OYO STATE LECTURE NOTES

AGRICULTURAL SCIENCE

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CLASS: SSS ONE.

FIRST TERM

COURSE OUTLINE

1. Meaning and importance of agriculture, branches of agriculture and their contribution to individual, community and nation
2. Problems of agricultural development and thier possible solutions
3. Meaning and differences between subsistence and commercial agriculture
4. Roles of government in agricultural development
5. Roles of non-governmental organization in agricultural development
6. Agricultural laws and reforms
7. Agricultural laws and reforms continued
8. Meaning and importance of Agricultural ecology
9. Meaning of land, characteristics of land, uses of land etc.
10. Factors affecting land availability for agricultural purpose

WEEK 1: MEANING AND IMPORTANCE OF AGRICULTURE

The term agriculture is derived from two Latin words ‘’ager’’ meaning field and ‘’cultural’’ meaning cultivation. By this statement agriculture means ‘’field cultivation’’. Agriculture is defined as the deliberate effort made by man to till the soil, cultivate crops and rearing of animals for food and other purposes.

IMPORTANCE OF AGRICULTURE

Agriculture occupies a most important position in development of West African countries. It’s the main stay and back bone of Nigeria’s economy and other developing countries. The importance include:

1. Provision of food: agriculture provides man’s food requirements for growth, good health and increased productivity. Large quantities of food items are obtained from agriculture e.g. rice, maize, sorghum, cassava, yam, fish, milk etc.

2. Provision of employments: agriculture provides employments for about 75% of the working population in Nigeria who either worked directly in the farm or indirectly in primary and secondary industries which utilize agricultural raw materials as inputs.
3. Provision of industrial raw-materials: the raw materials needs of many local agricultural industries, raw materials used by industry are palm oil, cocoa, rubber, tobacco, groundnut, cotton, hide and skin etc.
4. Development of towns: Development occurs when commercial agriculture exist as social amenities like electricity and pipe-borne water will be provided. Food and motor able roads are also provided.
5. Sources of foreign exchange: Through the export of agricultural produce like cocoa, cotton, groundnut etc. a nation can earn foreign exchange. Foreign exchange so earned can be used in turn to purchase goods necessary for the improvement of agriculture.
6. Source of income: agriculture is a source of income to farmers. The sale of agricultural product like groundnuts, cottons, cocoa, yam, cassava, animal and livestock products provide farmers with income for investment in agricultural production.
7. Provision of market for industrial goods: Agriculture provides market for industrial products such as farm machinery, chemicals, fertilizers etc.
8. Provision of materials for clothing: Agriculture provides fibres and cotton for textile production. It also provide hides and skin for clothing, shoes, belt, caps and bags.
9. Provision of material for shelter: agriculture provides materials essential for buildings, such as poles, doors, windows, roofs, furniture etc.

BRANCHES OR AREA OF SPECIALIZATION IN AGRICULTURE AND THEIR CONTRIBUTIONS TO AGRICULTURAL PRODUCTION

The branches or area of specialization in agriculture and their contributions are summarized as follow:

1. Animal science/ animal production: its contributions are:
   - It ensures efficient and effective management of farm animals
   - It ensures better productivity of more milk
   - It helps to ensure meat and egg production
   - It also promotes the development of new breed
   - It helps to ensure better feeds for growth and productivity
2. Veterinary medicine: its contributions are:
   - It provides better health management
   - It ensures the control of pest and parasites
   - It helps to control diseases
   - It ensures the production of vaccines for animal health care
   - It ensure a better meat inspection before and after slaughtering
3. Soil science: its contributions are:
   - Soil science ensures the maintain of soil fertility
   - It aids better soil classification
   - Soil science helps in erosion control method
   - It aids moisture conservation
   - It aids tillage operations of the soil
   - It helps in appropriate fertilizer for different soil type
4. Crop production / Agronomy: its contributions are:
   - Crop production ensures effective crop management practices
   - It ensures better productivities of crops
   - It promotes optimum harvesting times
   - It ensures the optimum plant population
   - Pathology ensures the control and management of plant diseases
   - Entomology ensures the control and management of pest

5. Agricultural economics and Farm management: its contributions are:
   - It promotes agricultural marketing
   - It exposes farmers to sources of farm finance
   - It teaches co-operative farming
   - It ensures the management of agricultural resources
   - It promotes good farm accounting
   - It provides for adequate farm planning and budgeting
6. Agricultural engineering: its contributions are:
   - It ensures the development of processing and storage equipment
   - It promotes the mechanization of farm operation
   - It ensures the maintenance of farm tools and implements
   - It enhances the operation of irrigation and drainage
   - It also ensures the development of appropriate farm tools and implement
7. Agricultural extension and education: its contributions are:
   - It promotes the training of farmers
   - It ensures the dissemination of agricultural information to farmers
   - It ensures the provision of support services to farmers
   - It links farmers to researchers
8. Forestry and wildlife conservation: its contributions are:
   - It promotes the conservation of forest product
   - It ensures the utilization of forest product
   - It ensures creation of micro climate
   - It ensures the conservation of wildlife
   - It is the source of medicinal products
   - It ensures the maintenance of soil fertility
9. Fishery: its contributions are:
   - It ensures better ways of fish management
   - It promote better fishing practise

- It promotes better fishing processing
- It ensures provision of fish meals

WEEK 2: PROBLEMS OF AGRICULTURAL DEVELOPMENT IN WEST AFRICA AND THEIR POSSIBLE SOLUTIONS

Many developing countries in West Africa are faced with numerous problems which militate against the development of agriculture.

1) *Inadequate land*: land is inadequate for farming, also land also land tenure system does not make land available for agriculture

Solutions

1. Farmers should use fertilizers
2. Crop rotation should be practised
3. Farmers should form co-operative societies for easy allocation of farm lands.

2) *Poor storage facilities*: lots of produce are wasted due to inadequate storage facilities. It is expensive to purchase.

Solutions

1. Government should provide these facilities at subsidized rate
2. Government should buy excess produce and store for future use
3. More people should be trained on the technology of food storage.

3) *Inadequate finance*: most subsistence farmers are poor and do not have the finance to make the purchase of necessary inputs. Also they do not have access to credit facilities and high interest prevents borrowing from banks.

Solutions

1. Bank should reduce interest rate to encourage borrowing
2. Establishment of farmers bank

3. Collateral security should be in form of guarantee rather than in material forms like land and building.

4) *Inadequate farm inputs*: farm inputs are scarce and expensive and they are not supplied at the right time. The available farm inputs are of inferior quality, outdated and crude.

Solutions

1. There should be timely supply of inputs
2. Supply of farm input should be adequate and sufficient
3. Government should subsidized the cost of farm inputs.

5) *Poor transportation facilities:* most farmers in rural areas are not linked by road and also motor vehicle are not enough and this eventually leads to wastage of food.

Solutions

1. Provision of good road by government
2. Cost of transportation should be reduced
3. Rehabilitation of existing damaged roads

6) *Inadequate basic amenities*: lack of basic amenities like electricity, pipe-borne water and proper health care makes able-bodied men and youths migrate from rural to urban areas in search of jobs.

Solutions

1. Government should make these social amenities available in rural areas
2. Establishment of dams to facilitate irrigation agriculture in rural areas

7) *Illiteracy*: majority of farmers cannot read and write, they do not know how to practise modern agriculture.

Solutions

1. Mass literacy program should be embarked upon by the government

2. Rural farmers should be trained on modern systems of farming

8) Poor marketing system: farmers dispose off their produce at cheap, also middle men buy goods from farmers and sell at high price to consumers.

Solutions

1. Government should buy excess produce from farmers
2. Government should stabilise prices of farm produce in the country

9) Rural –Urban Migration: this is the movement of able bodied men from rural areas to urban centre in search of jobs.

Solutions

1. Provision of employment in rural areas.
2. Training of people on modern farming practices
3. Provision of social amenities in rural area

10) Unpredictable climate: this discourages agricultural activities. It may leads to low yield or crop failure.

Solutions

1. Irrigation should be practiced
2. Teaching peasant farmers new innovations in agriculture
3. Water conservation techniques, such as mulching should be practised

WEEK 3: MEANING OF SUBSISTENCE AND COMMERCIAL AGRICULTURE

Subsistence Agriculture: this is defined as the type of agriculture which is concerned with the production of food by a farmer to feed himself and his family.

Commercial Agriculture: this is concerned with the production of food, animals and cash crop in large quantities for sale.

DIFFERENCES BETWEEN SUBSISTENCE AND COMMERCIAL AGRICULTURE

S/N	Subsistence Agriculture	Commercial Agriculture
1.	A small area of land is cultivated	A large area of land is cultivated.
2.	Produce is mainly for family consumption.	Produce is mainly for sale
3.	Crude tools and implements are used	Complex and modern tools implements are used
4.	Yields or returns are low	Yields or returns are high
5.	Family/ unskilled labour is usually employed	Paid/ skilled labour is usually employed
6.	It requires little capital investment	It requires large capital investment
7.	It does not require any special marketing strategies	It require special marketing strategies
8.	Pest and disease are not controlled	Pest and diseases are controlled
9.	No need for storage and processing facilities	Storage and processing facilities are required
10.	Mostly practised by peasant farmers	Mostly practised by any rich farmers or companies.

ADVANTAGES OF SUBSISTENCE AGRICULTURE

1. It is easy to operate since it requires little or no capital
2. Simple tools are used
3. Small area of land can be used
4. Family labour is used.

DISADVANTAGES OF SUBSISTENCE AGRICULTURE

1. Family labour supply is unreliable
2. Crude tools are used
3. Illiteracy of the farmers
4. Inadequate capital for investment
5. No surplus for sale

ADVANTAGES OF COMMERCIAL AGRICULTURE

1. It increase yield
2. Specialization of labour
3. Encouragement of research works
4. Provision of cheap products
5. Provision of quality products

DISADVANTAGES OF COMMERCIAL AGRICULTURE

1. Problem of acquisition of large farm land
2. It is very expensive
3. Problem of storage
4. Harvesting and marketing is tedious
5. It can lead to soil erosion and pollution

WEEK 4: ROLES OF GOVERNMENT IN AGRICULTURAL DEVELOPMENT

Most west African farmers are faced with the problem of primitive tools, land tenure, lack of education, poor pest and disease control etc. those problems together add up to impede agricultural development since these farmers produce food for consumption as well as export, they are therefore very important in the economy.

There is therefore the need of Government to assist the farmers to reduce some of these problems in order to increase agricultural production for domestic consumption or for export.

Provision of financial assistance: the government makes agricultural loans available to farmers through banks with reasonable and flexible terms of payment.

1. Establishment of agricultural programmes: the government decided to establish agricultural programmes with the aim of boosting greater production of crops and livestock e.g Green revolution, Operation Feed the Nation.
2. Provision of improved seeds and breeds of animals: government gives grants to institution and scientist to enable them to investigate the problem of farmers and also produce high quality varieties of crops and breeds of livestock for use by farmers. e.g CRIN, FRIN.
3. Provision of extension workers: the government also train many extension officers so that the scientific method of farming acquired is from research would eventually reach the farmer. The extension workers regularly visit farmers to teach them new technology and assist them to obtain input at low prices.
4. Intensifies agricultural education: government also assist in creating awareness of the importance of education by introduction of agricultural study at all level in schools and colleges e.g Nomadic education (for cattle Fulani) in order to enable them to read and write.
5. Provision of basic amenities: in order to discourage the migration of able bodied men and youth from rural areas. Government decide to provide basic amenities such as: electricity, health care services, and pipe borne water in rural areas.
6. Provision of storage and processing facilities: in order to prevent food wastage and provide food in period of scarcity government decided to provide storage and processing facilities in all part of the country.
7. Provision of pest and disease control services: government make provision for drug, chemical and vaccine which are used for pest and disease control.

Quarantine department in airport, borders, sea port are also set up to ensure that no plant or animal imported carries disease with it to the country.

8. Provision of research work: in order to improve the local varieties or breeds of crops and animals respectively, government also setup numerous research institutes to provide solution to the problem of local crops and animals with a view to increase production. e.g NIFOR, NCRI, CRIN, FRIN, NHORT, NVRI etc.
9. Provision of effective transportation network: government has helped in the construction of feeder roads in rural areas to ease the transportation of produce from the farm to urban centres.

EXAMPLES OF GOVERNMENTAL ORGANIZATIONS INVOLVED IN IMPROVING AGRICULTURAL PRODUCTION IN WEST AFRICA

1. Agricultural Development Projects (ADPs)
2. River Basin Development Authorities (RBDA)
3. National Agricultural Land Development Authority (NALDA)
4. Agricultural Development Bank (ADB)
5. National Agricultural Insurance Company (NAIC)
6. Any of the national agricultural research institutes

WEEK5: ROLES OF NON-GOVENMENTAL ORGANIZATION (NGOs) IN AGRICULTURE

Non-Governmental Organizations (NGOs) are established private agencies or corporate bodies concerned with the development of agriculture all over the world. Examples of such organization are:

1. International Institute for Tropical Agriculture (IITA)
2. West African Rice Development Agency (WARDA)
3. International Livestock Centre for Africa (ILCA)
4. Food and Agricultural Organization (FAO)

5. Farmers' Cooperative

WAYS IN WHICH (NGOs) CONTRIBUTES TO AGRICULTURAL PRODUCTION IN WEST AFRICA

1. They assist in rural development by providing social amenities like road, water supply, etc.
2. They carry out research to improve new crop varieties
3. They carry out research to develop breeds of animal
4. Provision of financial support for agricultural extension
5. Improvement of farmers' awareness and agricultural knowledge though extension services

WEEK 6: AGRICULTURAL LAWS AND REFORMS

Land Tenure System in West Africa

Definition: land tenure is defined as the system of land ownership or acquisition by individual, family, community or government agency either for temporary or permanent use. The land tenure system in West Africa varies with tribe, community and state. It can be classified into the following groups:

1. Communal Land Tenure
2. Land Tenure by Inheritance
3. Land Tenure by Rent
4. Land Tenure by purchase or freehold
5. Leasehold system
6. Land tenure by free gift or pledge
7. Tenant at the will of government

1. *Communal Land Tenure*: in this type, the land belongs to the entire community. The community may be a family, clan or village. Every member of the community has the right to use the land for agriculture but cannot sell any part of it. The head

of the community may be a chief, an Oba, Emir or a Baale, who decides how the land is to be divided among the members for farming purpose, usually at the beginning of each planting season.

Advantages of Communal Land Tenure

1. Each member of the community has access to the land
2. Cooperative farming is possible since the land is extensive
3. Large scale farming is possible due to its large size, if only community members cooperate.
4. The land is cheap to acquire as no cost is involved.

Disadvantages of Communal Land Tenure

1. Non-members of the community cannot have access to the land for farming
2. Increase in population definitely tends to reduce the size of the farm land
3. It cannot be used as security to obtain loans from banks
4. Permanent crops like cocoa, rubber cannot be established because of possible re-allocation of the land in another season.
5. It discourages permanent land development such as building of structure

2. *Land Tenure by Inheritance*: this is the type of land tenure in which land is inherited from one's parent or from one generation to another. The land so inherited from a single parent is shared among all his children and this eventually leads to fragmentation of the land.

Advantages of Land Tenure by Inheritance

1. The land can be used as collateral security to obtain loans from commercial banks
2. The land can be improved by way of fertilizer application in order to maintain its fertility
3. Perennial crops like coca, orange etc. can be planted since the land belongs to the rightful owner

Disadvantages of Land Tenure by Inheritance

1. It leads to excessive land fragmentation which makes the land very difficult and un economical to work
2. Sharing of land is a delicate issue which can generate bitter enmity among family members
3. Some feel it is immoral to sell land, since its robs future generation of the opportunity to inherit
4. Land is not readily available for every body
5. Large scale or commercial agriculture cannot be practised because the land is highly fragmented.

3. *Land Tenure by Rent*: in this system, the farmer rent the land for use over a short period of time during which certain amount of money is paid as rent for the use of it. At the end of the period, the agreement may be reviewed, if the landlord so desires.

Advantages of Land Tenure by Rent

1. It makes use if available land for agricultural purpose
2. The land is efficiently used and maintained for maximum production within the short period.

Disadvantages of Land Tenure by Rent

1. The land cannot be used for securing loan
2. It affects long term planning
3. There is limitation in the development of such land

4. *Land Tenure by Purchase or Free Hold*: in this type of land tenure, if a farmer buy a piece of land for agricultural purposes,he pays certain amount of money to the landlord and the land becomes his personal property. It gives the owner complete freedom on the land. He may sell the land, leave it fallow, farm the land or rent it out.

Advantages of Land Tenure by Purchase or Free hold

1. The farmer can use the land to secure loan from the bank.
2. Perennial crops can be grown
3. Proper planning in the development of such land can be done

Disadvantages of Land Tenure by Purchase or Free hold

1. The land may be too expensive to purchase
2. The actual ownership may be difficult to establish
3. The farmer may not have sufficient money to buy the exact size of the land.

5.*Leasehold System*: this type of land tenure requires the payment of certain amount of money for the use of the land over a stated period of time. Leasehold tenure system is a special contract existing between a person called the leasor (seller) and another called the leasee (buyer) for the lease of a land for a specified period of years which may be 10, 20 or 50 years. The leasee will exercise his right on the use and maintenance of the land for the period of lease.

Advantages of Leasehold System

1. It ensures the use of available land
2. It enables the farmer to maximize the use of land in terms of maintenance of the soil fertility in order to improve the productivity of crops.

Disadvantages of Leasehold System

1. The land cannot be used as security to obtain loan from banks
2. The farmer cannot develop the land beyond the lease agreement terms
3. Perennial crops cannot be grown

6. *Land Tenure By Free Gift Or Pledge*: This is the type of land tenure system in which land is donated or giving out of goodwill or free of charge in appreciation or as an incentive. The new owner does not need to pay any money.

Advantages of Land tenure by free gift or pledge

1. It ensures the maximum use of the land for increased production
2. Plantation agriculture can be practised

3. It can be used as security to obtain loan

Disadvantages of Land tenure by free gift or pledge

1. The ownership of the land can be challenged at any time
2. There may be disagreement over such gift among family members

7. *Tenant at the will of Government*: This is a system of land tenure in which a piece of land is allocated to a farmer by the government. The land belongs to the government and the farmer has to pay certain amount of money to the government for using such land, usually for a stipulated period.

Advantages of Tenant at the will of government

1. Farmers can easily have access to land
2. The land is wisely used for productive purposes
3. The land is cheap to acquire
4. The land can easily be improved by way of fertilizer application

Disadvantages of Tenant at the will of government

1. Perennial crops cannot be cultivated
2. Farmers cannot use the land to secure loan from banks
3. Such land can easily be revoked, if the tenant fails to pay the rent at the right time.

WEEK 7: AGRICULTURAL LAWS AND REFORMS CONTINUED

Government Laws on Land Use in West Africa

As a result of the problems and inadequacies of the land tenure systems, the federal government of Nigeria in 1978, during the regime of General Olusegun Obasanjo promulgated decree on land use in Nigeria. This decree was known as *land use decree of 1978 or land use act of 1978.*

Aims of the Land Use Decree

1. It encourages proper, productive and efficient use of the land
2. It allocates the land and creates opportunities for enterprising farmers to acquire more land for large scale farming
3. It facilitates planning of programmes for a particular land use
4. It streamlines and simplifies the management and ownership of the land in the country.

Features of Land Use Act (Decree)

1. The land use act was promulgated by the federal military government of Nigeria on March 29th 1978
2. The decree states that all land in country is vested in the federal government to be held in trust for the people i.e. acquisition of land and its uses for whatever purpose are to be controlled by the federal government
3. The decree empower each states to act on behalf of the federal government in all matters related to land use in the state
4. It also states that before anyone could be legally recognised as owning a piece of land, he must have applied to the government paid for the land and thereafter be issued with a certificate of occupancy (C of O) on the land acquired
5. All Nigerians are qualified to acquire land for use once they have attained the age of 21 years
6. The decree stipulate that individual can only use a piece of land for 99 years after which the land reverts to the government
7. It also provides that farmers should not be allocated more than five hundred (500) hectares of land for crop production or 5000 hectares for grazing purposes

Advantages of Land Use Decree

1. It enables land to be used properly and efficiently
2. People can acquire land anywhere in Nigeria
3. It makes provision for acquisition of large hectares of land for large scale farming

4. Certificate of occupancy which enables individuals to claim ownership of land enable them to secure loan from the bank.

Disadvantages of Land Use Decree

1. It enables very few and wealthy individual to acquire more lands
2. The procedure involved in the acquisition of land is too strict for an average Nigerian
3. It delays the execution of project as it takes a very long time to acquire certificate of occupancy
4. It makes land held by inheritance insecure

WEEK 8: AGRICULTURAL ECOLOGY

Meaning of agricultural ecology and ecosystem

Agricultural Ecology can simply be defined as the study of crop plants and farm animals in relation to their environment. In other words, it 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 two main branches – (i). Autecology (ii).Synecology

i) **Autecology**: is concerned with the study of an individual organism, or a single specie of organism and its environment, for example; the study of a single cattle and its environment.

ii) **Synecology**: this is concerned with the study of the inter-relationship with 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

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

should be noted that a farm ecosystem is a natural unit in which there is an interaction between all living organism and non-living organisms (biotic and abiotic factors) within a farm environment or habitat.

COMPONENT OF FARM ECOSYSTEM

The farm ecosystem is made up of two main components. These are the biotic(living) components and abiotic (non-living) components.

1. Biotic components: the biotic components include the living things (crop plants and farm animals). It can be grouped into two classes. These are

a) Autotrophism. b) Heterotrophism

a***) Autotrophism***: This is a group of organisms which can use sunlight or chemicals to manufacture their food from inorganic substance during the process of photosynthesis. The organism are mainly crop plants and they are called *producers.*

b) *Heterotrophism*: It is a group of organisms mainly farm animals, which cannot manufacture their own food but depend directly or indirectly on plant for their food, hence they are called *consumers.*

2. Abiotic components: the abiotic components of an ecosystem include the non-living things, e.g, climatic factors like temperature, wind, humidity, sunlight and rainfall.Edaphic factors like soils, rocks, topography etc.

GENERAL INTERACTION AMONG THE COMPONENTS OF ECOSYSTEM

There is a unique interaction among the various components of an ecosystem. Green crop plants use carbon-dioxide, water and chlorophyll in the presence of sunlight to produce carbohydrate or starch. Farm animals feed on this carbohydrate or plants and release carbon-dioxide for crop plant to take in.

Micro-organisms and other decomposers break down dead plants and animal dungs to release nutrients to the soil. These nutrients are absorbed by plants for use in food production. Crop plant gives out oxygen during photosynthesis which is used by animals for their normal respiration.

WEEK 9: LAND AND ITS USES

DEFINITION: Land may be defined as the uppermost layer of the earth's crust on which agricultural and non- agricultural activities are carried out. Or it may refers to where productive activities such as growing of crops, rearing of animals and establishment of farmstead etc. are carried out.

CHARACTERISTICS OF LAND

1. Land is a factor of agricultural production
2. Land is immobile and fixed factor
3. It is a free gift of nature
4. Reward for land is rent
5. It can be used as collateral for loan
6. Its value is determined by its location
7. Its suitability influences output
8. Land can appreciate or depreciate in value.
9. It is abundant in some areas and scarce in other areas.
10. Availability is subject to Land Use Act/Law

USES OF LAND

There are two major classification of land based on uses. These are

a). Agricultural land: agricultural land includes :

I. Land for crop production
II. Livestock production
III. Fisheries
IV. Forestry
V. Wildlife conservation

b). Non-Agricultural Land: the following are non-agricultural use of land

I. Industrial or factory use

II. Construction of building (residential purpose)
III. Mining
IV. Sport centres e.g, stadia, race courseand golf course.
V. Recreational purpose e.g, parks
VI. Market
VII. Worship places e.g church, mosque, shrine
VIII. Transportation e.g, railway, airports, roads etc.
IX. Cemeteries
X. Commercial purposes, e.g banks, warehouse etc.

HOW AGRICULTURAL LAND APPRECIATES IN VALUE

Farmland may appreciate in value through the following ways:

I. Fertilization, manuring and liming
II. Through reclamation and drainage
III. Through fallowing
IV. Proper cultivation methods, e.g, crop rotation
V. Proper erosion control
VI. Through rotational grazing

WEEK 10: FACTORS AFFECTING LAND AVAILABILITY FOR AGRICULTURAL PURPOSES

Many factors affect land availability and uses in Nigeria. These factors directly or indirectly determine whether land will be available for agricultural and non- agricultural purposes. These factors include:

1. Ecological Factors: the nature of the land determine whether such land will be available for agricultural purposes or not. A dry and not swampy land will be suitable for livestock farming while a wet and swamp lands will be good for swamp rice production.

2. Population Density: the higher the population, the lower the availability of land for agriculture and vice-versa.
3. Climatic Conditions: wet and raining conditions favours tree crops production while dry climate with little rains favour livestock production like goat, sheep and cattle.
4. Topography: flat or gentle slope of the land encourages farming while steep slope of the land discourages farming because of the effect of gully erosion.
5. Socio-cultural Factors: some cultural factors may forbid the rearing of certain animals' e.g, the Islam religion forbid the rearing of pigs in the environment.
6. Economic Factors: availability of good capital or finance promote agricultural activities while inadequate finance discourages intensive farming.
7. Land Tenure System: the type of land tenure system in area with determine whether such land will be available or not for agricultural purposes.
8. Soil Type: fertile soils are generally known to support agricultural activities whereas, poor and infertile soils do not support crop farming.
9. Degree of land Degradation: the level of land degradation will determine whether such land will be available for agricultural purposes. Land that are prone to erosion will not be suitable for farming.

SUBJECT: AGRICULTURAL SCIENCE

CLASS: SS ONE TERM: SECOND

COURSE OUTLINE

1) Agro-allied Industries
2) Relationship between Agriculture and industry
3) Environmental factors affecting Agricultural Production
4) Rock types
5) Soil formation and profile development
6) Composition of soil
7) Types and properties of soil
8) Simple farm tools
9) Farm Machinery and Implements
10) Farm Machinery and Implements (contd)

WEEK 1: AGRO-ALLIED INDUSTRIES

Agro allied industries are industries which depend on agriculture for their raw materials in order to operate successfully. These Industries help to provide market for agricultural products, provide employment opportunities etc.

	Agro Based Industries	Raw Materials Used
i.	Oil mill	Oil seeds
ii.	Soap Industries	Oil seeds local
iii.	Cigarette	Tobacco leaf

iv.	Textile	Cotton
v.	Breweries	Cereals
vi.	Fruit Canning	Fruit
vii.	Flour mill	Cereals
viii.	Tyre	Rubber, latex
ix.	Beverage	Cocoa, tea, coffee

WEEK 2: RELATIONSHIP BETWEEN AGRICULTURE AND INDUSTRIES

1. Provision of market

   Agriculture provides market for industrial products e.g chemicals, fertilizer etc.

2. Provision of agricultural tools and machinery

   Industries produce machinery and equipment for agricultural uses e.g tractor, hoes

3. Provision of food

   Agriculture provides food for industrial workers

4. Provision of storage facilities

   Industries provide storage facilities for agricultural produce e.g fruit, milk, fish etc

5. Development of industrial sector

   Rise in agricultural income due to effective and economic factor combination leads to development of industrial sector of the economy

6. Provision of raw material

   Agriculture provide raw materials such as timber,cocoa for industries

7. Shifting of factors of production
8. Provision of processing facilities
9. Provision of agro-chemicals
10. Competition for labour

WEEK 3: ENVIRONMENTAL FACTORS AFFECTING AGRICULTURAL PRODUCTION

All agricultural activities like crop and livestock distribution are affected by various environmental factors which influence the productivity of crops and animals. The environmental factors can be grouped into two: abiotic and biotic factors.

Abiotic factors : They are grouped into three: climatic, edaphic and physiographic factors.

1. **Climatic factors :** These are factors or elements of climate such as rainfall, temperature etc. Climate is the average weather condition of a place measured over a long period of time e.g 50years.

Importance of climate on agriculture

i. It affects the duration of a cropping season

ii. It affects vegetation distribution and soil formation

Climatic factors affecting agricultural production

i) **Rainfall:** This is the release of excess condensed water vapour in the atmosphere into the earth or the amount and distribution of water precipitated within a given period of time.

Ways in which high rainfall affects agricultural production

a. It encourages rapid growth of weed

b. High rainfall prolongs the cropping season

ii) **Temperature:** This is the measure of degree of hotness or coldness of a place.

Effects of temperature on Agricultural Productivity

1. Temperature affects the microbial activities in the soil
2. High temperature can lead to loss of soil nutrients through volatilization
3. High temperature reduces crop and animal performances

4. Optimun temperature is required for seed germination

iii) **Wind:** It refers to air in motion

Effects of wind on Agricultural Productivity

1. Wind aids the spread of disease pathogen
2. High wind may cause wind erosion
3. Wind aid pollination in wind-pollinated flowers

iv) **Sunlight/Sunshine:** Is the amount of heat and the period the sun's rays are received at a place. Sunlight is necessary for manufacturing of plant food ie photosynthesis.

v) **Relative Humidity:** Is the amount of moisture or water vapour in the atmosphere.

2. **Edaphic factors**: These are soil factors that affect agricultural production such as:

i. Soil texture: It refers to the degree of fineness or coarseness of the various soils in an area. It affects the population of soil organism and tillage practices.

ii. Soil structure: It is the way in which different particles of the soil are packed or arranged. It determines the population of soil organisms.

iii. Soil types: These are the different classes of soil such as clay, loamy and sandy soils

iv. soil pH: This is the measure of the degree of acidity or alkalinity of a soil. The pH determines the types of crops that can be grown.

Biotic factors affecting agricultural production

1. Soil organisms
2. Human activities
3. Weeds
4. Parasite
5. Predator

WEEK 4: ROCK

Rock is any mineral material of the earth. Rock is made up of earth's crust

Rock can also be the combination of different mineral elements e.g silica.

Major types of rock

1. **Igneous Rocks:** It is formed as a result of cooling and solidification of molten rocks called magma which is ejected from beneath the earth forms the magna which forces itself to the surface through cracks, it comes in contact with lower temperature at the surface, when it cools, it forms the igneous rock.

Characteristics of Igneous rock

a. They do not contain fossils
b. They are glassy in appearance
c. They do not form layers
d. They are resistant to erosion

Types of Igneous rock

a. Plutonic or intrusive Igneous rocks eg granite, gabbro etc.
b. Volcanic or extrusive Igneous rocks eg basalt etc

2. **Sedimentary Rocks:** It is formed from sediments accumulated in layers or strata either by water, wind or ice, when they harden it forms sedimentary rock.

Characteristics of Sedimentary Rocks

a. They occur in layers or strata
b. They contain fossils of plants and animals
c. They react with weak acid
d. They are prone to erosion

Types of Sedimentary Rocks (Based on process of formation)

a. Mechanically formed Sedimentary Rocks eg dolomite, limestone etc
b. Organically formed Sedimentary Rocks eg coal, graphite, peat etc

c. Chemically formed Sedimentary Rocks eg gypsum, nitrate etc

3. **Metamorphic Rocks:** They are rocks formed from pre-existing Igneous or Sedimentary rocks which have been changed has a result of great heat and pressure e.g marble, formed from limestone, slate form clay etc.

Characteristics of metamorphic rocks

a. They may contain fossils
b. Some may occur in layer or strata
c. The rock may be soft or hard
d. They exist in different forms and texture

Economic Importance of Rocks In Agriculture

i. Formation of soil
ii. Erosion control
iii. Obstacles to farm implement
iv. Source of plant nutrients e.g calcium, potassium etc
v. Domestic use

WEEK 5: SOIL FORMATION AND PROFILE DEVELOPMENT

Soil is the loose weathered material that covers the earth surface which supports growth of plants and sustain human and animal activities.

Factors of Soil Formation

Soil formation is greatly controlled by five major factors, they are:

i. Climate such as temperature, rainfall, wind etc
ii. Parent material
iii. Topography
iv. Biotic (Living organisms)
v. Time

Process of Soil Formation

The process of soil formation is known as weathering.

Weathering is the disintegration or breakdown of rocks into tiny pieces to form soil. It occurs through the agents of physical, chemical and biological processes.

i. **Physical process:** They include temperature, wind, ice and water

ii. **Chemical process:** They include solution, carbonation, hydration, hydrolysis and oxidation

iii. **Biological process:** They involve the activities of plants and animals in the breaking down of rocks to form soil e.g plant roots, termites etc.

WEEK 6: COMPOSITION (COMPONENTS) OF SOIL

There are five (5) major components the inorganic/mineral matter, organic matter, soil air and soil water are known as physical components of the soil while the living organisms is known as the biological components of the soil.

1. **Mineral or Inorganic matter:** It represents small rock fragments of the soil and forms the bulk of about 45% of the soil and total volume of the soil. It consist of gravel, stones, clay, sand and silt.

Importance/Effects of mineral matter on Agriculture

a. It forms the solid part of the soil and provides support for plants

b. It holds water and air for both plants and animals activities

2. **Organic matter:** It represents the remains of the decomposition of plants and animals. It is about 5% of the total volume of the soil. Organic matter is also known as human and it is formed when leaves, animal dung etc decay on the soil

Importance/Effects of organic matter on Agriculture

a. It is very rich in plant nutrient

b. When it is abundant and adequate in the soil it prevents leaching

3. **Soil Water:** Water found in the soil obtained either from rain or irrigation. It represents 25% of the total volume of the soil. It is found in the within the pore spaces. Soil can either be waterlogged or permanent witting point.

Importance/Effects of Soil Water on Agriculture

a. It helps to dissolve plant nutrients into solution form

b. It is an essential raw material for photosynthesis

4. **Soil Air:** This refers to gases present in the soil pores. It represents 25% of the total volume of soil. The ability of air to move or circulate freely in he soil is called aeration.

Importance/Effects of Soil Air on Agriculture

a. It is necessary for the growth and development of plants especially oxygen

b. Oxygen in the soil promotes easy germination of seeds

5. **Living Organisms:** This refers to plants and animals living in the soil. Some are harmful while some are beneficial. E.g bacteria, insect (e.g termite), mammals (e.g rat), snails etc.

Importance/Effects of Living Organisms on Agriculture

a. They increase the mineral or nutrient status in the soil

b. They help to decompose organic materials in the soil to form humus

WEEK 7: SOIL: TYPES OF SOIL AND THEIR PROPERTIES

Soil is the uppermost layer of the earth's crust which provides support and nutrients for plant growth. The 3 main types are; sandy soil, clay soil and loamy soil.

1. **Sandy Soil:** If the proportion of sand particles in a sample of soil is very high. The particles are mainly 2quarts. It is 0.02mm-2.0mm in diameter.

Properties of Sandy Soil

i. It is coarse, grained and gritty

ii. It absorbs and loses water easily

iii It is not sticky when wet

iv It is low in plant nutrients

v It has large pore spaces

Methods of improving Sandy Soil

i. Planting of cover crops

ii. Application of compost manure

iii. Avoidance of bush burning

iv. Mulching

2. **Clay Soil:** It has particle size of <0.002mm in diameter. It is a heavy soil and difficult to work on.

Properties of Clay Soil

i. When dry, it has fine, powdery and smooth particles

ii. When wet, it has sticky and moulding particles

iii. It supports water logging

iv. It is rich in plant nutrients

3. **Loamy Soil:** It is a mixture of sand and clay particles with high proportion of organic matter. It is the most fertile soil.

Properties of Loamy Soil

i. It is moist, loose with moderate-sized pore spaces

ii. It is dark-brown or black in colour

iii. It can withstand moderate period of drought

iv. It is the best soil for agriculture

SOIL PROFILE

Soil profile is the vertical section of the soil showing series of horizontal layers of different types of soil.

Horizons of soil profile

i. A –Horizon

ii. B –Horizon

iii. C –Horizon

iv. D –Horizon

Importance of Soil Profile

i. Level of soil fertility

ii. To know the type of crop to grow

iii. Level of drainage and aeration

SOIL TEXTURE

Soil texture is the relative proportion (size) of various particles of the degree of fineness or coarseness of the various soil particles which are gravel, sand silt and clay.

Determination of soil texture

i. By feeling

ii. By sedimentation

iii. By moulding

Importance of Soil Texture

i. It is useful in the evaluation of soil ability to supply mineral nutrient

ii. It helps to determine the tillage practices to be adopted by the farmer

iii. It determines the types of crops to grow on any type of soil

SOIL STRUCTURE

It is the way in which the different particles of the soil are packed or arranged.

Ways/Methods of preserving the soil structure

a. Planting of cover crops

b. Application of manure

Importance of Soil Structure

i. It determines the level of fertility of the soil

ii. It prevents erosion and water logging

iii. It allows easy penetration of plant root and germination

iv. It promotes activities of soil micro-organism

Types of soil structure

- Block-like
- Plate-like

- Prism-like
- Crumb structure
- Granular or spheroidal

SOIL pH

Soil pH is the measure of the degree of acidity or alkalinity of the soil

Causes of Soil Acidity

i. Use of acid fertilizers such as ammonium sulphate

ii. Presence of acid parent materials

Removal of soil acidity

Soil acidity can be removed through the application of liming materials such as

i. Limestone (calcium carbonate) – $CaCO_3$

ii. Basic slag

iii. Quick lime – CaO

iv. Wood ash

v. Slaked lime – $Ca(OH)_2$

Effects of soil acidity

a. Low pH or high acidity reduces the population of some useful soil organisms

b. High pH can lead to humus leached out of the crops

c. Soil acidity causes reduces growth/yield of crops

WEEK 8: SIMPLE FARM TOOLS

These are simple, handy tools used mainly by peasant farmers such as cutlass, spade, hand trowel, axe, headpan, wheel barrow, secateurs, watering can etc

1. **Cutlass:** It has a wooden handle with a sharp metal blade at one side and a blunt edge at the other side. We have two main types

- Slightly curved blade
- Straight blade

Functions/Uses

a. For transplanting seedling

b. For planting seeds and harvesting crops

2. **Hoe:** It is made up of wooden handle and metal blade we have two main types, West African hoe and West Indian hoe.

Functions/Uses

a. It is used for making ridges or heaps

b. It is used for harvesting some crops

3. **Shovel/Spade:** They both have long wooden handle. The spade has a sharp metal blade while the shovel has a hollow and broad blade which can be rectangular or round.

Functions/Uses

a. Spade is use for mixing cement (concrete for farm structures)

b. Spade is used for digging holes during transplanting

3. **Garden fork/hand fork:** Garden fork has long handle while hand fork has short handle.

Functions/Uses

a. Garden fork is used for loosening the soil before transplanting

b. It is used for loading hay

5. **Hand Trowel:** It has a small handle with a curve metal blade

Functions/Uses

a. It is used for transplanting seedling

b. It is used for digging holes for planting

General maintenance of simple farm tools

i. Tools should be washed or cleaned after use

ii. Store in a cool dry place

iii. Sharpen blunt edges or blade where necessary

iv. Paint, oil grease metallic parts to prevent rusting

WEEK 9: FARM MACHINERY AND IMPLEMENTS

Farm machinery includes various types of machines and implements used in the farm e.g tractor, harvester, incubator, planter, sheller etc. The most important of all the machines used in the farm is the tractor.

i. **Tractor**

a. It is a powerful, multi-purpose motor vehicle use for lifting and pulling of farm implements

b. Common model are David Brown, Ford, Fiat, Massey Ferguson

Functions/Uses of Tractor

a. It is used for drawing farm implements e.g plough etc

b. It can be a stationary power source for equipment like grinders, shellers etc.

Maintenance of Tractor

- It can be on daily and periodic basis

Daily Maintenance of Tractor

i. Remove all trashes or mud at the start or end

ii. Do not overload tractor and operate at appropriate

iii. Check tyre pressures daily before operations

Periodic Maintenance of Tractor

i. Service at regular intervals

ii. Employ a competent and experienced tractor operator

iii. Wash or clean carburetor regularly

2. **Bulldozers**

Description

a. They are powerful tractors with broad steel blade or sheet at the front

b. It uses petrol or diesel

Functions/Uses of Bulldozer

a. It is used for leveling the ground

b. It is used for felling trees and stumps

Disadvantages of Using Bulldozer On the Farm

a. It causes soil compaction

b. It packs away the top soil which is rich in top soil

3. **Tree Pullers**

It has the ability to move on the soil surface with minimal disturbance on the topsoil.

Advantages of tree puller over bulldozer

i. Tree puller does not compress the soil

ii. The removal of soil cover is avoided

4. **Shellers**

This is a processing machine used to separate dry grains at 10% moisture content from the cob of maize. It can be operated manually, electrically and mechanically. It is made up of hopper, bucket, winder and a drum.

Functions

- It is used to separate seeds from husk of cob

5. **Dryers**

It is a machine used to reduce the moisture content of commodities e.g grains, cocoa etc. It operates electrically.

Functions

a. It is use to reduce moisture content of stored produce

b. For drying animal products e.g meat

c. For drying plant materials e.g groundnut etc.

WEEK 10: FARM MACHINERY AND IMPLEMENTS (contd)

6 **Incubator**

They are machines used for hatching fertilized eggs artificially after 21days.

Types of Incubators

- Natural draught or table types
- Forced draught or cabinet types

Conditions for incubator to function

The incubator should run for 12-24hrs before placing fertilized eggs.

a. Temperature range of 37^0c-39^0c

b. Relative humidity of 50-70%

c. Adequate ventilation

Components of an incubator

Incubator is made up of

- Setter felt tray where fertilized eggs are placed for 18days at an inclined angle of 45%
- Hatcher where the eggs stay for the 3 remaining days before hatching.

The component are:

i. Insulator

ii. Heat source e.g heater, lantern etc

iii. Control unit, thermostat

iv. Egg turning device

v. Thermometer

Steps to ensure uniformity of hatching

i. Set eggs uniformly in tray

ii. Regular and timely turning of eggs

Operations/Activities carried out after hatching

i. Sexing of chicks

ii. Drying of chicks

iii. Packing normal chicks

7. **Milking Machine**

It is used for milking or extracting fresh milk mechanically from the udder of cattle i.e cow and other milk-producing animals like sheep i.e ewe and goat i.e doe.

Economic importance of milk

i. It is use to prepare dairy products like butter

ii. It is a source of protein in food

iii. It supplies minerals to livestock

Equipments used in dairy cattle farm

The major equipment is the milking machine others include

Feed trough, water trough, forage driers, milking pails, tattooing/numbering tools, health and medical tools, washing scale, silage fork etc.

CLASS: SS ONE **TERM: THIRD**

COURSE OUTLINE

1) Farm mechanisation
2) Problems of Agricultural Mechanisation
3) Problems of farm mechanisation
4) Source of farm power
5) Classification of crops
6) Husbandry of selected crops
7) Rice (Oryza sativa)
8) Cotton (Gossypium spp)
9) Pasture and Forage crops

WEEK 1: FARM MECHANISATION

PLOUGH

It is a primary tillage or work cultivation implement and the first to be used in land preparation it can be attach to a work animal or tractor.

Types of Plough

A. Disc Plough

Parts and functions of disc plough

1. **Beans or frame**

- It holds the disc in position
- It bears additional weight for greater depth

2. **Coupling point**

- It provides point of attachment to the tractor or work animal

3. **Scrapper**

- It helps to remove soil or mud that cling t the disc

4. **Disc or concave disc**

- It rotates and makes vertical and horizontal cuts as the tractor moves forward

5. **Standard**

- It holds the disc firmly to the beans

Advantages of disc plough in the tropics West African

i. It is capable of working heavy soil, tilling and moulding heavy soil.

ii. Roots of trees that grow extensively deep in the soil are easily removed by disc plough

Disadvantages of disc plough

i. Due to its heavy weight it can cause compaction of the soil

ii. It may results in soil erosion

B. **Mould board Plough**

It is adapted to temperate or light soil with no rock hard pans. This type of plough is not as strong as the disc plough.

i. **Beam or frame**

- It carries the plough and other components
- It provides additional weight for greater depth

ii. **Vertical disc or coultier**

- It makes vertical cuts/furrows

iii. **Mould board**

- It carries the soil
- It inverts weeds or exposes roots of weeds

iv. **Standard**

- It bears the mould board and the share

Advantages

i. It can only be used in temperate or light soil

ii. It can be used in soil free from stones etc

Disadvantages

i. It does not perform well in tropical environment

ii. It predisposes soil to erosion

General functions of plough

i. They help to mix the soil together

ii. They can be used to control weeds

iii. They help to improve the aeration of the soil

WEEK 2: PROBLEMS OF AGRICULTURAL MECHANIZATION

Farm mechanization is the application of engineering principles and technology in agricultural production, storage and processing on the farm.

Advantages of farm mechanization

i. Increase in farm revenue

ii. It encourages large scale farming

iii. It promotes specialization of labour

iv. It saves labour

Disadvantages of farm mechanization

i. High cost of operation

ii. Compaction of soil

iii. Land tenure system

iv. Inadequate technical know-how

Limitations of farm mechanization

a. Economic limitation

b. Technical limitation

c. Lack of maintenance

d. Small farm holdings

WEEK 3: PROBLEMS OF FARM MECHANISATION

i. Land tenure system

ii. Bad topography

iii. Inadequate spare parts

iv. Poverty of farmer

v. Inadequate technical manpower

Possible ways of improving agriculture through mechnaisation

i. Farmers should form co-operative societies to enable them pool resources together to buy farm machines

ii. Government should provide loans to farmers to enable them purchase farm machine

iii. Land tenure system should be reviewed to enable farmers acquire large hectares of land

iv. Farmers should be educated to accept modern system of farming

v. Government should establish training schools on agriculture and how to fabricate simple machines

vi. Simple and less expensive machines should be developed.

WEEK 4: SOURCES OF FARM POWER

Farm power derived from the provided by human beings and the most common source of power in farm operations especially when using traditional tools.

1. **Human Power**

This source of power is supplied by the farmer

Advantages of human power

i. It is easy to control and readily available

ii. It is the most intelligent source of power used for precision jobs

iii. It is easily available in all farm operations

Disadvantages of human power

i. Fatigue can easily set in

ii. Poor state of health may affect performance

iii. It consumes time and is less efficient

2. **Mechanical Power**

This involves the use of machines and engines like tractor, plough etc. It is required in farm operations such as tractor, ploughing, grinding, harvesting etc.

Advantages

i. It works faster and more efficiently

ii. It can handle more area of land

iii. They make farm operations timely

Disadvantages

i. It requires high capital

ii. It can cause air pollution through gases from exhaust pipe

iii. It can destroy soil structure

3. **Solar Power**

This is the energy derived from radiation, light and heat reaching the earth's surface from the sun. Some operations requiring solar

- For processing of farm produce e.g drying
- It is use by crops for photosynthesis

Advantages

i. It is free

ii. It is a neat source of energy

iii. It is a cheap source of energy

Disadvantages

i. It fluctuates in supply

ii. It is only available during the day

iii. It is supply cannot be controlled

4. Animal Power

This is the power derived from some animals e.g bull, Camel, oxen etc

Qualities of a good draught animal

i. It must possess strong hooves, good stride and stance (gait)

ii. It should be preferably male or castrated

iii. It must be docile

iv. I must have good body size

Precautions for using draught animals

- Do not overwork the animal
- Treat animals fairly to prevent them from being hostile
-. Apply muzzle

Some operations that require animal power

- For carrying people
- For transporting load
- For pulling tillage implement like plough/ ploughing

5. **Wind Power**

This is generated by wind movement. Wind power is used in windmill to pump water out of a borehole to a generating set for the production of electricity.

Farm operations requiring wind power

- Operation of windmills where the force of the wind is converted to electricity
- It is use in the separation of chaff from grains i.e winnowing
- It is use for drying produce

Advantages of wind power

i. It can serve as alternative to electrical power

ii. It is cheap

Disadvantages of wind power

i. Its supply is sporadic and uncertain

ii. It cannot be stored and is difficult to control

6. **Water power**

This is the power derived from water flowing in rivers, streams and dams. Water is used in hydro-electric stations to drive the turbines

Advantages of Water Power

i. It is easy to harness

ii. It is very cheap

Disadvantages of Water Power

i. Low level of water can cause low electricity

ii. It is not available in all areas

WEEK 5: CLASSIFICATION OF CROPS

Crop Husbandry is the acts of taken care of crop produce better yield. Crops are classified into two groups.

i. Classification based on their lifecycle

ii. Classification based on their uses

Classification based on life cycle

i. Annual crops are crops which grow and mature within one year e.g maize, rice, cowpea.

ii. Biennial crops are crops that grow and matured within two years or seasons. The first season is for vegetative growth while the second season is for flowering and fruiting e.g bananas/plantain, pineapple, ginger, cassava, etc.

iii Perennial crops are those ones that mature after 3-5 years. The first 3-5 years are for vegetative growth while subsequent years are for flowering and fruiting eg cocoa, oilpalm, colanut, cashew, coffee etc.

Classification based on uses

i. Fruit crop: They also provide minerals and vitamin. Eg guava, citrus, banana, pineapple, etc

ii. Spice: They add flavor to the soup e.g onion, pepper, garlic

iii. Oil crop provide vegetable oil when processed eg soabean, groundnut, oilpalm, coconut, etc

iv. Cereals: They belong to grass family they provide carbohydrate e.g millet, rice, maize

v. Root crops: They produce tuber, they are source of carbohydrate e.g yam, potatoes, cocoyam, etc

vi. Vegetable: They produce minerals and vitamins e.g water leaf, *Amaranthus*

vii. Beverages provide food drink when processed eg cocoa, coffee, tea

WEEK 6: HUSBANDRY OF SELECTION CROPS

MAIZE, *Zea mays*

It belongs to grass family. Maize is a fruit, its epicarp is fused with mesocarp (caryopsis).

Land preparation: This is done by clearing of land, making of ridges through the use of hole and cutlass or mechanically planting date is around April for early maize and July or August for late maize this is depend on location and rainfall.

Method of propagation: It is propagated by seed manually by the use of sticks or cutlass or mechanically by planting.

Seed rate: 2-3 seeds are planted per hole

Spacing: 90cm by 30cm at 1 seed per hole, 75-25cm for two seeds

Cultural Practices

- Supplying: Replace seeds that are not germinate with another @WAP
- Thining: Removal of weak plant 3- 4 WAP
- Fertilizer application: NPK 15:15:15 can be used or Inorganic fertilizer e.g farm manure 5-6 WAP
- Control of disease and pest is through the use of pesticides
- Maturity period is between 2-3 months after planting

- Harvesting can be done by hand or the use of sickle or combined harvester
- Processing: it can be processed into different kinds of food like corn flakes etc
- Storage: It can be stored in the fireplace or silo

WEEK 7 RICE (Oryza sativa)

Rice is a cereal, it belongs to grass family.

Land preparation: It can be done manually or mechanically

Varieties & Cultivars: Swampy rice and upland rice

Climate & soil requirement: Rice requires a temperature of 20^0C, 75cm-120cm rainfall or more. It requires slightly fertile soil.

Method of propagation is by seed

Planting date: April-May in south, August and September in the north

Cultural Practices

a. Supplying and thinning
b. Fertilizer application NPK
c. Weeding should be done regularly

Maturity period is between 4-7months

Harvesting: Cut off with knife or sickle or combined harvester

Processing

i. Sundrying is done immediately after harvest
ii. Threshing (separate grain from stalk)
iii. Winnowing: remove unwanted dust and remains
iv. Parboiling- This is soaking of rice paddy in warm water over night

Advantages of parboiling

1 It diffuses vitamins in the husk into the grains

2 It makes milling easier

3 It improves storability of the rice grains.

v. Hulling (remove husk from grain)

vi. Polishing (remove husk and other layers covering the grains

WEEK 8: COTTON (Gossypium Spp)

It belongs to family Malvacae

Land preparation: Clearing, ploughing, harrowing

Varieties & Cultivars: G hiritum, G vititolium, lshan type samara etc

Climate & soil requirement: Temperature of 25^0c-35^0c, rainfall 65mm-125mm, loamy soil

Cultural Practices are; Weeding, fertilizer application (super phosphate), mulching

Maturity period: 5-6month

Harvesting: Handpicking & sundrying

Storage: Store in sack material kept in dry place

Pest

i. Cotton stainer [Dysdercus Spp] handpicking and killing

ii. Boll worms

Diseases

i. Bacterial bight

ii. Leaf curl (virus)

iii. Damping of (fungi)

WEEK 9: PASTURE AND FORAGE CROPS

Pasture: This is the area of land covered with forage crops grazed or fed on by livestock.

Forage Crops: They are plants cultivated for their vegetative portions and used in fresh or preserved forms for feeding livestock.

Uses of Forage Crops

i. Livestock feed e.g hay

ii. Green manure: especially when young

iii. As bedding materials

iv. Cover crops: mostly leguminous plants

Types of Pasture

1. **Natural Pasture**: It is also known as natural grassland or rangeland. The pasture grow naturally on their own e.g savanna areas of Nigeria.

Characteristics of Natural Pasture

i. Forage crops in natural pasture can with stand trampling by animals

ii. Natural pasture may contain some grasses which cannot be easily eradicated

iii. It has good regenerative ability

2. **Artificial Pasture:** It is referred to as established or sown pasture because pasture are deliberately planted and managed by man to be fed to livestock

Factors affecting productivity of pasture

i. Resistance to trampling

ii. Pests and disease

iii. Seed viability

iv. Persistence

v. Aggressiveness

Factors affecting establishment pf pasture

i. Palatability

ii. Compatibility

iii. Time of maturing

Common and botanical names of forage

Forage crops i.e grasses and legume

Grasses

	Common name	Botanical name
i.	Elephant grass	Pennisetum purpureum
ii.	Northern gamba	Andropogon gayanus

iii. Southern gamba — Andropogon tectorum

iv. Spear grass — Imperiata cylindrica

Legumes

	Common name	Botanical name
i.	Stylo	Stylosanthes gracilis
ii.	Puero or kudzu	Pueraria phaseoloides
iii.	Mucuna	Mucuna utilis
iv.	Centro	Centrosema pubescens

Factors affecting distribution of pasture

i. Climatic factors

ii. Soil or Edaphic factors

iii. Biotic factors

Common management practices in pasture

1. Burning
2. Fencing
3. Application of fertilizer
4. Pest and disease control
5. Adequate stocking
6. Weed control
7. Irrigation

SUBJECT: AGRICLTURAL SCIENCE

CLASS: SSS 2

TERM: 1ST TERM

WEEK 1:

PLANT NUTRIENTS AND NUTRIENT CYCLES

Plants require nutrients or elements obtained from the soil for growth and healthy development. These elements or nutrients are classified into two main groups which are

i. Macro –nutrients
ii. Micro nutrients or trace elements

Macro –nutrients are mineral element nutrient required by crops in large quantities

Examples of macro –nutrients are nitrogen, phosphorus, potassium, magnesium, etc,

Micro nutrients or trace elements are mineral elements\ nutrients required by crops in small quantities

Examples of micro –nutrients are zinc, copper, boron, iron, chlorine.

FACTORS INFLUENCING NUITRIENTS AVALABILITY IN THE SOIL

1. Soil pH
2. Concentration of other nutrients
3. Leaching
4. Crop removal
5. Soil texture
6. Erosion

METHODS OF REPLENISHING LOST NUTRIENTS

1. Crop rotation
2. Organic manuring
3. Bush fallowing
4. Cover cropping
5. Liming
6. Fertilizer application

IMPORTANCE AND USES OF EACH OF THE PLANT NUTRIENTS

1. NITROGEN

Uses- a} Manufacturing of chlorophyll

b] Synthesis of protein

c] Constituent of cells

d] For growth and reproduction in plants

2.PHOSPHORUS

Uses- a] Assists in root development

b] important in the carbohydrate synthesis

c] Aids maturity/ripening of fruits

d] Increases crops resistance to diseases

3. POTASSIUM

Uses- a] Assists in the maintenance of acid/base in the crops

b] Assists in the synthesis of carbohydrates

c] Increases crops' resistance to diseases

4. CALCIUM

Uses- a] Constituent of the cell wall

b] Assists in maintenance of Ph in plants

c] Assists in the storage of carbohydrates in tubers

d] Helps in nitrogen fixation

5. MAGNESIUM

Uses- a] Constituent of chlorophyll

b] Essential for oil synthesis

c] Helps in the translocation of phosphates

6. SULPHUR

Uses – a] Helps in protein and carbohydrates metabolism

b] Helps in nitrogen fixation in legumes

7. IRON

Uses – a] Helps in chlorophyll formation

7. MANGANESE, COPPER, ZINC, BORON, AND MOLYBDENUM

Uses- a] They aid enzymic actions

b] They assist in protein synthesis

c] They assist in nitrogen fixation

GENERAL DEFICIENCY SYMPTOMS

1. Stunted growth
2. Poor root and leaf formation
3. Leaf chlorosis
4. Purplish coloration of leaf margin
5. Poor yield
6. Leaf dieback

NUTRIENT CYCLES

This is the transformation process undergone by each nutrient element in soil, plant, animal and atmospheric systems. It is complex in nature.

NITROGEN CYCLE

Processes in nitrogen cycle include

a] Addition of nitrogen into the soil- ionization of atmospheric nitrogen by thunderstorm, addition of manure, symbiotic and non symbiotic nitrogen fixation.

b]Soil processes- These are the oxidation of soil nitrogen from ammonium compounds to nitrites and lastly into nitrates by nitrifying bacteria, *Azotobacter*, *Nitrosomonas and Nitrobacter* respectively.

c] Removal of nitrogen from the soil- Crop removal, denitrification by denitrifying bacteria *Pseudomonas*, erosion, leaching and soil colloidal fixation

{form nitrogen cycle}

CARBON CYCLE- Processes include photosynthesis, burning of organic materials and respiration

WATER CYCLE- Processes involved are vapourization of water from the earth, condensation and precipitation in form of rainfall, ice and dew. The sun supplies the required energy

ORGANIC AGRICULTURE

This is agriculture system that sustain the soil, ecosystems and the people, It de-emphasizes the use fertilizers, herbicides, insecticide sand other agrochemicals. Organic meat, eggs and dairy products are obtained from animals that are not given antibiotics and growth hormones.

Importance of Organic Agriculture

1. It prevents environmental pollution
2. It is cheap to practice
3. It prevents food poisoning
4. It is less technical to practice

Practices like crop rotation, organic manuring, use of disease resistant crop varieties and breeds of animals are adopted.

WEEK 2: IRRIGATION

Irrigation is the artificial application of water to the soil to supplement insufficient rainfall.

IMPORTANCE OF IRRIGATION

1. Irrigation softens the soil for easy tillage operations
2. It provides moisture in the soil for root absorption
3. It encourages multiple copping in a year
4. It reduces soil salinity
5. It makes early planting possible
6. It cools the soil and environment
7. It extends the cropping season.
8. It increases quality of crop products

9. It increases crop yields
10. It provides pasture for livestock during the dry season

FACTORS TO BE CONSIDERED IN CHOOSING IRRIGATION SYSTEM

1. Soil type
2. Land topography
3. Source of water
4. Cropping system to be adopted
5. Type of crop to grow
6. Available technology
7. Cost of the system

IRRIGATION SYSTEM

1. Surface irrigation- This system involves supplying of water to farmland through channels or furrows. Methods adopted include flooding, furrow\channel and basin / border method. This system is cheap but is highly prone to erosion

2. Sub-surface\ underground irrigation- Water is supplied to the farm through perforated pipes laid underground to drop water within the root zone of crops. It minimizes moisture evaporation, prevents splashing of water on crops, reduces soil erosion and used to apply fertilizers. However it is highly technical and expensive

3. Over head irrigation – This is otherwise called sprinkler system. Water is pumped through pipes laid and raised to be supplied in form of rainfall. It may be portable or fixed. It is suitable for all land forms, affords control of the flow of water and can be used to apply agrochemicals.

The system is expensive, highly technical, affected by wind**,** highly tedious, quick spread of diseases and loss of water to evaporation.

PROBLEMS ASSOCIATED WITH IRRIGATION

1. Salt accumulation
2. Erosion problems
3. Build up of pathogens
4. Build up of pests
5. Poor technical knowledge
6. Insufficient water for irrigation
7. High cost of irrigation materials
8. High cost of maintenance
9. Non availability of land for irrigation
10. Displacement of people in area of irrigation.

HOW TO REDUCE DISEASE BUILD UP

i. Crop rotation
ii. Weed control

METHODS OF IRRIGATING A SMALL NURSERY

1. Drip irrigation
2. Use of watering can

WEEK 3: DRAINAGE

Drainage is a process whereby excess water in the soil is removed artificially to promote good farming activities.

IMPORTANCE OF DRAINAGE

1. It improves soil aeration for good root respiration
2. It helps to increase the soil temperature for the benefit of crop plant
3. It increases land availability for agriculture
4. It improves soil microbial activities
5. It makes nutrients available for crop uses
6. It removes toxic materials from the soil.
7. Drainage encourages early planting
8. It ensures early harvesting especially in paddy rice

DRAINAGE SYSTEMS

1. Surface system
2. Sub-surface system

DIFFERENCES BETWEEN IRRIGATION AND DRAINAGE

IRRIGATION	DRAINAGE
1.Supplies water into the soil	1 Removal of water from the soil.
2.Done mostly in dry \arid regions	2.Done in marshy or swampy regions.
3.Soil pores are filled with water	3.Soil pores are filled with water.
4.Water is taken from rivers, streams, lakes, ponds, etc	4Water is directed from soil to the water bodies

WEEK 4 **AGRICULTURAL POLLUTION**

Pollution can be defined as the release of harmful substances into the environment i.e air, water and land to the extent that it causes biological damage to man, animal and plant.

TYPES OF POLLUTION

1. Air pollution
2. Land pollution
3. Water pollution

WAYS BY WHICH AGRICULTURAL POLLUTION OCCURS

1. Bush burning 3.. Organic manuring

2. Improper disposal of animal wastes 4. Excess application of fertilizer

Non Agricultural Sources Of Environmental Pollution

a. Nuclear wastes d. Oil spillage

b. Industrial wastes
c. Motor vehicles exhaust
e. City refuse
f. Mining residue\activities

Effects of Land\ Pond Pollution On Farmers And Agricultural Productivity

a. Soil micro and macro flora and fauna are killed by pollutants there depleting soil fertililty
b. Depletion of oxygen in water
c. High levels of nitrates and phosphates caused by inorganic fertilizers cause overgrowth of plant and algae, eutrophication.
d. There is loss of top soil.
e. It causes health hazard to plants and animals.
f. The lack of oxygen caused by the increase in decomposers can kill aquatic organisms.
g. The health hazard caused by agricultural pollution may hinder farmers from production due to weakness and sickness.
h. Pollution of water bodies affects health condition of those consuming aquatic products as such the demand of such goods are reduced.
i. Pollution reduces availability of agricultural land
j. Pollution eventually reduces the farmers' income.

WEEK 5

SURVEYING AND PLANNING A FARMSTEAD FARM SURVEYING

Farm surveying is defined as the process by which measurement of land is made on the farm

IMPORTANCE OF FARM SURVEYING AND PLANNING IN AGRICULTURE

1. It helps to determine the hectarage of land
2. Farm survey helps in planning of the farmstead
3. It can be used for feasibility studies
4. It helps farmers to determine the location of structures on the farm.
5. It prevents wastage of farm inputs
6. Farm survey plan can be used as collateral for loans.
7. The yields from the farm can be predicted.
8. It prevents litigation over land

9. It reveals the soil type of the farm

SOME COMMON SURVEYING EQUIPMENT

1. Ranging pole
2. Measuring tape
3. Arrow or pin
4. Prismatic compass
5. Gunter's chain
6. Theodolite

WEEK 6

MEANING AND IMPORTANCE OF FARM PLANNING

Farm planning is a drawing or outline of a farmstead. It also involves the proper land use planning.

IMPORTANCE OF FARM PLANNING

1. It enables the farmer to make proper use of the land.
2. It promotes the neatness and prevents pollution within the farmstead.
3. It ensures quick overview of the farm
4. It eases management activities

FACTORS INFLUENCING THE SITING OF FARM OR FARMSTEAD

1. Topography
2. Soil type
3. Accessibility
4. Water supply
5. Nearness to market
6. Drainage

WEEK 7

PRINCIPLES OF FARMSTEAD LAYOUT

1. Plant the crops on the best soil with in the farm
2. Livestock buildings should be located on the poorest soil with in the farm
3. Farm building should not be located on slopes to avoid erosion.
4. Building should be located in easily accessible area
5. Residential and office building should be located far away from livestock buildings to avoid the noise and unpleasant odour from farm animals wastes and dung
6. Service buildings like offices should be located far away from the farms

WEEK 8 FOREST MANAGEMENT

Meaning of forest and forestry

Forest can be defined as a large area of land covered with trees and bushes either growing wild or planted for some purposes

Forestry is the art of planting, tending and managing forest including the utilization of their products

COMMON FOREST TREES

Iroko, obeche, mahogany, sapele, ebony etc

IMPORTANCE OF FOREST

1. Provision of food
2. Provision of fuel
3. Provision of medicinal herbs
4. Provision of timber
5. It serves as home for wild animals
6. Forest improves soil fertility
7. Serves as wind brake
8. Prevents soil erosion
9. Provides employment opportunities
10. Serves as source of foreign exchange

11. Forest purifies the atmosphere
12. Serves as tourist center

MANAGEMENT OF THE FOREST

1. Forest regulation
2. Selective exploration
3. Deforestation
4. Regeneration
5. Afforestation

FOREST REGULATION

These are laws promulgated by government in the form of decrees and bye –laws to prevent people from exploiting or indiscriminate tapping of forest resources. Violation of any these laws attracts sanctions. Some of these laws are:

1. Law specifying the girth of different tree species to be felled
2. Law prohibiting bush burning
3. People are to obtain license before exploiting forest resources
4. Ban on collection of leaves and firewood from the forest
5. Ban on farming in the forest reserve
6. Ban on killing \hunting of some species of wild animals
7. Encouragement of people to plant trees etc

SELECTIVE EXPLORATION- This is cutting of only the matured or those trees that have attained the specified girth for its specie while young trees are left to grow to maturity. It prevents deforestation.

REGENERATION- This is the process of allowing an exploited forest to re-grow into forest. It is of two methods namely i] Natural regeneration
ii] Artificial regeneration

Natural regeneration involves leaving the stump of a felled tree to sprout and the best chupon is chosen and allowed to a new tree[coppicing]

Artificial regeneration is the transplanting of a new tree seedling in place of a felled one

AFFORESTATION- This is the process of establishing forest in an area where there is non before. It is a tree planting campaign in Nigeria.

DEFORESTATION- This is indiscriminate felling of trees without any replacement

Causes of Deforestation

1. Bush burning
2. Farming activities
3. Construction activities

Effects of Deforestation

1. It encourages soil erosion
2. It leads to an increase in the environmental temperature
3. It increases evaporation of soil moisture
4. It destroys habitat of wild animals
5. It leads to loss of soil nutrients
6. Soil humus content is reduced

WEEK 9

AGRO –FORESTRY PRACTICES IN NIGERIA

TAUNGYA SYSTEM

This is the system of combining crop husbandry with forest management on the same piece of land i.e integrating agriculture with forestry. Only annual /food crops are grown during the seedling stage of trees. The farmers move to another side once the trees are forming canopy. This continues as a cycle.

Reasons For Adopting Agroforestry In Nigeria

1. Scarcity Of Land
2. Over population
3. Unemployment
4. Government policies

Advantages Of Taungya System

1. It makes land available for landless farmers
2. It boosts food production
3. Farmer make use of available soil fertility
4. It generates employment
5. It ensure survival of tree seedlings
6. It is a cheap afforestation or regeneration method

Other agroforestry practices in Nigeria are:

- Alley cropping
- Forest reserve
- Wildlife conservation

Problems associated with taungya farming

1. Competition may exist between crops and trees for soil nutrients
2. It does not give room for perennial crop production
3. The same duties are performed seasonally thereby making the process monotonous
4. Termites may be present in the forest area
5. There may be clash between the forest authorities and the farmers.

WEEK 10 FLORICULTURE

Floriculture is the growing of ornamental plants to beautify the environment and imitate natural scenery. It is a branch of horticulture. Other branches of horticulture are olericulture and pomology. Olericulture is the cultivation of vegetables while pomology is the cultivation of fruits. .

IMPORTANCE \USES OF ORNAMENTAL PLANTS

(1) For decoration
(2) Sources of local herbs
(3) Provision of employment
(4) Purification of atmospheric air
(5) For landscaping e.g. writing of words
(6) For scientific research
(7) Preparation of perfumes
(8) For ceremonial use e.g. during wedding ,burial.
(9) As a symbol of love
(10) Provision of shade

SUBJECT: AGRICULTURAL SCIENCE
CLASS: SSS 2 TERM: 2ND TERM

WEEK 1:
MAINTENANCE OF ORNAMENTAL PLANTS:

a) **Provision of shade:** this is done to protect seedlings from excessive heat and rainfall
b) **Regular watering:** water attest twist a day early in the morning and late in the evening
c) **Regular weeding:** remove unwanted plants ie that may complete with ornamental plants for space nutrient etc.
c) **Fertilizer application and manure:** they are added to improve the fertility of the soil
d) **Fencing:** ornamental plants should be protected from being eaten by animals
e) **Regular pruning:** old leaves, stems and side branches should be pruned with shear or secateurs

Types of Ornamental Plants

1. Lawn- These are grown to demarcate area of no passage They are mostly grasses e.g Carpet grasess, *Zoysia and Axonopus*
2. Potted plants – These are grown inside pots for internal decoration e.g Dumbcane, Elephant ear, Balsam etc
3. Spot plants – These are grown at a noticeable spot because of its special feature e.g Royal palm, cycads etc
4. Shade trees – These are to provide shade for refreshment e.g Almond tree, Umbrella tree, Flame of the forest etc
5. Hedge Plants – These demarcate the foot path e g croton, yellow and green bush, hibiscus, allamanda. etc
6. Life fencing – They are used to partition land areas They are mostly thorny e g rose, green bush, pride of barbados etc

WEEK 2:
COMMON SPECIES OF ORNAMENTAL PLANTS

A. Ornamental flowers

1. Sunflower
2. Clitoria
3. Marigold
4. Crotalaria
5. Morning glory
6. Dumbcane
7. Rangoon creeper

B. Ornamental shrubs

1. Allamanda
2. Hibiscus
3. Croton
4. Yellow bush
5. Wildrose
6. Cauliflower
7. Bougainvillea

C. Ornamental trees

1. Balsam
2. Indian almond
3. Royal palm
4. Neem
5. Cassia
6. Fan palm
7. Flame of the forest
8. Cauliflower

CULTIVATION OF ORNAMENTAL PLANTS

I. Choice of cite: use of well drained site, easily accessible with source of water.
II. Planting Materials: seed, stem etc
III. Method of cultivation : this can be achieved through any of the following means

- Use of prepared beds ie nursery beds
- Direct sowing to soil
- Use of nylon bags
- Use of pots
- Provision of shade
- Use of loamy soil or organic manure
- Regular watering

- Regular weeding

WEEK 3: DISEASE

Plant disease: This is the departure or deviation of plant from the normal state of health, showing marked symptoms or outward visible signs. Disease can be caused by the following agents, viruses, bacteria, fungi, nematode and nutrient deficiency

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General effects of diseases on crop production

1. Disease increase the cost of production through the expenses incurred in controlling them
2. They sender fruits and vegetables unattractive and unmarketable
3. They reduce quality of crop
4. They reduce yield or productively of crop
5. They can kill or cause the death of whole plant

Ways by which disease spread on crop farm

1. Through visitors to the farm
2. Through irrigation water
3. Through the use of contaminated tools and equipment
4. Through infected planting materials

General control of crop plant diseases

Cultural control

- Regular weeding on the farm
- By practicing crop rotation
- Removing and burning of infected plants
- Planting disease resistant varieties of crops
- Control of disease vector
- Timely harvesting etc

2. Biological control
   It involves the use of natural enemies of the disease to reduce or totally eliminate the disease

3. Chemical control

- Spraying plant protection chemicals on the farm e.g fungicides and on the plant materials.
- Spraying of insecticides to control insect vectors

WEEK 4: PLANT DISEASES

S/N	Disease	Causal organism	Mode of transmission	Symptoms	Prevention and control
1	Maize smut	Fungus, *Ustilago maydis*	Airborne fungal spores	Dwarfness of plants ,maize cobs turn powdery, low yield death of maize plants	Seed treatment before planting, Early planting Uproot and burn infected plant , Apply fungicide
2	Maize Streak	Virus	Insect vector	Stunted growth, Chlorotic streak along the leaf vein	Early planting, uproot and burn infected plant, apply, insecticide, plant resistant varieties
3	Rice blast	Fungus, *Piricularia oryzae*	Airborne	Death of rice seedlings, necrotic spots on leaves	Apply fungicide, planting of resistant varieties
4	Maize rust	Fungus *Puccinia polysora*	Airborne	Leaves turn deep brown and death of plants	Early planting, seed dressing and apply fungicide
5	Cassava mosaic	Virus	Insect vector, whitefly *Bemissia tabacc*i	Mosaic distortion of leaves, stunted growth , chlorosis,	Planting of resistant varieties, Early /late planting, Apply insecticide, destroy infected plants
6	Cassava leaf spot	Fungus	Airborne	Brown necrotic spots on leaves, stunted growth	Apply fungicide, plant resistant variety
7	Cocoa black pod disease	Fungus *Phytophthora palmivora*	Airborne later through infected pods by rain splash	Brown spot on the pod which later spread and turns the pod black	Removal and burning of infected pods, apply fungicide

8	Black arm or bacterial blight	Bacterium	Infected plants, farm tools ,irrigation water, rain splash	Angular spots on leaves, boll rot, blight in veins, black arm in stems	Destroy infected plants, burning of crop residue, plant resistant varieties
9	Cocoa swollen shoot	Virus	Insect vector Mealy bug, *Phenacoccus manihoti*	Leaf chlorosis, swollens on young stems and roots	Destroy infected plants, apply inseticide
10	Groundnut rosette	Virus	Insect vector	Mixture of small white and yellow leaves, stunted growth	Plant resistant varieties, destroy infected plants

WEEK 5: CROP PESTS

Pest is any organism capable of causing damage to crop plant.

TYPES OR IMPORTANT CLASSES OF CROP PEST

Insects, birds, rodents, monkey, man, nematode

Insect pests

Classification is based on mode of feeding

1. Biting and chewing insects: they have strong mouth part ie mandible and maxillae eg grasshopper, termite etc.

2. Piercing and sucking insects: they have strong mouth parts called proboscis, they suck liquid materials from plants tissues e.g cotton strainers, aphids etc
.
3. Burrowing insects: they destroy tissues of plant or fruits or seeds e.g bean beetles, maize, rice weevils etc.

EFFECTS OR ECONOMIC IMPORTANCE OF INSECT PESTS IN CROP PRODUCTION

1. May cause reduction in viability of stored produce
2. They destroy crops in the field
3. Some are carriers or vectors of disease

4. They reduce quality of produce
5. They make crop produce unattractive to consumers
6. Spots of feeding by pests provides entrance for crop pathogens

PREVENTION AND CONTROL OF PEST

Physical control methods

- Handpicking and killing
- Shooting rodents with gun
- Setting of traps
- Destruction of the habitat of pest e g termitarium

Cultural control methods

- Practise crop rotation
- Appropriate tillage operations
- Early planting
- Late planting
- Bush fallowing
- Timely harvesting
- Weeding
- Practice of close season

Biological control methods

The use of the natural enemies of crop pest to reduce the pest population.

Conditions For Successful Biological Control Practice

1. The control agent must not attack the preserved crop
2. The control agent must be able to sustain itself in the ecosystem
3. The agent must not be a pest to another crop in the environment
4. The agent must be able to locate and attack the pest by itself
5. The pest must not develop resistant to the control agent
6. The biological agent must not constitute any danger to the farmer and his farm workers.

Side effects of biological control method

1. Disbalance of the ecosystem- This occurs when the biological control agent is a suitable prey to other organisms in the ecosystem thereby constituting extra food item for such agent and reproduces profusely
2. The biological control agent may on the long term constitute another pest in the environment
3. The biological control agent may not survive in its new environment
4. It is expensive to practice

Chemical control method

This is the use of chemical formulations to kill a damaging pest

I

Insecticide is any chemical preparation used to control insect pest

forms/group of insect pest	**mode of action**
1. Power	contact
2. Liquid	systemic

Examples of chemicals used to control pest

Pest	**chemical**
1. Pest	Pesticide{ general term}
2. Insect e.g grasshoppers	Insecticide
3. Rodents e.g rat	Rodenticide
4. Birds e.g weaver birds	Avicides
5. Nematode e.g eelworm	Nematicide

Side Effects Of Chemical Control method

1. Broad spectrum- Most of the chemicals are non selective and will kill both beneficial and non beneficial organisms
2. Environmental Pollution- The chemicals are toxic and if washed into water bodies will cause death of aquatic organisms
3. Poisoning – The chemicals can cause death or serious ailment if mistakenly taken by man

WEEK 6:

CROPS PESTS

s/n	Insect pests	Crops attacked	Nature of damage and economic importance	Prevention and control measures
1	Stem borer, *Busseola fusca*	Cereals e.g rice, maize, millet	Larvae bore holes into stems, death of plants	Uproot and burn infected plant Apply insecticide, early planting, burn crop residue, practice crop rotation
2	Army worm	Cereal e.g Maize, rice, millet	Larvae eat stem and leaves	Hand picking, spray with insecticides
3	Aphids	Legume e.g cowpea, soyabean etc	Gall on leaves, transmission of disease	Spray insecticide, uproot and burn infected plants
4	Cassava mealy bug	Cassava	Sucking of cell sap, reduced leaf nodes, swelling of stem	Early planting, treating of stem cuttings before planting, spray insecticide
5	Yam beetle	Yams	Bore holes into yam tubers, Destruction of planted yam setts, reduction in quality and market value of tubers	Dust yam setts before planting, crop rotation
6	Cotton stainer	Cotton	Sucking of cell sap, transmission of disease, destruction of bolls, leaf distortion	Handpicking and killing, apply insecticide, crop rotation
7	Grasshopper	All crops	Defoliation of crops, feeding on stems	Handpicking and killing, apply insecticide
8	Maize weevil, Bean beetle	Stored grains	Larvae bore holes into grains, turn grains into powder, destroy seeds viability	Early harvesting, proper drying of grains, fumigation of store, apply insecticides
9	Birds e g Village weaver	Cereals and legumes	Feed on grains	Use of scarecrow, Trapping or use of cages Bait some seeds with avicides
10	Rodents	All crops	Destruction of plants on the farm, Destruction of stored and processed produce	Use of rodenticide, use of traps, Biological control eg use of dog and cat, fencing of farm

11	Termites	All crops	Destruction of stem and root systems of tree crops, destruction of planted seeds, destruction of stored produce and processed products	Destruction of the termitarium and removal of the queen, biological control, and use of insecticide

WEEK 7:

WEEDS

Weed is any plant that grows in a place where it is not expected to grow. Weed is also any plant that grows where it is not desired in such a way that it constitutes nuisance to either man, livestock or crops.

Effect/ economic importance of weeds

1. It leads to loss in income of farmers
2. It compete with crops for space
3. It compete with crops for nutrients
4. Some weeds are toxic to farm animals
5. Some weeds serve as alternate hosts to crop pests and pathogens
6. Weed control activities consume the farmers' time
7. Weed control activities are expensive

Weeds otherwise provide the following benefits:

1. Some weeds are edible eg water leaf
2. They are used as mulching materials
3. Leguminous weeds fix atmospheric nitrogen into the soil
4. They prevent soil erosion
5. They can be ploughed as green manure

Common weeds found in farms

Common names	Botanical names
1. Guinea grass	*Panicum maximum*
2. Bahana grass	*Cynodon dactylon*
3. Carpet grass	*Axonopus compressus*
4. Centro	*Centrosema pubescens*
5. Goat weed	*Ageratum conizoides*
6. Elephant grass	*Penisetum purpureum*
7. Mucuna	*Mucuna utilis*
8. Water leaf	*Talinum triangulae*

9. Puero *Pueraria phaseoloides*
10. Spear grass *Imperata cylindrica*

FEATURES OF WEEDS

1. Early maturity
2. Long term of dormancy in the soil
3. Production of large quantity of seeds
4. Multiple methods of propagation
5. Resistance to drought
6. Weeds have luxuriant growth
7. Most weeds are wind pollinated
8. They have persistent root system

Methods of weed control

1. Mechanical/ physical control: They include hand pulling or hand picking or uprooting
   hoeing, rotary cultivation like ploughing and slashing

2. Biological control: It involves the introduction of some insects and herbivorous animals to eat the leaves. This is used mostly in tree crop plantation.

3. Cultural control: The methods use include cover cropping crop rotation, mulching and burning

4. Chemical control: It involves the use of chemical solutions called herbicides to control growth of weed. Exampleare gramoxone, 2,4 dichloro acetic acid (2,4-d), paraquat etc.

WEEK 8: ANATOMY AND PHYSIOLOGY OF FARM ANIMALS

ANATOMY : It refers to the form and structure of the body.
PHYSIOLOGY: It refers to the functions of the forms and parts of the body. They enable us to understand and know more about the nutrition, reproduction and management of farm animals.

HEART

This is the most powerful organ in the circulatory system. It helps to pump blood round the body. Each pumping action of the heart is known as heartbeat.

The heart consist of muscles called cardiac muscles, it contract and relax continuously making the heart to beat ceaselessly. The heart is covered and protected by a thick membrane called pericardium. The heart consist of four chambers; the upper arches (right auricle and left auricle) and lower ventricle (right ventricle and left ventricle) with a central wall called septum dividing the heart into right and left halves.

The heartbeat occurs in two stages

a. Diastole: the two auricle contract, creating high pressure in the blood. Blood flows from the auricles into the ventricles. Deoxygenated auricle while oxygenated blood enters the left ventricle from the left auricle.
b. Systole: the two ventricles contract creating high pressure in the blood that causes the two valves to close. Deoxygenated blood from the right ventricle passes into the pulmonary artery while oxygenated blood from the left ventricle passed into the aorta.

LIVER

The liver is the most powerful organ in the body, it controls the major activities in the body. It is found on the right side of the upper abdomen and partly overlaps the stomach and divided into lobes.

Function of liver

- Digestion
- Storage of iron
- Detoxification
- Storage of vitamins
- Regulation of blood sugar
- De-amination of excess amino acids

KIDNEY

Function of kidney

1. Excretion: kidney helps to remove nitrogenous unwanted wastes from the body e.g salt urea etc
2. Osmo- regulation of the body: it helps to keep the concentration of the blood plasma and additive of the body cells fairly constant

WEEK 9

DIGESTIVE SYSTEM

The digestive system are all the organs and tissues associated with the breaking down or digestion of food in the body such as teeth or beak, alimentary canal etc

Classes of farm animals based on digestive tract

STOMACH COMPARTMENTS OF RUMINANT ANIMALS

a. Rumen (pouch):the 1st and largest
b. Reticulum (honeycomb): 2nd stomach
c. Omasum (many pile):3rd and smallest compartment
d. Abomasum : it is the 4th compartment representing the simple stomach of non –ruminants.

DIFFERENCES BETWEEN DIGESTIVE SYSTEM OF NON RUMINANT AND RUMINANT ANIMAL

S/N	NON – RUMINANT	RUMINANT
1.	It has no rumen	It has rumen
2.	Digestion is not aided bacteria	Digestion is aided by bacteria
3.	It has one stomach	It has four stomach chambers
4.	It cannot digest cellulose and fibre properly	It can digest cellulose and fibre properly
5	They do not chew the cud	They chew the cud ie rumination

IMPORTANCE OF DIGESTIVE SYSTEM

1. It aids the ingestion of feed
2. It promotes the digestion of feed
3. It ensures the absorption of digested food
4. It makes feed nutrients available to farm animals
5. It ensures growth of farm animals

CIRCULATORY SYSTEM

It involves all the organs and tissues concerned with the movement of materials from one part of the body to another where they are either used or removed e.g heart, blood and blood vessel

CIRCULATORY SYSTEM IN FARM ANIMALS

Farm animals possess a close circulatory system i.e oxygenated blood and deoxygenated blood does not mix in the blood. Farm animals undergo double circulation i.e the blood has to pass through the heart twice, each time going through separate path ways known as pulmonary circulation

Pulmonary circulation is the movement of blood between the hart and the lungs while systemic

COMPOSITIONS OF BLOOD

Blood is a fluid tissue made up of fluid plasma and blood cell or corpuscle

1. Plasma
2. The blood cells or corpuscles

a. Red blood cells or erythrocytes
b. White blood cells or leucocytes
c. Blood platelets or thrombocytes

FUNCTIONS OF BLOOD

1. Leucocytes help to defend the body against germs
2. It helps in blood clothing with the aid of platelets
3. It transports hormones from ductless glands to areas of activities
4. Blood transport food nutrients across the body
5. It carries oxygen round the body

WEEK 10 REPRODUCTIVE SYSTEM

The reproductive system are all organs and tissues concerned with reproduction animals

MALE REPRODUCTIVE SYSTEM

It includes the testes which produce the spermatozoa and the testosterone i.e sex hormone which aids the development of male sexual secondary characteristic

FEMALE REPRODUCTIVE SYSTEM

It includes the ovaries that produce the ovum or ova (eggs) which are enclosed by the graffian follicles and some hormones e.g oestrogen

a. Ovulation
b. Fertilization
c. Implantation

MAIN REPRODUCTIVE HORMONES AND THEIR FUNCTIONS

Hormones are chemical substances which co-ordinate the activities of the body

FEMALE REPRODUCTIVE HORMONES

1. Oestrogen
2. Follicle stimulating hormone (FSH)
3. Progesterone (pregnancy hormone)
4. Luteinizing hormone
5. Oxytocin
6. Relaxin

EGG FORMATION IN POUTRY

The process of egg formation is controlled by hormones. The egg is formed partly in the ovary and partly in the oviduct. The process involve; Ovary, Infundibulum, Magnum, isthmus, Uterus and Vagina/Cloaca.

STRUCTURE OF THE EGG

The egg is made up of the shell, double membranes, airspace, albumen, yolk, embryo and chalaza.

Reproductive Behaviours in Farm Animals

- **H**eat period/ oestrus cycle
- **Mating which can be** flock mating, pen mating, stud mating and artificial insemination
- **Fertilization**
- **Ge**station
- Parturition
- Lactation
- Weaning

SUBJECT: AGRICULTURAL SCIENCE
CLASS: SSS 2 TERM: 3RD TERM

WEEK 1
ENVIRONMENTAL PHYSIOLOGY

This is the effect of the environment on growth and performance of farm animals. Environmental factors of importance in animal husbandry include temperature, wind, rainfall, sunlight and relative humidity. Their effects can be seen on growth, reproduction, milk production and egg production.

EFFECTS OF TEMPERATURE ON ANIMAL PRODUCTION

1. High temperature results in heat stress which reduces the egg and milk production
2. Abortion may result due to heat stress in farm animals
3. High temperature reduces libido in farm animals
4. Too much will reduce the shelf life of eggs and milk
5. High temperature and humidity favour the growth of pathogens
6. Too high or low temperature reduce hatchability in poultry
7. High temperature results into low fertilization and conception in farm animals
8. Too high/low temperature affects the survival of young animals

Control Of Temperature

1. Materials for constructing animal pens should be poor conductors of heat
2. Adequate ventilation should be provided in the pens
3. Polythene materials should be used to cover pens in cold weather
4. Open part of pens should not be exposed to direct rays of sunlight
5. Room heater or high wattage bulb or kerosene lantern can be used to provide heat in a cold weather
6. Giant or industrial fan can be used to reduce heat on a hot weather

WEEK 2 LIVESTOCK MANAGEMENT

These include the care given to farm animals during breeding and rearing of farm animals.

Non-ruminant livestock management

Poultry, pig etc

System of management include; Intensive, semi-intensive and extensive management systems.

The intensive system for poultry can either be the battery cage or deep litter system.

Other management practices include; housing, feeding, sanitation etc.

MANAGEMENT PRACTICES IN FARM ANIMALS

Housing

Regular feeding

Disease control and prevention and hygiene like deworming, dipping and routine vaccination.

Dehorning mostly in cattle

Collection of animal products like eggs, milk etc

Reproductive/ breeding activities

BREEDS OF FARM ANIMALS

Cattle	Sheep	Goats	Poultry	Rabbit	Pig
White Fulani, Sokoto Gudali, Red Bororo, N'dama, Biu, Keteku, Muturu, Wadara, Guernsey, Dexter, Jersey, Kerry	Wesr African Dwarf, Yankassa, Ouda, Merino, Balami, Nellore,	Sokoto Red, Bornu Red, Kano Brown, West African Dwarf goat, Sahel, Saanen, Maradi, Bauchi ,Bantu, Alpine	White Leghorn, Red leghorn, Rhodes Island Red, Sussex, Cornish, Local breeds, Harco Hubbard ,Isa Brown, Plymouth Rock	Chinchilla, Flemish Giant, California White, Angora, New Zealand White, Crossbreeds , Local breeds	Local breeds, Cross breeds, Duroc- Jersey, Landrace, Chester white, Hampshire, Poland-China, West African Dwarf Pig, Large White

WEEK 3

ANIMAL NUTRITION

This refers to the science of providing mixed feed ingredients to supply farm animals with desired nutrients for them to be able to offer the desired products and by products. Food given to livestock known as feed needed for growth, reproduction etc

Feed ingredients are various materials which are fed to farm animals.

Characteristics of feed ingredients

- They must be acceptable to the animals
- They must be edible or palatable
- They must be digestible
- They must be available

Classes of feed ingredients

1) Carbohydrate concentrates
2) Protein concentrates
3) Mineral/vitamin supplements
4) Roughages which can be hay, straw, silage and soilage
5) Succulents

Characeristics of carbohydrate concentrates

a. Low in fibre content b. Low in protein, mineral, fats and oil

c Highly digestible d. Rich in carbohydrates

e Mainly of plant origin eg cereal grains root and tubers

Characteristics of protein concentrates

a Low in carbohydrates, fibre, fats and oil

b Rich in crude protein

c Highly digestible

d May be of plant or animal origin

e Plant sources include soyabean seed and cake, groundnut cake, etc

Characteristics of roughages

Contain crude fibre/ cellulose more than 18 o/o
Low in protein carbohydrates, minerals fat and oil
It is of poor digestibility
Regulates movement of chyme in the intestine of farm animals
Examples are silage, hay straw, peels etc

Characteristics of suppliments

Rich in minerals, low in protein, carbohydrates, fats and fibre
Examples are oyster shell, limestone, salt etc

Additives- These are vitamin, growth stimulants, hormones and drugs added to feed in small quantity eg yeast, Lysine etc
Succulents – Contains high moisture fed to farm animals as source of vitamins eg water leaf, carrots, fruits etc
FEED NUTRIENTS OF LIVESTOCK

A. CARBOHYDRATES
   Supply of energy
   Maintenance of body temperature
B. PROTEINS
   For growth,
   Production of hormones, enzymes, antibodies ,milk and egg
   For the development of foetus
   For repairing of worn out tissues
   May be used as source of energy
   Production of protective covers like hair, hooves, horn and feathers
C. FATS AND OIL
   As source of energy
   As solvent for fat soluble vitamins
   Protect delicate internal organs like kidney
   Improve palatability of feed
   Make the animal body to be water proof

Sources, Functions And Deficiency Symptoms of Minerals In Animals

Minerals	Sources	Functions	Deficiency Symptoms
Calcium	bone meal, oyster-shell meal, milk, Limestone meal,	Bone ,teeth and egg shell formation, blood clotting.	Rickets , osteomalacia, soft eggs or shell-less eggs, retarded growth
Phosphorus	Bone meal, Fish meal	Acid-base balance, bone, teeth and egg shell formation	Ricket, loss of appetite, osteomalacia
magnesium	Salt lick, forage and grasses	Aids functioning of the nervous system, activation of enzymes	Nervous disorder
Sodium and chlorine	Common salt, salt lick, fish meal	Regulates acid base balance ,maintains osmotic pressure constitutes HCl in the stomach and improves feed palatability	Loss of appetite, Poor growth ,feather pecking, cannibalism

Sulphur	Salt lick and fish meal	Constituents of amino acids and proteins	Poor growth,
Iron	Yeast iron injection, salt lick,	Constituent of haemoglobin and myoglobin	Anaemia
Iodine	Fish meal, iodized salt	Constituent of hormone	Goitre
Fluorine	Fluorinated water, salt lick	Prevents tooth decay	tooth decay
Cobalt	Salt lick	Activation of enymes	General malnutrition
Copper	Salt licks	formation of haemoglobin and iron absorption	Anaemia

Sources, Functions And Deficiency Symptoms of Vitamins In animals

Vitamins	Sources	Functions	**D**eficiency Symptoms
Vitamin A Retinol	Fish meal, grasses, and yellow maize	Good vision, aids reproduction	Night blindness, low fertility, rough coat and scaly skin
Vitamin B 1 Thiamin	Yeast, cereals green plants	Acts as co-enzymes in metabolism of energy	Poor appetite and beriberi,
Vitamin B 2 Riboflavin	Yeast green fodder, milk	Acts as co-enzyme in protein metabolism	Poor growth, curled toe paralysis, Diarrhoea, dermatitis
Vitamin B12 Cobalamine	Fish meal, milk products	Acts as co-enzyme in biochemical reaction and aids red blood cells formation	Anaemia and poor growth rate
Vitamin C Niacin	Yeast, cereals, grasses and liver	Aids oxidation of carbohydrates, co-	Pellagra, reddish/black tongue, poor growth, dermatitis

Nicotinic acid		enzyme in food metabolism	
Vitamin D Calciferol	Bone meal, Fish meal, sunlight	Aids bone and teeth formation, eggshell formation,	Ricket, osteomalacia, soft egg shell-less eggs
Vitamin E Ergosterol or Tocopherol	Vegetables, Salt	Essential in reproduction. Has antioxidant property	Sterility in farm animals, Abortion, Poor quality semen
Vitamin K Phylloquinone	Fish meal and vegetables	Aids blood clotting and formation of prothrombin	Heamorrhage or inability of blood to clot

Functions of Water

- It serves as medium for all metabolism reactions
- It helps in maintaining cell and muscular turgidity
- It helps in maintaining body temperature of farm animals
- Water assists in the removal of waste product
- Water is an important component of milk and eggs
- Assists in enzymes and hormone formation
- Water is used in cleaning and washing of farm tools
- Water is used in preparing animal drugs and vaccines

Types of ration and diet

Diet: This a type of formulated for a class of farm animal to keep the animal on a level of maintenance and or production.

Ration: This is the quantity of feed required by a farm animal or group of farm animal per unit time.

The two terms are relatively similar and used interchangeably. There are two types viz:

Maintenance ration and production ration.

Maintenance ration – This type of feed/ration is given to farm animals to prevent a loss or gain in weight. Maintenance ration is made of fibre and of poor digestibility. It is given when-

- the animal has attain the market size/weight

- the animal is in a resting period
- the weather is unfavourable or scarcity of feed ingredients
- the animals are on transit

Production ration – This diet supplies nutrient above maintenance and enables farm animals to offer the required product of high quality. It is fortified with peculiar nutrient for such product e.g layers' mash in poultry usually contains higher calcium content for the birds to lay strong shelled eggs. Animals that require production ration include-

- lactating animal for milk production
- weaned animals for quick growth
- layer birds for egg production
- pregnant animals for the maintenance of the foetus
- broilers and fattening animals for build up of flesh
- animals for steaming up or flushing for improved oogenesis before mating

Balanced Diet – This is a feed formulation which contains all the essential feed ntrients required by farm animals in the appropriate proportion

MALNUTRITION

This is a condition in which farm animals show evidence of nutritional disorders when their feed is lacking in one or more essential feed nutrients or inadequate quantity of feed is given over a period of time leading to starvation and loss of condition. { refer to the nutrient table}

WEEK 4

RANGELAND AND PASTURE MANAGEMENT

Rangeland is an extensive area of land which contains grasses, legumes and other herbage crops where animals can graze.

A pasture is a piece of land cultivated to grasses and other herbage plants purposely for feeding ruminant animals.

Importance of Rangeland

1 Serves as source of food for ruminant animals
2 Rangeland allows farm animals to exercise their body
3 It gives opportunity for mating among farm animals

4 Animal dung helps in maintaining soil fertility
5 It supplies grasses and legumes for preparing hay and silage
6 It is a cheap source of feed for ruminant animals

Characteristics of A Rangeland

1Highquality grasses, legumes and herbage are present in a good range land
2 It contains some shade trees
3 It should be free of weeds and other poisonous plants
4 It can withstand trampling
5 It can also withstand drought
6 The grasses, legumes and other herbage plants have high regenerative ability.

Methods of Rangeland and Pasture Improvement/
Maintenance Practices in Pasture or Rangeland

1) Controlled stocking
2) Reseeding
3) Paddocking- This is the partitioning of a vast rangeland or pasture into units to be able to practice rotational grazing.
4} Fertilizer application
5} Weed control
6} Maintenance of grass/ legume mixture

Advantages of grass/legume mixture

a It supplies balance diet to farm animals
b Legumes fix atmospheric nitrogen into the soil
c Legumes helps in suppressing weed growth
d It prevents soil erosion
e It improves palatability of the pasture

7} Irrigation especially in the dry season for continuous growth of the pasture
8} The practice of rotational grazing
9} Pest and disease control
10 Control burning [advantages]
It breaks the cycle of animal pests, parasites and pathogens
It gives room for the rejuvenation of pasture

- **Carrying Capacity-** This is the optimum number of animals that can conveniently graze on a pasture without causing overgrazing

.

Factors That Determine The Productivity Of A Pasture/ Rangeland

- Climatic factor especially rainfall and temperature
- Soil fertility
- Topography of the rangeland
- Grazing pattern adopted
- Resistance to trampling

Pasture Utilization

A Grazing B Soilage C Browsing

Pasture Preservation

Pasture can be harvested and preserved for future uses especially in the dry season or winter period when the animals will not found grasses or unable to go out for grazing. These are :

A. Hay i.e sundried grasses and leaves of other edible plants. The plants are harvested when they are about to flower. They are left overnight to wilt before sun-drying

Qualities of a good hay

- High leaf/stem proportion
- Fair retention of the green colour
- Soft and palatable
- Free from weeds, non-edible and poisonous plants
- Possess pleasant and sweet aroma

B. Silage – This is the fermented product of green fodder. The grasses are preserved by the organic acid of the anaerobic fermentation of the sugar in the leaves.

Qualities of a good silage

- Has an acidic taste
- Light green in colour
- Pleasant and sweet aroma
- High leaf stem proportion
-

Some PastureGrasses and Legumes

Pasture grases		**Pasture legumes**	
Northern Gamba grass	*Andrpogon gayanus*	Centro-	*Centrosema pubescens*
Southern Gamba	*Andropogon tectorum*	Calopo-	*Calopogonium mucunoides*
Guinea grass	*Panicum maximum*	Mucuna –	*Mucuna utilis*
Elephant grass	*Pennisetum purpureum*	Puero -	*Pueraria phaseoloides*
Giant star grass	*Cynodon clectstachyum*	Stylo -	*Stylosanthes gracilis*
Carpet grass	*Axonopus compressus*	Sun hemp-	*Crotalaria juncea*

WEEK 5:
BASIC ECONOMICS PRINCIPLES

The basic economics principles we have are; scarcity, choice, scale of preference and law of diminishing returns.

Scarcity:- This refers to the limited available resources used in satisfying the unlimited human wants. These resources are scarce relative to their demand. It is a result of scarcity of resources that made it essential to study economics in order to find alternative uses of these scarce resources because available resources cannot satisfy human wants.

Choice:- This arise as a result of numerous human wants and the scarcity of the resources used in satisfying these wants hence decision making which is choice. Hence, the process of selecting some needs for satisfaction out of many others based on the resources available is known as choice.

Scale of reference:- This refers to list of individual wants in order of their relative importance which make it easier for choice to be made.

Law of Diminishing Returns:- It states that as more and more units of a variable factor of production are added to fixed factor, after a certain paint, the marginal product diminishes or decline.

PRODUCTION

Production: This is refers to all economic activities which results in the creation of goods and service that can satisfy human want. For goods and services to be created during the process of production, certain factors are combined together known as factors of production namely land, labour, capital and entrepreneur or management.

FACTORS OF PRODUCTION

(1) Land
(2) Labour
(3) Capital
(4) Entrepreneurship or management

LAND – It is a natural gift of nature. Its supply is limited. It is immobile. However its size can be increased by reclamation practices like drainage. Its quality can be improved or degraded depending on the management practices. Land includes all natural resources like soil, mineral, climatic and atmosphere. The reward for land is rent

.

LABOUR – This refers to all human efforts exerted in the course of production. It may be mental or physical. Labour is mobile. Its quality is affected by health, feeding and training. It is measured in man-hour or man-day. Labour can be skilled or semi skilled or unskilled. The reward for labour is salaries and wages

.

CAPITAL – This is the assets acquired by the farmer from his past efforts. Capital is man- made. Capital in agriculture refers to machinery, stock of animals, crops , buildings etc. Capital depreciates over time. Capital can be increased by saving or borrowing. The reward for capital is interest.

ENTRPRENEURSHIP or MANAGEMENT – This is the coordinating activity of the farm business. It controls, decides and administers all other

factors of production. Management may be distinct or combine with labour depending on the size of the farm. The reward for management is profit or loss.

FUNCTIONS OF A FARM MANAGER

A farm manager is the person saddled with the responsibility of coordinating ther factors of production towards a target product, agricultural produce. The manager may be hired or done by the farmer him/herself. The following are the functions of a farm manager:

1 The manager sets the objectives of the farm
2 He plans the use of farm resources
3 He takes decision on the farm enterprise
4He allocates resources to each sector of the farm enterprise
5 He supervises the daily activities of the farm
6 He sources for fund to finance the farm
7 He keeps the farm records and accounts
8 He markets the farm produce
9 The farm manager bears responsibility for all the decisions taken

MANAGEMENT GOALS

1. Minimization of cost
2. Maximization of profit
3. Survival of the business
4. Capturing of the existing market
5. Acquisition of economic power
6. Minimization of risks and uncertainties

WEEK 6:-

BASIC ECONOMIC PRINCIPLE OF DEMAND

DEMAND: This is the amount or quantity of agricultural produce which a consumer is willing and able to buy at a given price and at a particular period of time.

LAW OF DEMAND: It states that, the higher the price, the lower the quantity of agricultural produce demanded for or the lower the price, the higher the quantity of goods demanded for.

ASSUMPTIONS FOR THE LAW OF DEMAND

(1) That there will be no change in taste and preference of the consumer.
(2) That the consumer's income remains constant

FACTORS AFFECTING DEMAND

(1) Price of the produce
(2) Price of other commodities
(3) Income of consumer
(4)Changes in taste of consumer
(5) Population
(6) Periods of festival
(7)Expectation of future change in prices
(8) Taxation
{9} Availability of close substitute

Demand schedule:- This is a table showing the relationship between the quantity demanded for an agricultural produce and its price. This illustrated below

Price of rice #/ bag	Quantity demanded { bags}
10	2000
20	1850
25	1700
35	1530
50	1367
75	1245
100	1100

Draw the graph

Change in Demand:- This is brought about by changes in the price only. An increase in price from #20:00 to #25:00 brings about a corresponding decrease in quantity of rice demanded from 1850 to1700 and vice versa

Shift in Demand:- This is caused by any factor that can affect the purchasing power of the consumers or reduce the cost of production or improve the yield. Such factors include increase or decrease in consumers' income, improved technology and season

WEEK 7: BASIC ECONOMIC PRINCIPLES OF SUPPLY

SUPPLY:- This is the quantity of commodity a producer is willing and able to offer for sale at a given price over a particular period of time.

LAW OF SUPPLY:- It states that the higher the price, the higher the quantity of produce that will be supplied or the lower the price, the lower the quantity of produce that will be offered for sale

SUPPLY SCHEDULE:-

It is a table that shows the relationship between price and quantity of commodity supplied

Price of maize {#/ bag}	Quantity offered for sale{ bags}
250	1100
300	1250
400	1400
400	1560
450	1780
500	1950
650	2056

Draw the graph

Change in quantity offered for sale:- This is brought about by changes in price of the produce only. An increase in price from #250:00 to #300:00 shows an increase in quantity supplied by farmers from 1100 bags to 1250 bags. This will be so because the farmers want to make more profit and vice versa

Shift in Supply:- This is caused by any factor that can positively or negatively affect agricultural production. The farmer offered more or little for sale at the same price. Such factors include {un}favourable weather, improved technology, government subsidy, etc

Factors that affect supply of agricultural produce

(1) Price of commodity
(2)Price of other goods
(3)Changes in cost of production
(4) Technological advancement
(5) Changes in climate and weather
(6) Aims and objectives of the farmer
(7) Prices of factors of production
(8) Changes in the number of producers/ farmers

WEEK 8

DETERMINATION OF PRICE BY DEMAND AND SUPPLY

Market equilibrium is determined by the interaction of the forces of demand and supply which is influenced by price.
The price at which the quantity demanded equates the quantity of goods supplied is known as *Equilibrium/ market price* while the point where the demand curve meets the supply curve is called *Equilibrium quantity* .

Table Illustrating Interaction Between Demand
And Supply Of Agricultural Produce

Price of yam tubers [#/ ton]	Quantity supplied [tons]	Quantity demanded[tons]
2150	200	630
2250	250	580
2400	340	515
2500	450	450

2650	510	411
2750	570	380
2800	625	290

NB *:- Draw the graph*

Explanation- From the table above, equilibrium price Ep= #2500:00 and quantity supplied Qs= quantity demanded Qd= 450 tons of yam tubers. At any price lower than the Ep, Qd is always higher than the Qs i.e much money chasing few goods, the price shoots up and thus attracts more suppliers. Also at any price above the Ep, Qs is always larger than the Qd which means few money is chasing plenty goods. There will be glut and the price is reduced to avoid spoilage. These forceful interactions continue until the equilibrium price is attained.

Factors That Help In Maintaining The Equilibrium Price

1. Processing of excess produce into more durable forms
2. Distribution into non producing areas
3. Storage of excess farm produce
4. Subsidy by the government

IMPLICATIONS OF DEMAND AND SUPPLY ON AGRICULTURAL PRODUCTION

(1) Increase in number of farmers will lead to higher supply and reduction in price of food
(2) High cost of production may lead to low supply and high prices of products
(3) When demand for an agricultural product is lower than the supply, the price for such product will fall discouraging farmers from further production
(4)Higher supply of agricultural products by producers may lead to reduction in price and demand
(5) Supply of farm produce will be high when climate or weather for production of crops is favorable

(6) High cost of a particular product e.g. yam may lead to low demand for that product and high demand for a close substitute e.g. sweet potato.

WEEK 9:

COMBINATION OF FACTORS OF PRODUCTION
LAW OF DIMINISHING RETURNS

The law of diminishing returns states that as successive amount of a variable factor are added to a set of fixed factors, output might increase a lot but there comes appoint at which additional unit of the variable input will add less and later diminish the yield of the farm. The law shows the relationship between factors of production and output when various combinations of inputs are used. The law is illustrated thus:

Fixed Factors e.g Land, Capital plus other factors	Variable Factor e. g Labour	Total output kg	Marginal returns [product per unit of labour] kg
2	1	I25	-
2	2	184	59
2	3	279	95
2	4	358	79
2	5	399	41
2	6	430	31
2	7	438	8
2	8	425	-13

Draw the curve

From the table above, an increase in the number of labour from 1 to 3 brings about an tremendous increase in the total output than the preceding year i.e 59 and 95 respectively. This referred to as increasing marginal returns.
From 4 to 7 units of labour, total output keeps on increasing but at a reducing rate. This is referred to as decreasing marginal return
At 8 unit of labour, total output reduces i.e diminishing returns

Importance of The Law of Diminishing Returns

1. It shows the optimum level of input combinations.
2. It prevents wastage of inputs
3. It helps to determine level of salaries and wages
4. It helps in maximizing the input utilization

PROBLEMS OF A FARM MANAGER

1. In-adequate farm input
2. Problem of marketing
3. Administrative problem
4. Government policies
5. In-adequate information
6. In-adequate personnel
7. Transport problem
8 . Financial problem

AGRICULTURAL SCIENCE

CLASS: SSS THREE TERM: 1ST TERM

WEEK 1: CROP IMPROVEMENT

Crop improvement refers to the ways of developing and breeding varieties of crops that would perform better than the existing varieties in a number of characters.

Aims of crop Improvement

i To increase crop yield

ii. To breed crops with early maturity

iii. To meet the needs of growers eg uniformity in height for easy mechanization.

iv. To produce crops which can adapt to harsh weather and climatic conditions

v. To develop crop varieties that are resistant to pests and diseases

vi To develop crops that will meet the processors needs e.g seedlessness in citrus

vii To meet the needs of the consumers eg reduction in the time of cooking in cowpea

viii To improve the nutritional value of crop produce eg vitamin in cassava

Definition of Genetic Terms

i. Traits or Characters ii. Chromosomes iii. Genes iv. Gamete v. Zygote

vi. Allomorphs vii. Phenotype viii. Genotype ix. Dominant gene

x. Recessive gene

1. **Traits or Characters:** These are inherited attributes which plant breeders select e.g seed colour, disease resistance etc.
2. **Chromosomes:** These are rod or thread like shaped bodies found in the nucleus of a cell
3. **Genes:** They are hereditary units located in the chromosomes and are responsible for the transmission of traits from parents to offsprings.

4. **Genotype:** This is the trait or sum total of the genes inherited from both parents i.e the genetic make-up of an individual which can either be dominant or recessive e.g. TT for tallness or tt for shortness
5. **Phenotype:** This is the physical expression of the genes in an individual or the physical appearance of the individual.
6. **Dominant genes:** These are the genes whose effects are expressed in every individual e.g **TT** or **Tt** for tallness where **T** is a dominant gene
7. **Recessive genes:** These are the genes whose presence are suppressed example as in **Tt** (shortness) where **t** is a recessive gene.
8. **Gamete:** This is a mature sex cell which is involved in sexual reproduction.

Mendelian Laws of Inheritance

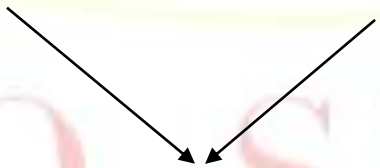
a. Mendel's 1st Law of Segregation of Genes: This law states that the characteristics of an organism are controlled by genes of which only one of the pair is passed to the offspring. It implies that genes are responsible for the expression an individual's traits and are independently transmitted from one generation to another without undergoing any alteration.

This law can be illustrated thus:

Genes: **TT** **tt**

Phenotype **Tall** **Short**

Gamete **T** **t**

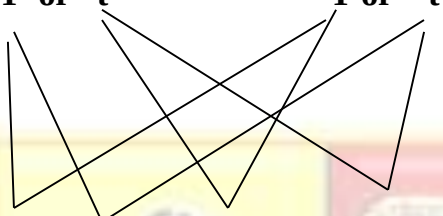


Offspring (F1) **Tt (Tall)**

When the offsprings from this combination are crossed, the following result would be obtained.

Parents: **Tt** **x** **Tt**

Gametes T or t T or t



Gametes TT Tt Tt tt

Genotypic expression of the offsprings are in the ratio of 1:2:1 while the phenotypic expression of the offsprings are in the ratio of 3 tall and 1 short. The segregation of these genes actually took place in the F2 generation.

b. Mendel's 2nd Law of Independent Assortment of Genes: It states that each character behaves as a separate unit and is inherited independently of any other character.

In an attempt to illustrate this law, two traits/characters are considered. For instance, crossing a parent plant with smooth and yellow seeds with another with wrinkled and white seeds.

Illustration:

Parents: Smooth and Yellow x Wrinkled and White

Genes SSYY ssyy

Gametes SY sy

F1 offspring SsYy (Smooth and Yellow)

In order to get the F2 generation where the F1 is crossed with another F1 generation, 16 offsprings would be obtained in the ratio of 9:3:3:1. This ratio could be better understood when a checker board is used for illustration.

SsYy x SsYy

The gametes would segregate as SY, sY, Sy and sy

	SY	sY	Sy	Sy

SY	SSYY	SsYY	SSYy	SsYy
sY	SsYY	ssYY	SsYy	ssYy
Sy	SSYy	SsYy	SSyy	Ssyy
sy	SsYy	ssYy	Ssyy	Ssyy

The result of this crossing in the F2 generation is:

Smooth and yellow seeds = 9

Smooth and white seeds = 3

Wrinkled and yellow seeds = 3

Wrinkled and white seeds = 1

Processes of Crop Improvement

The processes of crop improvement include introduction, selection, breeding or hybridization.

1. **Introduction:** This is the importation of some varieties of crop with desirable characteristics to areas where they have not existed before. Imported crops are first quarantine before planting. Introduction is done to upgrade the qualities of local varieties of crops.

Advantages

a. It may enhance greater productivity

b. It helps to upgrade quality of local varieties of crops

c. Crops with better characteristics are introduced

d. Absence of pests and diseases

Disadvantages

a. There is possibility of introducing new crop diseases and pests

b. The introduced crop may not be able to adapt to soil and climatic conditions in the new area

c. It may be costly when crops are imported from other countries.

2. **Selection:** This is the artificial picking of crops with desirable characteristics which are mostly favoured by the environment.

Methods of Selection

a. Mass selection: this involves the selection of many plants that show desirable traits for breeding

b. Pureline/individual selection: this occurs when only one plant with desirable qualities is selected

c. Pedigree selection; here, selection is based on the performance of the parents/ancestors

d. Progeny selection: this is the selection of plants based on the performance of the offsprings.

Advantages

i. It ensures that only the best naturally available crop is grown

ii. Crops with desired qualities are selected

iii. Crops with undesirable character are rejected

iv. It reduces the spread of diseases and pests

Disadvantages

i. Selection is tedious and time consuming

ii. It requires expertise which may not be available

iii. It brings about the elimination of some desirable traits of parent stock

3. **Breeding or Hybridization:** This is the method of crossing two different plant varieties of the same species to produce an offspring.

Types of Breeding

a. In-breeding: This is the pollination and fertilization of closely related crop plants, this can lead to pure line or pure breed.

b. Cross breeding: This is the pollination and fertilization of unrelated crop plants belonging to different breeds. Offsprings produced are superior to the performance of the parents; this is known as ***heterosis*** ***or*** ***hybrid vigour.***

Advantages

i. It can produce superior offsprings known as heterosis

ii. Offsprings can withstand variations of environment

iii. Progeny grows more rapidly

Disadvantages

i. It may lead to poor or low resistance to disease attack

ii. It can lead to depression or loss in vigour and performance of offspring known as inbreeding depression.

iii. There is drop in production or yield of crops in terms of quality and quantity.

Methods of improving crop productivity

Productivity of crops can be achieved through a combination of methods such as

1. Proper timing of planting
2. Crop improvement method
3. Adoption of better cultivation method
4. Use of manure and fertilizer
5. Control of pests and diseases
6. Use of resistant varieties of crops
7. Use of good crop varieties

WEEK 2: ANIMAL IMPROVEMENT

This refers to ways of developing and breeding only animals that show the greatest merit such as disease resistance, high growth rate, egg size, etc. It also involves the upgrading of existing local breeds as a result of some desirable characteristics they posses.

Aims of animal improvement

i. To produce animals that can give high yield of products such as milk, meat, etc

ii. To produce animals with high feed conversion efficiency

iii. To produce animals that can adapt to climatic or environmental conditions

iv. To produce animal varieties that can mature early

v. To produce animal varieties with increased resistance to pest and disease attacks

Processes of Animal Improvement

There are four processes or methods of animal improvement i.e Introduction, Selection, Breeding and Artificial Insemination.

1. **Introduction:** This involves bringing into the farm or country high quality breeds of livestock with high productive capacity and other good desirable traits. Introduction may involve the actual importation of an animal possessing the desired traits or its semen from its country of origin into a new area.

Types of breeds of animals

a. Local breeds

b. Exotic or imported breeds

c. Crossbreeds/Hybrids

Advantages of Introduction

i. Breeds may perform better in terms of quality and quantity, if it is able to adapt to local environment

ii. It takes less time to get animals with desirable qualities than through breeding

Disadvantages of Introduction

i. It may introduce new pests and diseases in the area

ii. It may have the problem of adaptation to the new area

iii It may not perform maximally

2. **Selection:** This is the process of picking or selecting from a mixed population, animals with desirable breeding values as parents.

Types of Selection

a. Natural selection: Animals that could not withstand variation in weather conditions may not survive especially in a new environment, hence they may die. When this occurred, it is assumed that nature has done the selection by way of "survival of the fittest".

b. Artificial selection: This type of selection is the one done by man and it include the following types

- Individual selection: Animals are picked on the basis of the performance of the individual animal
- Mass selection: A group of animals are selected based on the average performance of the group.
- Progeny selection: Selection is based on the performance of the offsprings.
- Family selection: Here, selection is done on the basis of the performance of the family members.
- Pedigree selection: Selection under this class is done on the basis of the performance of the parents.

Advantages of selection

i. Animals with undesirable characteristics are detected and rejected
ii. Animals from best breeds are bred for distribution
iii. Selection helps to reduce the spread of diseases/pests

Disadvantages of selection

i. It is tedious and time consuming
ii. It requires expertise which may not be readily available

3. **Breeding:** This involves breeding or development of animals by transferring inherited qualities from parents to offsprings mainly through mating.

Types of Breeding

i. In breeding: This involves the mating of two animals that are closely related to produce n offspring.

ii. Cross breeding: This involves the mating of two animals that are of same species but of different breeds.

Advantages of breeding

i. It brings about hybrid vigour or heterosis i.e the crossing or mating of superior animals

ii. Offsprings grow rapidly and the animals are more economical to rear

Disadvantages of breeding

i. It may result in poor resistance to disease and pest attacks

ii. It may result in reduction in vigour and performance

4. Artificial Insemination: This is the introduction of semen into the reproductive tract of the female by a method other than through natural mating. This method is done for female animals on heat. Methods of collecting semen from desired male animals for artificial insemination include:

i. use of artificial vagina to stimulate the male animal

ii. use of a dummy

iii. massaging the male organ (penis)

iv. recovery of semen from the vagina after ejaculation

v. use of electro-ejaculator

Collected semen is diluted and stored in a freezer under a very low temperature until when it is required for use. The diluted semen is deposited into the reproductive tract of a female animal on heat using a rubber syringe.

Advantages

i. It brings about reduction in the transmission of venereal and infectious diseases

ii. The semen of a good bull can still be used long after the death of the bull.

iii. The method is easier than natural mating

iv. It is cheaper to import the semen of exotic breeds than importing the animal.

v. Semen from a single proven male could be used to service many female animals.

vi. It improves the profit margins of the farmer

Disadvantages

i. It requires expertise which may not be readily available

ii. It may be difficult to detect heat in female animals

iii Semen, when not properly handled and stored may die before being used for insemination

iv. The method is easy for only female animals whose heat/oestrus cycles are easily detected.

WEEK 3: ANIMAL HEALTH MANAGEMENT

Disease: This is any abnormality in the functions of the tissues, organs or system of an animal's body.

Causes of livestock diseases

Diseases in livestock are classified based on their causes. Examples are those caused by Viruses (Viral diseases) e g. foot nd mouth disease, rinderpest, Newcastle diseases, etc ,

ii. Bacteria (Bacterial diseases) e. g. brucellosis, anthrax, tuberculosis, fowl typhoid, etc.,

iii. Fungi (Fungal diseases) e. g. ring worm, aspergillosis, etc,

iv. Protozoa (Protozoan diseases) e. g. coccidiosis, trypanosomiasis, etc

v. Malnutrition (Malnutritional diseases) e.g. rickets, kwashiorkor, marasmus, aenamia, osteoporosis/osteomalacia, etc

Resistance and Susceptibility

Resistance: This is when an animal is not affected by an invading pathogenic disease causing organism or pathogen. Resistance of an animal to disease attack depends on age and specie of animal, level of feeding, development of immunity, etc. Susceptibility on the other hand is when an animal is not able to ward off the effect of an invading pathogenic organism.

Factors that can predispose animals to diseases

i Poor housing

ii. Sanitation

iii. Health status of animal/nutrition

iv. Management system

Economic importance of animal disease

a. It leads to poor feed utilization by animals

b. It brings about low yield of production

Methods of preventing diseases

i. Isolation

ii. Vaccination.

iii. Quarantine

iv. Hygiene

v. Good feeding

vi. Rotational grazing

WEEK 4: ANIMAL HEALTH MANAGEMENT

Livestock Parasite

Parasite is an organism living in or on another organism called the host. Parasite derives benefits such as food, shelter, etc from the host while in most cases the host is harmed or injured. A parasite living inside the host is called an endoparasite e.g tapeworm, round worm, liver fluke, etc while the one living on the body of the host is called an ectoparasite e.g tick, fleas, lice, etc.

A. Endoparasites

1. **Roundworm: - Ascaris lumbricoides**

The roundworm is an elongated cylindrical white worm with pointed ends and smooth body covered by thick, tough cuticle of few centimeters long.

Life cycle of Roundworm

Eggs are fertilized in the female worm and the larvae develop within the egg shells. The eggs are deposited in the intestine of pig where they are passed out with the faeces into the soil and remain there for years.

Economic Importance of Roundworm

i. High infestation can affect respiration of host
ii. They reduce growth of host animals
iii. They cause slow growth in affected animal
iv. Infestation results in poor appetite

Control

i. Deworm pigs with piperazine drugs regularly
ii. Practice and maintain good sanitation
iii. Animals should be given good and clean water and feeds

2. **Tapeworm: - Taenia solium**

Tapeworm is a long endoparasite flatworm that has a very small head, neck and long segmented body. It belongs to the group platyhelminthes. It can be found in pigs and cattle which are the secondary hosts while man is the primary host.

Economic Importance of Tapeworm

Infestation of Tape worm causes the following problems in affected animals

i. Indigestion
ii. Anaemia
iii. Abdominal pain or discomfort
iv. Weakness
v. Poor growth rate

Control

i. Practice good sanitation for livestock
ii. Cook meat properly before eating

3. **Liver fluke: Fasciola hepatica**

The liver fluke is a flattened leaf-like organism brown in colour and about 2cm long. Farm animals like cattle, sheep and goat are the primary hosts while snail (Limnaca truncatula) is the secondary host.

How to break the life cycle of liverfluke

1. Control weeds along river sides
2. Periodic burning of pasture to kill eggs in faeces

Economic Importance of Liver fluke

i. It causes anaemia i.e inability to produce blood/shortage of blood
ii. It causes liver rot and may lead to death
iii. It may obstruct digestive process
iv. Severe infestation may cause death of infested animals

Control

i. Introduce duck and geese to eat up snails
ii. Drain pasture properly
iii. Practice rotational grazing and control movement of livestock

B. **Ectoparasites**

i. **Tick:** This is an ectoparasite of cattle, sheep and goat. The body is divided into head and abdomen. It has four pairs of tough leathery integument and a toothed hypostome used for sucking blood of host.

Life cycle of tick

It occurs in four stages; egg, larvae, nymphs and adult stages

Economic Importance of Tick

i. They suck blood leading to anaemia
ii. They cause irritation which results in restlessness
iii. Injuries caused may become source of secondary infection

Control

i. Animals beddings should be changed regularly
ii. New stock should be isolated
iii. Rotational grazing should be adopted
iv. Ticks on the body of the animal could be hand picked while cattle egrets could also be allowed to peck the parasite

2. **Life Cycle of Lice**

Lice spend their whole life on the surface of the host. They lay their eggs called nits on the hair or feather of the host. The young one called the nymph emerges from the hatched egg and becomes the adult louse after series of mounting of skin. Life cycle takes about 3- 4 weeks. Transmission from host is by body contact.

Economic Importance of Lice

i. They suck blood which leads to anaemia
ii. They act as vectors of diseases
iii. Attack causes low productivity
iv. Infected young animals show signs of retarded growth
v. Sores from scratching expose animals to further infections

Control

i. Maintain clean surroundings
ii. Ensure regular dipping of animals
iii. Spray infected animals' body with insecticides

WEEK 5: AQUACULTURE OR FISH FARMING

Fish farming is the act of rearing selected species of fish such as crabs, prawns, shellfish, etc under scientifically controlled condition in enclosed bodies of water such as pond, lakes, tanks, etc.

Terminologies

Fisheries – The study of fish and fishes

Pond – Artificial body of water where fish(es) are reared

Fingerlings – Baby fish(es)/young fish(es) (weeks old)

Fry - Newly hatched fishes (days old)

Juvenile – A young fish

Hatchery - An artificial unit where eggs are incubated and hatched artificially

Aquarium – Artificial fish pond kept for experiment /aesthetic or entertainment purposes at home

Importance of fish farming

i. Fish is a source of food and protein

ii. Source of employment and income to people

iii. Source of recreation

iv. Source of income

v. It can serve as a source of foreign exchange when exported outside the country.

vi. Scales of fish can be used as ornaments.

Conditions or factors for siting a fish pond

a. Soil in the area (Clayey soil is necessary for an earthen fish pond)

b. Adequate water supply

c. Vegetation of area

d. Topography

e. Basic infrastructure

f. Security

g. Accessibility

Classification of fishes

Fishes are classified into 2 main groups

1. <u>Classification based on habitat</u>

a. Fresh water fishes

b. Salt water fishes

2. Classification based on body structure

a. Bony fishes

b. Cartilaginous fishes

Features of a standard fish pond

i. Dam ii. Core trench iii. Distribution channel iv. Spill way

v. Monk/Outlet vi. Inlet

Operations to be carried out when constructing fish pond

i. Site selection ii. General survey iii. Clearing and stumping of site iv. Pond fertilization

Maintanace of fish pond

1. Desilting 2. Constant supply of water 3. Aeration 4. Regular water and erosion control 6. Pest control

Fish processing and preservation

- Fish Processing
- Fish Preservation

i. Salting

ii. Canning

iii. Smoking

iv. Freezing

Fishing tools or gears

They are tools used for harvesting or cropping of fishes. These include Fishing nets such as Scoop net, Gill net and Seine net

ii. Fishing trawlers

iii. Fishing basket

iv. Hook and Line

Fishery Laws and Regulations

Fishery regulations are sets of rules and laws governing the exploitation and other practices of fishery resources especially in open access water. They are also laws made by government in order to control and protect fish harvesting so that they don't go into extinction.

These regulations include:

i. Allocation of fishing area
ii. Close season: prohibits fishing activity within a given period of time
iii. Population control: requires the use of other fish species to control population explosion in the pond
iv. Regular stocking: involves the addition of desired species into the pond in order to increase the number of fishes in the pond
v. Prevention of vessels: this is the prevention of use of vessels within the first two nautical miles of the Nigerian territorial waters.
vi. Prohibition of use of explosives and poisonous substances to kill fishes

Ways of making fishery regulations effective in Nigeria

- Revocation of license
- Simple presentation to farmers
- Use of local or native language
- Use of law enforcement agents

WEEK 6: APICULTURE / BEEKEEPING

Apiculture is a branch of agriculture that deals with the rearing of bees in an enclosed environment for the production of honey and other by products.

Importance of beekeeping

i. Little space is required for rearing
ii. Honey produced is a source of income
iii. Beekeeping serves as source of employment

Types of Bee

i. Queen ii. Workers iii. Drones

Bee Products

i. Honey ii. Royal jelly iii. Wax iv. Honey poison

Bee Keeping Equipment

i. Hand gloves
ii. Hooded suit or hat
iii. Face mask
iv. Overall clothing
v. Hive and hive tool
vi. Jungle boots and brushes
vii. Smokers

Methods of Bee Keeping

a. **Traditional Bee Keeping:** this is the keeping of bees in artificial hives made from wooden boxes, pottery vessels or woven straw baskets. At time of harvest, the entire colony would be destroyed using smoke.

b. **Modern Bee Keeping:** this involves the keeping of bees in movable hives which allow for better inspection of bee colonies in their hives.

Precautionary Measures in Bee Keeping

i. Always wear protective clothings
ii. Locate apiary far away from human dwellings
iii. Use bee smokers
iv. Put warning signs/symbols near the apiary

WEEK 7: AGRICULTURAL FINANCING

i. Agricultural Finance
ii. Agricultural Credits

Agricultural Finance is the acquisition and utilization of money required for agricultural production. Agricultural credit refers to the financial assistance/loans received by the

farmer to start and run/or expand his farm business. Agricultural credits are repayable with interest over a specified period of time.

Importance of Agricultural Finance

i. It helps to determine the area of land that a farmer can cultivate effectively;
ii. It is required for increased output;
iii. Agricultural marketing is enhanced with availability of adequate finance
iv. It helps to guard against some uncertainties
v. It increases the efficiency of farm operations

Types of farm credits

i. Short term credit: This is a type of loan that is obtained, utilized and paid back within a short period of time usually within a year or two.
ii. Medium term credit: This type is paid back within a period of two and five years.
iii. Long term credit: Long term credits are paid back after five years of acquisition.
iv. Interest: Interest is the amount of money that is payable on the credit facility obtained by an individual either from banks, individuals or other lending agencies.

Differences between subsidy and credit

S/N	Credit	Subsidy
1.	It is repayable	It is non-repayable
2.	It is always in cash	It may be in cash or kind
3.	It has a time period for refunding	It is given and never to be returned

WEEK 8: AGRICULTURE FINANCING

Sources of Farm Finance

i. Individuals
ii. Cooperative Societies
iii. Agricultural Banks
iv. Supervised Agricultural Credit Scheme

v. Self financing
vi. Thrift and Savings
vii. Commercial Banks
viii. Money Lenders
ix. Government Agencies

WEEK 9: PROBLEMS FARMERS ENCOUNTER FROM SOME CREDIT SOURCES

1. **Family sources**
- Loan is usually small and inadequate
- It can only be used for short term purpose
2. **Community Banks**
- A would-be lender must first open account with them before obtaining loans
3. **Money lender**
- Interest rates are too high for farmers to pay back
4. **Commercial Banks**
- They are biased because they usually favour large scale farmer

Implications of Farm Credits

Famers find it difficult to obtain loans from banks due to the following reasons:

i. Bureaucracy
ii. Lack of collateral security
iii. Small farm holding
iv. Lack of farm records
v. Lack of insurance policy
vi. High interest rates
vii. Lack of moratorium
viii. Long gestation period of some crops

ix. Unpredictable climate that can lead to crop failure

x. Lack of awareness

TERM: 2ND TERM

WEEK 1: FARM RECORDS AND ACCOUNTS

Farm Accounts: These are statements of money paid out (for purchase of farm produce, settlement of debts, etc) or received (due to sales of farm produce or loans) used in farming business.

Farm Records: These are written documents that show major activities going on in the farming business.

Importance of Farm Records and Accounts

i. Farm records help to tell the history of the farm business

ii. To determine the actual worth of a farm

iii. They help to determine whether profit or loss is made

iv. They help in farm auditing

v. They assist in providing the farmer with figures for planning and budgeting purposes

vi. They help the farmer to obtain loan from banks

vii. They assist in eliminating fraudulent practices on the farm.

Types of Farm Records

i. **Farm Diary:** This record shows the day-to-day activities on the farm. All important activities on the farm are recorded accordingly. Below is an illustration

Date	Work done	No. of worker	Duration	Wage rate	Total wage	Remarks

ii. **Farm Inventory:** this is used to document all assets that are available to the farmer on the farm. Aside from recording the property of the farm, the monetary value of each item/asset is also recorded in the book. Inventory is usually done at the beginning and middle of the year.

S/N	Farm Asset	Quantity	Date of purchase	Amount (₦)

iii. **Farm input record:** is used to note all items/inputs used in the running of the farm.

Date	Input used	Quantity used	Purpose/Remarks

iv. **Production record:** is a record which shows all that is produced on the farm at the end of each farming season. This record could be crop production record or livestock production record.

Crop Production Record

Crop Type	Date of Harvesting	Quantity Harvested	Remarks

Livestock Production/Breeding Record

Type of Animal	No Bought	No Delivered	No. that died	No. sold	Remarks

v. **Sales record:** shows all the sales made by the farmer either on a daily, weekly or monthly basis.

Date	Item sold	Quantity	Rate	Amount	Remarks

vi. **Consumption record:** shows all items produced on the farm and consumed by the farmer and his family

Date	Details of items consumed	Amount	Remarks

vii. **Expenditure and income record:** the monetary value of inputs utilized in the farm and output from the farm are recorded in this record.

Expenditure Details	Income Details	Remarks

WEEK 2: FARM ACCOUNTS

Farm Accounts: are the financial statements of all transactions on the farm stating all monies received or paid out by the farmer within an accounting year. The farm accounts enable the farmer to know whether the farmer is actually making a profit or incurring losses at any given period of time.

Types of Farm Accounts

i. **Expenditure account:** gives the details of all items purchased and utilized on the farm. Hence, it is also known as the Purchase account.

ii **Income and sales account**: gives a detail of farm items/produce sold, type of item, quantity sold, date of sale and amount sold.

iii. **Profit and Loss account:** contains a record of the income from the sales of farm items and expenses incurred. It shows a picture of the profit or loss incurred during the accounting period, which is usually a year.

iv. **Balance sheet:** this gives a detail of the financial standing of the farm as it relates to the farm assets and liabilities as at the close of the accounting year usually a year.

Definitions of some accounting terms

1. **Liabilities:** are all the external debts of the farm business i.e. the amount that the business owes to persons other than its owners
2. **Farm Assets:** are those items either owned by the farmer or owed the farmer. They could be physical items or cash (fixed or current assets)
3. **Useful life of an asset:** is the period in which an asset can conveniently be used on a farm with little or no maintenance after which it is termed a scrap .
4. **Appreciation:** is the increase in value of an asset over a given period of time.
5. **Depreciation:** is the reduction in the value of an asset over a given period of time. Depreciation could be calculated using the straight line method or the sum of the year digit.
6. **Salvage value:** is the value of an asset after its useful life span or the amount realized from the sale of an asset after its life span.

WEEK 3: MARKETING OF AGRICULTURAL PRODUCE

Agricultural marketing involves all the activities required in the movement of farm produce from the producer (farmer) to the final consumers.

Importance of Marketing

1. It enables producer to know the taste of consumers
2. It locates areas of surplus and brings them to areas of shortage
3. It provides employment opportunities for people engaged in farming directly or indirectly

4. It ensures the availability of of seasonal crops throughout the year
5. It makes provision the of credit facilities to farmers
6. Government generates revenue through levies

Marketing Channels

These are pathways or channels through which farm produce pass through to get the final consumers. They are:

i. Local market
ii. Cooperative societies
iii. Middlemen
iv. Commissioned agents

Functions or stages of agricultural marketing

i. Processing
ii. Advertisement
iii. Trading
iv. Packaging
v. Assemblage
vi. Transportation
vii. Bank financing
viii. Branding

WEEK 4: MARKETING AGENTS

Marketing agents are people or bodies who are involved in the marketing of farm produce. They include

1. Producer/farmer

Advantages:

i. Consumers get product fresh
ii. Consumers get goods at reduced prices

Disadvantages:

i. Lack of storage facilities,

ii. It diverts farmer's attention at reduced prices.

2. Cooperative society

Advantages:

i. They sell at reduced rate,

ii. They provide storage facilities

iii. They counter the exploitative tendencies of middlemen

iv. They enjoy the advantages of large scale production

Disadvantages:

i. It is prone to financial misappropriation;

ii. It does not encourage individual enterprise

iii. It may take some time before a decision is reached

3. Wholesaler

Advantages:

i. They purchase produce in bulk,

ii. They have good transportation facilities

iii. They grant credits to retailers thereby boosting trading

Disadvantage:

i. They inflate prices of produce,

ii. They exploit producers and retailers

4. Retailers

Advantages:

i. They give credit to consumers,

ii. They make produce readily available to consumers

iii. They sell in smaller quantities to consumers

iv. They inform wholesalers about changes in the taste/choice of consumers.

Disadvantages:

i. They can suffer loss due to pilfering and decay of perishable goods,

ii. They hoard produce

iii. They sometimes arbitrarily inflate prices of farm produce.

WEEK 5: WAYS OF IMPROVING OR ENCOURAGING MARKETING OF AGRICULTURAL PRODUCE

1. Provision of good roads
2. Provision of sufficient capital or finance
3. Provision of adequate market infrastructure
4. Provision of storage facilities
5. Market research
6. Good government policies

Characteristics or Features of Agricultural Produce

1. Perishability i e farm produce gets spoilt shortly after harvesting cannot be held for a long period

2 Bulkiness ie farm produce are heavy and needs to be carried with special device need for transportation

3 Processing most agricultural produce have to be transformed to a new form before they can be consumed. This is so because they possess poisonous materials eg cassava

4 Seasonality Each crop has its own time of the year when it is usually in abundance. This calls for a storage device to make it available throughout the year

Problems of Agricultural Marketing

1. Perishability of farm produce
2. Problems of middlemen
3. Inadequate processing facilities
4. Frequent changes in price
5. Poor financing
6. Subsistence agriculture

7. Problem of assemblage
8. Contamination of products

WEEK 6: AGRICULTURAL EXTENSION

Agricultural extension is an informal, out-of–school voluntary agricultural education that involves the dissemination of information in agriculture from researchers to farmers through extension agents. The new ideas are aimed at improving the farming techniques and output/outlook of the farmers

Roles/Functions/Objectives of Agricultural Extension

1. An intermediary between farmers and research institutes
2. Supervision of Agricultural Development Programmes
3. Teaches improved farming practice
4. Identification of proper marketing channel
5. It helps to source and procure farm inputs
6. It assesses agricultural extension programmes and projects
7. It helps farmers to help themselves
8. It assists the farmers to improve their social and cultural well-being.
9. To teach rural people how to recognize and take interest in their problems so as to overcome them
10. To evaluate successes or shortfalls of extension programme

Problems of Agricultural Extension in West Africa

1. Inadequate extension workers
2. Undefined roles for agent
3. Delay in information dissemination
4. Non-involvement of extension officer
5. High level of illiteracy among farmers

6. Conservative attitude of farmers
7. Inaccessibility of rural communities
8. Poor remuneration of extension agents
9. Bureaucratic bottlenecks in the implementation of government policies

Target Groups of Extension Agents

- Farmers Cooperative Societies
- Nomads, Youth Organizations e.g Young Farmers' Clubs
- Commercial and subsistence farmers
- Fishermen / fish farmers
- Non-Governmental Organization (NGO)
- Beekeepers
- Community Development Associations (CDAs)

Methods of dissemination new ideas and techniques to farmers

These are media or channels through which new ideas and techniques are disseminated to rural farmers. We have three methods viz: individual, group and mass media

1. **Individual Method:** The individual farmers are contacted either in their homes or directly on their farms where the new innovations are passed across to them.
2. **Group Method:** Under this method, a group of farmers are involved. Here, mode of information dissemination could be through lectures, symposia, group discussion, workshops and demonstrations.
3. **Mass Media:** Involves passing information across to a large number of farmers at the same time through the media such as radio, television, posters, handouts, etc.

a. Electronic Media e.g. Television set, radio, film shows

b. Print Media e.g. Newspapers, News Bulletin, pamphlets, circulars, etc

Agricultural Extension Programmes in West Africa

Examples of Agricultural Programmes

* Farm Settlement Scheme
* Agricultural Development Project (ADP)
* Directorate of Food, Road and Rural Infrastructure (DFFRI)
* Agricultural Loan schemes
* Green Revolution
* Operation Feed the Nation
* National Fadama program.

WEEK 7: ADOPTION OF INNOVATION

The rate at which new innovations are imbibed or accepted by farmers depend on several reasons:

Factors affecting the rate of adoption of innovation

1. Financial status of farmer
2. Level of education
3. Attitude of farmer
4. Result of demonstration
5. Size of farm
6. Culture
7. Belief of the farmer
8. Presence of extension workers/agent

Categories of farmers based on adoption of innovation

1. Innovators
2. Early adopters

3. Late adopters
4. Never adopters
5. Laggards

Qualities, Functions and Problems of Extension Agents

An Extension Worker/Agent is an individual who had been trained technically and professionally to disseminate new farming techniques to farmers/rural dwellers. He acts as an intermediary, responsible for disseminating new ideas and techniques from research institutes to farmers.

Qualities of a good Extension Worker

1. Good leadership traits
2. Respect for culture and tradition
3. Problems solving ability
4. Originality
5. Organizational ability
6. Technical knowledge

Functions/Roles of Extension Worker

1. He organizes and supervises farmers
2. He teaches the farmers new farming practices/techniques
3. He acts as intermediary between researchers and farmers
4. He assists farmers to source for and utilization of loans, input, e.t.c
5. He conducts and organizes training for farmers

Problems Facing Agricultural Extension Officers

1. Language barrier
2. Inadequate resources
3. Non-involvement of farmers in planning programme
4. Inadequate trained extension agents

5. High level of illiteracy on the part of the farmers