.	Revision.
11-12.	Examination

REFERENCES

- Essential Agricultural Science by O. A. Iwena
- Fundamental Agricultural Science by P. E. Okafor
- Prescribed Agricultural Science by Omoruyi and Oruhue
- SSCE Agricultural Science Pack

WEEK ONE

DATE: _____

TOPIC: REVISION OF LAST TERM'S WORK
CONTENT

- Answers to last term's objective questions
- Answers to last term's theory questions

WEEK TWO AND THREE

DATE: _____

TOPIC: CULTURAL PRACTICES
CONTENT

- Pre-planting Operations
- Planting Operations
- Post-planting Operations

Cultural Practices: Cultural practices are the various activities carried out on the farm before, during and after planting to ensure proper growth and establishment of crops. Cultural practices are classified into: pre-planting, planting, post-planting operations.

Pre-planting operations are the operations carried out before planting, while planting is the sowing of seeds and post-planting operations include thinning, supplying, irrigation, manuring, mulching and weeding.

PRE-PLANTING OPERATIONS



- A. **Landclearing:** this is the removal of pre-existing vegetation on the farm land. It is carried out by cutting the vegetation and grasses with cutlass or hoes; and trees fell with axes. It can also be done mechanically with the aid of bulldozers and tree pullers.
- B. **Stumping:** This is the removal of stumps by digging them out manually using cutlasses and axes. It can also be done mechanically by using bulldozer. Stumps are the left over cut trees on the farm left on the soil surface.
- C. **Farm layout:** Farm layout is a judicious way of using the farmland where the plots are divided into sections and each section is used to give maximum yield.
- D. **Land preparation:** this is ensuring the soil is put in the best condition and state suited to the crop needs. The process of preparing the soil involves carrying out tillage, making beds, making heaps, making ridges, leveling soil after stumping etc.

Tillage is the breaking or turning of the soil with a simple tool or farm machine after the land has been cleared in preparation for planting crops. It can be done manually with a hoe or mechanically with a tractor - driven plough.

Ploughing is cutting through the soil and making it into lumps or clods of soil. It is called primary tillage. While secondary tillage (harrowing) is the use of harrow to break down the large clods of soil into fine particles and making it ready for ridging. Other implements used in carrying out tillage are spring tine cultivator, mould board plough etc.

Importance of tillage

1. It loosens the soil and allows air and water to reach the roots of plants.
2. It allows easy penetration of roots into the soil
3. Plant nutrients are brought to the reach of the plant root
4. Tillage helps to destroy pest by exposing them to the sun
5. It ensures proper mixture of manure and fertilizer with the soil

Ridging involves the making of ridges on the farm, sometimes heaps are also made to serve the purpose of ridges on slopes ridges are made across, with the ridges made at intervals to check erosion, ridges also help to provide water for plant use and aids root penetration and establishment of crops.

EVALUATION

1. What is land clearing?
2. Define stumping.
3. Define tillage and state three importance of tillage.
4. What is ridging?
5. Differentiate between primary and secondary tillage.

PRACTICAL DEMONSTRATION

1. Clear the school farm using cutlass and till the land
2. Do the layout.
3. Make ten ridges in preparation for maize cultivation.
4. State three importance of tillage
5. Differentiate between primary and secondary tillage.

PLANTING OPERATIONS – DISTANCE, DATE, SEED RATE, NURSERY AND NURSERY PRACTICE



CONTENT

- Definition of planting operation
- Planting method
- Basic considerations in planting operation
- Nursery and Nursery operation

PLANTING OPERATION: These are the operations carried out when inserting the planting materials (cutting or seeds) into the soil. When seeds are sown in the soil, they develop root and shoots, this is called **germination** and the young plants that emerge are called **seedlings**.

A seed when planted undergoes the following processes.

1. Germination: the process whereby the embryo of a seed resumes growth under favourable conditions.
2. Emergence: this refers to the appearance of a seedling above soil level.

Conditions necessary for germination of seeds are

1. Adequate moisture
2. Viable seed (living embryo)
3. Optimum temperature
4. Adequate air

Methods of sowing

1. In-situ (directly into the field/farm land)
2. Nursery

In-situ planting/sowing is sowing directly in the field on flats (plain land) ridges or garden beds e.g. of crops sown in-situ are maize, okra, cowpea, millet etc.

Sowing/Planting methods

1. Drilling: sowing a seed by drilling with stick or knife, followed by dropping seeds and covering them.
2. Broadcasting: sowing of seeds by spreading it broadly on prepared seed bed
3. Dibbling: sowing of seeds up the bed at the planting point only and placing the seeds at the correct depth.

BASIC CONSIDERATIONS IN PLANTING OPERATIONS

1. Planting space/distance
2. Planting time
3. Planting depth
4. Number of seed
5. Viability of seed

Planting space: This is the space between a sown or planted seed and the next. It is the distance between two plants stand on the field. Planting is usually in rows and the distance between plants on the same row is called within row spacing (intra row spacing) while the distance between plants in two adjacent rows is called between row spacing (inter row spacing).

Planting time: This is the time of planting or sowing seeds in which the crop can thrive or perform well. This is largely dependent on rainfall.



Planting depth: This is the distance of the sown seed in the soil from the soil surface

Number of seeds: This is the amount of seeds sown per hole per planting point (position)

Seed viability: This is the life in the seed or deadness of the seed.

NURSERY AND NURSERY OPERATIONS

Nursery is a special place prepared for raising seedlings which are later taken to the field for proper planting (transplanting).

Seedlings are grown in nursery beds, seed trays or boxes, basket or polythene bags may be used as boxes. E.g. of such crops are cocoa, kola, tomatoes, citrus etc.

Why seeds are raised in nurseries:

1. The seeds are tiny hence cannot be handled easily and sown as required
2. The seedlings are weak and may not survive in field. They require protection from sunlight and rainfall.
3. They are better protected from pest in the nursery
4. So as to select the healthiest or seedling with best vigor for transplanting.

EVALUATION

1. What is germination?
2. Define sowing in-situ
3. What is planting space?
4. Mention two reasons why seeds are raised in the nursery.
5. State three conditions for seed germination.

POST -PLANTING OPERATIONS

CONTENT

- Definition of post planting operations
- Post planting operations

Post planting operations are the operations carried out after planting. It creates a good condition and proper maintenance for plants growth.

Post planting operations include the following:

1. Thinning
2. Supplying
3. Irrigation/ watering
4. Use of manure and fertilizer
5. Mulching
6. Weeding
7. Harvesting
8. Processing
9. Storage, etc

Thinning is the removal of excess, weak or not well positioned seedlings from a seedbed after the viable seeds have germinated



Advantages of Thinning

1. It helps to avoid over crowding
2. Proper aeration is ensured leading to high yield

Supplying is the replanting of propagative materials where they fail to germinate. Supplying should be done as soon as possible.

Advantages of supplying

1. Correct plant population can be maintained
2. The farmer can achieve uniform maturity

Irrigation(watering) is the artificial watering of farmland especially during dry season.

Advantages of irrigation

1. It makes the soil temperature moderate for plant growth
2. It enables a good nutrient supply to plant

Manuring/fertilizer application is the addition of organic manure such as poultry droppings, cow dung and green manure or inorganic manure (made from chemicals) to the soil to maintain soil fertility. Manure can be in form of:

1. Animal and plant refuse (organic manure)
2. Chemical manure (inorganic manure).

Types of Organic Manure

1. **Green manure:** This involves growing of a crop usually a legume and just before flowering it is ploughed into the top soil to rot down
2. **Farmyard manure:** This consists of faeces or excreta, urine and other waste products of domesticated animals. Animals dropping are usually mixed with straw.
3. **Compost:** Plant and animal remains and ashes heaped together and allowed to decay properly by ensuring that there is plenty of air in its making. It is then spread on the farmland to incorporate nutrients into the soil.

Inorganic Manure (Fertilizer)

These are chemical substances which are usually prepared in the farm, they are made in form of liquid, powder, granules, pellets or crystals Fertilizers should be added to the soil only when the soil shows that some important minerals are lacking commercial fertilizers usually contain macro nutrients or elements which are removed in large amount by crops. Fertilizers therefore usually contain nitrogen (N), phosphorus (P) and potassium (K).

Examples of Nitrogen fertilizers are ammonium sulphate, ammonium nitrate urea, sodium nitrate, potassium nitrate etc.

Examples of phosphate fertilizers are single super phosphate fertilizers are single super phosphate, triple super phosphate. Examples of potash fertilizer are potassium nitrate, sulphate of potash.



Care should be taken when applying in-organic fertilizer because it can burn the plant if it comes in contact with it.

Ways of applying fertilizer

1. Broadcasting
2. Localized placement in the row or in a circle around the plant (side placement)
3. Spraying
4. Foliar fertilizer application

Advantage of manuring/fertilizer application

1. It supplies the plants with essential nutrients.
2. It maintains good soil structure

Mulching is the covering of the surface of the soil with a layer of clean dry vegetative part of plant such as grasses or leaves.

Advantages of mulching

1. It conserves soil moisture.
2. It regulates the soil temperature.
3. It reduces weed and prevent erosion.
4. It adds humus to the soil.

Weeding is the removal of unwanted plants (weeds) from the farm. It can be done with the aid of cutlass and hoes or by spraying herbicide. It is done for the following reasons:

1. To avoid competition for nutrients, moisture, sunlight and space between crops and weed.
2. To prevent the buildup of pest and pathogens.

Harvesting is the removal of ripe or matured useful part of a crop is known as harvesting. Commonly harvested parts of a plant are tubers, leaves, fruits, seeds, roots etc. Harvesting tools like cutlass, hoe, knife, sickle etc are usually used for harvesting and in mechanized farms, harvesters are used.

Effects of timely versus late harvesting

Delayed harvesting can lead to a total loss of products, although some crops like maize can be left on the field to get dry before harvesting, others like tomatoes and other perishables must be harvested immediately they are due for harvest. Delayed harvesting can lead to pest attack on crops or rotting of products.

Post-harvesting operations

After harvesting, processing of the produce is required in order to make the produce more acceptable and to prevent spoilage. In some farm products, processing starts from the farm site, e.g. melon, groundnut, cassava etc. Melon is usually extracted from its pod and pulp on the farm, also groundnut is detached on the farm, at times, peeling of cassava starts from the farm. Extraction of cocoa beans from its pods, fermentation and drying of beans in most cases take place on the farm.

Other forms of processing like milling, de-husking etc which cannot be done on the farm are done in factories where machines have been installed for that purpose.



Storage

After crops have been processed to usage forms, storage which is the keeping of farm products for future use is done. Methods of storage are: usage of barns, cribs, silos, refrigerators, baskets, sacks etc.

EVALUATION

1. What is thinning?
2. List two weeding tools.
3. State two reasons for weeding.
4. Why is supplying important?
5. What is manure?
6. State the two main types of manure.
7. List three types of organic manure.
8. State three ways of applying chemical fertilizers.

GENERAL EVALUATION/REVISION QUESTIONS

1. What are cultural practices?
2. Distinguishing between the categories of cultural practices.

FIELD WORK ON LAND PREPARATION

Demonstration of all practices taught on the farm site using simple farm tools.

WEEKEND ASSIGNMENT

1. Primary tillage is otherwise known as ____ A. harrowing B. ploughing C. ridging D. stumping
2. Secondary tillage is otherwise known as ____ A. harrowing B. ploughing C. mulching D. stumping
3. The operation that follows harrowing is ____ A. ridging B. stumping C. clearing D. layout
4. Stumping is carried out with the following except ____ A. gun B. cutlass C. bulldozer D. axe
5. Which of these operations comes first? A. Tillage B. Ridges C. Stumping D. Harvesting
6. Which of these operations involve the removal of left over parts of plants in the soil? A. tillage B. Stumping C. Harrowing D. Ridging
7. Which farm operation involves the breaking or turning of the soil? A. Stumping B. Ridging C. Tillage D. Harrowing
8. Which of these farm operations involves the division of plots for farm work? A. Ridging B. Harrowing C. Tillage D. Farm layout
9. ____ allows easy penetration of roots into the soil A. Harrowing B. Tillage C. Stumping D. Land clearing
10. One of the following is not a basic consideration in planting operation A. plating space B. planting depth C. planting time D. seed pod
11. The distance between two sown seeds/plants is ____ A. Planting space B. Time C. Planting depth D. Planting seed
12. Some seeds are raised in the nursery because A. The seedlings are weak B. The seedling are green C. The seedlings love the nursery D. So that they can get enough sunshine



13. This is the distance of the sown seed in the soil A. Planting time B. Planting Depth
C. Spacing D. Number of seeds
14. The covering of soil surface with vegetative material is known as A. Weeding
B. Thinning C. Mulching D. Supplying
15. This is the removal of unwanted plants on the farm A. Weeding B. Thinning C. Mulching
D. Supplying
16. This is the removal of excess and weak seedling from the seed bed A. Weeding
B. Thinning C. Supplying D. Mulching
17. Correct planting population can be maintained by ____ A. Thinning B. Supplying
C. Weeding D. Mulching
18. Which of these is not an organic manure? A. Compost B. Farmyard manure C. Green
manure D. Ammonium nitrate
19. The growing of crops (legumes) and ploughing of the same into the soil as soon as it
flowers is called? A. Compost B. Farmyard manuring C. Green manuring D. Yellow
manuring
20. Which of these manure is faeces or dropping of animals usually used in making.
A. Compost B. Farm yard manure C. Green manure D. In organic manure

THEORY

1. What are cultural practices?
2. Write short note on the following: A. Land clearing B. tillage
3. Write short note on the following: A. planting distance B. planting depth, C. seed viability.

WEEK FOUR AND FIVE

DATE.....

TOPIC: HUSBANDRY AND CULTIVATION OF SOME SELECTED CROPS

CONTENT

- Cultivation of Cereals
- Cultivation of Legumes
- Cultivation of Roots and Tubers

CULTIVATION OF CEREALS

	MAIZE (<i>Zeamays</i>)	RICE (<i>Oryzasativa</i>)
Description	Maize also called corn is a member of the grass family (Gramineae). It produces grains, use as food by human beings and livestock. The seed/fruit is called <u>caryopsis</u> .	Rice is a member of the grass family (Gramineae). The seed/ fruit is called caryopsis
Varieties / cultivar	Sweet maize, flint maize, dent maize, flour maize and popcorn	Swamp rice (Toma) and upland rice (Agbede).
Land preparation	Clearing the land and making ridges either manually or mechanically.	Clearing the land and making ridges either manually or mechanically.
Climatic requirement	Temperature - 26 ⁰ C-30 ⁰ C, Rainfall – 75cm-150cm per annum	Temperature of 20 ⁰ c, Rainfall of 75cm-120cm for upland rice and over 250cm for swamp rice.
Soil requirement	Sandy-loamy soil of PH 6-7	Loamy-clayey soil.



Method of propagation	By seeds	By seeds
Planting date	Early maize - March/April Late maize – July/August	South – April/May, North – August/September.
Planting	It can be done manually using cutlass or mechanically by planter at 2-3 seeds per hole.	Planting can be done by broadcasting, sowing or drilling.
Seed rate	20-30kg per hectare of land	65kg per hectare at 2-3 seeds per hole.
Spacing	80cm between row and 30cm within row	25-30cm apart depending on varieties.
Cultural practices	Supplying, thinning, weeding fertilizer application, control of pests and diseases.	Supplying, thinning, weeding fertilizer application, control of pests and diseases.
Maturity period	90-120 days after planting depending on varieties.	4-7 months depending on varieties.
Harvesting	Harvesting can be done manually with hand or using a hand sickle and mechanically using a combined harvester.	Red heads of rice are harvested with knife, sickle or combined harvester.
Processing	It can be eaten either boiled or roasted or processed into corn flour or corn flakes.	Sun drying, threshing, winnowing, per boiling, hulling and polishing.
Uses	It is consumed by man and farm animals and as a raw material in brewery industries	It is consumed by man and farm animals.
Storage	Dried cobs are stored in cribs, rhombus or in a fire place, grains stored in a silo.	Processed form in silos or jute bags.

EVALUATION

1. Mention the nutritional value of the following class of crops A. cereals B. legumes C. vegetables D. spices E. beverage crops
2. Discuss the cultivation of a named cereal under the following subheadings A. soil and climatic requirement B. cultural practices C. planting date, materials and planting D. maturity period (e) harvesting

READING ASSIGNMENT

Answer question 7 on page 177 of Essential Agricultural Science by O. A. Iwena

CULTIVATION OF LEGUMES

	COWPEA (<u>Vigna unguiculata</u>)	GROUNDNUT (<u>Arachis hypogea</u>)
Description	Cowpea is a member of the pulses or legumes. It belongs to the family leguminosae. It is rich in protein. The fruit of cowpea is called Pod.	Groundnut is a dual purpose crop. It serves as oil crop as well as a pulse or leguminous crop. However, it is grown mainly for its oil. The seed gives about 40-45%



		of excellent edible oil.
Varieties / cultivar	Erect type, creeping type, Ife brown, Ife bimpe	Bunch or erect type, creeping type, Kano local, Kano 50, castle cary.
Land preparation	Clearing the land and making ridges either manually or mechanically.	Clearing the land and making ridges either manually or mechanically.
Climatic requirement	Temperature of 27°-35°C, Rainfall of 60-125cm per annum.	Temperature of 25°-30°C, Rainfall of 70-100cm per annum.
Soil requirement	Well drained sandy loamy soil	Coarse textured sandy loamy soil which is slightly acidic and rich in calcium and phosphorus for pod formation.
Method of propagation	By seeds	By seeds
Planting date	April to September depending on the ecological zone.	South – March / April North – May / June
Planting	Planting can be done manually or mechanically at 2-3 seeds per hole.	Planting can be done manually or mechanically at 2-3 seeds per hole.
Seed rate	20 – 25kg per hectare.	30 – 35kg per hectare.
Spacing	Erect type – 30 x 75cm, Creeping type – 25 x 90cm	Erect type – 60 x 15cm Creeping type – 60 x 20cm
Cultural practices	Supplying, thinning, weeding fertilizer application, control of pests and diseases.	Supplying, thinning, weeding and control of pests and diseases. Groundnut does not need fertilizer application except on a very poor soil.
Maturity period	9 – 12 weeks after planting depending on varieties.	3 – 4 months after planting.
Harvesting	Hand picking of matured brown pods.	It is ready for harvest when the leaves turn yellow and begin to wilt. It is done by uprooting the plant manually or mechanically and allowing to dry for easy removal of pods.
Processing	Sun drying, threshing and winnowing.	Sun drying, removal of seeds from the pods by slightly pounding in mortar or using a decorticating or shelling machine.
Uses	A source of plant protein for man It serves as a cover crop It serves as forage legumes It is used for making green manure.	For making oil For making cake to feed man and farm animals For making groundnut butter.
Storage	Seeds are stored in jute bags silos or air tight container after proper drying. Seeds should be treated with insecticide and the store	Dried groundnut seeds are stored in silos or rhombus. Unshelled pods are stored in jute bags.



	fumigated to prevent weevils attack.	
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EVALUATION

1. Mention the pre-planting operations in cowpea cultivation
2. Mention three uses each of a) groundnut b) cowpea
3. Outline five importance of legumes

READING ASSIGNMENT

Answer question 9 on page 178 of Essential Agricultural Science by O. A. Iwena

CULTIVATION OF ROOTS AND TUBERS

	YAM (<u>Dioscoreaspp</u>)	CASSAVA (<u>Manihotspp</u>)
Description	Yam belongs to the family <u>Dioscoreacea</u> . It is a root and tuber crop grown in West Africa and it is rich in carbohydrates.	Cassava is a root and tuber crop, rich in carbohydrate. It is easily cultivated and can grow in relatively poor soil.
Varieties / cultivar	Water yam (<u>Dioscoreaalata</u>) Yellow yam (<u>Dioscoreacayenesis</u>) White yam (<u>Dioscorearotundata</u>) Bitter yam (<u>Dioscoreadomentorum</u>) Aerial yam (<u>Dioscoreabulbifera</u>)	Sweet cassava (<u>Manihotutilissima</u>) Bitter cassava (<u>Manihotpalmata</u>)
Land preparation	Clearing the land and making ridges either manually or mechanically.	Clearing the land and making ridges either manually or mechanically.
Climatic requirement	Temperature of 25° – 30°C, Rainfall of 100cm – 180cm per annum.	Temperature of 21° – 35°C, Rainfall of 150 – 200cm per annum.
Soil requirement	A well-drained sandy-loamy soil, rich in humus.	Dried loamy soil. It can also tolerate poor soil.
Method of propagation	By yam seeds or yam sets.	By stem cuttings (25 – 30cm long).
Planting date	Early yam – November / December Late yam – March / April	March to September depending on ecological zone.
Planting	Open a hole on the ridge using a hoe and place one yam sett inside with the cut surface turned upward and slantly placed at an angle of 45o	2/3 Of the stem cuttings are buried in slanting position or at an angle of 45o.
Seed rate	3 – 5 tonnes per hectare	
Spacing	90cm x 100cm	100cm x 100cm.
Cultural practices	Mulching, weeding, application of fertilizers, staking, training of vine.	Weeding and fertilizer application.
Maturity period	8 – 12 months depending on variety.	10 – 15 months depending on varieties.
Harvesting	This is done by digging the soil gently with a cutlass to remove the tuber from the soil.	This is done by digging the soil gently around the tubers and pulling the stem gently so that the



		tubers are pulled along or use cassava puller.
Processing	It can be processed into yam flour.	It can be processed into cassava flour, garri or foofoo.
Uses	It is consumed by man and farm animals.	It is consumed by man and farm animals.
Storage	Yam tubers are store in barns.	Cassava is stored in processed form in sacs.

EVALUATION

1. List three cultivars of yam and their botanical names.
2. Name the soil and climatic requirement, planting material, maturity period and planting date in cassava cultivation

GENERAL EVALUATION

1. Discuss the cultivation of yam under the following subheadings A. method of propagation B. planting date and planting C. harvesting D. soil and climatic requirement
2. Discuss the production of a named legume under A. varieties B. soil and climatic requirement C. method of propagation D. planting (e) harvesting
3. State four uses of groundnut.
4. Discuss the cultural practices in yam cultivation.

READING ASSIGNMENT

Answer question 2 on page 177 of Essential Agricultural Science by O. A. Iwena

WEEKEND ASSIGNMENT

1. Legumes that produce edible seeds are called A. pulses B. spices C. grains D. cereals
2. The following are cultural practices of yam cultivation except A. thinning B. staking C. mulching D. weeding
3. The following are importance of mulching in yam cultivation except A. reduce soil temperature B. conserve soil moisture C. prevent pests attack D. prevent yam rot
4. Cowpea processing involves the following except A. threshing B. sun drying C. per boiling D. winnowing
5. Rice processing include the following except A. threshing B. winnowing C. fermentation D. per boiling

THEORY

1. Discuss the following practices in yam cultivation A. staking B. mulching C. training of vine
2. Outline four importance of legumes.

WEEK SIX

DATE.....

TOPIC: AGRICULTURAL ECOLOGY CONTENT

- Meaning of Agricultural Ecology
- Components of Farm Ecosystem



- Interactions Among the Components of Agro-ecosystem

MEANING OF AGRICULTURAL ECOLOGY

Agricultural Ecology is defined as the study of crop plants and farm animals in relation to their environment. Ecology is derived from a Greek word “**Oikos**” which means home or dwelling place. In other words, agricultural ecology can be defined as a field of study which deals with the relationship of living organisms with one another and with the environment in which they live.

Agricultural Ecology is divided into:

- A. Autecology
- B. Synecology.

Autecology is concerned with the study of an individual organism, or a single species of organism and its environment. For example the study of a single cattle and its environment.

Synecology is concerned with the study of the inter-relationships between groups of organisms or species of organisms living together in an area. For example the study of different fishes in a fish pond in relation to their aquatic environment.

Ecosystem refers to a community of crop plants and farm animals functioning together with their non-living environment. In other words, ecosystem consists of living factors (plants and animals) interacting with the non-living factors in a farm environment.

EVALUATION

1. What is Agricultural Ecology?
2. Write short notes on the two aspects of ecology.
3. Define ecosystem.

COMPONENTS OF FARM ECOSYSTEM

The farm ecosystem is made up of two main components. These are:

- (a) Biotic (living) components
- (b) Abiotic (non-living) components

BIOTIC COMPONENTS: The biotic components include the living things i.e. crop plants and farm animals. The biotic components can be grouped into two classes which are; Autotrophism and Heterotrophism.

(i) Autotrophism: This is a group of organisms which makes use of sunlight or chemicals to manufacture their food from inorganic substance during the process of photosynthesis. In other words, autotrophs are organisms mainly crop plants which are capable of synthesizing their own food, hence they are called producers.

(ii) Heterotrophism: This is a group of organisms mainly farm animals which cannot manufacture their own food but depend directly or indirectly on plants for their food, hence they are called consumers. Farm animals that feed directly on green plants (producers) are called herbivores or primary consumers e.g. cattle, sheep, goat and rabbit.



ABIOTIC COMPONENTS: The abiotic components of an ecosystem include the non-living things which are:

- (i) Climatic factors like rainfall, temperature, wind, humidity and sunlight.
- (ii) Inorganic materials and nutrients such as carbon dioxide, oxygen, nitrogen, calcium and phosphorus.
- (iii) Edaphic factors like soils, rocks, topography.
- (iv) Other factors like dust, storm, fire and water.

EVALUATION

1. Differentiate between autotrophs and heterotrophs.
2. State five examples of climatic factors.
3. Write short note on primary consumers with relevant examples.

INTERACTION AMONG THE COMPONENTS OF AGRO-ECOSYSTEM IN SOME FARM SETTINGS

- (a) **In Mono-cropping/Sole Cropping:** Mono-cropping is a system of cropping where one type of crop is grown on a farmland at a particular time. For example oil palm farm, kolanut farm, maize farm, etc. The interaction between the biotic and abiotic factors in the environment include:
- (i) Crop plants absorb nutrients from the soil to grow.
 - (ii) Crop plants also absorb water to grow and produce fruits.
 - (iii) Crop plants also take in carbon dioxide from the air to carry out photosynthesis.
- (b) **In Mixed Cropping System:** Mixed cropping is a system of cropping which involves the growing of two or more crops on the same piece of land at the same time. Crops like maize, cassava, cowpea etc can be cultivated at the same time on the same farmland. Their interactions include:
- (i) Crops like cowpea is capable of adding nutrients to the soil.
 - (ii) Crops like cassava obtain nutrients from the soil to grow and produce fruits.
 - (iii) The leaves of all crops which fall on the ground, decayed and add nutrients to the soil through decomposition by soil microorganisms.
- (c) **In Mixed Farming:** Mixed farming involves the cultivation of crops and rearing of animals simultaneously on the same piece of farmland. The farm may be divided into two parts: one part for growing crops and the other for growing grasses and keeping of livestock. Their interaction include:
- (i) The grasses or the remains of crops serve as food for the animals.
 - (ii) The animal dungs and droppings are used as organic manure to improve the soil fertility for the crops.
 - (iii) Some crops like cowpea and crop residue may decay to release nutrients to the soil.

GENERAL EVALUATION

1. What is Agricultural Ecology?
2. Write short notes on the two aspects of ecology.
3. Define ecosystem.
4. State five examples of climatic factors
5. Explain briefly the interaction among the components of ecosystem in:
A. mixed farming
B. mixed cropping
C. fish pond.



READING ASSIGNMENT

Essential Agricultural Science by O.A. Iwena, pages 37-40

WEEKEND ASSIGNMENT

1. All these farm animals are polygastric animals except A. cattle B. goat C. rabbit D. sheep
2. The branch of ecology which deals with the study of a single species of organism and its interaction with the environment is known as... A. autecology B. synecology C. entomology D. pathology
3. Climatic factors include the following except... A. wind B. sunlight C. rocks D. rainfall
4. involves the cultivation of crops and rearing of animals simultaneously on the same piece of farmland. A. Mixed cropping B. Mixed farming C. Bushfallowing D. Pastoral farming
5. The animal dung and droppings are used asto improve the soil fertility for the crops. A. inorganic manure B. organic manure C. moisture D. mulch

THEORY

1. Write short notes on the two aspects of ecology
2. Explain briefly the interaction among the components of ecosystem in: A. a fish pond B. a forest/savannah

WEEK SEVEN

DATE.....

TOPIC: ROCK FORMATION AND TYPES

CONTENT

- Meaning of Rock
- Types of rock

ROCK

A rock is any mineral material of the earth. It may be a combination of different mineral elements such as silica (silica contain silicon and oxygen).

TYPES OF ROCKS

Rocks can be classified into three major groups based on how they are formed and their appearances. These include

1. Igneous rock
2. Sedimentary rock
3. Metamorphic rock

MODE OF FORMATION OF IGNEOUS ROCK

They are formed as a result of cooling and solidification of molten magma erupted from the earth crust. Magma occurs from high temperature and pressure underneath the earth and forces itself towards the earth surface through the cracks. As the magma approaches the earth surface, it cools as a result of lower temperature of the earth surface and solidify to form igneous rocks.

TYPES OF IGNEOUS ROCK

- a. **PLUTONIC [OR INTRUSIVE] IGNEOUS ROCK:** These are rocks formed when molten magma solidifies slowly before it gets to the surface of the earth to form large



crystals. Prolonged erosion makes the rock to be exposed later to the surface. Examples include granite, gabbro, and diorite.

- b. **VOLCANIC [EXTRUSIVE] IGNEOUS ROCK:** These are formed when the molten magma cools and solidifies rapidly when it gets to the surface to form crystals. Examples include basalt, pumice.

CHARACTERISTICS OF IGNEOUS ROCKS

1. They have glassy appearance
2. They contain crystals i.e they are crystalline in nature.
3. They do not occur in layers.
4. They do not contain fossils.
5. They are hard and impervious
6. They are resistant to erosion

EVALUATION

1. Describe the mode of formation of igneous rock
2. Outline four characteristics of igneous rocks

MODE OF FORMATION OF SEDIMENTARY ROCKS

They are rocks formed from deposits of organic materials and existing weathering rocks which accumulate and consolidate over time. They are cemented together after a long time to form sedimentary rocks. The sediments are deposited by natural agents such as water, wind and ice and settle down in layers one on top of another.

There are three types of sedimentary rocks based on the process of formation.

1. **Mechanically formed sedimentary rocks:** These are rocks formed from sediments of other rocks that are accumulated and cemented over a long period of time. Examples include sandstones, shale, clay, breccia, and conglomerate.
2. **Organically formed sedimentary rocks:** These are rocks formed from the remains of living organisms. When the rocks are formed from the remains of animals like coral or shellfish, they are called calcareous rocks e.g. lime stone and chalk. When the rocks are formed from vegetable matter such as swamps and forest are called carbonaceous rocks e.g. coal, peat, and lignite.
3. **Chemically formed sedimentary rocks:** These are rocks formed from precipitated chemically from rock solution. Examples include gypsum, potash, and dolomite.

CHARACTERISTICS OF SEDIMENTARY ROCKS

1. They occur in layers or strata.
2. They are not in crystal form i.e they are not crystalline in nature.
3. They contain fossils of plants and animals.
4. They are not resistant to erosion
5. They may be coarse, fine soft or hard.

EVALUATION

1. Describe the mode of formation of sedimentary rocks
2. State four characteristics of sedimentary rocks

MODE OF FORMATION OF METAMORPHIC ROCKS



These rocks result from igneous or sedimentary rocks due to combined effect of pressure and heat. The composition and texture of unstable parent rock minerals are changed under pressure and heat. Examples are marble, quartzite, gneiss, schist, graphite and slate.

- Slate is formed from clay (sedimentary)
- Marble is formed from limestone (sedimentary)
- Quartzite is formed from sandstone (sedimentary)
- Gneiss is formed from granite (igneous)
- Schist is formed from shale (sedimentary)
- Graphite is formed from coal (sedimentary)

CHARACTERISTIC OF METAMORPHIC ROCKS

1. Some may occur in layer or strata
2. The rock may be hard or soft
3. They are not in form of crystals
4. They exist in different colours and texture
5. They may contain fossils

EVALUATION

1. Describe the mode of formation of metamorphic rocks
2. Give four examples of metamorphic rocks and their parent materials

GENERAL EVALUATION

1. What is a rock?
2. State three types of rock
3. Describe the mode of formation of the two types of igneous rock
4. State four characteristics of sedimentary rocks.
5. Classify sedimentary rocks based on based on mode of formation and give two examples in each case

BOOK REVIEW

Essential Agricultural science by O. A. Iwena chapter 10, page 61 – 64

READING ASSIGNMENT

Answer question 6 Essential Agricultural science by O. A. Iwena chapter 10, page 64

WEEKEND ASSIGNMENT

1. Which of the following is not a sedimentary rock? A. mica B. sandstone C. limestone D. dolomite
2. Granite is ----- rock A. igneous B. sedimentary C. metamorphic D. weathered
3. Schist is formed from A. shale B. sandstone C. quartzite D. coal
4. A metamorphic limestone is A. marble B. gneiss C. schist D. shale
5. The type of rock formed from molten magma is known as A. sedimentary B. schist C. igneous D. sandstone

THEORY

1. Write short note on the mode of formation and characteristics of A. granite B. limestone
2. State three characteristics for each of the three rock types.



WEEK EIGHT

DATE:

TOPIC: ROCK WEATHERING

CONTENT

- Meaning of rock weathering
- Types/Processes of rock weathering

ROCK WEATHERING

The process of soil formation is referred to as weathering.

Weathering is defined as the disintegration of rocks into smaller particles to form soil.

PROCESSES OF ROCK WEATHERING

The processes of soil formation (rock weathering) include:

1. Physical process
2. Chemical process
3. Biological process

PHYSICAL PROCESS OF ROCK WEATHERING

Agents of physical weathering include temperature, ice, rainfall, wind and pressure.

- a. **Temperature:** The rise and fall of temperature brings about the expansion and contraction in rocks respectively. After a long time, rocks begin to crack and break down which later give rise to soil.
- b. **Ice:** When rivers overflow their banks or when it rains, water collects in the openings. At a cool temperature or freezing point, the water in the openings freezes and increases in volume, the force of expansion makes the rock to expand thereby cracking them to particles. As the temperature rises, ice melts and carries the rock particles away from their origin to a different place to form soil.
- c. **Rainfall /water:** The splash of rainfall exerts force on the rock surfaces. Flowing water also carries and hits rock particles against one another turning them into fragments.
- d. **Wind:** heavy winds carry particles of rock, hitting them against one another or against hard surfaces to form smaller fragments.
- e. **Pressure:** high pressure on hanging rock may cause such rocks to fall and the process break into smaller particles to form soil.

EVALUATION

1. Define rock weathering.
2. What are the processes of rock weathering?
3. List three agents of physical weathering.
4. Describe two of the agents of physical weathering.

CHEMICAL PROCESS OF WEATHERING

Agents of chemical weathering include solution, hydration, hydrolysis, carbonation and oxidation.

- a. **Solution:** This is when water dissolves soluble minerals present in the rock and the minerals taken from one place to another while flowing.



- b. **Carbonation:** Carbon (iv) oxide reacts with water to form trioxocarbonate (iv) acid, a weak acid which weakens and dissolves rock minerals.
- c. **Hydration:** This is the reaction of water with rock minerals which result in chemical alteration of the mineral. Example is the conversion of iron (ii) rocks to hydrated rocks.
- d. **Hydrolysis:** This is the reaction of water with rock minerals to produce a rock that is different from the original one.
- e. **Oxidation:** This is the reaction of rocks with oxygen from the atmosphere which then weakens the rocks.

EVALUATION

1. List five agents of chemical weathering
2. Explain two of the processes mentioned above

BIOLOGICAL PROCESS OF WEATHERING

This is the activities of plants and animals in the breaking down of rocks to form soil.

- a. The action can be brought about by some animals such as termites, earthworms, millipedes and other soil organisms.
- b. Movement of some organisms /heavy animals like cattle can cause small fragments of rocks to disintegrate.
- c. The roots of some crops penetrate through cracks in rocks making them to expand and break to form soil
- d. Activities of man during tillage can break small rocks into tiny pieces.

EVALUATION

1. Outline four biotic factors of rock weathering
2. What are the processes of rock formation?
3. State three agents of physical weathering.

GENERAL EVALUATION

1. What is rock weathering?
2. What are the processes of rock formation?
3. State three agents of physical weathering
4. Describe five agents of chemical weathering.
5. List five factors of soil formation.

BOOK REVIEW

Essential Agricultural science by O. A. Iwena chapter 11, page 65 – 68

READING ASSIGNMENT

Answer question 1 and 2a from Essential Agricultural science by O.A. Iwena chapter 11, page 86

WEEKEND ASSIGNMENT

1. The attachment of water to rock minerals resulting in chemical alternation of the minerals is termed A. carbonation B. hydration C. hydrolysis D. solution
2. The reaction of rock with oxygen from the atmosphere which eventually weakens the soil is A. carbonation B. oxidation C. hydrolysis D. solution
3. Which of these is not an agent of physical weathering A. ice B. water C. animal



- D. temperature
- Which of the following is not a soil organism that disintegrates rock particles
A. termite
B. earthworm
C. cattle
D. millipede
 - _____ is defined as the disintegration of rocks into smaller particles to form soil.
A. Chemical reaction
B. Weather
C. Weathering
D. Breaking down

THEORY

- A. What is rock weathering?
B. Mention three processes of rock weathering.
- List and discuss three agents of one of the processes mentioned above.

WEEK NINE

DATE:

TOPIC: FACTORS OF SOIL FORMATION

CONTENT

- Climate
- Parent materials
- Topography
- Biotic factors
- Time

FACTORS OF SOIL FORMATION

The factors that control soil formation include; climate, parent materials, topography, biotic factors (living organisms) and time.

CLIMATE

Climate refers to the average weather condition of a place measured over a long period of time. Elements of climate include sunlight, temperature, wind, relative humidity, rainfall and pressure.

Rainfall: Running water as a result of from rainfall causes gradual wearing away of rocks during erosion giving rise to soil. Impact of rain drops can also break rocks to form soil.

Temperature: The alternate heating and cooling of rocks give rise to continuous expansion and contraction of rocks. This causes cracks in rock and over time lead to formation of soil.

Wind: High wind velocity most especially in desert regions carries tiny rocks which hit themselves or other rocks leading to breakdown of rocks into tiny pieces to form soil.

Pressure: High pressure in a hanging rock may cause the rock to fall down and break into tiny pieces to form soil.

EVALUATION

- What is climate?
- List five elements of climate

PARENT MATERIAL

The physical and chemical features of parent materials determine the type of soil that can be obtained from such material. Parent of predominantly quartz mineral give rise to sandy soil while that of micas and feldspars give rise to clayey soil.



TOPOGRAPHY

Soil erosion is more pronounced on sloppy area than flat land. Wind or water easily wears away the soil and rock surfaces in sloppy area. As the rock particles are washed down to the bottom of the slope, the particles further break up into smaller particles due to combined effect of other processes of weathering.

EVALUATION

1. Describe how parent materials affects soil formation.
2. What is topography?

BIOTIC FACTORS [LIVING ORGANISMS]

The action of microorganisms, plants and animals plays active part in rock formation.

- Termite and earthworms mix the minerals and organic matter together resulting in the formation of soil.
- The burrowing activities of earthworm and crickets permit the air and water movement in the soil which reacts with rock to cause breakdown into soil.
- Activities of man during tillage operation break rock into tiny pieces to form soil.
- Penetration of plant roots cause weathering of rocks.
- The decaying of falling leaves of the trees with the aid of bacteria result in the formation of humus rich in plant food.

EVALUATION

1. List five biotic factors of soil formation
2. Describe briefly the role of vegetation in soil formation

TIME

Time also plays an important role in soil formation. It takes a long time for mature soil to be formed. It takes time for small pieces of rocks to disintegrate into grains of soil. It also takes a long time for plants to decay and become part of the soil.

GENERAL EVALUATION

1. What are the factors of soil formation?
2. What are the elements of climate
3. List five biotic factors that causes soil formation
4. List five biotic factors of soil formation
5. Describe briefly the role of vegetation in soil formation

BOOK REVIEW

Essential Agricultural science by O. A. Iwena chapter 11, page 65 – 66.

READING ASSIGNMENT

Answer question 5 and 9 from Essential Agricultural science by O. A. Iwena chapter 11, page 86 and 87

WEEKEND ASSIGNMENT

1. The average weather condition of a place over a period of time is referred to as
A.Climate B.Vegetation C.Biotic factor D.Humidity



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2. Which of these is not a climatic factor of soil formation? A.Temperature B.Wind
C.Humidity D.Erosion
3. The following are biotic factors influencing soil formation except A.Termites
activitiesB. soil pH C.Microorganism D.Tillage activities
4. The shape of the ground in relation to the underlying rock of the earth surface is known
as ____A.slopeB.disintegrationC.topographyD.weathering
5. Which of the following is not a factor of soil formation?A.Topography B.Vegetation
C.Parent material D.Weathering

THEORY

1. Mention two major elements of climate
2. Discuss three ways by which vegetation affect soil formation.

WEEK TEN REVISION

DATE: