COURSE GUIDE

COP 621
GENERAL AGRICULTURE I

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INTRODUCTION

COP621: General agriculture I is a one -semester, two units, 600 level course. The course is designed for Post-Graduate Diploma students of Cooperative Studies.

This course will expose you to an understanding of many of the concepts in general agriculture. It will assist you to be able to have wider knowledge of the various fields of agriculture such as crop science, soil science and animal science.

The course which consists of twenty (20) units includes: Concepts of agriculture, prospects and problems of agriculture, measures of improving Nigeria agriculture, agriculture and natural environment, land use and land tenure in Nigeria, basic principles of crops production, classification of crop plants, pasture and forage crops and soils for agricultural production. Others include- farm animal production-ruminant, farm animal production- systems of cattle management, farm animal production -pig production, poultry production and management, management of chicks, broilers, cockerels and layers, agricultural extension services, agricultural extension and rural development, forest production in Nigeria, wildlife production and fish production in Nigeria.

This course guide tells you briefly what the course is all about, what course materials you will be using and how you can work your way through these materials. It suggests some general guidelines for the amount of time you might be spending in order to successfully complete each unit of the course. It also gives you some guidance on your tutor-marked assignments, details of which will be made available in the assignment file. These are regular tutorial classes that are linked to the course. You are advised to attend these sessions.

WHAT YOU WILL LEARN IN THIS COURSE

Cop 621: General Agriculture I consists of all the major parts of general agriculture. The major parts include: general agriculture, crop science, soil science, animal science, forestry, wildlife and fishery.

The first five units will introduce you to general agriculture. Issues discussed in these units are as follows: Unit one deals with the meaning of agriculture, the scope and types of agriculture. Unit two will also look at the importance of agriculture to the economy of Nigeria and problems of agricultural development. Unit three will highlight the measures put in place to improve agriculture in Nigeria. In unit four we will discuss the natural vegetation of Nigeria in relation to agriculture. We will also

look at the relationship between agriculture and environmental factors. While in unit five we will look at land and its uses, the type of land tenure system in Nigeria and land use decree.

Crop science will cover the major parts of our discussions in units six to nine. In unit six we will discuss the essential parts of a typical crop plants which include-stem, leaf, flower and root. Unit seven describes all the farming operations carried out before, during and after crop planting is done. In unit eight we will classify crop plants using mode of cultivation, lifecycle and the use of the plants. In the same unit we shall present the summary of production of some important crops. The last unit in this section will be devoted to pastures and forage crops production.

Unit 10 will look at another specialised area of agriculture called soil science. The essential aspects of soil science that we need to know are the meaning of soil, soil erosion and ways of improving soil fertility.

Farm animal production will cover our discussions in units eleven to fifteen. Unit eleven will look at ruminant animals especially cattle, sheep and goats. As follow-up to unit eleven, the next unit will look at the systems of managing cattle. Some important aspects of pig production that will be highlighted in unit thirteen include- economic importance of pig, characteristics of pig, selection of pig for breeding, management of pigs and disease of pigs. The last two units of this section will be on poultry production. Unit fourteen will look at the management of poultry. The last unit in this section will highlight the management of chicks, broilers, cockerels and layers.

Agricultural extension services take units sixteen and seventeen. Some of the essential aspects of agricultural extension services that will be discussed include- the meaning, objectives and the role of agricultural extension, qualities of a good extension officer, development of agricultural extension in Nigeria and the problems facing agricultural extension in Nigeria.

Other areas that unit seventeen will look at are: rural development rural, poverty, social system, social change, training and visit system and general administration of agricultural extension.

The last three units of the study guide discuss another specialised area of agriculture. Unit eighteen will be on forestry production followed by wildlife in unit nineteen and fish production in unit twenty.

COURSE AIMS

The aim of the course is to give an understanding of the meaning of the various concepts of agriculture. This will be achieved by trying to:

- introduce you to the definition and meaning of the various concepts in agriculture
- describe the various land use and land tenure systems in Nigeria
- describe the various classifications of crop plants
- describe the cultural practices commonly used by farmers in crop production
- outline the systems of managing farm animals
- explain the production systems used in forestry, wildlife management and fishery.

COURSE OBJECTIVES

In order to achieve the aims set out above, there are sets of overall objectives. Each unit also has specific objectives. The unit objectives are always included at the beginning of each unit. You need to read then before you start to work through the unit. You may also want to refer to them during your study of the unit to check your progress. You should always look at the unit objectives after completing a unit. In doing so you will be sure that you have followed the instructions in the unit.

Below are the wider objectives of the entire course. By meeting these objectives you should have achieved the aims of the course as a whole. On successful completion of the course, you should be able to:

- define the concept of agriculture
- identify the contributions of agriculture to the economy of Nigeria
- outline the problems of agricultural development in Nigeria
- suggest solutions to the problems of agricultural development in Nigeria
- describe the effects of climatic factors on agricultural production
- identify the various land tenure systems in Nigeria
- describe the external features of a typical crop plant
- state the various farm operations carried out before, during and after planting
- classify crop plants using lifecycle and use of the crop
- give examples of forage grass and forage legumes found in Nigeria
- explain the various methods of improving soil fertility
- describe the systems of managing cattle, sheep, goats and pigs

- highlights the economic importance of cattle and pigs
- determine the factors that influence the sitting of poultry farm
- explain the management of the following categories of chicken-chicks, broilers, cockerels and layers
- define agricultural extension, forestry, wildlife and fishery
- list the economic importance of forests, wildlife and fish production in Nigeria
- explain the establishment of fish pond.

COURSE REQUIREMENTS

To complete this course you are required to read the units, read suggested books and other materials that will help you achieve the objective. Each unit contains tutor marked assignments and at interval in the course you are required to summit assignment for assessment purpose. There will be final examination at the end of the course.

During the first reading, you are expected to spend a minimum of two hours on each unit of this course. During the period of two hours you are expected to read through the text of the unit and also answer the self assessment exercise and questions. As a two unit course, it is expected that the lecture contact hours will be eight (8). In addition to eight (8) hours of lectures with the course facilitator, tutorial classes will also be organized for students to discuss the technical areas of this course. In addition to the tutorial classes, I would also advice that you form discussion group with your mates to discuss some of these questions. Discussion group of between three to five people will be ideal.

COURSE MATERIALS

You will be provided with the following materials for this course

i. course guide
   The material you are reading now is called course guide which introduced you to this course.
ii. study guide
   The textbook prepared for this course by National Open University of Nigeria is called study guide. You will be given a copy of the book for your personal use.
iii textbooks
   At the end of each unit, there is a list of recommended textbooks which though are not compulsory for you to acquire or read, but are necessary as supplements to course materials.

STUDY UNITS

There are twenty (20) study units in this course. They are arranged as follows:

MODULE 1

Unit 1 Concept of Agriculture
Unit 2 Prospects and Problems of Agriculture
Unit 3 Measures of Improving Nigerian Agriculture
Unit 4 Agriculture and Natural Environment
Unit 5 Land-Use and Land Tenure System in Nigeria

Module 2

Unit 1 Basic Principles of Crop Production
Unit 2 Principles of Crop Production: Cultural Practices
Unit 3 Classification of Crop Plants
Unit 4 Pasture and Forage Crops
Unit 5 Soils for Agriculture Production

Module 3

Unit 1 Farm Animals Production: Ruminants
Unit 2 Farm Animals Production: Systems of Cattle Management
Unit 3 Farm Animals Production: Pigs production
Unit 4 Poultry Production and Management
Unit 5 Management of Chicks, Broilers, Cockerels and Layers

Module 4

Unit 1 Agricultural Extension Services
Unit 2 Agricultural Extension and Rural Development
Unit 3 Forest Production in Nigeria
Unit 4 Wildlife Production in Nigeria
Unit 5 Fish Production in Nigeria

Each unit includes a table of contents, introduction, specific objectives, main content, conclusion, summaries of key issues and ideas, Tutor-Marked Assignments and references / further readings. At intervals in each unit, you will be provided with a number of exercises or self-assessment questions. These are to help you test yourself on the material you have just covered or to apply it in some way. The value of these self-test is to help you evaluate your progress and to re-enforce your understanding of each unit. The exercises and the tutor marked

assignment will help you in achieving the stated learning objectives of the individual unit and of the course.

TEXTBOOKS

For detailed information about the areas covered in this course, you are advised to consult more recent editions of the following recommended books.

Akinsanmi, O. (1975). *Certificate Agricultural Sciences.* London: Longman Group Ltd.

Anyanwu, A.C., Anyanwu, B.O. & Anyanwu, V.A. (1986). *Agriculture for School Certificate.* (4th ed.). Onitsha: Africana-Fep Publishers Ltd.

Erebor, O. (1998). *Comprehensive Agricultural Science for Senior Secondary Schools*. Lagos: Johnson Publishers Ltd.

ASSESSMENT

There are two components of assessment for this course

1. Tutor- Marked Assignment (TMA)
2. End of Course Examination

TUTOR- MARKED ASSIGNMENT (TMA)

The TMA is the continuous assessment component of this course. It accounts for 30 percent of the total score. You will be given six TMAS to answer. At least four must be answered from where the facilitator will pick the best three for you. You must submit all your TMAS before you are allowed to sit for the end of course examination. The TMAS would be given to you by your facilitator and returned to him or her after you have done the assignment.

END OF COURSE EXAMINATION

This examination concludes the assessment for the course. It constitutes 70 percent of the whole course. You will be informed of the time for the examination through your study centre manager.

SUMMARY

COP 621: General Agriculture 1 is designed to provide background information on agriculture for students of post graduate diploma in cooperative studies. By the time you complete studying this course, you will be able to answer the following type of questions:

- What is agriculture?
- What are the importances of agriculture to the economy of Nigeria?
- What are the problems facing agricultural development in Nigeria? Suggest solutions to them.
- How do temperature, rainfall and sunshine affect agricultural production?
- Describe any three types of land tenure in Nigeria stressing their advantages and disadvantages
- Outline all the pre-planting and post-planting farm operations
- Classify crop plants using their lifecycle pattern
- Describe the effects of soil erosion on agricultural production
- Explain how forage crops are process by ruminant
- Describe the various types of manure use for crop production
- List the advantages and disadvantages of extensive system of cattle management
- List the advantages and disadvantages of battery cage system of poultry keeping
- Outline the factors that influence the sitting of poultry farm.
- Define agricultural extension and list the objectives of agricultural extension
- Define forestry, wildlife, fishery and fish farming
- Explain the economic importance of forests to the economy of Nigeria.

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MODULE 1

UNIT 1 CONCEPT OF AGRICULTURE

CONTENTS

1.0 INTRODUCTION

Cop 621- General Agriculture I is one of the courses designed to give students of cooperative, background information on agriculture. The course is similar in content to cop111- Introduction to general agriculture I and cop112- General agriculture II. You are advised to read through the course guide before reading through this book so as to have an idea of what this course is all about. This unit will introduce you to the course. The area covered in this unit includes the meaning of agriculture, scope of agriculture and types of agriculture.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- define agriculture
- list at least five different fields of agriculture
- state the functions of at least five fields of agriculture
- explain four types of farming practiced in Nigeria.

3.0 MAIN CONTENT

3.1 Meaning of Agriculture

Originally the term agriculture is derived from two Latin words “Ager” and “Cultura”. Ager means land and cultura means cultivation i.e. tilling the soil and preparing it for planting of crops. Putting the two words together i.e. land and cultivation, agriculture could be regarded as land cultivation.

In this modern day farming, this definition is no longer acceptable as agriculture means more than land cultivation. Modern agriculture therefore could be defined as the production of crops and rearing of animals for the purpose of producing food for man’s use and raw materials for industries.

Generally speaking, modern agriculture involves the following activities:

- cultivation of the land for the production of crops
- rearing of farm animals for the production of food and raw materials
- partial processing of farm products
- preservation and storage of farm products, and
- marketing of agricultural products.

From the above definition, it implies that modern agriculture does not end in the production of food for man alone. In this modern day farming, farmers also cultivate land for the production of crops for feeding livestock. Similarly, farmers grow cotton not for food but to supply raw materials for textile industry. The conversion of raw cassava tuber to gari and groundnut into groundnut oil and groundnut cake comes under the term processing.

A farmer’s job therefore includes the production of large quantities of the farm products, preserving them against wastage and selling them to make profit which he add to his capital or uses in obtaining other necessities of life.

3.2 Scope of Agriculture

The scope of agriculture is as wide as human endeavor, because there is no part of human activity that is not touched by agriculture.

The discussion of the areas of specialisation in agriculture will give us an insight into the scope of agriculture.

This area of specialisation will be classified into three. All the areas related to plant activities will be grouped under crop husbandry, those relating to animal activities will be grouped under animal husbandry and others that cannot fit into these two groups will be classified as other areas.

3.2.1 Crop Husbandry Areas

Agronomy
This is the study of crop production practices and soil management. Agronomists study plant life, and soil and their complex relationship. Agronomists attempt to develop techniques that will increase the yield of field crops, improve their quality, and enhance production efficiency and profitability, while conserving the fertility of the soil.

Agronomic research has resulted in important new strains of disease-resistant plants and in the development of such practices as the selective breeding of crops and the use of chemical fertiliser.

Horticulture
Is the science and art of growing fruit, vegetables, flowers, shrubs and trees. Horticulture originally meant the practice of gardening and, by extension now means the cultivation of plant once grown in garden. In contrast, the term agriculture by derivation, referred to more open forms of culture such as the production of grains and grasses, known as agronomic crops. There is therefore no clear cut distinction between crop science and horticulture.

- Pomology: Is the study of fruits especially tree fruits
- Floriculture: The production of vegetable crops
- Floriculture: The production of flowers
- Soil Science: The study of soil management which includes:
    - proper tillage
    - maintenance of organic matter
    - maintenance of proper nutrient supply
    - control of soil pollution
    - maintenance of correct soil acidity
    - control of erosion.

Crop Science
This is the branch of agriculture that involves the production of crops. It is regarded as an aspect of agronomy that deals with crop production and management only.

Crop Protection
This is another branch under crop husbandry that study crop pests and diseases and their control.

Entomology
Entomology is the study of insect pests. This is an important aspect of agriculture as about 20% of the total loss of agricultural products is attributed to insect pests.

Forestry
This is another important branch of agriculture that is concerned with the management of forest trees. It is also called silviculture.

Plant Pathology
This is the field of agriculture that deals with plant diseases. Those who specialise in this field of study are called plant pathologists.

Plant Breeding
Plant breeders are concerned with the raising of hybrid or improved varieties of crops. Their areas of concern among others include:

- improvement in the size of seed or fruit
- colour of seeds/fruits
- resistance to pests and diseases
- resistance to drought and other harsh weather condition
- reduction in the height of plants etc.

3.2.2 Animal Husbandry Areas

Animal Science
This is the branch of agriculture that deals with the production of farm animals. Some of the farm animals includes: cattle, sheep, goats, pigs, rabbits, chicken, turkey, ducks etc.

Agricultural Biochemistry and Nutrition
These concern themselves with the formulation and production of animal feeds. This branch of agriculture formulates feeds for different categories of animals. For example for chicken we have broiler starter and broiler finisher for broiler category and chick mash, grower mash and layer mash for layer category.

Animal Health
This is the branch of agriculture that deals with the study of farm animal diseases and pest and their control. It is sometimes called animal pathology.

Animal Breeding
Like their counterparts in plant breeding, animal breeding is concerned with the development of improved or hybrid stock of farm animals.

Fishery
This branch of agriculture involves the breeding, rearing and production of aquatic animals.

3.2.3 Other Areas of Specialisation

Agricultural Economics
This area is concerned with the application of economic principles for the purpose of resource allocation in the agricultural industry.

Agricultural Extension
Agricultural extension is the art and science of communicating agricultural information to the local farmers. The experts in this field achieve this by persuading the farmers of the value of change and to transmit the result of research to the farmers.

Agricultural Education
This branch of agriculture involves training of agricultural manpower personnel in the education sector. While agricultural extension is directed at training of farmers on their farms, agricultural education focuses on the training of students under the classroom settings.

SELF-ASSESSMENT EXERCISE

Discuss career opportunities in agriculture.

Agricultural Engineering
This is another important area of specialisation in agriculture. It involves the study of farm machineries and their maintenance.

Agricultural Biology
This branch of agriculture looks at the disease and pests that attack farm crops and tries to device various storage programmes. It involves the use of life science for the improvement of agricultural practices.

All these branches of agriculture mentioned above showed the areas or scope of agriculture.

3.3 Types of Agriculture

Agriculture can be broadly divided into two main types namely:

a. Crop farming, and
b. Animal farming

(A). **Crop Farming**

Just as we discussed under the scope of agriculture, crop farming is an area which involves the production of things of plant origin on the farm. Crop farming can further be sub-divided into the following types of farming:

- Food crop farming
- Cash crop farming
- Fruits and nuts farming
- Fiber farming, and
- Wood farming

i. **Food Crop Farming**

This is the oldest form of agriculture. It involves growing of edible crops. Majority of food crops belong to annual crops. The major aim of farmers growing food crops is to produce food crops for family consumption. Any excess are however taken to the market to raise capital for other necessities of life. The major type of crops that belong to this group of farming include:- maize, sorghum, millet, cassava, yams, rice etc.

ii **Cash Crop Farming**

Cash crop farming involves the cultivation of crops which are produced for the purpose of selling them to earn money. Unlike food crops, cash crops are grown mainly to provide raw materials for our agro- industries and not for eating. Cash crops farming are an important aspect of agriculture as this sector is responsible for export commodities and subsequently earned foreign exchange for the country. Examples of cash crops include; - cotton, cocoa, rubber, coffee, tea, soybeans etc.

iii **Fruits and Nuts**

Examples of fruits and nuts crops include:-pawpaw, pineapple, banana, mango, cashew, groundnut, bambara nut etc. this type of farming deals with the cultivation of crops whose emphasis is on the production of fruits and nuts. The practices of orchard belong to this type of farming.

iv **Fibre Farming**
The production of fiber used to be a popular form of agriculture some years back. However, with the introduction of synthetic materials and the use of biotechnology, there is less dependence on agriculture for fiber production. Cotton production is the most popular fiber crop in agriculture. Some few areas are still known to grow jute and other fiber crops.

v **Wood Farming**
Wood farming is normally referred to as forestry or silviculture. Wood farming brings about the production of forest trees for the supply of fire wood, timber for construction works, paper industries etc.

(B). **Animal Farming**
Animal farming is concerned with raising of farm animals for man's use. Animals can further be sub divided into the followings:

- Livestock farming
- Dairy farming
- Poultry farming
- Fishing

i **Livestock Farming**
The main purpose of this type of farming is the rearing of farm animals for meat production. This is done to improve the protein intake of man. The skin of some of these animals provides hide and skin for the leather industries. Some of the animals in the category include: - cattle, sheep, goats, pigs, rabbits etc.

ii **Dairy Farming**
The main purpose of this type of agriculture is to produce milk for man use. Secondary functions include provision, hide and skin. Animals in this category include cattle, goats etc.

iii **Poultry Farming**
These types of farming involve the rearing of domestic birds such as chickens, turkeys, ducks, geese etc for the purpose of egg and meat production.

iv **Fish Farming**
Fish farming is now gradually becoming popular in agricultural business. All other aquatic animals are classified under the fish farming.

4.0 CONCLUSION

In this unit you have learnt the meaning of agriculture, scope of agriculture and the types of agriculture. From our discussion it can be concluded that agricultural profession is as old as man kind. Modern agriculture is more than the production of crops and rearing of animals. Other areas are provision of raw materials, partial processing and marketing of agricultural products. Finally that agricultural profession is as wide as human endeavour.

5.0 SUMMARY

A summary of the major points in this unit are as follows:

- Agriculture is originally derived from two Latin words- "Ager" meaning field and "cultura" meaning cultivation.
- Modern agriculture must encompass the following activities:
  a. Crop production
  b. Rearing of farm animals
  c. Partial processing of farm products by agro- industries
  d. Preservation and storage of farm products, and
  e. Marketing of agricultural products
- The scope of agriculture is divided into three major areas- crop husbandry areas, animal husbandry areas and other areas of specialisation
- Crop husbandry areas includes- Agronomy, Crop Science, Soil Science, Horticulure, Entomology, Crop Production, Pomology, Olericulture, Floriculture, Forestry, Plant Pathology, Plant Breeding etc.
- Animal husbandry areas include- Animal Science, Agricultural Biochemistry and Nutrition, Animal Health, Animal Breeding, Fishery etc. other areas of specialisation include- Agricultural Economics, Agricultural Extension, Agricultural Education, Agricultural Engineering, Agricultural Biology etc.
- Agriculture can be grouped into two major types: Crop Farming and Animal Farming
- Crop Farming activities include- food crop farming, cash crop farming, fruits and nuts farming, fiber farming and wood farming.
- Animal Farming activities include- livestock farming, dairy farming, poultry farming and fish farming`

6.0 TUTOR-MARKED ASSIGNMENT

i. Define agriculture
ii. List six branches of agriculture and briefly explain each one of them.

7.0 REFERENCES/FURTHER READING

Agricultural Science for the Junior Secondary school (Book1). Ibadan: Onibonoje Press.

Anyanwu, A.C. & Anyanwu, B.O. (1987).

Falusi, A.O. & Adeleye, I.O.A. (1986). *Junior Secondary School Agriculture*. Onisha, Africana- Fep Publishers Ltd.

STAN (1990). *Agricultral Science for Junior Secondary Schools* (Book1). Lagos: Longman Nigeria Ltd.

UNIT 2 PROSPECTS AND PROBLEMS OF AGRICULTURE

CONTENTS

1.0 INTRODUCTION

In unit 1, we discussed the meaning of agriculture, scope of agriculture and types of agriculture.

In this unit, our attention will be focused on the prospects and problems of agriculture. The prospects of agriculture will be discussed under the importance of agriculture to the economy of Nigeria. Finally, the problems affecting agriculture in Nigeria will be highlighted.

2.0 OBJECTIVES

At the end this unit, you should be able to:

- list and discuss five importance of agriculture to the economy of Nigeria
- list at least ten (10) problems facing agricultural development in Nigeria
- explain in details any five of the problems listed above.

3.0 MAIN CONTENT

3.1 Importance of Agriculture

The importance of agriculture means the role agriculture is playing to the survival of an individual and the development of the economy of the nation. The followings are some of the major roles that agriculture is playing to the economy of Nigeria:

i. Provision of food for man's use

Agriculture is primarily the most important source of food to all Nigerians and indeed to the whole world. Without food, the nation will be starving and the average life span of an individual is shortened. They are also rendered more susceptible to various diseases.

This important function will continue as long as there is life. Through the years, man has sought various ways of perfecting the quality and quantity of food available through experimentation, breeding and improved farming techniques.

ii. **Provision of feed for animals**

Agriculture grows crops. Some of these crops are fed to domestic animals which turn them into animal protein like meat, eggs, fish etc for human consumption. Protein is a very important component of man's food. Apart from the provision of concentrates for farm animals, agriculture now produces pasture and forage crops to prevent ruminant animals trekking for a long distance looking for grasses. With this function, man does not need to depend entirely on wild animals for the supply of animal proteins.

iii **Employment of labour**

Apart from being the source of food supply, it is generally known all over the world especially among the less developed countries that agriculture is an important source of employment of labour.

In Nigeria, inspite of the rapid growth of the other sectors, agriculture still retains its leading position as the largest provider of employment for the working population. It is estimated that about 70 per cent of the labour force is employed in the agricultural sector while about 90 per cent of the rural population depends largely on agriculture. Women and children are directly or indirectly employed to produce or process groundnut, palm oil, cocoa, cotton and rubber latex. Many others are employed to work in agro based industries.

iv **Provision of raw materials for industries**

The role of agriculture as a source of raw materials for manufacturing industries cannot be over emphasised. In Nigeria, efforts have been made over the years to establish and expand our local manufacturing industries. As a matter of fact it is in the interest of our domestic industries that agriculture should be able to meet adequately the needs for our local industries. Examples of agricultural raw material utilised and the products manufactured include the followings:

- palm oil is used for the manufacture of soap
- oil seeds used for the manufacture of oils and oil cakes
- seeds and oil cakes used for the manufacture of livestock feeds
- sugarcane for refined sugar
- tobacco leaf for cigarette
- cotton lint for the manufacture of textile fabrics
- cocoa for the manufacture of beverages
- ripe fruits for the manufacture of canned fruits
- raw rubber for the manufacture of tyres and tubes
- wood pulp for paper manufacturing.

v. **Foreign exchange earner**

Primary producing countries depend largely on agricultural exports for their foreign exchange earnings which they use to finance their imports. Economic development in most countries has been financed mainly with the earnings from agriculture. Such was the case with Nigeria before the impact of petroleum on our economy became so prominent.

In 1962 for example, agriculture accounted for about 82% of the total value of the export for the country. In 1976 during the oil boom the contribution of agriculture to the foreign exchange earning dropped to only about 4 percent. However, with the intensification of various government and private efforts towards improving agriculture, the figure for 2007 was about 20 percent.

vi. **Contribution to national income**

Revenue realised from the sale of agricultural products form the major source of income for farmers. Other people that are engaged in the processing and marketing of these agricultural products earn their livings from them. All these personal incomes from agriculture form part of the Gross Domestic Product (GDP) for the country. For example at current prices, the share of agriculture in the Gross Domestic Products has varied from 36.5% in 1973/74 to 24.4% in 1977/78. Even though there is decline over the years, it is worth noting that agriculture has made remarkable contributions to the growth of the national income.

vii. **Rural development**

Agriculture has contributed immensely to the growth and development of rural areas. Agriculture is synonymous with rural development. On the part of the farmers, through the income generated through farming, they have embarked on community development and self-help projects. Many rural communities

have used their earnings from agriculture to provide amenities like primary school, secondary school, borehole, bridges, hospital, post-office etc.

On the part of government, in order to evacuate important agricultural products from rural areas, government embarks upon the construction of roads and railways. Large markets are also established in rural areas with agricultural potentials. Some rural villages are well known because of the location of important markets.

viii. **Provision of shelter and clothing**

Agriculture also contributes substantially to nation's shelter and clothing. The trees from which some of the permanent crops are cultivated can be made into timber used for building and furniture, while crops such as cotton provide lint for the manufacture of textile fabric for people's clothes.

SELF-ASSESSMENT EXERCISE

Agriculture may be regarded as the nerve center of the nation. Discuss this statement.

3.2 Problems of Agricultural Development

Erebor (1998) identified seventeen problems facing the development of agriculture in Nigeria as follows: - land tenure, amenities, finance, transportation, communication facilities, processing and farm machines, government policies, marketing systems, pests and diseases, production uncertainty, farm inputs, attitudes towards farming, and environmental degradation. Other problems that can be added include: customs, poverty and farmer's organisation.

1. **Problem of land tenure**

Land tenure is a system of land ownership. In Nigeria the major parts of the land either belongs to individuals or communities. This method of the land ownership does not encourage commercial agriculture, as the land is owned through inheritance. This method of land ownership leads to land fragmentation. This method often leads to communal clashes and destruction of life and properties. Farmers who have the capital to make the best use of the land may not belong to the group that owns the land. Even when such people are given access to land, they are often afraid to put in their best on the land as the land owner can demand it from him at anytime. At times the land owners often dictate what the landless farmer should plant on the land. Increase in

population has increased the various alternatives which land can be put this further put pressure on the available land.

2. **Lack of basic infrastructural amenities**

Agriculture is synonymous with rural economy. Most of the rural areas where over 70% of agricultural production is taking place lack social and infrastructural amenities. These basic amenities includes: motor-able roads, electricity, health facilities, standard schools, telephone services, clean water supply etc. these social and infrastructural amenities are needed to improve the standard of living of local farmers and thereby increasing agricultural production. Good road will ease movement of workers and transportation of their farm products to urban centers, clean water supply will reduce the rate of infection of water borne diseases and health facilities will ensure prompt treatment of illness in the rural areas. This will ensure that farmers and their family members remain strong and healthy to work on the farm. The lack of basic amenities often leads to rural-urban migration. This will also lead to reduction in the working population in the villages and eventually reduction in farm output. Presently, in Nigeria majority of farmers remaining in the villages are those above 40 years of age. The young ones have gone out in search of job in the cities.

3. **Poor financing of agriculture**

Most of agricultural activities in Nigeria are left in the hand of peasant farmers. One of the major problems confronting rural farmers is lack of finance. The number of farmers who succeed in getting loan from credit institutions are very few compared to the teeming population of farmers. This is due to the following reasons:

- the farmers are generally very poor
- most of them cannot secure the collateral demanded for loans, and
- some cannot pay the high interest rates charged on loans by financial institutions.

As a result of this, most of them still operate at subsistence level. Farmers need both production and consumption credits to promote them out of poverty,

4. **Poor transportation facilities**

The major mode of transportation in Nigeria especially in the rural areas is by road. Transportation facilities in this context refer to the mode and means of transportation i.e. the condition of the road as well as the condition of the vehicles used for the

transportation. We have already discussed the poor condition of basic amenities in the villages. The roads are generally rough and bad. Some of the roads are only motor-able during the dry season. With this condition of the road, it is not surprising that vehicles are inadequate. The vehicles also lack spare parts.

All these transportation problems often lead to high cost of bringing farm products from rural areas to urban centers. It also increases the perishability of farm products. Middlemen often take advantage of this transportation problem to increase the price of the products and at times hoard them to create artificial scarcity.

5. **Poor communication**

The means of communication includes radio, television, telephone, telex, fax etc. communication is essential for agricultural development. They are needed to pass useful information about agriculture and other related matters to farmers. Our communication system in Nigeria is still very poor. Television and telephone services are not available in the villages and where available most farmers cannot afford to buy them.

6. **Lack of storage facilities**

Our rural farmers depend largely on local methods of storing their agricultural products. Local methods like barns, cribs and rhumbus are not very efficient in storing large quantities of agricultural products for a long time. They cannot be used to store fresh products.

Modern storage facilities like silo, cold room, refrigerator etc are lacking in the rural farming communities. These poor storage facilities can lead to perish ability of farm products and pests and disease attack. Other problems of poor storage include reduction in quality and quantity of farm products, glut during harvests and famine outside harvest periods.

7. **Lack of processing facilities**

Processing of agricultural products is one of the major conditions that must exist for agricultural development to occur. Both the processing machines and the spare parts are presently lacking in the rural areas of Nigeria. Even when available their prices are beyond the reach of local farmers. Some of the machines also require expert to operate as they are highly technical in nature. Maintenance of the existing machines is difficult and expensive. Maintenance is difficult due to non-availability of exports as well as spare parts

8. **Illiteracy level of the farmers**

Most farmers in Nigeria can neither read nor write. Most of the farmers in Nigeria are not educated enough in the technicalities relating to agricultural production. Many people do not know of new developments in agriculture. It is only when a person knows of the existence of something that he can think of its use. If a farmer knows of the existence of fertiliser and does not know how to use it, he is not much better than those who do not know about it.

The results of the illiteracy of farmers according to Erebor (1998) are:

- reluctance of the farmers to change
- farmers are superstitious in their beliefs
- suspicious of new innovation
- unscientific in mind and in thinking, and
- generally uncooperative, hostile and unaccommodating.

9. **Poor extension services**

Extension services is the process through which farmers receives information in modern farming from the relevant government agencies. This is necessary to keep the farmers informed of the latest development in the field of agriculture. The extension services delivery system in Nigeria is very poor. The numbers of extension workers in Nigeria are very few compared to the number of farmers. The few available ones have no mobility to visit the farmers. Many of them are not prepared to live in rural areas where farmers reside. Those that are ready to stay in the rural areas are not adequately remunerated. All these factors combine to bring about poor extension activities in Nigeria.

10. **Poor farm tools and machineries**

Most Nigerian farmers still depend on the use of crude farm implements and so remain at subsistence level. Some of the available modern farm tools are not adapted to function under our soil condition. Some of the machines are very expensive, some require experts to operate and most of them cannot be used on fragmented land.

As a result of these problems, farmers still depend on their energy and crude implements. This leads to low yield, short life span of farmers, time wasting and low farmer's income.

11. **Unstable government policies and programmes**

In order to promote the development of agriculture, Government at times establish some agricultural programmes or announced

some policies. Such as land use decree, operation feed the nation, marketing boards, green revolution, farm settlement scheme, directorate of food, road and rural infrastructure etc. many of these programmes and polices lack continuity as some of them cease to exist as soon as the initiator leaves office. Some polices have negative effects on farmers e.g. importation of rice and other food items will reduce demand for local rice. Inconsistencies in government policy like the granting of subsidies and removal of subsidies on farm inputs; have negative effects on agricultural development.

12. **Poor marketing system**

Efficient marketing system is one of the conditions for the development of agriculture. The Nigerian marketing system for agricultural products is generally poor. Some rural areas are not motorable throughout the year and where motor-able, the roads are generally bad. Vehicles for carrying the products are few and the available few are in bad condition which leads to breakdown of the vehicles. As a result of this the volume of trade is generally low for agricultural products. The journey of two hours may take six hours. Due to lack of competition, farmers are forced to sell their farm products at very low prices. Abolition of agricultural marketing boards left farmers at the mercy of middlemen.

13. **Problem of pests and diseases**

Pests and diseases have serious effect on agricultural production. Some of the effects of pest and disease on agricultural development include the following:

- increase in the cost of production
- reduce the quality of farm produce
- reduce the income of farmers, and
- reduce the quantity of farm produce.

14. **Production uncertainty**

Agricultural production unlike industrial production is subject to the vagaries of the weather, crops depend on rainfall to grow. Shortage of rain leads to drought and excessive rain leads to flooding. Long period break of rainfall also have adverse effects on the crops. High humidity has effect on drying process and excessive sunshine can lead to wilting of crops. Nigerian farmers depend on natural weather conditions for their operations as a result of this; any adverse weather condition will have serious effect on their output.

15. **Wrong attitude to farming**
Farming is looked upon by many as an occupation for the poor people. The youths therefore will not like to belong to this category of people in the society. They prefer to take up jobs that would enable them to put on nice cloths and sit in air conditioned offices. As such they move out of the villages in large number in search of white collar jobs in the cities. Those youths who venture to remain in the village to farm are being looked upon as low class. This poor attitude of the general societies towards farming has negative impact on farming as those who remain in farming are old people. Old farmers are known for their reluctances to accept new innovation which implies that rate of agricultural development will remain slow.

16. **Problem of environmental degradation**
There are some environmental problems that affect agricultural development. Such problems include pollution, soil erosions, bush burning, deforestation etc. environmental pollution is a very serious problem in the oil producing areas of Nigeria. Oil spillage is injurious to the growth of crops. Erosion menace is another serious environmental problem. Erosion is the gradual wearing away of the soil surface by either rain or wind. This leads to soil depletion, which will increase the cost of farm production. Similarly bush burning can destroy useful crops on the farm and cause oxidation of some important elements. Deforestation can reduce the activities of micro-organisms in the soil.

17. **Custom of the people**
Traditional beliefs and customs affect the development of agriculture in Nigeria. For example the consumption and production of certain food stuff is forbidden in some communities for no reason other than superstitious ones. Some communities believed that children who eat or demand for eggs will become thieves in the later part of their life. At times customs dictate what crop farmers can plant and what animals they can rear.

Social customs on the practice of agriculture influences the people's acceptance of any innovation. Some localities are highly sacred and they express a high degree of unwillingness to respond to any change.

18. **Poverty level of farmers**
Success in agriculture requires considerable capital investment. Majority of the problems highlighted above is hanged on the poverty level of farmers. Most farmers operate within the vicious cycle of poverty. Low farm output leading to low income and low

income leads to low savings and low savings leading to low investment and low investment in turn leads to low output and the circle continues.

There is the need to acquire enough land to make farming an economic venture. The improved planting materials and improved breeds of livestock can only be acquired with money. Modern farming requires power and equipment that are very expensive. Poverty therefore, prevents farmers from going into commercial farming. So farmers will remain poor unless there is government intervention.

19. **Poor farmers organisations**
Various farmers' organisations are established to assist the farmers in different areas of farming. For example, marketing cooperatives are established to help the farmers solve their marketing problems, thrift and credit society also help the farmers to solve their financial problems. Other organisations include: group farming cooperatives, consumer cooperatives etc. due to administrative and financial problems these organisations are not effective in performing their functions.

4.0 CONCLUSION

In unit two, you learnt the importance of agriculture to Nigeria's economy. You have also learnt the problems of agricultural development with reference to Nigeria. From the various discussions, it can be concluded that agriculture has great prospects. As it contributes to Nigeria's economy, it also faces a great deal of problems. As a result of these problems agriculture is yet to reach the desired level of development in Nigeria.

5.0 SUMMARY

- Agriculture is important to the economy for the following reasons:
  a) supply of food for human consumption
  b) supply of feeds for livestock
  c) employment of labour
  d) provision of raw materials for industries
  e) foreign exchange earner
  f) contribution to national income
  g) contribution to rural development
  h) provision of shelter and clothing.

- The following problems are facing agricultural development in Nigeria:
  a) problem of land tenure
  b) lack of basic infrastructural facilities
  c) poor financing of agriculture
  d) poor transportation facilities
  e) lack of storage facilities
  f) poor communication
  g) lack of processing facilities
  h) illiteracy level of the farmers
  i) poor extension services
  j) poor farm tools and machineries
  k) unstable government policies and programmes
  l) poor marketing system
  m) problems of pest and diseases
  n) production uncertainty
  o) inadequate agricultural inputs
  p) wrong attitude to farming
  q) problem of environmental degradation
  r) customs of the farmers
  s) poverty level of farmers
  t) poor farmers' organisations.

6.0 TUTOR-MARKED ASSIGNMENT

i. Discuss ten (10) problems of agricultural development in Nigeria.
ii. Discuss briefly the ways in which the following factors contribute to the problems of agricultural development in Nigeria:
  (a) finance
  (b) farm input
  (c) transportation
  (d) storage and processing facilities.

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UNIT 3 MEASURES OF IMPROVING NIGERIAN AGRICULTURE

CONTENTS

1.0 INTRODUCTION

In the last unit, you were familiar with the problems of agricultural development. About twenty (20) problems affecting the development of agriculture with particular reference to Nigeria were highlighted. Some of the problems highlighted include:- land tenure system, infrastructural amenities, finances, transportation, communication, storage facilities, processing facilities, illiteracy level of farmers, extension services, tools and farm machines, government polices and programmes, marketing systems, pest and diseases, production uncertainties, farm inputs, attitudes towards farming, environmental degradation, customs, poverty and farmers organisations. In this unit, you be considering the solutions to the above problems.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- list at least eight (8) solutions to the problems of agricultural development
- explain in details any five (5) of the solutions listed above.

3.0 MAIN CONTENT

3.1 Measures for Improving Agriculture in Nigeria

The Nigeria government and other developing countries of the world have realised the importance of agriculture in their overall economic development and are taking steps to eliminate these problems. The following are some of the steps taken and others that need to be taken by Nigerian government and other agencies connected with the development of agriculture:-

3.1.1 Land-use Decree

The decree was promulgated in 1978 and amended by an Act in 1990. Land use decree vested all land ownership on the hand of government rather than individuals; the decree was promulgated to assist prospective and genuine landless farmers. With this decree the problem of land tenure supposed to be over. What is left to be done now is the enforcement of the law in the rural areas. The law is only effective in the urban centers where land is demanded for building purpose and not for agricultural purposes.

3.1.2 Provision of Infrastructural Facilities

One of the major problems of agricultural development identified was lack of infrastructural amenities especially in the rural areas.

Government should provide good access roads to the areas of food production to facilitate the transportation of the farm products to the urban areas. The farming communities should have electricity, water, health care facilities, schools and recreational centers to make life more pleasant for the farmers and hence prevent or reduce drift to the urban centers.

3.1.3 Formation of Formidable Cooperative Societies

Cooperative society is a voluntary organisation, formed, owned and organised by farmers for their mutual benefits. Government should therefore encourage the farmers to form themselves into cooperative bodies that can carry out farming on a large scale. By this they will be better organised, better financed and more credit-worthy to financial institutions than individual farmers. Cooperative department under the ministry of commerce and industry should be made more functional to assist the farmers. Apart from issuing certificate of registration to farmers, they should be able to supervise and nurture the society to maturity.

3.1.4 Provision of Credit Facilities

The establishment of the Nigerian Agricultural and Rural Development Bank (NARDB) to cater for farmers credit need is in the right direction government should ensure that the rural farmers benefit from the credit facilities of this bank. Government should also ensure that the loan facilities are not diverted to other sectors. Governments should also assist farmers in obtaining loans by ordering the commercial banks and other financial institutions to grant some loans to the farmers without demanding the usual collateral which the government can guarantee for them. Agricultural credit is essential to increase the investment level of farmers and also to promote them out of poverty level. The amount granted should be substantial enough to make meaningful impact on the life of farmers.

3.1.5 Establishment of Efficient Communication System

We have already discussed the importance of communication on the development of agriculture. Efficient communication systems will combine with extension service in the dissemination of modern agricultural information to farmers. In this regard government can establish radio stations and television stations. In addition substantial time should be alloted to agricultural programmes. News papers and magazines should be established by the ministries of agriculture and Agricultural Development Project (ADP). All these measures will ensure efficient dissemination of agricultural information to the grassroots.

3.1.6 Efficient Transportation System

The services of government transportation corporation should not be limited to urban centres only. The rural dwellers should also benefit from such services, government can also assist the farmers to transport their perishable produce such as meat, eggs, vegetables, milk etc to the markets by providing them with refrigerated vehicles which are too expensive to be purchased or maintained by individual farmers.

3.1.7 Provision of Storage Facilities

Government should assist farmers in building storage houses for their surplus produce. Government can also buy these surplus produce, store them scientifically and market them during scarcity seasons. Government can also build cold rooms in the rural areas with generating set attached to them. This will assist in the storage of fresh and perishable produce. Government should also establish processing centers in the villages to take care of agricultural products. Government can buy the raw materials from the farmers for processing. Alternatively, government can allow the farmers the use of the machines at a reduced price. If processing machines for crops like cassava and rice are established for farmers, it will encourage them to produce more.

3.1.8 Mass Literacy Programmes

In order to minimise the level of illiteracy among farmers, government should establish adult education centres in the villages. The centres should be well equipped to encourage farmers to attend. At the end of the programme certificates should be awarded to those who successfully completed the course. Such programmes will afford the farmers the opportunity to go to school without necessarily disrupting their farming activities. Through the programme farmers will now be able to read and write on their own. Education has helped to minimise the effect of some of the custom and the superstitious practices of the local farmers.

3.1.9 Promotion of Agricultural Education

The teaching of agricultural science in all primary and post primary schools all over the country must be encouraged or even enforced. Agriculture has been made a school subject and many schools such as secondary schools and teacher training colleges now offer it in public examinations. This will create an awareness of the significance of agriculture in national economy. More faculties of agriculture in the universities and more colleges of agriculture should be established to train people in the different fields of agriculture. Scholarship should be provided for those who want to specialise in the field of agriculture. To

attract students into field of agriculture, loan should be approved for them on completion of their courses to establish agricultural enterprises.

3.1.10 Extension Education

Government should establish a well organised and functional agricultural extension service to carry the result of agricultural researches to our farmers. A functional extension service will ensure that farmers are organised and occasionally films and slides on different aspects of modernised agriculture are shown to them. Through extension services farmers are taught to adopt better cultural practices and minimise loss of soil fertility through erosion and leaching.

3.1.11 Establishment of Demonstration Plots and Film Shows

Government through the ministries of agriculture and natural resources should establish demonstration plots at strategic positions all over the country. This is meant to enable the farmers to copy from practical examples.

Agricultural shows should be organised from time to time and farmers be invited. Through the extension workers, government teaches the farmers on their own farms and even helps them to carry out some of the operations in the farm.

3.1.12 Establishment of More Research Institutes

Government should establish more research institutes to cater for all aspects of agricultural production. The existing agricultural research institutes should be expanded so that they can carry out the necessary researches and develop new varieties of seeds and breeds or strains of livestock that will yield better results.

3.1.13 Provision of Subsidies on Farm Inputs

Government should assist in the production and introduction of improved seeds and more productive, disease resistant animals for use by farmers.

Agricultural subsidies should be given to the farmers by selling the necessary farm inputs such as fertilisers, insecticides, fungicides and animal drug to the farmers at heavily subsidised rates. Subsidies involve selling at much lower rate than the real cost of purchase or production in order to encourage a large number of the farmers who are poor to buy and use them. The same thing applies to farm tools.

3.1.14 Establishment of Tractor Hiring Centers

Government should establish a tractor hiring centers that will service the needs of farmers, particularly the large-scale ones. By so doing, farmers can mechanise their farms without buying the tractors and other heavy machineries and equipment.

When such tractor-hiring units are in existence, government must ensure that they have in stock a good consignment of spare parts of various types to keep the machines in operation. Personnel that are also technically competent in the maintenances of these machines must be available in reasonable numbers at these centers.

3.1.15 Improving Veterinary Services

The veterinary division of the Ministry of Agriculture should be made functional and effective to give attention to the farmers' livestock. Livestock units should be equipped enough to carry out artificial insemination of the various classes of female livestock with the imported semen or semen from improved males of local breed. This will upgrade the local stock without going into the expenses of buying and maintaining these expensive male breeds.

Government through veterinary division must enforce quarantine regulation within the country and at the borders to ensure that disease are not imported carelessly into the country.

3.1.16 Establishment of Young Farmers Club

Young farmers club is one of the voluntary organisations among the secondary school students. Presently only few secondary schools have functional young farmers club. The club is necessary to create awareness among the young generations the importance of agriculture to the economy. The presence of young farmers club will help to change the bad impressions that the youth have against farming that will equally help to change the people's bad attitude towards agriculture. Through the club, many youth have embraced agriculture. Government therefore should enforce the establishment of the club among secondary schools. The existing ones should be assisted to function properly.

Government can provide farm inputs and financial assistance to them to establish both crop farm and livestock production in their schools.

SELF-ASSESSMENT EXERCISE

Mention 20 machineries that the government has put in place to improve agriculture in Nigeria.

4.0 CONCLUSION

In this unit, you have learnt about the solutions to the problems of agricultural development in Nigeria. It can be concluded from our various discussions, that if government can address these various suggestions, Nigerian agricultural sectors will attain the level of development. Secondly, apart from government, all other agencies that are connected with agricultural development e.g. Banks; Non-governmental organisations etc have major roles to play in solving the problems of agricultural development in Nigeria.

5.0 SUMMARY

In this unit, the following solutions to the problems of agricultural development in Nigeria were suggested:

- Enforcement of land use decree in rural areas
- Provision of infrastructural facilities
- Formation of formidable cooperative societies
- Provision of credit facilities
- Establishment of efficient communication system
- Efficient transportation system
- Provision of storage facilities
- Mass literacy programmes for farmers
- Promotion of agricultural education
- Extension education programmes
- Establishment of demonstration plots and film shows
- Establishment of more research institutes
- Provision of subsidies on farm inputs
- Establishment of tractors-hiring centers
- Improving veterinary services, and
- Establishment of young farmers club

6.0 TUTOR-MARKED ASSIGNMENT

In what ways can government assist in the development of agriculture in Nigeria?

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UNIT 4 AGRICULTURE AND NATURAL ENVIRONMENT

CONTENTS

1.0 INTRODUCTION

The last unit discussed the ways of improving agriculture with particular references to Nigeria. The unit highlighted sixteen (16) solutions to the twenty (20) problems affecting the development of agriculture. The problems highlighted include: land tenure system, infrastructural facilities, finances, transportation, communication, storage facilities, processing facilities. Illiteracy level of farmers, extension services, tools and farm machines, government policies and programmes, uncertainties, farm inputs, attitudes towards farming, environmental degradation, customs, poverty and farmers organisations. In this unit, you will learn about the effects of environmental factors on agricultural production.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- identify the vegetation zones of Nigeria
- explain the pattern of agricultural practices along the line of vegetation zones
- identify weather instruments and their uses
- describe the effects of climatic factors on agricultural production.

3.0 MAIN CONTENT

3.1 Agriculture and Natural Vegetation of Nigeria

The various vegetation or ecological zones in Nigeria are determined by the amount and distribution of rainfall. The amount and distribution of rainfall varies from the southern coastal area to the far northern part of the country, giving rise to the various vegetation zones.

It is necessary for farmers to know that the growth of all types of crop plants is influenced by the amount and distribution of annual rainfall. It is not surprising therefore, why the vegetation of Nigeria varies as one travels from the southern part of the country to the northern part. It is also important to note that the distribution of annual rainfall influences the type of animal husbandry that can be practised.

Nigerian vegetation can be grouped into two major zones: forest zone and savannah zone.

(A) Forest Zone

The forest zone can be subdivided into two major parts: mangrove swamp forest and rain forest.

(i) **Mangrove Swamp Forest**

The mangrove swamp forest occurs around the southern coastal areas of Nigeria. This area is characterised by heavy rainfall, high humidity and swampy saline and water log soil.

The vegetation of the area is generally dominated by trees that can survive under water-log condition. Most of the trees belong to two major species- Rhizophora spp and Avicenia Spp. These groups of plants can survive saline and water-log conditions by means of their procumatophores breeding roots.

Most of the farming activities are limited to fishing only. The species of fish that can survive under salt water condition are found in the area. No other serious farming activities are carried out in this zone.

Immediately after the mangrove swamp forest is the fresh water swamp. This zone shares similar conditions with mangrove except that the water is fresh and not salty. Fresh water swamp is characterised by the presence of Raphia species. The major farming activity in this area is fishing.

(ii) **The Rainforest**

There is heavy rainfall and high humidity in the rainforest. However, the amount is less than that of swamp forests. Unlike mangrove swamp forest, the soil is in most cases well drained. Annual rainfall is usually between 1,300mm and 3,500mm. The rain is not only heavy but well distributed throughout the year.

Some of the forest tress found in this zone includes:- mahogany and iroko. The thick forest provides timber but make farming operation difficult and laborious. Farm mechanisation is generally difficult.

The zone support a number of tree crops. The main crops are: - oil palm, cocoa, rubber, cola nut etc. the forest in this zone serves as vegetative cover and help to build up the soil through the dropping of the leaves. Other crops found in this zone include:- plantain, banana, coconut, yam, cassava, sweet potatoes and maize. The only livestock that can strive well in this zone is poultry. Ruminant animals especially cattle are not popular in this zone because of the absence of natural grassland, difficulty in growing pasture and high tsetse fly infestation.

(B) Savannah Zone

Savannah zone is subdivided into four zones and they include:- derived savannah, guinea savannah, sudan savannah and sahel savannah. The savannah is dominated by grasses with few scattered trees.

(i) **The Derived Savannah**.

Derived savannah occurs between the borders of forest and savannah zones. It originally belongs to the forest zone. The forest is converted to grassland as a result of human activities such as over cultivation, over burning, settlement etc. the annual rainfall in this zone is between 1000mm to 1500mm. the tree species include- Albigia spp, Sterculiar spp , Parkia spp. Grasses found in this zone include:- Andropogon spp, Panicum spp, Pennisetum spp and Paspalum spp.

The main crops of this area include:- cassava, yam, maize, cowpea, pigeon pea, groundnut etc.

(ii) **The Guinea Savannah**

Guinea savannah zone is the most extensive zone. It occupies almost half of an area of Nigeria and it occurs

within the middle belt of the country. The zone is divided into two- southern guinea savannah and northern guinea savannah.

The southern guinea savannah has annual rainfall of between 1000mm and 1500mm. the length of the dry season is about five to six months. The production of livestock in this area is high all trees and grasses found in derived savannah are also found in this area.

The northern guinea savannahs are the parts of guinea savannah found mostly above rivers Niger and Benue. The annual rainfall in this area is about 1000. The major vegetations this area are tall grasses which include:- andropogon spp, pensetum spp, hiparrhinia spp etc. few trees like combretum spp, teninelia spp, parkia spp etc are also found there.

The guinea savannah is of relatively important in agriculture in Nigeria. A number of food crops are cotton, sugarcane, groundnut, cassava, yam, cocoyam, sweet potatoes, cowpea, pigeon pea, bambara-nut etc.

(iii) **Sudan Savannah**

The sudan savannah lies immediately above the guinea savannah. The annual rainfall in this zone is generally below 1000mm. the dry season is fairly long. The vegetation of this zone is made up of trees like Acaciaa spp, combrestum spp, butryospermum spp etc. grasses found in this zone include:- Andropogon spp, Hyperrhana spp, Brachiaria spp, Eragrostic spp and pennisetum spp etc. this low grassland zone is free from tests fly and so provides a good environment for livestock production. The livestock fond in this zone are cattle, sheep, goats etc. the soil is a loose sandy-loan suitable for the production of groundnut, millet, sorghum and cotton.

(iv) **Sahel Savannah**

Sahel savannah is the last zone, located at the extreme northern part of the country. It is a very dry type of savannah with an annual rainfall of less than 750mm.The rainy season last between three to four months. The soil is loose with sparse vegetation. Grazing occur mainly around the fadama area of the zone. The major livestock productions in Nigeria occur in this zone. The trees found in this zone are those that withstand drought, such trees include: - Andosonia spp, Acacia spp, Bombax spp.

The common grass species are the pennisetum spp, Andropogon spp etc. it is predominantly a pastoral zone.

Some crop production takes place such as the drought resistant varieties of millet, sorghum, cotton and groundnut.

SELF-ASSESSMENT EXERCISE

With the aid of map of Nigeria, classify the Nigerian vegetation into ecological zones.

3.2 Agricultural and Environmental Factors

3.2.1 Agricultural Meteorology

Meteorology is concerned with the science of the atmosphere including the study of weather. A weather or metrological station is a place where all the elements of weather are measured and recorded. Some of the instruments used in measuring some weather variables include the following:

a. **Thermometer**
   This is an instrument used to measure the temperature, that is, the degree of hotness and coldness of the day.
b. **Hygrometer**
   This instrument is used to measure the relative humidity of the atmosphere, that's, the amount of water vapour in the air.
c. **Barometer**
   This is used to measure atmospheric pressure.
d. **Anemometer**
   This is an instrument used to measure the speed of wind.
e. **Rain Guage**
   Rain guage is used to measure the amount of rainfall.

SELF-ASSESSMENT EXERCISE

Draw the following weather instruments:

i. Rain gauge
ii. Thermometer
iii. Hygrometer

3.2.2 The Effects of Climatic Factors on Agriculture

Climatic factors include: Temperature, rainfall, solar radiation and relative humidity.

These factors together with soil and other living organism constitute the environment of crop production. These factors of the environment are the factors of crop growth and yield. What is harvested as yield is the net production realised after the interaction of these factors of the environment.

Temperature

Temperature is the heat income in an environment or in a body. Temperature is one of the factors influencing crop productions and the locations of the production are controlled by physical and chemical processes which are in turn controlled by biological reaction that takes place in plants.

Temperatures affect pollination, absorption of water and plant nutrient, photosynthesis, transpiration, respiration translocation of food and metabolism. All of this affects the growth of plant. For each crop there is a minimum, optimum and maximum temperature, below the minimum and above the maximum temperature the crops will not thrive well and death may even occur. It is assumed that the cardinal maximum temperature for plant life is about 54^{o}c and that the cardinal minimum temperature for growth is about 5^{o}C. This means that most plants will not live if temperatures are below 5^{o}C.

Undesirable temperature may cause death of plants. Depending on the temperature requirement, crops may be classified into cool and warm season crops.

In the tropics, temperatures are relatively high most of the year and there is virtually little variation in temperature all the year round. Never the less the intensity of tropical temperature are between 25^{o}c and 33^{o}c. the relatively high tropical temperature enable the farmers plant throughout the year provided water is available.

Although, tropical crops are sun- loving or warm season crops, the limit of their heat tolerance varies with crops and at different growth stages. Rubber, cocoa and oil palm are very sensitive to temperature such that they are cultivated within the tropical region.

Irrigation can be used for temperature control because water used in irrigation is relatively warm and after the field has been watered; heat is more readily transferred from the lower depth through the surface thereby reducing the soil temperature. Mulching also helps in regulating soil temperature by preventing direct heat of the soil by solar radiation; similarly it prevents heat loss from the soil during the rainy season.

Rainfall

Rainfall has a tremendous influence on agriculture, since it is the main source of water to crop and livestock. Water is required for photosynthesis and maintenances of soil turgidity. Crops do well when their water supply is enough and around field capacity.

Insufficient or excessive amount of soil moisture are both harmful to plant growth. Drought and flooding are two climatic hazards that seriously affect crop production.

Insufficient or deficient soil moisture will result in slow down or even cessation of plant growth inhibition of photosynthesis, yield or even crop failure may occur. Most crops are especially sensitive to drought at the seeding and reproduction stage. Similarly excessive water (flooding) may decrease yield through the leaching of soil nutrients, erosion and increased water table which limit root growth and eventually shoot growth. Rice is the only crops that thrive well under water log condition (Hydrophiat).

In Nigeria, as in other parts of Africa, rainfall is seasonal such that there is a distinct dry and wet season, except in areas with irrigation restricted to the rainy season. Rainfall varies from 3500mm in the Niger Delta to about 1000mm-1500mm in the middle belt and to less than 500mm in the semi arid zone of north-east Nigeria. The raining season in the southern Nigeria normally starts from April and terminates in October.

The amount of rainfall and its distribution throughout the year are important in determining the types of crop that can be grown in an area. In the north where there is less rainfall, water shortage usually occurs. The lighter rainfall results in the cultivation of given crops and keeping of livestock. The crops that do well in the north include maize, sorghum, cowpea, millet etc. On the other hand tree crops and other long duration crops do well in the south where the rainfall is high. Such crops that are favoured by the high rainfall in the south are cocoa, oil palm, coffee, cola nut, banana and food crops like cassava, rice, maize, cocoyam, yam etc.

The dry season (which is the period of drought) occurs between November and March in southern Nigeria. Crops at this time are subjected to moisture stress. But for permanent or perennial crops like oil palm, castor oil plant, pineapple, African bread fruit and bitter leaf, there is a reduced crop production.

Forage grass such as *Andropogin* spp, *Pennisetum purpurium* etc become fibrous and unpalatable and dry up. Consequently there is a drastic shortage of herbage supply and livestock loose weight considerably.

(a) Crops failure due to drought condition is overcome by means of irrigation. Irrigation will supply water to the soil for essential crop growth. Irrigation will help to maximise crop yield because at that time, sunlight is not limiting due to absence of cloud cover. Irrigation is an insurance against drought.

Other ways of preventing soil moisture stress include:

- mulching
- terracing
- crop rotation
- fallowing
- weeding
- tillage operations
- manuring
- use of high plant population.

Terracing
Although terracing may be designed primarily to prevent erosion it also facilitates water conservation. Terraces slow down surface run off and hence increase infilteration.

Crop rotation and fallowing
This also helps to conserve soil moisture where the permeability of soil surface is inadequate, the construction of ridges and furrows will increase water percolation.

Mulching and weeding
Mulching reduces soil moisture loss by weeding competition between crop and weed for water is eliminated and hence there is more water for crops.

Manuring
Manuring also helps to conserve soil moisture by improving the physical condition of the crops

High plant population
Close spaces are effective in reducing run-off there by conserving soil moisture.

Sunlight or solar radiation

Solar radiation or sunlight is the energy of the sun, used in crop production. The primary effect of solar radiation on crops is in photosynthesis sunlight provides the necessary energy for photosynthesis and the length of the days or number of days hour affect the growth of flowering plants sunlight also have profound effect on physiological processes such as germination, dormancy and photo tropism.

Phototropism is the movement of plant or growth of plant towards the direction of light. Sunlight varies in quantity, quality and duration. All these have tremendous effect on crop production and distribution.

Light quality over the surface of the earth is relatively uniform and so the particle aspect of light as an environmental factor are, light intensity (quantity) and light duration (hours of light in the day).

Usually the higher the light intensity the greater the photosynthesis, plant growth depends on the amount of carbon fixed during photosynthesis. In other words plant growth depends on the amount of carbon fixed during photosynthesis. In other words plant growth depends on photosynthesis. Photosynthesis and chloroplast development can not take place without light.

Normal plant growth occurs in the presence of light, in the absence of light, etiolation or abnormal internodes elongation will occur. In this case, the stems are thin, the leaves are not fully expanded and the roots develop poorly and the plants are not strong enough to grow erect.

Sunlight duration affects the geographical environment of crops. It affects the growth, distribution and flowering of crops.

The response of plant to day length such that the plant flowers only at a certain period of the year is referred to as photo-periodism. There are 3 classes of plant on photo-periodic responses:

- **Short Day Plants**- these are plants that flower when the days are short, i.e. between 8 to 10 hours or less than 12 hours. Some tropical crops such as sweet potato, some varieties of cowpea and okro and African yam beans are adapted to short day light.
- **Long Day Plants**- These are plants that flower when the day lengths are long. Day length for long day plant is usually between 12 and 14 hours. Temperate crops are mainly long day plants. Examples include lettuce, spinach, cabbage etc.

- **Day Neutral Plants**- These plants are unaffected by the day length and so flower at anytime of the year; examples include maize, tomatoes, peppers etc.

Control of light

Sunlight varies in quantity and duration and none of these is amendable to human control in other words as human being we cannot do much to affect the intensity or duration of sunlight but we can adjust crop to light needs in the following ways:

(1) **Time of planting**

This is one of the technique used to obtain maximum utilisation of light, planting can be done at the right time of the year when there will be sufficient light.

(2) **Plant density or plant population**

The control of density will lead to the control of the amount of light received by the plant. Plant density may be modified by plant spacing. Pruning and training the intensity of planting is adjusted to suit the light requirement of the crops and so this is one of the ways to control the amount of light received by individual plant. When plants are grown close together unusual shading prevent direct light from reaching all but the top.

When plants are widely spaced more light will be received by individual plant. When compared to close spacing, there is higher yield per plant but lower yield per unit area planted.

(3) **Training and pruning**

Competition for light between different parts of the plant can be modified by training and pruning. Training refers to the orientation of the plant in space e.g. yam while pruning is the judicious removal of plant parts. In the case of fruit crops, pruning is done to control competition for light within the plant to improve crop size and quality.

(4) **Shading**

It is sometime necessary to reduce the amount of light. Shading may be used to reduce light depending on the sunlight requirement of the crops. Shading is usually important in nursery operation to reduce light and temperature and to lower moisture requirement.

(5) Another way of adjusting crops to light need is by growing crop varieties that are adapted to sunlight condition of a given area e.g. it will be useless to grow long day plant in the tropics because the days are short.

4.0 CONCLUSION

In this unit, you have learnt about our natural environment and agricultural practices. From your study you can conclude that climatic factors like temperature, rainfall, relative humidity and solar radiation determine the vegetation pattern in Nigeria. These factors determine the types of agriculture practised by the people of Nigeria.

5.0 SUMMARY

In this unit, you have learnt about the following:

- the Nigerian vegetation belt is divided into two major zones- forest and savannah
- forest zone is subdivided into mangrove or salt water swamp, fresh water swamp and high or rain forest.
- savannah zone is also subdivided into derived savannah, guinea savannah, sudan savannah and sahel savannah.
- thermometer, hygrometer, barometer, rain guage and wind vane are some of the instruments for measuring weather conditions.
- climatic factors that affect agricultural production include- temperature, rainfall, relative humidity and solar radiation.

6.0 TUTOR-MARKED ASSIGNMENT

i. Describe the characteristics of Nigerian vegetation zones under the following headings
   a. Climatic conditions of the zones
   b. Farming activities of the zone

ii. Identify five climatic factors and describe the effects of one of them on agricultural production in Nigeria.

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UNIT 5 LAND-USE AND LAND TENURE SYSTEM IN NIGERIA

CONTENTS

1.0 INTRODUCTION

In unit 4 above, you learnt about agriculture and the natural environment. Under the unit, we identified the various vegetation belts of Nigeria and the types of agricultural activities in each zone. We also identified some of the instruments used in measuring weather conditions. Finally, we discussed the effects of climatic factors on agricultural production.

In this unit, we shall discuss about land. Such issues like land uses, land tenure system and land use decree will be discussed.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- define land
- list agricultural and non-agricultural uses of land
- explain at least three types of land tenure system in Nigeria
- mention the advantages and disadvantages of the three systems
- explain the major aspects of land use decree.

3.0 MAIN CONTENT

3.1 Land and its Uses

3.1.1 Meaning of Land

Land could be defined as a farm resource given by nature. Land resources include the followings: soil, minerals, forests, fishing ground (water surface) and climates. All resources that exist naturally and contribute to the production of farm output are classified as land. From the point of view of agriculture, land is the most important factor of production. No agricultural production can take place without land.

Land for the production of crops and rearing of animals is not homogeneous. What can be produced from a particular piece of land depend on a number of factors namely:

- the climatic condition of each area especially rainfall distribution.
- the nature of the fertility of the soil, this explain why in the same area maize do well on some plots of land and perform poorly on other plots.
- the topography of the area
- cultural practices of the people
- the quantity and quality of the resources applied
- the position of the area in relation to the market.

3.1.2 Use of Land

The use of land can generally be divided into two major groups. Those are the agricultural uses and non-agricultural uses.

A. Agricultural Uses of Land

Land can be used for the following agricultural production:

a. **Crop production:** the most important use of land for agricultural purpose is the cultivation of crops. Such crops include: food crops, tree crops, fruits, vegetables, fiber crops etc.

b. **Animal production:** animal rearing requires the use of land for grazing as well as for the provision of shelter for the non-ruminant animals. For grazing purpose land can be used to produce pasture and forage for feeding livestock. In some places animals are allowed to graze on nature pasture.

c. **Fishery:** apart from the natural water for fishing, artificial lakes and ponds are constructed on land for the purpose of rearing fish.

d. **Forestry:** large areas of land are used for the establishment of agro-forestry. Some areas that are not suitable for arable crops production can be converted to forest. Generally, forest can be established in poor land and land that is under dispute between two communities

e. **Wildlife conservation:** many areas of land in Nigeria are reserved for wildlife management. Wildlife conservation is necessary to preserve some species of wild animals and prevent them from extinction.

B. Non-Agricultural Uses of Land

Apart from agricultural production, land can be put into other uses. These other uses may directly or indirectly aid farmers in their farming activities. Some of the non-agricultural uses of land include the following:

a. **Residential Building:** land is needed for the building of houses. The expansion of these houses gives rise to villages and villages develop to towns and cities. Residential buildings take substantial part of agricultural land.

b. **Land for Industries:** as population increases in towns and cities, so there is the need to build-up industries to meet the needs of the people. In Nigeria there are thousands of industries scattered all-over the country. Each industry require tangible portion of land for their establishment.

c. **Institutions:** a lot of land is occupied by both civil and religious organisations for the establishment of institutions, schools, churches and mosques are established in all villages, towns and cities throughout Nigeria. These require land wherever they are sited.

d. **Roads and Bridges:** there are various road networks in Nigeria with bridges constructed across the rivers. Roads including rail lines linking one state to another and one town to the other occupy millions of hectares of land.

e. **Parks and Recreational Centre:** amusement parks and recreational centre such as football field, swimming pools and other recreational centre occupy a lot of land area.

f. **Mining**: mining in whatever form make extensive use of land. Mining also reduces or destroys the value of land. For example crude oils often spill into the farmland and render the soil totally unproductive and leaving a vast area of waste land.

3.2 Land Tenure System in Nigeria

Land tenure is the term used to describe the way men control their land either for temporary use or as permanent property.

The word "tenure" comes from the Latin word tenere meaning "to hold". It refers to the land held either by individuals or group or family. Land tenure has great impact on agriculture in Nigeria and it is one of the centre problems of agriculture from medieval time to present period.
There are different systems by which land is held in Nigeria. This includes communal land tenure system. Individual land tenure system, freehold title, lease hold, tenants at will of government and finally land tenure by inheritance.
The various ways by which each of the above named system of land ownership are described below:

Communal land tenure system
This is the system where land belongs to the community and not individual. The community may be a family, a village and a clan. Members of such a community are entitled to a piece of land to farm but the land does not belong to them. In this system of land ownership, land is not given to a stranger and cannot be sold unless the whole community agreed together. Due to the fact that, the land belongs to the community, it is referred to as communal tenure. However, this does not mean that the community controls what is grown on the land, once a plot or piece of land has been allocated to a member of the community, he can grow what he likes on the land. He can choose the ways of using the land but cannot sell it.

- The benefit derived from this method of land ownership in Nigeria is that, it provides and ensures that every member of the community has some land to supply his needs, thus satisfied the needs of every one because every man will grow all the food he need on his own.
- However, the demerits of this system cannot be eliminated when discussing land tenure system in Nigeria.
- Communal land tenure relies on small population, plenty of land and subsistence farming, thus difficulties began to arise when population of community grow into larger societies such as in Nigeria. The land belonging to community remain fixed once all the cultivable land has been divided, therefore, a farmer is not able to obtain more land even when he needs it.
- Communal land tenure may hinder modern agriculture in another important way. This is because even though in a place where land

is now bought and sold, it is usually not sold to strangers but to members of the community.

- The community also tries to prevent a farmer from getting more land because they do not see why a man should have more land he needs to feed his family even though the land is available in this way, they may stop the farmer from growing cash crops because they do not think it is proper way to use land.
- Furthermore, it cannot be used as a security, if the farmer is trying to get a loan from commercial bank.

Individual land tenure system

a. The individual land tenure takes different forms such as free hold ownership or rent tenancy.
b. Individual freehold ownership gives a man complete freedom over his land. The land belongs to him permanently and no other for any purpose, he can sell the land as he chooses without interference from other.

The main advantage of freehold ownership is the security it offers to the holder, who may be willing to invest money in improving his land with the knowledge that he will benefit through his own use of the land or by selling or retting it.

However, one demerit of the individual freehold ownership of land is that, those who have too little land or no land for their needs may be unable to buy or rent from freehold owners.

Another demerit is fragmentation or the division of land into a large number of small and scattered plots. A free holder may divide his land among a number of sons, who will each own a small plot of the original land. These small plots may not be suitable for modern farming methods, as machinery cannot often be used on a small plot and economy efficiency of farming on larger scale cannot be achieved. The owner of the land can rent some or all of his land to farmers who are called tenants. This tenants pay to landlord rent for use of land. The landlord may ask the tenant to pay a proportion of the yield from his farm. This form of individual land tenure is called share rent tenancy.

Lease hold land tenure system

Under a lease hold, land is held for a fixed; known length of time on agreed specified conditions. This system does not permit control of land by the community.

Primitive land tenure system

a. Under primitive land tenure system, land is not regarded as a negotiable possession, such system exist where land is so plentiful that it has little or no value and belongs to the same rank of natural resources as air and water.
b. Land is usually worked by nomadic grazing and shifting cultivation for production of food crops. Such lands are allocated to tribal members by chiefs and authorities.

Tenants at will of government system

In this system, land is owned by the government and anybody living on it does so at the will of the government.

Land tenure by inheritance

a. This is a system where a piece of land owned by a great ancestor is transferred within the family from generation to generation.
b. In Nigeria and West Africa in general, lands for agricultural activities are acquired through inheritance within extended family system.
c. As a result, holders of capital who wish to invest in large-scale farming are seldom able to acquire clear title to enough land for such an operation, and this fact has had its influence on agricultural development throughout Nigeria, West Africa in general.

There are various problems of land tenure through inheritances. These include the following:

- There is excessive land fragmentation which may leave a farmer several small and holdings scattered over an area and therefore very difficult and economic to work.
- Sharing of land in land tenure by inheritance is a delicate issue which very often generates bitter enmity among family members. It is very difficult to asses how far the individual has the right freely to use and control a piece of inherited land. The content of the entire family, generally all the male heads, is for instance required before any piece of inherited land may be passed into the hands of a non-member of the family.
- Another problem of land tenure through inheritance is that, cultivators are tied to their plots, partly because they are unable to acquire land outside their family, and partly because they are unwilling to part with what they have. Regardless of how long a piece of land remains in the ownership of whoever abandoned it. Even when a man leaves the village, a brother may exercise only temporary rights of use over his land, and this does not confer on

him any permanent ownership. In addition some sort of tribute is expected to be paid to the true owner.

Moreover, land owners; generally feel that it is immoral to sell land since it robs future generation of the opportunity to inherit.

3.3 Land use Decree

The land use decree was enacted on 28th of March, 1978 by the Federal Military Government. It states that:

- All the land in Nigeria belong to the government
- The right to allocate land is vested in the hands of the state governors
- The state governor or any of his agents is the one who can issue certificate of occupancy to an individual. The person has the absolute right on the land with the certificate.
- The period of ownership of land will not exceed ninety-nine years.
- Crop production is allotted 500 hectares while grazing is allotted 5000 hectares
- Adult Nigerians of twenty one years and above have a right to acquire land.

Aims of the land use decree include:

a. this decree is aimed at reallocating land in order to make more lands available to intending farmers for large-scale agricultural production
b. to also remove the bad effects and arguments which land has generated in Nigeria.

Advantages of land use decree include the following:

1. people can acquire land outside their tribe or state, that is anywhere within Nigeria
2. large hectares of land can be acquired for agricultural purposes
3. certificate of occupancy can be used to source for loan from banks.

Disadvantages of Land use decree are as follows:

1. it makes it difficult for the federal government to acquire land
2. land acquisition now lies on the few rich individuals
3. the state governor can abuse his power by revoking the certificate of occupancy prematurely

4. it makes land use difficult
5. it creates room for irregularities as many land speculators may backdate land agreement before the decree
6. it may delay the execution of projects as the governor might not sign the certificate of occupancy on time.

Before the Land Use Act, the rights of all land ownership, land inheritance and succession, free leasehold, sale of land, co-ownership of land and regulating alienation of land were governed by customary laws. But since the promulgation of this decree, all forms of and ownership are no longer governed by customary law.

SELF-ASSESSMENT EXERCISE

Discuss land use decree and assess the level of success achieved by the decree.

4.0 CONCLUSION

In this unit, you have learnt about land use and land tenure system in Nigeria, it was discovered during the course of this unit that without land, no agricultural production can take place. As a result of the importance attached to land, government promulgated land use decree so as to make land available to every interested farmer.

5.0 SUMMARY

You can summarise the main points in this unit as follows:

- land resources include: soil, minerals, forests, fishing land and climates
- land can be used for both agricultural and non-agricultural purpose
- land for agricultural purpose include-crop production, animal production, fishery, forestry and wildlife conservation
- land for non-agricultural purpose include: residential building, land for industries, institutions, roads and bridges, parks and recreational centre and mining.
- the various ways in which land is held in Nigeria include:- communal land tenure, individual land tenure, freehold title, leasehold, tenants at the will of government and inheritance
- Land Use Decree was enacted on the 28th of March, 1978 by the Federal Government of Nigeria.

6.0 TUTOR-MARKED ASSIGNMENT

Explain how land tenure systems can affect the development of agriculture in Nigeria.

i. Explain any five major systems of land tenure in Nigeria.
ii. Give two advantages and two disadvantages of each system

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MODULE 2

UNIT 1 BASIC PRINCIPLES OF CROP PRODUCTION

CONTENTS

1.0 INTRODUCTION

In the last unit we discussed about land. In the unit you learnt the meaning of land, agricultural and non-agricultural uses of land, land tenure system in Nigeria. Other items discussed include: the advantages and disadvantages of each type of land tenure system and land use decree. In this current unit, we shall concentrate our efforts on the various parts of crop plant and their agricultural importance.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- list the various parts of crop plant
- state the agricultural importance of the various parts.

3.0 MAIN CONTENT

3.1 Parts of Crop Plant and their Agricultural Importance

The external morphology of a typical crop plant is divided into two major parts: the shoot and the root. The shoot is subdivided into stem, leaf and the flower.

3.1.1 The Shoot

The shoot system of a crop plant is composed of the following parts: stem, leaf and the flower.

The stem

The stems of some crop plants are hard and can survive for many years. They are called woody stems. They include cocoa, rubber, citrus and coffee. Others have soft stems. They live for a short time but their seeds or underground parts can grow into new plants. They are called herbaceous stems. Examples of such plants include: maize, rice, sorghum and millet.

The stem of crop plants that grow above the soil level is called aerial stem. Majority of the stems are erect. Others may have climbing stems e.g. yam while some stems prostrate and lie horizontally on the ground as does most grasses.

Other groups of stems grow under the soil and they are called underground stems. The major difference between this group of stem and root is that such stem can produce leaves and buds. Some stems such as banana produce rhizomes, some other under-ground stems produce tubers such as yam, potato and carrot. The other form of underground stems is bulb and corm as in onion plant.

Generally, the stem of flowering plant originate from that part of the embryo with the seed known as the epicotyls which is a continuation of the hypocotyls and is a mass of meristematic tissue that is narrower at its apex.

Agricultural importance of stem

a. The stem conduct materials to and from the leaves
b. It also supports the leaves and distributes them in space so that they receive adequate light. This function of the stem is of great importance in that it is the leaf that manufactures the plant food in the presence of light energy. If there is no enough light, this

activity of the leaf is greatly reduced thereby the plant yield is also reduced.

c. The stem also stores food as in the case of sugar cane.
d. The stems of some plants are used as cuttings for propagation of the plants as in the case of the cassava, bitter leaf etc.
e. Wood-stems supply timber, for building and construction and fuel.
f. The bark of some stems also supply fiber e.g. jute
g. Some stems such as the bamboo stem serve as pegs and poles in farm survey.
h. The stems of most plants particularly the barks are used for manufacturing of drugs.

The leaf

The leaf has a flattered blade called lamina. It is attached to the stem by a stalk called the petiole. The petiole continues into the lamina as the main vein, veins and veinlets. Most leaves are green in colour. The green colouring matter is called chlorophyll. The leaves grow from the stem. The point where the leaf is attached to the stem is called node. The distance on the stem between the stem and the leaf or a branch is known as an axil. In the axil is a part of the plant called an auxiliary bud. The bud at the top of the plant is called the terminal bud.

The bud is an embryonic or young shoot that has the capacity to produce leaves and braches. If a bud develops into a branch bearing footage leaves, it is called a leaf-bud. A flower-bud is one which produces a flower.

The leaves of crop plants occurred in various forms. Leaf may occur inform of cotyledons. This type of leaf occurs when they come above the ground as the first pair of assimilating leaves of the plant. Another form of leaf is scale leaves. This type of leaf is a brown membranous leaf devoid of chlorophyll and is directly attached to the stem. They are found in most underground stems protecting the bud. Bract leaf is similar to scale leaf. Bract leaves are found associating with flowers. Foliage leaves are the ordinary green leaves. They contain chlorophyll and form the major transpiring organs of the plant. Floral leaves are the modified which go to build-up the flowers of a flowering plant.

Agricultural importance of the leaf

- The leaf is the main seat of photosynthesis. It is the organ responsible for the manufacture of food for all living organisms. All food used by living organism are the products of leaves or other green parts of the plant. The yield of a plant is therefore controlled by the leaf area, leaf index and other green parts of the

plant. It is therefore of great agricultural importance that a crop should have adequate foliage to ensure high yield.

- The leaf also carries out transportation of nutrients from the soil and also helps to control the temperature of the soil.
- Leaf serve as food in the form of vegetables cattle and most other livestock and even man depend greatly on leaves as direct sources of food.
- dead leaves serve as manure for crop plants
- Leaves are also used as drugs for healing disease.

The flower

The part of the plant which is concerned with the production of flowers is known as the inflorescence and it may or may not be distinct from the vegetative part. The flower is the reproductive organ i.e. it produces the seeds. A flower will contain the followings:

1. **The calyx or sepals**
   These are the outer most covering of the flower they are generally green in colour
2. **The corolla or petal**
   These are usually brightly coloured part of the flower. They attract insects to the plant.
3. **The stamens**
   They are the male organs of the flower. Each stamen consists of a stalk or filament which bears another. The male cells or pollen grains are formed in another.
4. **The carpel**
   This is the female part of the flower. There may be one or many carpel in a flower.

A carpel has an ovary which contains female cells called the ovules the top of the ovary grows into a thin stalk called the anther specially produced to receive pollen grains

A seed is a ripened ovule; it is the result of the changes which take place in the ovule after fertilisation. The seed serves both for reproduction and for food.

A fruit is a fully developed and ripened ovary or the result of the changes which go on in a flower due to fertilisation. Fruits are important to plants as agents for seed dispersal and survival. It is also important to man and animals as a source of food.

Agricultural importance of flower

a. production, of seeds for the perpetuation of the species
b. it is used for decorative purposes

c. natural dyestuffs and stains are obtained from some flowers.

3.1.2 The Root

The root system is made up of parts which grow in the soil. The root system may contain one main or tap root system as in cowpea, pepper, orange, mango and cocoa.

In other plants, all the roots are almost of the same length and thickness. There is no main root. This is called the fibrous root system as maize, rice, sorghum and oil palm.

Root hair are developed a short distance behind the root tip. They are generally short lived and as older ones die fresh ones develop.

Agricultural importance of root

- The root fixes the plant in the soil. It is of great agricultural importance to take into account the rooting system of a crop plant in relation to the type of soil in which it is to be planted. If soil conditions are shallow, the plant is likely to be blown down by any slight wind.
- The root also absorbs water and mineral salts from the soil for the use of the plant. It is essential to make sure that the soil is well tilled to ensure that the roots penetrate deep enough to absorb the essential nutrients and water, thus replacing the water loss through the leaves.
- Some roots also serve as storage organs they are called root tubers e.g. cassava
- Some roots produce climbing organs or spines which help to position the plants firmly to the soil or other objects around the plant.
- When plants die, the roots decay in the soil and help to enrich the nutrient content of the soil
- The roots of leguminous plants contain nodules which harbor micro-organisms that fix-in atmospheric nitrogen into the soil. The roots of leguminous content of the soil.
- Some roots of plants are used in the preparation of drugs for curing diseases
- Many roots especially root tubers are used for feeding man and livestock.
- Roots also prevent soil erosion most roots hold soil particles together and prevent it from being washed away by water.

4.0 CONCLUSION

In this unit, you have learnt about parts of crop plants and their agricultural importance. The major parts of crop plants identified include: the stem, leaves, flowers and the root. Without the proper functioning of these various parts, the plant will not grow well. This will eventually lead to food scarcity in the country.

5.0 SUMMARY

At this point, you would have noted that:

- plant parts are divided into two major parts: the shoot system and the root system
- the shoot system is divided into three major parts: the stem, leaves and flowers
- the shoot system of most plants are found above the ground level
- the root system in most cases are found under the soil
- each part of the plant is very important for the survival of man and the plants
- there are modified forms of stems, leaves and roots.

6.0 TUTOR-MARKED ASSIGNMENT

i. Describe the external structure of a typical crop plant.
ii. Give two agricultural importance of the following parts of crop plant:
    a. stem
    b. leaves
    c. roots
    d. flowers

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UNIT 2 PRINCIPLES OF CROP PRODUCTION: CULTURAL PRACTICES

CONTENTS

1.0 INTRODUCTION

In the last unit, you learnt about the major parts of crop plant and their agricultural importance. The parts of crop plant discussed include: the stem, leaf, flower, and root. The agricultural importance of each part was highlighted. In this unit, you will be looking at the cultural practices in crop production. Under the cultural practices you will learn about the factors to be considered when selecting a site for crop farm. We shall also discuss the pre-planting, planting and post planting operation in crop production.

2.0 OBJECTIVES

At the end this unit, you should be able to:

- identify at least five factors to be considered when selecting a site for crop farm
- identify at least four pre-planting operations that must be carried out in crop production
- discuss planting operations and
- list the essential post-planting operation in crop production.

3.0 MAIN CONTENT

3.1 Cultural Practices in Crop Production

All the cultural operations on the farm are basically designed to control the factors necessary for healthy growth of crop plants, some of these operations are carried out before the actual planting is done while some are done during planting. The last sets of operations are carried out after planting is done. Details of these operations are highlighted below.

3.1.1 Selection of Site for Crop Farm

In choosing a site for crop farm there are some factors one has to consider the following:

a. **Proximity**: this refers to nearness of the farm in relationship to the residence. A site to be selected for farm should be near the farmer's resident. There will be a better security to the farm if it's nearer to the farmer's resident.
b. **Fertility and productivity of the soil:** the site to be selected must have fertile and productive soil. Soil fertility refers to the degree of mineral nutrient present in a given soil. The essential nutrients for crop production are grouped into two namely macro and micro nutrients.
c. **Macro nutrients:** are nutrients needed or required by plants in large quantity. They aid proper plant development and the absence or insufficient supply of any, affects the crop plants in their yields, growth and vigour. Such nutrients include: Nitrogen (N) Phosphorous (P) Potassium (K) Carbon (C) Hydrogen (H) Oxygen (C) Calcium (Ca) Magnesium (Mg) Sulphur (S). The growing plants show different deficiency symptoms to insufficient supply of any of the nutrients.
d. **Micro nutrients:** are mineral nutrients required by growing plants in a small quantity. They are other wise known as elements. They aid proper development and well being of the crop plants. But their insufficient supply has little effect on the crop plants. Micro elements include Iron (Fe) Manganese (Mn), Zinc (Zc), Copper (Cu), Boron (B) Molybdenum (Mo), Chlorine (Cl), and Sodium (Na).

The soil nutrients could be derived from organic and inorganic sources. The organic source of nutrients comes as green manure, farm yard manure and compost manure. The inorganic sources of fertiliser include the various synthetic or industrial fertilisers.

a. **Soil productivity**: this refers to the ability of the soil to supply plant life. It is the sum total of all the mineral components of the soil in addition to other soil properties such as texture, structure and the porosity. These properties determine the amount of nutrients and water held in the soil and made available to crop plants e.g. a clay soil has fine texture, and smooth touch which make the soil retain a lot of water when rain falls. Too much water in the soil affects the nutrients availability to crop growth no matter the amount of nutrients present. Likewise sandy soil rich in the required nutrients may be unproductive because the texture is made up of large size grains which permit free drainage of water from the soil. This situation may lead to leaching of nutrients and of water to dissolve the mineral for plant uptake.

b. **Topography of the area**: this refers to the nature of the slope of the land. A fairly flat level or land with a very gentle almost imperceptible slope should be selected. Land on a very steep slope should be avoided because such slope accelerates erosion and soil destruction. It retards rate of soil development and formation.

c. **Water supply**: a good site for a farm should have good sources of water supply. Water is needed abundantly by farmers while on practical work. They both need water for drinking when thirsty, to wash down after work and to wash tools after use. Water is needed to crops such as dry season vegetables, to dissolve soil nutrients to accelerate organic manure decomposition, to wash equipment in animal house, to wash the animal and to clean the house.

d. **Shady areas**: when choosing a site for school garden one should avoid shady areas. This is because sunlight energy is prevented from reaching the photosynthesis area of the crop plants. When farming under shade, the energy is rationalized, and the plant may not receive sunlight while at another time the plant may receive too much light. This rationing of sunrays as a result of shade reduces the photosynthesis duration for the growing crops per day. On the whole, it results into a decrease in the growth vigour and yield hence it should be avoided.

e. **Accessibility**: there should be an accessible road to the farm. This is permitting the movement of equipment to and from the farm and the transportation of agricultural produce from the farm.

f. **Rocky areas**: a rocky land is always difficult to cultivate as a result of stone and in some cases there is not enough soil to anchor the crop plants firmly to the ground. This lead to the failing over of crop plants during rainy season when erosion is pronounced or during a strong wind. The tubers or roots find it difficult to penetrate such rock hence rocky area should be avoided as much as possible.

3.1.2 Pre-Planting Operation

Land preparation in agricultural involves clearing of the vegetation which is in most cases the first operation in agricultural production especially in the tropics. It also includes the removal of the stumps, felling of trees and the packing before using the primary and secondary tillage equipment to prepare the seed beds.

1. **Land clearing operation**: This refers to the removal of natural vegetation in preparation for further land development for production purposes. This can be done manually or through bush burning, mechanically and chemically. When clearing, there should be due consideration to the soil stability. An inappropriate land clearing can lead to irreversible soil degradation which requires expensive remedial measures for the soil restorations. Clearing is the first operation in crop production and is done yearly in subsistence agriculture. In commercial agriculture where the land is mechanised, clearing after the first cultivation of the land is reduced. In arable farming land clearing is an annual event.

   Types of clearing

   a. **Manual clearing:** this is most common in traditional system of farming for small holdings. It is usually done by using simple tools such as matchet hoes and other indigenous tools in order to ensure regrowth or regeneration during the fallow period, removal of stumps is not generally done. This method cause the least soil disturbance and the problem of the runoff and soil erosion are minimal. The method however is slow and involves time wasting. It is also labour- intensive and therefore expensive. It is limited to small scale farmers.

   b. **Burning**: this refers to setting a dry vegetation ablaze intentionally or unintentionally. In most parts of West Africa, bush burning was extensively applied during the dry season partly for hunting purpose and in some instance as a means of removing the vegetation. Apart from this general burning exercise the cut bush (grasses) during manual clearing is usually burnt before the preparation of seed beds begins.

      Bush burning has a lot of both beneficial and harmful effects on the soil. They are as follows:

      - it is a quick means of removing vegetation cover
      - it is cheap and saves time and energy

- enriches the soil by supplying potassium through the ashes
- can be used to stimulate vegetation growth in pasture field
- breaks the life cycle of pest and disease organisms by killing them
- sterilises the soil
- aids in killing seeds of weeds
- on the other hand during burning nitrogen is lost to the atmosphere in form of gas
- in the same way sulphur is also lost
- it exposes the soil surface to rain fall and risk of surface erosion
- burning destroys useful soil organisms, farm animals and crops
- it reduces soil water content
- the soil pH is affected by raising and lowering and therefore it becomes unstable
- it affects the soil structure
- it leads to loss of organic matter in the soil
- burning causes environmental pollution resulting from the excess release of carbon dioxide.

c. **Mechanical clearing:** this is the use of machine in clearing the farm land. This type of clearing is common in grassland areas. The machine called plough (disc/mould board) is used for clearing purpose. This operation is followed by the use of harrow (another machine) for the secondary tillage or breaking and mixing soil clods with grasses and root remains.

d. **Tree removal/destumping:** this is another clearing operation performed before seed bed preparation. There are traditional/cultural, chemical and mechanical methods of killing and removing tress from the field.

Traditionally ring barking and bush burning are straight forward cultural operation used for killing trees. The ring cut on the bark and the burning at the base disturb the conducting tissues (phloem and the xylem vessels) of the plant. These result to impossible conduction of mineral nutrients and food reserves. The tree therefore withers and dry and later falls down during strong wind-blow.

e. **Use of chemicals:** the tree could be poisoned with chemical formulated in water or soil and used for treatment of the stem. Such chemical includes the phenoxy compound e.g. 2.4D (dischlophernoxy Acetic Acid) or 2, 4, 5, T (Tricholorophenoxy Acetic Acid).

f. **Mechanically:** trees, big or small could be removed by the use of machine from the field. There are different machines for this purpose:

- a heavy chain pulled between 2 tractors moving in a parallel direction
- front mounted dorsa blade
- combination of tree pushers and root rakers
- tree extractor attachment
- the flat button cutting blade.

2. **Tillage operations:** tillage is the loosing or pulverisation of the soil to improve the soil's physical conditions and to prepare a seed bed suitable for the crops to be planted. A soil in good tilth breaks up easily into crumbs and granules. These granules are porous and allow spaces for air and water.

Generally tillage is grouped into two stages called the primary and secondary tillage.

The primary tillage refers to the ploughing operation while the secondary tillage refers to the cultivation or ridging the soil. It involves the stirring of the soil at a deeper depth when ploughed. The weeds and other plant residues are destroyed to form organic manure which is mixed with top soil during the ridging process.

Reasons for tilling the soil:

1. to prepare a suitable seed bed
2. to improve the physical conditions of the soil such as loosening the soil for proper aeration
3. to conserve moisture in the soil
4. to eliminate competition from weed growth
5. to promote the activity of micro-organisms in the soil
6. to improve the soil fertility through the incorporation of organic manure.

3.1.3 Planting Operations

Basically the following methods are used during crop planting:

a. **Nursery methods**: in this method nursery beds are prepared to nurse the plants which are later transplanted to their permanent field. The nursery may be done in polythene, pots, boxes, in green houses before transplanting or under shades of trees.

b. **Permanent planting**: this is planting of the crops to the field directly without any nursery treatment. In this case different methods are used.
c. **Broadcasting**: this is the spreading of seeds over a given land or plot. Broad-casting is applicable with seeds of small size. There is no given hole.
d. **Drilling**: seeds can be sown using seed drill. Seed are drilled in rows of a given planting distance and at the same time fertilisers are placed. Seed drill makes fertiliser application to be easy as it is often mechanised.
e. **At stake or check plantings**: this is planting a determined number of seeds per piquate or per hole in between and within the side rows. The population can easily be estimated and the distance can be adjusted.

Planting Materials

In most crops seeds are used as the planting materials. Seeds are developed through the fertilisation of ovules. E.g. maize, guinea corn, groundnut etc. vegetative organs of plants is also frequently used as planting materials. This includes: cutting, tubers, roots, vines etc.

Selection of planting materials: the quality of seeds affects the early life of the plants and has a direct effect on the vigour of crops produced. Great care therefore must be taken in selecting seeds to use for planting. In selecting seeds the following are the guiding principles:

a. When making selection in the field, the vigour and size of the plant producing the seeds should be considered. Good healthy vigorous plants are more likely to produce viable and vigorous seeds than weak one.
b. They should be harvested when fully mature. Immature, seeds may not germinate or may produce weak seedlings which may eventually die.
c. Largest seeds from any sample should be selected. Large seeds are more likely to give yields than small one of the same sample. This is because more food reserve is in the larger seeds to support the vigour than the small ones.
d. Seeds to be selected should be well formed and should not be wrinkled or soft. A wrinkled seeds or soft seed often indicate malformation of the internal structure.
e. Duration of storage selected seeds should not be stored for a long time before use. The longer the seeds stay the more they lose their capacity for germination.
f. Seeds should be properly dried and stored in a dry place. Seeds should be dried to a moisture content of 12% to prevent the mould developing on the seed.

3.1.4 Post-Planting Operations

a. **Thinning** is the removal of extra seedlings from a stand when all the viable seeds have germinated. It is preferably done after rain when the soil is moist, and great care should be taken to remove only the weakest plants without doing damage to the remaining plants. The soil around the roots should be pressed firmly down again.

b. **Mulching** In the dry season, when the amount of rainfall is relatively small, mulching is a good way of conserving moisture. This can be done with dust or with grass. Generally mulching reduces the rate of the upward movement of water in the soil. A layer of cut grass also limits the effect of temperature fluctuation. The mulch also keeps down weeds, which reduce the amount of water in the soil through transpiration, and when the grass decays it forms humus which increases the water-holding capacity of the soil. Mulch also reduces run-off, again increasing the rate of water absorption into the soil. It makes clay soil more porous and enables sand particles to form good aggregates, and so encouraging infiltration.

c. **Fertilising**

An adequate supply of nutrients promotes plant growth and development. These nutrients must be supplied in a balanced amount at the right time and under the right conditions in order to be very effective. It is a good idea first to test the soil and know in what nutrients it is deficient so that the right type of fertiliser may be supplied. The fertilisers must not be allowed to have any direct contact with the plants because they have a toxic effect on them.

The response of crops to fertiliser application depends on many factors. First, the weather must not be so dry that the fertiliser cannot dissolve. Second, good improved varieties of crops well adapted to the environment should be used. Third, there should be a proper control of weeds to prevent their competing with the crops. Fourth, the poorer the soil the greater is the response to fertiliser application-in very rich soils the fertiliser might not have any effect at all. Fifth, fertilisers are better applied first during planting or shortly after germination for luxuriant vegetative growth, and again just before flowering for good fruit development.

Methods of Fertiliser Application

The three main methods are by broadcasting, placement and spraying.

Broadcasting means throwing (casting) the material as uniformly as possible over a whole area. It can be done by hand or mechanically. This method is mostly employed where crops are not arranged in rows but in dense stands: on plants whose root systems are properly developed and distributed within the soil and when using readily soluble nitrogenous or potash fertilisers or insoluble phosphate fertiliser.

The placement method, which is, placing small amounts of fertiliser near every plant, is used

- when the amount of fertiliser to be distributed is very small
- where phosphate and potassium fertilisers are used and there is danger of potassium and phosphorus being fixed, as in clayey soil
- when large spaces are present between the plants or rows of the plants
- on plants with poorly developed root system
- on soils at low level of fertility
- under flooded conditions e.g. for swamp rice cultivation.

The spraying method is adopted:

- when the nutrients are absorbed by the roots in the soil with difficulty. Such nutrients as the trace elements and magnesium sulphate can be absorbed through the leaves.
- where the nutrients are required in the smallest possible quantity-again, such as trace elements.
- when the crops have to be sprayed regularly with other chemicals. A mixture of fertilisers and insecticides or fungicides can be sprayed in one operation.

d. Weeding

Weeding is the removal from the farm of plants which grow in places where they are not wanted. Weeding is preferably done by uprooting the plants before they form seeds in order to prevent their spread to other parts of the farm.

The method adopted depends on the nature of the crops. The short-handle native hoes can be used for clean weeding on plots of maize, cowpea, sorghum, rice, yam and cassava. Handpicking is usually practiced on plots of creeping plants such as groundnuts, melons and pumpkins and on vegetable beds where the spacing is short. Strong cutlasses are used for brushing the undergrowth of plantation crops such as cocoa, bananas, coffee, kolanuts etc.

In highly mechanised farms, weeds can be destroyed by the use of chemical compounds called herbicides. These are poisonous to the weeds but harmless to crop plants, and they are available in the form of sprays, powders and dusts. Each chemical compound usually destroys a specific kind of weed: for this reason, many different chemicals are needed to destroy an assortment of weeds which are not of the same major plant group. Some common herbicides are: paraquat (gramoxone); 2,4-dichloroacetic acid (2,4-D); and 2,4,5-trichoroacetic acid (2,4,5-T). Some herbicides which act through the roots are simazine and linuron.

Chemical weed killers should always be used with care, since crop damage can easily be done by too high a chemical concentration.

SELF-ASSESSMENT EXERCISE

Describe the cultural practices you would adopt for a named crop after planting.

4.0 CONCLUSION

In this unit, you have learnt about the cultural practices in crop production. The issues discussed in this unit include: factors affecting the selection of farm site, pre planting operations, planting operations and post planting operation. From our various discussions it was discovered that the proper knowledge of all the cultural practices is essential for maximum crop production.

5.0 SUMMARY

The main points in this unit include the following:

- some of the factors to be considered in choosing a site for crop farm are; proximity, soil fertility, topography of the area, water supply, accessibility, rocky areas etc.
- pre-planting operations highlighted are land clearing and tillage operations
- methods of planting discussed include: Nursery method permanent planting, drilling etc.
- post-planting operations identified are: Thinning, mulching fertilising, weeding etc.

6.0 TUTOR-MARKED ASSIGNMENT

i. If a new university graduate who has just obtained cooperative loan, approach you for advice on where he wants to site his crop farm. What advice will you give him?
ii. Describe the sequence of pre-planting operations involved in the establishment of a named crop.

7.0 REFERENCES/FURTHER READING

Akinsanmi, O. (1975). *Certificate Agricultural Science.* London: Longman Group Ltd.

Ononamadu, E.O., Ibrahim, M.J. & fakehinde, P.B. (1999). *Basic Agricultural Science for Colleges of Eduction.* Okene: Consolidated Paper Mill Ltd.

UNIT 3 CLASSIFICATION OF CROP PLANTS

CONTENTS

1.0 INTRODUCTION

In the last unit, we discussed the factors that will guide a farmer in selecting new site for his crop farm operations. We also discussed all the various farm operations carried out before, during and after planting. In this unit attempt will be made to classify crop plants using different methods. The summary of cultivation of some food crops.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

i. classify crop plants using the following methods
ii. mode of cultivation
iii. life cycle, and
iv. the use of the plant
v. describe the production of the following groups of crops
    a. cereals
    b. legumes
    c. fruits
    d. vegetables
    e. tree crops

3.0 MAIN CONTENT

3.1 Classification of Crop Plants

There are various ways of classifying crops and each depends on the time and development of agriculture. Ononamadu *et al.* (1999) identified three major methods.

3.1.1 Classification Based on Method of Cultivation

On the method of cultivation, crop plants can be classified into three thus:

a. **Non-cultivated crops**: these are crops that are not generally cultivated which eventually came to live with us as if they were cultivated. They grow on their own in wild grooves and are harvested for man's use. They usually live for many years. , e.g. mango, cashew, oil palm, coconut, shear butter etc.
b. **Cultivated crops**: these are crops that are domesticated and their wild species are uncommon too. They are given proper care to increase their yield percentage. Their wild species may not be good or safe for consumption e.g. cassava, yam, maize, guinea corn, millet, potatoes, cowpeas, onion, melon etc.
c. **Sod (sward):** these are pasture crops which animals feed on. Usually they are not cultivated in Nigeria but they inhabit the environment on their own e.g. gamba grasses, guinea grasses, elephant grass, centro, stylosanthes etc.

3.1.2 Classification Based on Lifecycle

With the advancement in agriculture this method of classification became crude and unsatisfactory. Another method was realized and this method was based on the life span of crop plant. All the cultivated and uncultivated crops were subsumed into three classes as follows:

a. **Annuals**: these are cultivated or non-cultivated crops which grow, mature and complete their life cycle within a year and cease vegetative growth e.g. yam, rice, maize, groundnut, Gamba grass, guinea grass etc.
b. **Biennials:** these are crops which grow, mature and complete their vegetative growth life within two years. They can grow for more than one year but not more than two years and their vegetative growths cease. They include some species of cassava, sugar cane, pepper etc.
c. **Perennials**: these are crops that can last for more than two years. Their growth lives persist from a few years to many years. They

grow vegetatively for two or more years and then start their reproductive life. They can live for so many years (3-100 years) before the growth life ceases e.g. cocoa kola, mango, oil palm, rubber, cashew etc they are main tree crops.

3.1.3 Classification Based on Uses of Crop

With the discovery of various uses of plants the above classification became limited and less important, although they are still in use. Domesticated plants are classified according to the uses of the plants as follows:

- **Legumes:** leguminous crops are pod bearing crops which are capable of fixing atmospheric nitrogen into the soil. The roots of leguminous crops have nodies which contain bacteria called Rhizobium. The bacteria trap nitrogen from the air and soil for plant use in form of nitrate ions. Examples of legume plants include cowpea, groundnut, and pigeon pea, Soya beans, Bambara nuts and other pulses.
- **Cereal crops:** these are grasses grown for their edible seeds. They are also called grain crops. The grains contain carbohydrates that are edible to man and livestock e.g Rice, millet, Guinea corn, wheat, maize, barley, oats etc.
- **Fibre crops:** they are crops cultivated and harvested for fibre materials processed for making clothing, thread, rope, bag and jute sack such crops include cotton, jute, sisal, kernel, hemp etc.
- **Drug crops:** they are mainly grown for processing into drugs. They are tobacco, hemp, pyrethrium, coffee and kola.
- **Stem tubers:** these are short thickened underground stem which serve as food storage organ to the plant e.g. Irish potato, yam etc.
- **Root tubers:** these are crops grown for their enlarged roots which also serve as food storage organ e.g. cassava, carrots, sweet potatoes etc.
- **Oil crops:** these are oil producing crops. They are grown with the intention of producing oil from them. Examples include castor, cotton, groundnut, sunflower, oil palm.
- **Sugar crops:** they are grown for the production of their edible sugar e.g. sugar cane and sugar beet.
- **Latex:** these are crops that provide latex (liquid rubber) for processing into rubber products e.g. Rubber tree.
- **Fruits:** these are groups of trees grown for their edible developed ovules and ovary e.g. mango, cashew, guava, lrvengia, taminela etc.
- **Beverages:** they are also tree crops grown for their economic importance locally or internationally. They are otherwise called

economic trees or cash crops. They are used for the production of beverages.

SELF-ASSESSMENT EXERCISE

Name ten different crops which are grown in your locality. Classify these crops on the basis of use.

3.2 Summary of the Production of some Important Nigerian Crops

The summary of the production of some important Nigerian crops as presented by Akinsanmi (1975) are reproduced below:

	Yam	**Cassava**	**Maize**
Soil requirement	Well drained clayey loam	Tolerant to poor soils but does well on well drained rich friable loamy soil	well drained loams and silt loams with fine tilth
Method of Propagation	seed yam (whole tuber) or cutting of yam tuber about 250gms	20 to 30cm mature cutting having 4 to 6 growth buds	Seed
Date of planting West African Forest zone	November-December (early yam); March- April (late yam)	September under late maize	Mid March-April (early maize) late August-mid September (late maize)
Spacing	90cm apart on top of Mound and staggered in alternate rows.	100 cm between plants on top of ridge or 100 To 150 cm between rows And 100cm between Plants	80cm between rows and 50cm between holes
Number of propagatory material per hole	1	1	3 to be later thinned to 2 from two to three weeks after planting
Planting depth	cover tuber with about 5cm soil layer. Then Cover ridge or mound With grass mulch	either buried horizon-tally in the ground or slantingly with about 10cm above soil level.	4-5cm
Maturity period	8-9months	8-12months or more depending on variety.	13-16weeks
Method of harvesting	Tuber is carefully dug	by uprooting	cob torn from parent while green or dry.

	out of the soil with the Aid of any sharp tool e.g. cutlass		
Storage	1.Tubers are tied up in barns 2. In form of dried peeled tubers 3. In form of flour	1.As gari 2.As cassava flour	1.Maize hung up with part of shuck and dried by smoking. 2.cob removed from Chuck, shelled, and Stored in insect-free Containers at, moisture Contain of 10-15%
Marketing	Sold locally	1. Extracted starch sold locally and exported 2. Root, flour and gari Sold locally	Sold locally
Uses	1. Eaten cooked 2. Cooked and pounded	1. Roots cooked and pounded. 2. Roots ground and baked for 'gari'. 3. Terminal shoots as Vegetable soup	1. Grains eaten roasted or boiled 2. Starch extracted and taken as 'ogi'

	Guinea	**Rice**	**Cowpeas**
Soil requirement	Well drained, lightly alkaline sandy loam	Wide variety with high fertility but slightly acidic	Rich sandy loam
Method of Propagation	seed	Seeds planted in nursery seedlings to be transplanted To the field	seed
Time of planting West African Forest zone	May-June in the north, June-July in the south	April-May August-September	First week September
Spacing	On flat 60 to 80cm between rows. 10 to 15cm between seed.	25 to 30cm between rows and 25 to 30cm between plants depending on variety; or can be planted	50cm between rows 60 to70 cm between seed holes.
Number of seeds per hole	Up to 4 to be thinned down to 2-3	2-3	3-4 seeds to be thinned down to 2 seedlings per stand 2-3 weeks after planting
Planting	2cm	2cm	3-4cm deep

depth			
Maturity period	6-7months	4-7months	3-4months
Method of Harvesting	stems cut to the ground flower stalks then cut, collected and stacked. Grains separated from panicle by manual thrashing with stick.	Inflorescence stalk cut with small knife or sickle. Combine harvester used on large river farms.	Pick ripe pods as soon as they are completely yellow; dry in the sun before shelling.
Storage	Grains stocked in sacks.	Dry dehusked grains Stored in bags or insect- free containers.	After shelling seeds are stored in sacks and pots
Marketing	sold locally	sold locally.	Sold locally.
Uses	Staple food. Source of Starch and alcohol for Human beings. The green leaves and grains are used for livestock food. Dry stems are used for fuel, baskets and mats.	Staple food. Source of starch and alcohol.	Staple food. cover crop. green manure.

	Groundnut	**Cotton**	**Melon**
Soil requirement	Coarse-textured, sandy light loam, slightly acidic	Rich sandy loam	Soils rich in organic materials.
Method of Propagation	seed	Seed	seed
Time of planting West African Forest zone	March-April	First week in July	March-April after yam
Spacing	15cm between seeds and 40 or 60cm between rows depending on variety, or 15cm between seeds on Ridges.	90cm apart on top of ridge or 90sqcm on the flat.	1 planted directly into beds at about 120 to 200cm between rows and between seed
Number of seeds per hole	1-2	3 to be thinned to 1-2	3
Planting depth	4-5cm	3cm	3cm
Maturity period	5-6months	5-6months	5months
Method of Harvesting	By picking from up- rooted plant and digging from soil.	Dry seed cotton picked from the Bolls.	By collecting the fruits which are later cut and fermented to get out the seeds
Storage	After shelling seeds is stored in sacks.	put in sack container and kept in dry place.	Dried seeds kept in bags and insect-free containers.
Marketing	both sold locally and exported.	1. Sold locally 2. Sold to local industries 3. Exported	Sold locally
Uses	1. Food for human and livestock 2. Oil for cooking. 3. Cake for livestock.	Cloth making	1. Seed and oil for soup. 2. Melon cake as livestock feed.

	Fluted Pumpkin	**Tomato**	**Okra**
Soil requirement	Soil rich in organic matter.	well-drained, deep, humus-rich soil with good tilth.	most types of soils.
Method of Propagation	Seed	Seed	Seed
Time of planting West African Forest zone	March-April	Best towards the end of rainy season September-October	Early in April, August to September
Spacing	Planted directly into beds at about 120-200cm between rows and between seeds.	10cm by 10cm in seed trays. Transplant to bed at 60cm between plants depending on varieties.	planted directly into beds, 60cm between seed hole
Number of seeds per hole	3-5	1	2-3 to be later thinned to 1
Planting depth	3cm	0.5cm in nursery	3cm
Maturity period	Vegetative growth 1-6 months. Fruits mature 6-8 months.	3months	3-7 months depending On variety
Method of Harvesting	Young shoots and branches with immature Fruits plucked.	by picking the mature fruits.	plucking green Immature fruit for eating and Dry fruits for planting
Storage	Dried fruits and seed kept in sacks.	kept in straw indoors Or tinned.	Dry fruits kept In containers.
Marketing	Sold locally	Sold locally	Sold locally
Uses	Taken as vegetable Consumption of seeds	Eaten raw or cooked	immature fruits taken as green vegetables.

	Citrus	**Cocoa**	**Coffee**
Soil requirement	Well-drained sandy loams, silt or clay	Well-drained, clayed friable, red to brownish deep soil.	Rich, deep, friable, slightly acidic soil.
Method of Propagation	seed, budding, grafting	mainly by seeds. Budding. Leaf cuttings.	Seed Layering.
Time of planting West African Forest zone	seeds sown in pre-nursery October-December. seedlings transplanted to nursery April-May To be budded a year after. Then transfer to Field, a year after budding	Nursery planting December, January, Transplanting April-June.	Nursery planting April –May Field planting a year after
Spacing	Pre-nursery: 3 x 3cm in Seed tray. Nursery: 60 to 90cm between plants and rows. Field: 7-6m between plant and 9.1m between rows.	in nursery: plant 0.3cm deep in polythene bag packed with fertile soil. Transfer to field 6 months after. Field: 3cm between trees.	Nursery: plant 0.3cm deep in polythene bag packed with fertile soil. Transfer to field. Field:3cm between plant and 3cm between rows.
Number of seeds per hole	1	1	1
Dimension of planting Hole	15cm diameter and 30cm deep	15cm diameter and 30cm deep	15cm diameter and 30cm deep
Maturity period	3-7 years	3-5 years depending On variety, soil and climatic condition	first fruits produced 2-3yrs after planting. Full product- ion when about 8-9yrs old.
Method of harvesting	Clean picking if fruits mature at the same time. Or spot picking if not mature at the	use a sharp instrument To cut only the stalk of the pod without any damage to	1. collection of dropped fruits. 2. picking of ripe fruits

	same time	the flower cushion	
Storage	By processing e.g. 1. Fruit canning. 2. Concentrated juice bottling	Dry beans stored in bags and kept in dry pest-free stores.	Coffee complex each consisting of two seeds surrounded by silver skin endocarp are dried and kept in sack
Marketing	1. Sold locally 2. Exported	Mainly for export. Sold to local industries.	Main for export.
Uses	Beverage Fruit	Cocoa oil, butter, powder, chocolate, wine, shoe polish	Beverage stimulant.

	Kolanut	**Rubber**	**oil palm**
Soil requirement	Fertile soil with good humus content	Swamp clay or sandy or poor soils.	Deep loamy soil rich in humus and other plant nutrients. Must be slightly acidic pH 4.5-6
Method of Propagation	1. Mainly by seed. 2. Cutting 3. Budding 4. Grafting	1. Seed 2. Budding 3. Grafting	Seed
Time of planting West African Forest zone	Planting at nursery May-June. Field planting a year after.	Pre-nursery August- October. Nursery 9 months later. Budding in following February-April. Field planting March-June of following year.	Pre-nursery December Transplanted to nursery in April. Field planting March-May a year after.
Spacing	Nursery: plant 0.3cm deep in polythene bag packed with rich soil. Transfer to field 7 months after. Field: 7.6cm between plant, 9.1m between rows.	Pre-nursery: place viable seeds in fertile soil water and mulch heavily until they sprout. Nursery: 60cm between plants and 120cm between rows to be trans- ferred to	Pre-nursery:7.6cm x 7.6cm to be trans-ferred to nursery 4-6 months after. Nursery: 60cm x 60cm to be transferred to field a year after. Filed: 7.8m

		the field a year later at 6.8cm between rows.	between rows and 9m between plants.
Number of propagation materials per hole	1	1	1
Dimension of planting hole	15cm diameter and 30cm deep	15cm diameter and 30cm deep	60cm long, 60 cm wide and 80cm deep
Storage	After removing the skin, the insect-free nuts are wrapped in fresh banana leaves or placed in baskets lined with leaves.	the crepe sheets or ribbed smoked sheets are baled at 72kg per bale. Painted with Rubber paste solution and talcum powder.	After processing, the palm oil extr-acted is stored in containers made of copper, iron, zinc or aluminium
Marketing	1. Sold locally 2. Exported	1. Mainly exported. 2. Sold to local industries	1. Sold locally 2. Exported
Uses	1. Contains caffeine hence used as masticulatory stimulant. 2. Source of liquor 3. Source of tannin	1. Tyres, tubes 2. Shoes 3. Rubberized fabrics 4. Balls	1. Food 2. Margarine 3. Soap making 4. Steel industry

	Banana	**Mucuna**
Soil requirement	Well-drained rich loamy soil	Most types of soils
Method of Propagation	Sucker	Seed
Time of planting West African Forest zone	April – September	June, July, October
Spacing	4.6m x 4.6m	Irregularly by broadcasting or 60sq cm apart
Number of seeds per hole.	1	2
Planting depth or Dimension of hole	About 20cm diameter and 20cm deep	4.5cm
Maturity period	1-2 years	6-8 months
Method of Harvesting	Cut bunch stalk after felling the pseudostem	By picking of pods which are later shelled to get out

	when the fruits begin to round up.	the seeds.
Storage	In refrigerator Sliced and dried pulp. Dried and powdered pulp.	Seeds kept in containers
Marketing	Sold locally Exported	Nil
Uses	Food for man and livestock Banana wine	1. Cover up 2. Green manure

SELF-ASSESSMENT EXERCISE

Give the common names and botanical names of ten crops grown in your district.

4.0 CONCLUSION

In this unit you have learnt the classification of crop plants using the mode of cultivation, life cycle and the use of the crop. You have also learnt the production of major crop plants found in Nigeria. The knowledge of the soil requirements, method of propagation, and time of planting, spacing, and number of seed per hole, planting depth, maturity period, method of harvesting, storage, marketing and uses of crop is very essential in the production of crop.

5.0 SUMMARY

You should be able to summarise this unit as follows:

- based on the mode of cultivation, crop plants can be classified into cultivated and non-cultivated crops
- according to the lifecycle, crops can be grouped into annual, biennial and perennial
- According to the use of the crop, crop plants can be classified into cereal, legume, fruit, beverage, oil, drug, sugar, tuber and latex
- the following crops are produced extensively in Nigeria: yam, cassava, maize, sorghum, rice, cowpea, groundnut, cotton, melon, tomato, okro, citrus, cocoa, coffee, kola nut, rubber and oil palm.

6.0 TUTOR-MARKED ASSIGNMENT

i. In a tabular form, discuss yam, cowpea, maize and cocoa production under the following headings:
   a. soil requirement
   b. method of propagation
   c. planting and spacing
   d. harvesting.

ii. Explain with examples the classification of crops using lifecycle and the use of the plant.

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UNIT 4 PASTURE AND FORAGE CROPS

CONTENTS

1.0 INTRODUCTION

In the above unit, you learnt about the different classes of food crops and their production. You also learnt that crop plants can be classified into various groups using cultivation method, lifecycle method and the use of the plant. In this unit, you are going to learn about pasture and forage crops.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- define- forage, pasture, range and fodder
- list three importance and three characteristics of a good pasture
- list four advantages of mixing grasses and legumes in a pasture

- explain how pasture can be utilised
- describe how to establish pasture.

3.0 MAIN CONTENT

3.1 Concept of Pastures

3.1.1 Important Terms

1. **Forages**- are plants which are consumed by livestock and are often grown primarily for that purpose
2. **Pasture**- a pasture, on the hand is an area of land on which forage plants are growing or are being grown. A pasture may be natural pasture if the forage plants occur naturally on the land or it may be a cultivated pasture, if the forage plants have been specially planted and are being managed and maintained
3. **Range**- areas of the world where wild and domestic animals graze on uncultivated vegetation i.e. natural pasture
4. **Fodder**- dried food, hay or straw for stall-feeding of animals.

3.1.2 Disadvantages of Natural Pasture

1. The quality of the forage is very low
2. Livestock have to walk across vast areas in order to obtain sufficient food
3. The pasture is highly seasonal

3.1.3 Importance of Pasture

1. Provision of food for livestock
2. for soil conservation- erosion control and maintenance of soil fertility
3. Prevent wastage of land- land which is not suitable for crop production can be used for pasture.

3.1.4 Characteristics of a Good Pasture

1 Contains- grasses, legumes and a very small quantity of local weeds.

Grass only	- lack of nitrogen
Legume only	- too much nitrogen in the diets
	- not satisfactory as only diet
	- cannot withstand grazing
Weeds	- some are palatable
	- highly nutritious.

2 Must be palatable – tasty

3 Must be highly nutritious – proteins, vitamins etc.
4 Ability to regenerate under adverse conditions
5 Age or succulence- must not be too fibrous or too old
6 High leaf/ stem ratio- must be very leafy
7 Greenish colour – more appealing.

3.1.5 Mixing Legumes and Grasses in a Pasture

1. Both are used in feeding ruminant animals
2. The legumes provide or add nitrogen to the soil
3. The mixture improves the palatability of the pasture
4. Provides nutritionally balanced diet to the ruminants
5. Economical-saves labour
6. Wide coverage of soil- against erosion
7. Better and quicker regeneration after grazing.

3.2 Management of Cultivated Pastures

Cultivated pastures have to be established and managed, just like a field of any other crop. The land is first cleared, then ploughed and harrowed. However, instead of planting a single forage species on the soil, it is best to plant a mixture of grasses and legumes.

In natural pastures, it is also beneficial if a mixture of grasses and legumes is maintained. It seems that over the years that grasses seem to dominate, while the percentage of legumes decreases. For this reason it is sometimes necessary to restore the balance in natural pasture by encouraging legumes growth. This is done by broadcasting legume seeds, and by applying phosphorus and potassium fertilisers.

Seeds for establishing a pasture are usually sown by broadcasting. In some cases however, the seed may be drilled i.e. planted very close together in rows. In the case of some grasses, vegetative parts such as rhizomes and stem pieces are used for propagation. Ion all cases it is best to start establishing the pasture as early as possible during the rainy season.

Weeding should be done until the forage species cover the ground well. Phosphorus and potassium fertilisers may be used. There is no need for nitrogenous fertilisers.If irrigation is available the pasture should be watered during the dry season.

3.3 Utilisation of Forage Crops

Forage crops can be utilised in the following ways:

- for grazing
- soilage
- silage
- hay.

3.3.1 Grazing

The livestock are allowed to go into the field and to cast the growing forage crops. This method has the advantage that the actual harvesting is done by the animals themselves. Animals feel free, and that the dung deposited on the field pasture by the animals serves to enrich the soil.

However, a grazed pasture must be carefully managed. Care must be taken to avoid overgrazing, which expose the soil to erosion and allows weeds to grow. On the other hand, under grazing which allows the plants to become tough and less nutritious should also be avoided. The best way to ensure uniform grazing is to divide the field into fenced sections or paddocks. After one section has been adequately grazed, the animals are moved to another one while the first section has time to re-grow. If the plants are growing faster than grazing is occurring, then some of the forage should be cut and preserved as silage or hay. Weed and other plants which the livestock discriminate against should be removed whenever they are seen.

3.3.2 Soilage

When forage crops are cut on the field, taken to livestock and fed fresh to them they are referred to as soilage. The main difference between this form of feeding and grazing is that the harvesting is not done by the animals.

3.3.3 Silage

Silage is made by first cutting the forage into pieces. It is then packed tightly in a pit or silo (an upright metal container). So that air and external moisture are excluded under these conditions certain bacteria are able to convert some of the sugars present in the forage into acids. The reaction stops after a few days, but the acid produced has the effect of preserving the forage by preventing the growth of micro-organisms that cause rotting. As long as air is excluded, the silage will remain preserved, until it is fed to livestock.

3.3.4 Hay

To make hay, the plants are cut on the field and left dry there for a few days. They are then baled gathered together into tight blocks tied with string and stored in the dry condition. Plants should be cut for hay at about the onset of flowering. Good quality hay should be leafy, green, and free of weeds and foreign matter.

3.4 Common and Botanical Names of Major Pastures in West Africa

3.4.1 Some Major Forage Grasses of West Africa

	Common Names	Botanical Names
1.	Giant star grass	*Cynodon plectestachyum*
2.	Guinea grass	*Panicum maximum*
3.	Northern gambie grass	*Andropogon gayanus*
4.	Southern gambie grass	*Andropogon techorum*
5.	Elephant grass	*Pennisetum purpureum*
6.	Guatemala grass	*Cynodon dactlon*
7.	Pangola grass	*Tripsacum laxum*
8.	Pangola grass	*Digitaria decumbens*
9.	Para or Mauritius grass	*Brachiaria mutica*
10.	Signal grass	*Brachiaria decumbens*

3.4.2 Some Major Forage Legumes of West Africa

Common Names		Botanical Names
1.	Centrosema	*Centrosema pubescens*
2.	Pueraria	*Pueraria phaseoloides*
3.	Stylo	*Stylosanthes gracilis*
4.	Mucuna bean	*Mucuna utilis*
5.	Calopogonium	*Calapogonium mucunoides*

In addition to plants listed above, several crop plants which are normally grown for other purposes are sometime grown specifically for use as forage plants. Often used in this way include maize, cowpea, and Soya beans. When grown as forage, these crops are spaced much closer than when they are grown for seed. Harvesting is done before the seed matures and all the shoot portions are used to feed livestock.

3.5 Establishment of Pastures

Forage and pasture crops are grown primarily for farm animals. They can either be grazed by livestock in the field in pastures, or cut and processed into hay or silage before being fed to livestock. Pasture is sown with grasses or legumes or with a mixture of both. Both grasses and legumes can be grown under a wide range of conditions of climate and soil. Both are growing for a long period, and so they can be used continuously or in rotation. Not much attention has been paid to these types of crops in West African countries except on government farms, university farms and on experimental stations. In West Africa, farm animals move from one part of the country to another, grazing on uncultivated pastures which are usually overgrown, fibrous and not very nutritious species of native grasses, legumes and shrubs. Natural grasslands are mainly found in the savannah zones of West African countries, where most cattle are raised.

3.5.1 Grasses

Grasses are nutrition. Their food value, however, depends on the age at which they are grazed or cut and on their variety. The food value of grasses is highest when they are still young and succulent. This is when their fibre content is low and protein content is highest. A good grass must produce very many leaves and should not be stemmy.

The common types of grasses found in West Africa are also cultivated on government and university farms.

A) Elephant grass (*Pennisetum purpureum*)

1. **Origin and Distribution**

   Elephant grass originated in Africa but has now spread throughout the tropics and sub-tropics where it is used primarily as a forage grass. It has also been used to a limited extent as a soil cover for erosion control of steep land. Elephant grass is the most high-yielding of all the perennial tropical grasses and it responds to very high levels of fertilisation both in terms of dry material and quality. However it is rather fibrous compared to other perennial forage grasses such as guinea grass when allowed to grow for more than 50 days. At this age it has a digestible nutrient content of about 60 a fibre content of 30-35%.

   Elephant grass is used for producing dried grass pellets for compounding animal's feeds and for fresh forage production. It can be silage under tropical conditions. Elephant grass recovers from grazing but yields less than

one-third of the yield under cutting unless used in the fence-grazing system (padlocks).

2. **Climate and soil**

Different varieties are grown over a wide range of climates from the humid equatorial regions to frost-free temperate regions. Very high yields may be obtained in the humid tropics from climatically adapted strains with high sunshine levels. Elephant grass requires good drainage, yields poorly in heavy soils.

3. **Cultivation**

Elephant grass should be grown in rows of one meter (1m) a part which will permit cultivation between the rows, since harvesting is best done by forage harvester, high ridging should be avoided as this will impede the entry of the machinery. On free draining soils planting should be on the flat. Cutting of up to 3 nodes should be shown in furrows about 6cm deep. If plenty of planting material is available two rows may be shown. Under good conditions it will take about 4 months to establish. However, once it is established, it is perennial and may be cut for many years with good management.

4. **Management**

Management involves weeding and fertiliser application. Weeding may be done using herbicides (paraguat and simazine). Paraguat should be sprayed immediately after a cut at the rate of liter per hectare. Elephant grass is not delayed beyond 24hrs. After this new buds develop that will be killed by the herbicide. After paraguat, simazing at 24 kg per hectare should be applied. Generally, this herbicide treatment will give at least 4 months free from weeds.

It has been found that elephant grass responds to very high levels of fertiliser. Fertilisers should be balanced since response to high levels of nitrogen does not take place without potassium and other nutrients.

- Urea – 300 kg/ha
- Rcl - 100 kg/ha
- Po4 - 60 kg/ha

5. **Harvesting and Processing**

For feeding to livestock such as cattle, goats etc, elephant grass should be cut between 50 to 70 days with a forage harvester. Yield exceeding 60 tonnes per hectare of dry material or 300 tonnes per hectare of fresh forage may be contained under good physical conditions and with high rate of fertiliser use. When it is used for production grass pellets for non-ruminants cuts should be made at 4wks

intervals and yields will be only half the above rates. However, with heavy fertilisation, protein levels exceeding 18% may be obtained.

6. **Pests and Disease Control**
   Elephant grass is extra-originally free of serious pests and disease. Occasional leaf spot fungi infect the crop to a minor extent and certain varieties are susceptible to a die back virus. These varieties should be avoided. Leaf eating insects such as grasshoppers may be harmful during establishment and should be controlled with a suitable insecticide when necessary.

B. Guinea Grass (*Panicum maximum*)
   This is orderly distributed all over tropical countries. It can grow up to 4-5m. It is tufted in appearance and seeds rather early. It grows rapidly and can be used to make hay or silage for cattle sheep and goats. It is especially useful in a mixture with legumes or other grasses. It can be propagated from seed or stem cuttings.

3.5.2 Northern Gamba Grass (*Andropogon gayanus*)

This is a perennial, indigenous grass found growing in the northern savannah areas. It occurs in many varieties, most of them reaching heights of 2.5m when mature. All the varieties are liked by livestock and tend to be the first type of grass to be eaten in native pastures. They contain low protein content. They are drought resistant and will survive the dry season if they are protected from bush fires.

A) Giant Star Grass (*Cynodon plectostachyum*)
   This is a spreading, perennial grass with long and rapidly growing stems. It is very resistant to drought. It reaches a height of 120cm when fully developed and is grown from cuttings. Once it is established, it is difficult to eradicate. It provides good grazing material and responds well to fertilisers particularly phosphates.

B) Rhodes Grass (*Chloris gayana*)
   This is a perennial, spreading and drought resistant grass indigenous to West Africa. It reaches up to 120cm in height and is propagated from seeds. It is a nutritious grass which unfortunately does not survive repeated cutting or grazing

C) Kyasuwa Grass (*Pennisetum pedicellatum*)
   This is a re-seeding annual grass which reaches a height of 1.5m if left uncut. It produces very many seeds and tends to spread rapidly. It is fairly high in protein content and other nutrients and is considered a good fodder or hay grass.

3.5.3 Legumes

Legumes are species of forage crops which use the nitrogen in the atmosphere with the help of certain bacteria, to make the nitrogen they need. They store the excess nitrogen in their roots in little swellings called nodules. Legumes are liked by livestock and they are particularly high in protein content. They also contain quantities of calcium and phosphorus and are a good source of vitamin A. legumes grown in mixture with grasses introduces a rich, sweet taste into the pasture.

Legumes at the same time help to improve soil fertility by fixing nitrogen in the nodules of their roots. This benefits the crops which are grown after them. Most legumes send their roots deep-down into the soil so that when they decay they add humus and minerals plant food to the deeper soil. Legumes also help soils form erosions. This is especially helpful on steeping land. Legumes are sometimes referred to as cover-crops. They are also called green manure, because they can be cut and dug into the soil during the green stage of growth before flowering. The most cultivated forage legumes of West Africa are:

A *Centroseme pubescens*
This is a perennial vine-like plant which provides a good cover 4-6 months after planting. It is drought resistant, responds well to fertiliser application and is persistent on good soils. It is suitable in a mixture with grass species such as *Cynodon plectostachyum*, *Chloris gayana* or *Panicum maximum*. In such a mixture it provides good grazing, hay or silage.

B *Stylo-santhes gracilis* (stylo or Brazilian Lucerne)
This is also a perennial legume reaching 60-90cm in height. When kept short through regular cutting or grazing, it develops into a leafy plant. It takes livestock a little while to get used to the taste. It is drought resistant and performs better in dry areas. It is propagated by seed.

C *Pueraria phaselolides*
This is a perennial legume which is propagated by seed. It forms a good cover crop when well established and it is liked by cattle. This legume acts as a good protection against erosion. In Nigeria it is commonly planted as a cover crop in oil palm end rubber plantations.

SELF-ASSESSMENT EXERCISE

Describe the process involved in preparing preserved forms of harvested forage.

4.0 CONCLUSION

In this unit, you have learnt about pasture and forage crops. You also learnt how to establish pasture, how to manage and utilise pasture and the importance of pasture to agricultural development. From our various discussions, it can be concluded that it is as important as any other crop plant because, without pasture most ruminant animals can not survive.

5.0 SUMMARY

In this unit, you have studied pasture and forage crops. In this regard you have learnt that:

- natural pasture is called range while cultivated pasture is called forage
- there are disadvantages of depending only on natural pasture
- a good pasture must possess the following qualities- palatable, nutritious, succulent, contains mixture of grasses, legumes and weeds
- pasture must be well managed through application of fertiliser, weeding, disease control etc.
- for mutual benefits it is highly advisable to mix grasses with legumes in a pasture
- pasture can be utilised in any of the following ways- grazing, soilage, silage and hay.
- pasture can be established like any other crops.

6.0 TUTOR-MARKED ASSIGNMENT

i. Explain the meaning of the following terms: pasture, range, forage and fodder.
ii. What are the advantages of mixing grasses and legumes in a pasture?

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UNIT 5 SOILS FOR AGRICULTURAL PRODUCTION

CONTENTS

1.0 INTRODUCTION

In unit 4, we learnt about pasture and forage crops and we discussed the meaning of some key terms used in pasture management. We equally highlighted the importance of pasture, the advantages of mixing grasses and legumes in a pasture. Finally, we attempted to establish both grass and legume pasture. In this present unit, we shall discuss the various types of soil available for plant growth and how to improve on them for maximum production.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- list the types of soil suitable for agricultural production
- describe soil texture and structure
- list the type of soil erosion
- explain the effect of soil erosion on crop production
- describe the various types of manure used for crop production.

3.0 MAIN CONTENT

3.1 Concepts of Soil

3.1.1 Meaning of Soil

Soil is unconsolidated material derived from rock weathering and which has been acted upon by climate and vegetation.

The soil consists of the following:

- mineral materials, e.g. sand, clay, silt, gravel.etc.
- organic materials which are made up of plants and animals
- water
- air.

3.1.2 Soil Classes

Soil materials are classified according to the size of the individual particles that make up the major proportion of the sample. The international scale for naming rock or soil particles is shown on the following page.

This is also called the Alterberg system. The proportion of the various sizes in a soil sample has important effects on the soils physical and chemical properties. Agricultural soils are mixture of separates in varying proportions together with organic matter, air and water. They are classified according to the separate that has greatest influence on the characteristics of the sample.

For example, if coarse particles are predominate, the properties of the soil will be more of sands and where fine particles are in greater number characteristics of heavy soils will be more evident.

Particle	Range
Gravel	above 2 mm in diameter
Coarse sand	between 2 mm and .2mm in diameter
Fine sand	between .2 mm and .02 mm in diameter
Silt	between .02 mm and .002 mm in diameter
Clay	below .002 mm in diameter
Colloids	less than .0002 mm in diameter

The classes are:

- **Loam**: Loam is soil made up of separates in such a way that the characteristics of no one separate dominate those of the others. It is neither sticky as clay, nor floury as silt nor gritty as sand. It offers easy passage to water and at the same time retains enough water for use by the plants. It is easily worked into good tilth which enables plant roots to penetrate easily.
- **Sandy loam**: This is the name given to a sample in which the properties of the sand fraction predominate over those of clay and silt.
- **Clay loam**: This is the name given to the soil when the properties of clay predominate.
- **Silt loam**: This is the name for a sample that contains large quantities of silt thus showing the velvety characteristic of silt. Silt loam has neither the cohesive properties of clay nor the grittiness of sand. Because it lacks the cohesiveness of clay, and clay loam it is easier to keep it in good tilt
- **Silt**: This is soil material that contains about 80% or more of silt and less than 12% of clay. The velvety or flour-like properties are predominant in silt.
- **Sandy soils**: These are soil materials that contain 85% or more of sand. The percentage of silt plus clay shall not exceed 15%. The gritty properties of sand predominate.
- **A generalised grouping of soils**: Sometimes soils are grouped into coarse-textured, medium-textured and fine-textured soils. Under coarse-textured soils we get sandy soils and sandy loams. Loams and silt loams are medium-textured soils. Clay loams, silty clay loams and clays are fine-textured soils often called heavy soils, while coarse-textured soils are referred to as light soils. Usually heavy soils retain much moisture and sometimes are water-logged. Light soils are porous.

3.1.3 Soil Formation

The factors affecting soil formation are:

1. **Parent material**

   The earth's crust is composed of elements. The major ones in their order of predominance are oxygen, silicon, aluminum, iron, calcium, sodium, potassium, magnesium, titanium, hydrogen, carbon, phosphorus and sulphur.

   These elements vary in the proportion in which they exist in different parts of the crust. For example while calcium exist in commercial quantities and is mined in some places, the quantity in some areas is not sufficient to promote plant growth. These

elements combine in various proportions to form the rocks of the earth which are the parent materials. Parent materials differ in structure, composition and rate of decomposition. These differences are due to the difference in the proportions and type of elements that form the parent material.

For example, oxygen combines with iron to form oxides of iron. It combines with silicon to form the oxide of silicon. On the other hand metals form hydroxides which may combine with carbon dioxide to form carbonates. Elements like Ca, Mg, Na, Al, Fe, and K form silicate minerals with various types of silicic acid like metasilicic, polysilicic and orthosilicic. The parent materials disintegrate to form the soils whose properties will be greatly influenced by the properties of the parent material.

2. **Topography**

This involves the position of the land, whether the land is on a hill or a slope or in a valley and the degree of exposure of the surface to wind, light and rainfall. Topography affects run-off. Much soil may not form on a steep slope as the soil is subject to run-off as well as wind erosion. On the other hand, there is likely to be rapid accumulation of soil in a valley as rain, wind and running water will carry soil from other places and heap it on the valley.

3. Climate

Climatic factors like rainfall, temperature changes and wind are of major importance here. Rainfall facilitates the washing down of the products of disintegration deeper into the soil. Due to run-off in some places, the amount of soil formed will continue to decrease. Heat aids chemical reaction and the greater the heat- the faster the reaction. The soil forming process involves some chemical disintegration of minerals and the greater the intensity of heat the greater the amount of soil formed. Wind carries away soil particles so that the greater the velocity of the wind greater will be the amount of particle carried away.

4. **Biotic factor/organisms**

This means plants and animals whether they are microbes or microbes. Here man is even included. Organism helps in one way or the other in the disintegration of rocks. Micro-organism may secrete substances that help the chemical reaction in the soil; the roots of plants on finding their way into small cracks in the rocks. The larger animals through their activities on the surface of the rocks help to break the rocks into particles. It must be remembered that when any organism dies the remains of the body will eventually go to form part of the soil.

5. **Time factor**
   This means the duration of the soil forming process- the longer the time the soil forming process lasts the greater the quantity of soil that will be formed.

3.1.4 Soil Texture

Texture refers to the proportion or percentage of the different sized particles that make up the sample.

The following methods are adopted in determining the texture of the soil:

1. **By feel**
   The texture can roughly be determined by its feel. When rubbed between the fingers a coarse or gritty feel indicates a sandy texture while a smooth or flouring feel denotes a silt texture. When wet, clay has a sticky feel.
2. **Moulding**
   This is a field method of determining texture. The sample is moistened and kneaded thoroughly. It is formed into a ribbon. If the ribbon can be formed into a circle, the sample is clay. If it can bend into a "U" it is a clay-loam. But if the ribbon breaks when bent the texture is loam and if it does not form a ribbon at all then it is a sandy texture.
3. **Sedimentation and sieve method**
   This is usually a laboratory method. The sieve is used to separate sand fraction but it cannot be made fine enough to separate silt and clay. Sedimentation uses the principles that when different sized particles are shaken up in water they separate out, the largest particles falling to the bottom first followed by the smaller particles and the smallest particles are left on top.

3.1.5 Properties of Sand and Clay

Clay	Sand
a. Physical	
1. Clay has very small particles	
2. It forms aggregates or lumps	Sand has large particles
3. Has small pores	Sand has no structure
4. Has high water holding capacity	Has a large pore
5. Hard to cultivate	Has low water holding capacity
6. Clay soils are cooler soils	Easy to cultivate
7. Swells when wet and cakes when dry	Sandy soils are warmer soils Not affected by wetting and drying.
b. Chemical	
1.Clay consists of many elements or minerals	Sand consists chiefly of silicon dioxide (SiO2) called quartz
2. Rich in plant nutrients	Sand is poor in plant nutrients.
3. Has good mineral holding capacity.	Has poor mineral holding capacity.

3.1.6 Soil Structure

1. **Meaning**

   This is the arrangement of individual particles of soil into aggregates or clusters separated from neighboring aggregates by surfaces of weakness. The formation of the soil particles into definite structural patterns is brought about by cementing agents. These cementing agents are:

   - colloidal clay
   - colloidal humus or organic colloids
   - hydrated oxides or iron (Fe2O3) and aluminum (AI2O3)

   These are also known as sesquioxides.

   Clay is a powerful cementing agent but the aggregates formed by it are usually smaller and easily broken.

2. **Importance of structure**

   (a) Good structure facilitates suitable seed-bed preparation.

   (b) It permits optimum aeration and water holding during the growth of plants.

   (c) It reduces erosion.

   (d) It helps the emergence of plants. It is known that much of the cultivation is done to bring the soil to an optimum structural condition.

3. **Factors affecting soil structure**

(a) Climate

(i) Rainfall: Rainfall tends to destroy soil structure. Rain drops break the aggregates thus reducing the soil to particles. This brings about one form of erosion called raindrop erosion. Aggregation is greatest in areas of medium rainfall.

(ii) Temperature: High temperatures stimulate chemical activity and decomposition of organic matter and humus. Hence high temperatures cause less aggregates.

(b) Plants

Plant materials decay to form humus and plant roots both break up large aggregates and help to form small aggregates.

(c) Micro-organisms

Some bacteria and fungi can break already formed aggregates and can form others.

(d) Absorbed cations

Soil especially clay can absorb cations. The main cations they absorb are $Na^{+,}$ $Mg^{++,}$ $Ca^{++,}$ K^{+} and $H^{+.}$ Except sodium cations, the others tend to attract soil particles thus helping in aggregation.

(e) Cultivation

Tillage has both favorable effects on soil structure. If tillage is done often it helps aggregation. If it is done when the soil is too dry or very wet it destroys soil aggregates. The best time to till the soil is when it is friable and soft.

3.2 Soil Erosion

3.2.1 Types of Soil Erosion

Because of the devastating nature of this phenomenon called soil erosion it is important for us to discuss some of its major cause so that field workers and farmers alike will take note of them. Soil erosion is the removal and transportation of the few centimeters of top soil which is the portion containing the largest concentration of plant nutrients and micro-organism which aid soil development or improvement.

There are two types of erosion:

- water erosion
- wind erosion.

A **Water Erosion**

Water erosion occurs in areas where rainfall is either far in excess of the capacity of the soil or that the rate of down pour is faster than the rate of infiltration.

Factors aiding water erosion include:

- intensity of rainfall
- duration of rainfall
- size of rain drops
- turbulence
- slope or gradient of land
- vegetation cover
- agricultural practices
- soil types (i.e. whether clayey or sandy).

B **Wind Erosion**

wind erosion occurs where the soil particles are loose, small, and the soil is dry due to lack of sufficient moisture.
Factors aiding wind erosion:

- particle size of the soil
- speed of wind
- water deficiency
- vegetation cover.

Generally, the pattern of land use (cropping, grazing and stocking density) will either aid or discourage erosion. Farmers are, therefore, advised to strictly adhere to recommended cultural practices to prevent wind and water erosion.

3.2.2 Effects of Erosion on Agricultural Production

1 Erosion destroys agricultural land by trans-locating the most fertile portion and depositing it far away from where it was eroded. It can also destroy originally fertile soil at the site of deposition.
2 It impairs soil development/formation processes.
3 It can lead to destruction of settlements or farmlands to the extent that inhabitants are forced to abandon their holdings.

3.2.3 Method of Minimising the Effects of Soil Erosion

1. Land use: In areas prone to erosion, as in parts of Anambra State, land should be such that the land is not left bare i.e. Ensure vegetation cover at all times as much as possible.

2. Soil conservation method should be incorporated into farming systems. For instance, bench terracing should be adopted on slopes as well as mulching and planting cover crops to protect exposed soil surfaces.
3. Farmers should make their ridges across the slope
4. Strip cropping could be adopted- where the farmer divide his piece of land into strips and crops are rotated on the strip i.e. Row crops alternating with some form of cover crops, e.g. maize and cowpea or melon.
5. Gullies can be obstructed by constructing barriers across them and also by constructing out-let for oncoming water, and by planting the channel with perennial grass and trees which will reduce the transportation of soil particles down the slope.
6. Wind breaks could also be constructed to reduce the force of the wind so as to minimise its effect on exposed soil.
7. Construction of dams to break the force and speed of water down the slope.

3.3 Soil Improvement

Various measures can be taken practically to maintain or improve the fertility of the soil. This include: proper cultivation, prevention of erosion and leaching, maintenance of good drainage system, well planned crop rotational system and use of cover crops. These practical measures are aimed at improving or maintaining the fertility of our soils. Other method include the application of organic manure such as farm yard manure, green manure, compost manure, artificial fertiliser, lime and all process that will promote increased useful activities of soil micro-organisms.

3.3.1 Organic Manures

Manure is material which is added to the soil in order to replace the nutrients that are deficient in the soil. In other words, it is anything added to the soil to maintain or improve soil fertility.

Types of organic manure are:

- farmyard manure
- compost manure
- green manure.

1. **Farmyard Manure**
   Farmyard manure refers to the dung from livestock such as cattle, pig, poultry, sheep and goat. It is a mixture of dung, faeces, urine and the grass used for litter or bedding.

Advantages of Farmyard Manure

i. It is a source of major plant nutrients, i.e. nitrogen, phosphorus and potassium.
ii. Farmyard manure helps to improve soil texture and structure.
iii. It improves the water retaining capacity of the soil because it readily absorbs and retains water.
iv. It provides favorable medium for the growth and activities of beneficial micro-organisms e.g. Bacteria.
v. It is cheap because it can be produced in the farm and around the home.

2. **Compost Manure**

Compost manure is a mixture of partially decayed organic materials and may also include ashes, lime and chemicals. It is made by placing crop residues, grass, weed, house-hold wastes, poultry dropping and ash in heaps or pits and allowing the mixture to rot or decompose.

Advantages of Compost Manure

i. It is a source of soil nutrient, especially as it increases nitrogen content of the soil.
ii. It improves the texture and structure of the soil.
iii. It improves the water holding capacity of the soil.
iv. It encourages the activities of soil micro-organisms.
v. Compost manure helps to balance the acid/base condition of the soil. Rapid change in soil temperature is reduced with the application of compost manure.

3. **Green Manure**

These are crops that are grown with the purpose of adding them to the soil while they are still green. These crops are buried in the soil just before they start flowering. If the crops are too old, the rate of decomposition is slow. Nitrogen content is also decreased. Green manure is usually fast growing plants. They include legumes and grasses like mucuna and cowpea.

Advantages of Green Manure

i. It adds nutrients to the soil. Legumes fix nitrogen from the air into the soil.
ii. Green manure increases the organic matter content of the soil.
iii. It improves the texture of the soil.
iv. It checks soil erosion and leaching of soil nutrients.
v. Green manure crops may help to control weed by smothering them.

4. The Importance of Soil Micro-Organisms in the Maintenance of Soil Fertility
    1. They aid in partial disintegration of plant materials into their component parts to form plant nutrients.
    2. They help in transporting sub soil to the surface of the soil there by aid mixing of the top and sub soils.
    3. They aid development of humus.
    4. They improve water percolation and aeration e.g. burrowing soil animals.
    5. They produce materials that bind soil particles into aggregate e.g. earthworm and algae.

3.3.2 Fertilisers or Inorganic Manure

Fertilisers are chemical materials supplied to the soil to improve its fertility and productive capacity. They are usually applied to soils which lack some important nutrients. Usually they are solids but some can be dissolved and applied as liquids. These fertilisers are salts containing the needed nutrients in available forms. They are available in powers, granules, crystals or pellets.

(A) Types of Fertilisers
    1. **Complete Fertilisers**: These contain the three major elements: Nitrogen, Phosphorus and Potassium (NPK). The salt containing the NPK sometimes contain trace elements as impurities. Proportions of N, P and K vary in different fertilisers, the variation is in accordance with the specific need of the soil to which they are applied. They are marked as NPK 15:15:15; NPK 20:20:20; NPK 10:10:10; NPK 5:10:5; these figures standing for percentage of N, P, and K respectively.
    2. **Nitrogenous Fertilisers**: These are fertilisers containing nitrogen essentially. They are usually applied to the soil to increase the nitrogen content of the soil e.g. urea containing 42-45% N, sulphate of ammonia containing 12% N, anhydrous ammonia containing 82% N, sodium nitrate containing 16% N. nitrogenous fertilisers are very good for leafy vegetables.
    3. **Phosphatic Fertilisers**: These are fertilisers containing more of phosphorus than any other element. Rock phosphate is the main source of phosphorus. Rock phosphate is treated with chemicals to form fertilisers. Super phosphate with P2 O5 content of 29-30% is the commonest phosphatic fertiliser. Other is tride super phosphate containing about 54% P2 O5, basic slag

containing 15-25%, P2 O5, bone meal containing 25-30% P2 O5 (P2 O5 is oxide of phosphorus).

4. **Potassium Fertiliser**: These are fertilisers which are usually applied to make potassium and other nutrients available to the soil e.g. potassium sulphate containing 48-50% K2O, potassium nitrate containing 44%, K2O and extra supply of 13% N, potassium chloride containing 48-60% K2O. (K2O is oxide of potassium).

B Method of Applying Fertiliser

1 **Broadcasting:** Broadcasting involves the spreading of the fertiliser all over the ground. It is done by hand or machine. Some of the chemical fertilisers are toxic to the plant, hence should not fall on the plant but should be carefully applied to the soil. The distribution of fertiliser must be uniform on the soil. After spreading, it should then be covered up with soil. This method is good for vegetable garden and rice farms.

2 **Row Placement**: This involves making a hole few centimeters from each plant after which the fertiliser is put about the hole. This method is good for most field crops.

3 **Ring Method**: This involves the spreading of the fertiliser evenly in a ring made round the base of the plant at specific diameter. It is commonly practiced in tree crop plantations.

Advantages of using Chemical Fertilisers

i. The major advantage is that essential elements concentrated in them are liberated within relatively short period.

ii. It brings about increase in soil nutrients with consequent increase in farm income.

iii. Disadvantages of Using Chemical Fertilisers

iv. Some parts of the chemicals are easily leaching away because they are mobile. Such chemical fertilisers cannot work in the soil for a very long time.

v. Chemical fertilisers cannot improve the texture and structure of the soil as do humus.

C **Liming**

Liming is a practice which involves the addition of some chemicals to the soil to reduce soil acidity. Forms in which lime is added to the soil include quick lime (oxide of lime); slaked lime (hydroxide of lime) calcium carbonate or dolomite (carbonate of lime).

Effects of Liming on the Soil

1. It has physical effects, as it encourages granulation in heavy soils.
2. It improves soil structure
3. It has some chemical effects because it increases levels of calcium and magnesium in the soil. It also encourages the uptake of molybdenum and phosphorus whilst discouraging the build up of toxic levels of iron, aluminum and manganese in acid soils. Excessive liming can, however cause detrimental reduction in iron and manganese level in the soil, resulting in poor crop yield.
4. It reduces soil acidity thereby allowing soil micro-organisms effective and active functioning.
5. It makes nutrients more readily available to plants.

SELF-ASSESSMENT EXERCISE

Draw a soil profile and describe each layer of the soil.

4.0 CONCLUSION

In this unit, you have learnt about soil. The important aspects of soil discussed include: the meaning of soil, types of soil, soil formation, soil texture, soil structure, soil erosion and soil improvement.

Concerning soil erosion, you learnt about the types of soil erosion, the effects of minimising the effects of soil erosion, the effects of erosion on agricultural production. The two major manures. It can be concluded that the application of the right type of manure can increase crop yield by 50 per cent.

5.0 SUMMARY

The main points in this unit include the following:

- soil consist of mineral materials, organic materials, water and air
- the following types of soil can be identified- loam, sandy-loam, clay-loam, silt-loam, silt, sandy soils etc
- the factors affecting soil formation include parent materials, topography, climate, organisms, time etc.
- soil texture can be determined by feeling, moulding and sedimentation
- soil structure is the arrangement of individual particles into aggregates
- there are two types of erosion- water and wind erosion
- there are two types of manure- organic manure and inorganic manure

- organic manure includes- farmyard, compost and green manure
- fertiliser can be applied using any of the following methods- broadcasting, row placement and ring.

6.0 TUTOR-MARKED ASSIGNMENT

i. (a) Discuss briefly five factors that affect soil formation
   (b) Explain any three physical properties of soil

ii. Explain the term soil structure and state its importance in agriculture.

7.0 REFERENCES/FURTHER READING

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MODULE 3

UNIT 1 FARM ANIMALS PRODUCTION: RUMINANTS

CONTENTS

1.0 INTRODUCTION

In module 2 you learnt about soils. In the module we highlighted the meaning of soil, types of soil, soil formation, soil texture, soil structure, soil erosion and soil improvement.

In this module we shall discuss the production of farm animals. The farm animals to be discussed in this module are cattle, sheep and goat. They are called ruminant animals.

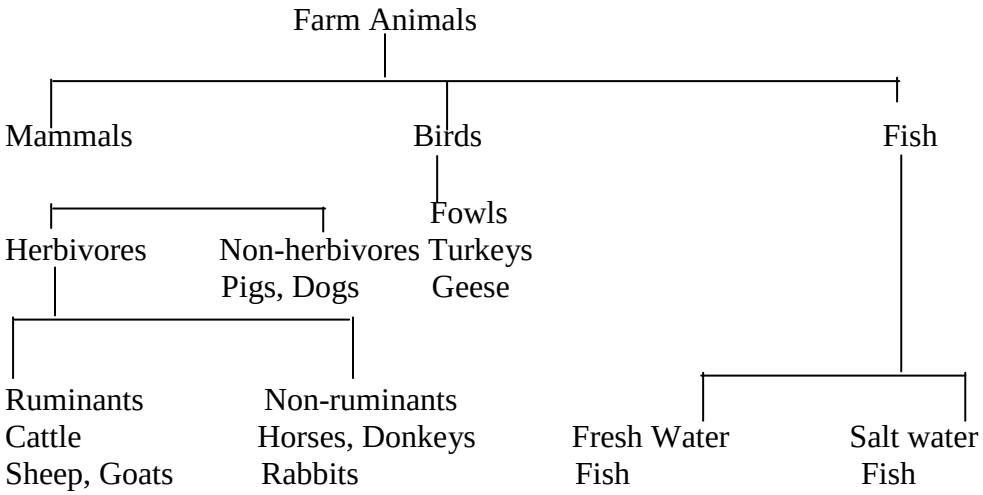
2.0 OBJECTIVES

At the end of this unit, you should be able to:

- classify farm animals
- classify cattle
- list the different breeds of cattle found in Nigeria
- list the factors that affect cattle distribution
- list the four types of cattle
- list the various breed of sheep
- list the different breed of goats.

3.0 MAIN CONTENT

3.1 Classification of Domestic Livestock



3.2 Cattle Production

All domesticated cattle belong to the genus Bos of the Bovidal family. The genus Bos may be divided into four sub groups, namely:

i. Bos Taurine
ii. Bos Biborine
iii. Bos Bisontine
iv. Bos Bubaline

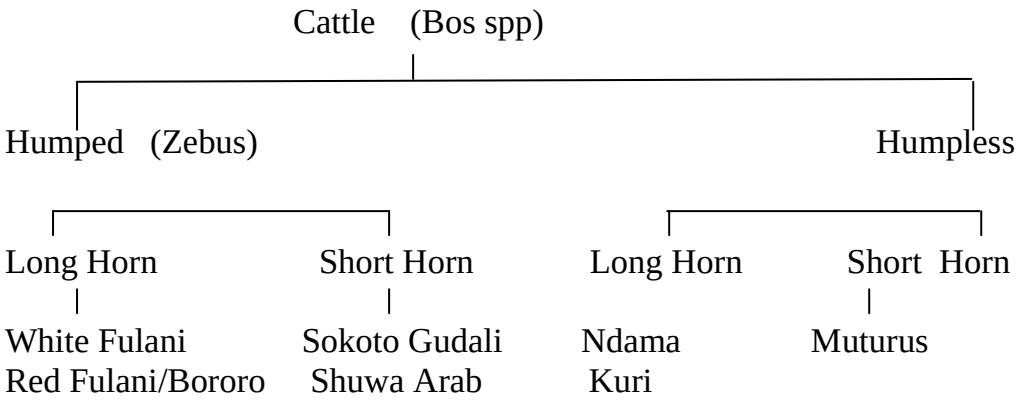
In West Africa, the majority of the cattle belong to the taurine sub-group.

3.2.1 Origin of Cattle

It is believed that the various breeds and types of cattle now found in Africa have been introduced from Asia, the Middle East and move recently from Europe.

The earliest ones to be introduced are the Ndamas, followed by the humpless short horn muturus (Bos brachyceros). After them came the Zebus (*Bos sindicus*). In West Africa today, cattle population has mixed up a lot in breed even though several types can still be identified.

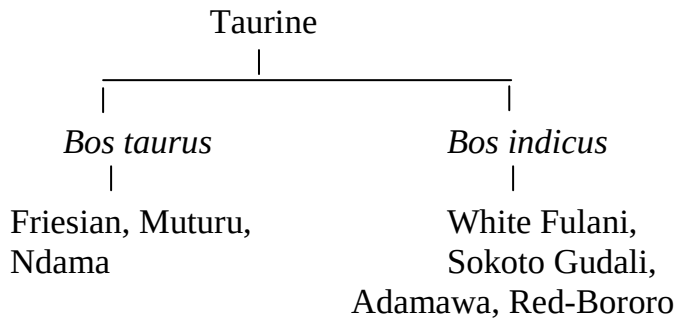
3.2.2 Types and Breeds of Cattle



Comparison between *B. taurus and B. indicus*
Almost all the cattle in West Africa belong to one sub-group – Taurine. This sub-group includes the two most important spieces which exist today, *Bos taurus*, the Europe types and *Bos indicus* or the Zebu type cattle which is believed to have originated from South-central Asia.

B. taurus has a worldwide distribution and is known to be the most productive breed under normal conditions. These groups, which are usually humped, include the Friesian cattle, originating from the Netherlands and West African Muturu and Ndama.

B. indicus, are tropical cattle which are not found in temperate zones. They are humped with conspicuous horns. The West Africa breeds of the Zebu include the white Fulani, the Sokoto Gudali, the Adamawa and the Red Bororo.



3.2.3 Common Terms Used in Cattle Production

i. **Cow** – This refers to the female bovine animals which has had one or more calves or has reached advanced pregnancy or one which although barren has reached maturity with the physical characteristics of cow.
ii. **Bull** – This is the uncastrated male bovine animal which can be of any age.
iii. **Steer** – This is a male bovine animal castrated early before maturity and development of physical sexual characteristics associated with bulls.
iv. **Stag** – This refers to the male animal which has been castrated after maturity and development of physical sexual characteristics associated with a mature bull.
v. **Heifer** – This refers to a female bovine animal which has not had a calf or reached advance pregnancy or developed into the mature form of a cow
vi. **Calf** – A calf is any member of the bovine family which is less than a year old.
vii. **Yearling** – These are young cattle between twelve and twenty four months of age.

3.2.4 Characteristics of West African Cattle

The breeds of cattle found in West Africa include the following:

i. The White Fulani
ii. The Red Bororo
iii. Sokoto Gudali
iv. The Ndama
v. The Muturu
vi. The Friesian

1. **The White Fulani –** These are bred in northern Nigeria under an average maximum temperature of 36.7^{o}C in April an average minimum temperature of 13.3^{o}C in December and an average annual rainfall of 109.2cm. The white Fulani, also called

"Bunaji" is grey in colour with black points. The males have a muscular neck, a large hump and a rather coarse neck. Their bodies are compact and fleshy with a well develop rump. The head is small and the horns are of medium size. The white Fulani is the most suitable milk producer among the zebus.

2. **The Red Bororo –** This longhorn breed is found in the north – eastern part of Nigeria where the average annual rainfall is 63.5cm. The mean maximum shade temperature in summer is 32.2.oC and in winter is 19.4^{o}C. The red bororo has a narrow body, long legs and weighs about 408.2 kg at maturity. Their horns are long and the back stops towards the rump. It is a poor milk producer and mature late.
3. **The Sokoto Gudali –** These are found around the Sokoto province as the name suggests. There, the mean maximum shade temperature in April is 41.1l^{o}C and the minimum shade temperature is 15.6^{o}C in January. They are less resistant to trypanosomiasis than the white Fulani, hence they are found in the drier parts. They have a well developed hump, a fleshy and compact body and large dewlap. Though they are suited for beef cattle as a result of their conformation, they are also good as dairy cattle especially when they are fed under good farm conditions. The breed is popular in many parts of northern Nigeria as they are comparatively docile and are easily trained for farm work.
4. **The Ndama –** This is one of the humpless cattles found in Guinea, Sierra Leone, and Senegal. Here the maximum shade temperature in summer is about 30^{o}C and the minimum shade temperature is about 23.3^{o}C. The average annual rainfall is 147.3cm. They have been introduced into Ghana and Nigeria. There conformation is very much like that of specialised beef breeds but their average weight is only 299.4 kg. The bulls have been found to weigh up to 550kg under improved management. Their body is compact with short legs and a broad straight back. They have little or no dewlap and small sheath. They are typically brown in colour. These cattle are early maturing and are poor milkers but are exceptionally fertile. They tend to be nervous, stubborn and easily provoked into action. One of their greatest assets in West Africa is their resistance to trypanosomiasis. This is why they are successfully reared along the tsetse fly coastal areas of West Africa and are even used to up-grade other breeds.
5. **The Muturu –** This is a dwarf breed and reared in typical rain forest areas of West Africa. The colour ranges from dark brown to pure black sometimes with white markings. It has a good body conformation with a large fleshy body and fine bone. It is hump less with a relatively small head. It is highly resistant to trypanosomiasis. It matures in 3 to 4 years and teaches a body

weight of about 225kg. It is low in milk yield. In most cases they are kept for prestige purposes and not for work or food. This is why they are not found in large numbers. They are often seen grazing in the bush. The Muturu is often given as dowry or used in ceremonies like burial of distinguished tribesmen and chiefs.

6. **The Friesian –** This is a dairy type which originated from the Netherlands. It has succeeded in West Africa because it is resistant to trypanosomiasis. It is being used to cross breed with the native breeds in order to improve. They have high milk producing capacity. The Friesian is a large size breed which at maturity weights between 540-675kg for cows and 675-900 kg for the bull.

3.2.5 Factors Affecting Cattle Distribution in Nigeria

Cattle occur in Nigeria in herds of various sizes. They are very dependent on open pasture. Their distribution is governed by:

- availability of suitable pasture land
- availability of territory free of tsetse flies
- traditional practice of the tribes
- adaptability of a breed to an environment.

Distribution of cattle is very much related to the breeds that are reared. The white Fulani which can adapt better than other breeds has a wider distribution in Nigeria. The Ndama and Muturu which can resist the tsetsefly are found in southern Nigeria. The Sokoto Gudali abounds in Sokoto.

3.2.6 Types of Cattle

a. Beef
b. Dairy
c. Dual purpose type
d. Draught type

Beef cattle have heavy body with thick muscles and long broad back. The humps are also heavy with square shape. The legs are short and filled with flesh. They also mature early. Examples includes:-Ndamas, Muturus and Jersey.

Dairy Cattle are noted by their prominent mammary glands and pronounced development of parts at the hind quarters. They are good milk producers. They breed regularly and high fertility with regular calving. Examples include: British Friesian (Holstein), Hereford, German brown, Swiss brown etc.

The dual purpose cattle produce both meat and milk in appreciable quantities. Their features are developed to produce these products. The Gudalis are good examples.

The draught cattle are used for work. They serve by carrying things, e.g they can pull the cart to which they are attached. They are also used for ploughing the soil. The animals in this group are large and have well developed muscles. Examples include the Zebus.

3.2.7 Factors Favourable for Cattle Production

1. Cattle, particularly the beef cattle, utilise roughage such as the maize, millet, groundnut residues of the farm.
2. The cattle can rely on the natural grass growth throughout the year.
3. Cattle can be reared comfortably in land areas that are unsuitable for crop production.
4. Cattle- rearing does not involve many workers. One man can control about 200 herds of cattle.
5. A large production of dung by cattle provides a good means of maintaining soil fertility.
6. They do not need much expenditure of money for housing and equipment.
7. Products of cattle, both meat and milk are widely consumed by people.

3.2.8 Factors Unfavourable for Large Scale Production of Cattle

1. It takes time to build up a herd of cattle since this group of animals is not very prolific.
2. Cattle production needs a heavy initial capital investment.
3. Because of their large size, cattle are not easily taken as laboratory animals. It is expensive to use cattle for experiments.
4. The climatic conditions pose a problem. Heat stress and humidity affect the cattle adversely in some parts of the country.
5. There are many diseases which very much retard growth, development, production and reproduction of cattle in Nigeria.
6. The traditional method of cattle production adopted by the major group of cattle producers of the country does not favour large scale production of cattle.
7. Lack of a good supply of water and forage all the year round, in areas free of tsetse – flies, hinder large scale production of cattle.

Lack of planned pasture in these areas does not favour the raising of cattle during the dry season.

8. Lack of improved breeds is another problem. The local breeds have poor yield. The rate of growth is low, milk and meat yields are poor compared with improved breeds.
9. The lack of easily available financial credit facilities for farmers is a problem.
10. The existence of a communication gap between the research stations and cattle producers does not lead to improvement in cattle prosecution.

3.2.9 Ways of Improving Cattle Production in Nigeria

a. More effort should be geared towards the control and eradication of the deadly diseases of cattle in the entire country.
b. The traditional system of cattle production should give way to modern and scientific method
c. Provisions of adequate supply of water
d. Planting of pastures should be encouraged.
e. Better yielding breeds of cattle should be imported and efforts should be intensified towards up-grading the local breeds
f. Advantage should be taken of the resistance offered to trypanosomiasis and some diseases by Ndama and Muturu cattle, to produce them on a larger scale.

3.2.10 Establishing a Herd

The factors to be considered in establishing a herd of cattle include:

1. Choice of product
   The cattle may be kept for milk, meat or both or for draught. In determining the choice of product, several factors are taken into account:
   a the market for the product
   b the cost and availability of feed
   c personal choice of the breed of cattle
   d environment under which the herd is to be kept
   e size of business.
2. Selection of breed of cattle
   The breed of cattle chosen should be one that:
   a. shows a high production of the chosen product
   b. can survive the environment
   c. is personally preferred by the farmer
   d. is resistant to disease
   e. has high fertility.
3. Management of the herd

Without a high standard of management, the above two factors would not allow for the establishment of a herd. We have to consider such factors as:

a. housing of the cattle
b. feeding of the cattle
c. measures of control of insects and diseases.

SELF–ASSESSMENT EXERCISE

Draw a map of Nigeria and indicate on it, the main area of production of the major types of ruminant farm animals. Explain the reasons for this distribution.

3.3 Sheep Production

Sheep are kept in the major sheep- producing areas of the world for the production of mutton (meat), wool and milk. Leather from sheep hides is used to make shoes, gloves and jackets.

In West Africa, sheep are often seen roaming about the town or village premises in small flocks. They thrive on local grazing, either browsing or scavenging, and appear to relish roadside and fallow grasses as well as scrub bush and the leaves of small trees. They also take any discarded scraps which may come their way such as banana leaves and skins, husks of beans and peas and maize bran. They sleep at night on any fast draining sandy open area or on the farm of major roads. Under these conditions, they keep fairly clear of heavy parasite infestation during the height of the rainy season.

3.3.1 Classification of Locally Produced Sheep

The three well recognised breeds of sheep in West Africa are the:

- Ouda
- Y'ankasa
- West African dwarf sheep.

Ouda Sheep
They are found only in the extreme north, the main breeding population being located on the southern fringe of the Niger and Mali republics, northern Nigeria and northern Ghana but the flocks may be brought further south for dry season grazing.

The facial profile of the Ouda is strongly convex in both sexes and the horns, which are large, wide and spiral in the ram, are absent in the ewe. The ears are long and pendulous. The hair is short and the body colour

distinctive. The entire fore end anterior to the lumbar abdominal girth line is black or less frequently brown and the rear end is white. The tail is long almost touching the shank.

A well organised slaughter trade in Ouda sheep exists, and large numbers are purchased by traders for railing and trekking to the southern markets. The rams especially are in great demand during the Muslim festivals.

Y'ankasa

Y'ankasa is a short-haired breed occurring throughout most of the northern areas in small flocks kept by town dwellers and nomads alike. It is intermediate between the more northerly ouda and the West African dwarf sheep in the south. The ram has curved horns which are short or absent in the ewe. The body colour is white, but a typical animal has a black patch covering one eye which may extend over the ear and muzzle. Small black spots elsewhere on the body are not uncommon. It has a short neck and a short non-pendulous ear.

It usually lives in close association with towns and villages. It may receive very limited supplementary feeding of guinea corn bran and dried groundnut tops in the dry season. The small flocks owned by the Fulani cattle owners are grazed with the cattle in the daytime, returning to the encampments in the evening.

There is no well developed Y'ankasa sheep trade, although animals are offered for sale in local markets in small numbers. They are used occasionally for local slaughter.

West African Dwarf Sheep

This is the smallest breed of sheep in West Africa. They are found roaming about the towns and villages in many Southern parts of West Africa in small flocks. They thrive and breed successfully in areas of trypanousomiasis risk. Their coat colour is either predominantly white with irregular black patches or black marked with white patches. The rams have curved horn which are absent in the ewe.

They live mainly on local grazing and browsing. Their owners may give them occasional supplementary feed of yam and banana peelings when they happen to come home and they visit local markets and pick up edible discarded food wastes. They sleep in any available dry place in kitchen, the corridors of private and public buildings and on tarmac roads.

There is no large scale production of these animals and no organised sale, but they are readily found in local markets where they are bought to be used for certain religious rites.

Goats Production

The goat is one of the commonest domestic animals throughout West Africa. Its popularity lies in the fact that no section of the community discriminates against it on any ground whether religious, social or cultural. As a result the population of goats kept in the south is greater than the population of goats kept in the northern part of Nigeria where the Sokoto Reds are kept mainly for the skins. In some parts of the world, goats are kept for meat, milk and leather; their hides are tanned and used in the manufacture of gloves and fancy leathers.

Breeds of Nigerian Goats

Many breeds of goats are found in West Africa, and each breed is well adapted to its environment. They include:

- the dwarf goat
- Sokoto Red-have red glossy colour
- Kano Brown – medium size, but larger
- Bornu Red
- Bauchi Goat – white and red in colour.

The temperate breeds of goats are:

- The Anglo – Nubian
- The British Saanen
- The Toggen – burg
- The Angora and the Kashmeri.

4.0 CONCLUSION

In this unit, you have learnt about the classification of farm animals, cattle production, as well as sheep and goats production. These three categories of farm animals belong to the ruminant groups.

5.0 SUMMARY

The main points in this unit include the following:

- farm animals belong to three categories – mammals, birds and fishes
- cattle can be categorised into hump and humpless cattle and short horn and longhorn.
- some important terms used in cattle production include – Bull, Cow, Steer, stag heifer, calf, yearling etc.

- the breeds of cattle found in Nigeria include – white fulani,red bororo, Sokoto gudali, ndama, muturu and Friesian
- the four major types of cattle are – beef, dairy, dual purpose and draught cattle
- the three most popular breeds of sheep found in Nigeria are: Ouda, Yankasa and the West African dwarf
- the popular breeds of goats found in Nigeria are: the dwarf goat, Sokoto red, Kano brown, Bornu red and Bauchi goat.

6.0 TUTOR-MARKED ASSIGNMENT

i. Name any two types of ruminant farm animals found in Nigeria and list the products obtained from each.
ii. Explain in detail the factor that affects cattle distribution inn Nigeria.
iii. Write brief notes on
   a. Cattle production in Nigeria or
   b. Sheep production in Nigeria.

7.0 REFERENCES/FURTHER READING

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UNIT 2 FARM ANIMALS PRODUCTION: SYSTEMS OF CATTLE MANAGEMENT

CONTENTS

1.0 INTRODUCTION

In the last unit, you learnt about the production of ruminant farm animals. Farm animals and cattle were categorised into their various groups. You also studied the different breeds of cattle, sheep and goats. In this unit, we shall continue our discussion on ruminant farm animals.

We shall focus mainly on the systems of managing cattle.

2.0 OBJECTIVES

At the end this unit, you should be able to:

- state the importance of cattle production to the economy of Nigeria
- list the advantages and disadvantages of the following systems of cattle management:
    a. Extensive system
    b. Semi – Intensive System
    c. Intensive System.

3.0 MAIN CONTENT

3.1 Economic Importance of Cattle Production

A country cannot be self-sufficient or self-reliant in food production and economically viable if she cannot abundantly supply the protein requirements for her population. A healthy population makes a wealthy and economically independent nation and to be healthy, the population needs sufficient amount of protein. This protein is mainly supplied by livestock. From this perspective at least, one can see at a glance the vital position occupied by livestock in a nation's economy.

Cattle, in this country, are one of the main arms of livestock production. It is therefore necessary that cattle-rearing in this country should have been developed beyond the present level. Let us hope that something is already being done. It has been proved experimentally that in human nutrition the major protein is derived from animals. Though fish supply more protein than cattle, the protein derived from beef cannot be compared with plant protein. The protein derived from plant is of low biological value hence it is very necessary that the production of beef should be increased to meet the demand of protein of high biological value. If the nutritional intake or consumption of a country is low in protein, especially animal protein, that country's economy is in danger because an under-fed worker cannot achieve much, since he has no hope of good and balanced diet at the end of each day's work.

Cattle supply milk for human consumption. It is on record that the present price for a tin of milk ranges from 80 Naira to 100 Naira. About two years ago the price of a tin of milk was between 50 to 70 Naira. Here is a good indication of the huge sum of money spent annually in the importation of milk. At this rate, no average Nigerian can boast of taking a tin of milk daily to improve his diet. On the contrary, if it were possible for Nigeria to produce enough milk for consumption, much money would have been saved both individually and nationally. The money would have been diverted to another aspect of national development. Not only milk, the price of one gramme of beef is very exorbitant. Consequently, a great fraction of Nigerian population regards an adequate daily consumption of meat as luxury.

Cattle can be used for work purposes, such as cultivation and as beast of burden. Fragmentation of land brought about by the land tenure system in some parts of this country has made the use of large machines on our farms almost impossible. This is because it is difficult to acquire a large area of land where machines can work on. But it is possible for animal-driven tractors to work on such small areas. It is also easier for a farmer to purchase and maintain a small animal-driven tractor than to purchase

and maintain a power-driven tractor with its attendant costs. Unfortunately, the animals such as cattle are not there. The result is that agricultural production has remained very low and the cost of food high. In the northern part of the country where there is a large expanse of land on which machines or animals can work, the problem has been the lack of both machines and the animals.

Crop production can be increased by the use of not only artificial manure, but animal manure. Cattle supply plenty of manure through their feaces and urine to meet the nutrient demands of the soil. It goes without saying that increased cattle population in the country will undoubtedly increase the supply of their manure, which in turn will be used to increase our crop production. Supply of food through crop production is important in the economy of a country.

Some cattle products such as hides and skin and milk can give rise to the development of agricultural industries. Such industries as leather-works industries or tanning industries will go a long way to improve the economy of a nation.

The bones of the animals are good sources of minerals such as calcium, phosphorus, sodium and magnesium. These minerals are essential for the maintenance of good health. The bones are crushed for use as bone-meal in livestock feeds.

Cattle can be a source of direct income to this country. This is true because of the fact that they can be sold to other countries for cash. The money realised from the sales can be used to meet urgent demands in other sectors of the country's economy.

Thus, you can see that cattle play an important role in the economy of a nation, including Nigeria.

3.2 Systems of Cattle Management

The system of management adopted for cattle rearing depends on the type considered. While the milk type of cattle requires special handling, the beef type requires less specialised management.

Numerous modifications of this system exist but in essence the system can be classified under three major headings as follows:

- Extensive system
- Semi – intensive system
- Intensive system.

3.2.1 Extensive System

Here the cattle are moved from one grazing land to the other depending on the availability of pasture. No effort is made to improve the natural pasture. This is the traditional system of raising cattle in most of West Africa, especially in the savannah zones, where nearly all the West African cattle are raised. A young farmer may buy his foundation stock from a herdsman and hand these over to another herdsman of his choice to be reared along with other cattle. In this case, it is normal to see a large herd of cattle, made up of stock belonging to many individuals, under the management of one herdsman. The herdsman and each of the owners will agree on the terms under which the rearing will be done.

Feeding of Cattle under the Extensive System
This system depends on the availability of grasses. The herdsman and his attendants will drive their cattle out into the field to graze each morning. These animals will forage far and wide, looking for succulent grasses to eat. In the evening, the attendants will drive the animals back to their temporary home (kraal) to rest. This procedure is repeated everyday till the grasses around the area are no longer able to sustain the herd. Then, they move to other areas where they can find food. During the dry season, when the grasses in the savannah regions die, the herdsmen usually move down south with the cattle to areas where both pasture and water are found. They remain there till the next rainy season when they get enough luxuriant pasture in the north. The movement by the animals usually causes them to lose much weight and this reduces their resistance to infection.

Housing of cattle under the traditional system, or the extensive system, is usually in an open space, often fenced and cleared for the purpose. This space is cleaned from time to time.

Advantages of the system are as follows:

1. The system is inexpensive, in that buildings, feeds etc are not provided
2. Worm infestation is reduced to minimum for the animals are most of the time on the move.

Disadvantages of the system

1. It is wasteful in terms of land because, it requires about 5-10 hectares of land per animal.
2. The animals have seasonal growth i.e. they put on more weight in the rainy season and lose or maintain it during the dry season.
3. It takes longer time for the animal to reach market weight.

4. There is complete lack of record e.g amount of feeds (feed efficiency).
5. Exposure of animals to danger – snakes, wild animals and robbers.
6. Introduction of diseases to other areas.

3.2.2 Semi – Intensive System

This system is also called ranching. It is a very good system of managing beef cattle. Usually land which is not very suitable for crop production is utilised for this purpose. In this case, enough land is acquired and pasture established on it. It should be large enough to allow about 5 hectares of grassland per head of cattle. The animals graze on a section of the pasture for some time, till that area is properly grazed. They are then moved to another section, thus allowing the grazed section to regrow. In this case, houses or pens are constructed for the animals to stay at night. The houses are built of solid materials and the roof may be made of thatch or aluminum roofing sheets. Dwarf walls or rails maybe constructed. It is essential to ensure free movement of air in the pen. In most cases the animals stay in the pens only during bad weather. They stay outside or in the open air at night and during the dry season. However, it is essential to clean the pens regularly. Effort should also be made to control pests like ticks and worms. Ranching or the semi-intensive system is used in government and experimental farms in many parts of West Africa. It is the system used for beef production in most of the advanced countries like America and Australia.

Feeding Cattle under the Semi-Intensive System

During the rainy season or when the pasture is luxuriant and succulent, the animals can depend entirely on grazing as the pasture is rich enough to supply complete nourishment to the animals. However it is advisable to supply mineral salt licks made up of elements like sodium potassium, iron, copper, zinc, chlorine and manganese which are deficient in the pastures on which they feed. Enough water is also provided at convenient times. As the grasses and herbage will certainly die during the dry season, provision is therefore made for this period by the preparation of silage. Silage is pasture cut and preserved in such a way that nearly all the food elements in them are preserved intact and without any loss in palatability. They are fed to the animals as required during the dry periods. Here, mineral salt licks and water are essential. In some areas, food crops like maize, sorghum and millet are included in the material used in preparing silage. In such cases, the quality of the silage is greatly improved.

The ranching system acts as a bridge between the other two systems (ie) the intensive and extensive systems). Usually there is no disadvantage in this system but sometimes it is still expensive. It combines the advantages of other system.

3.2.3 Intensive System

In this system, the animals are confined in the pens most of the time. Most of the foods are brought into the pens, in the form of silage or hay depending on the time of the year. Movement outside the pen is restricted, and little grazing is allowed in very well managed pastures.

This is the system used in the advanced countries for the production of dairy cattle. In West Africa, it is only used in a few experimental farms.

The system is capital intensive and can only be used where the breed of cattle has a very high rate of conversion and the management is efficient enough to pay its way.

Advantages of intensive system are as follows:

1. not wasteful in terms of land
2. animals grow uniformly and mature quickly
3. mechanisation of farm operations is possible
4. it is possible to keep record of feed intake, weight gain, growth rate etc.
5. danger of wild animals and thieves is eliminated.

Disadvantages of intensive system include the following:

1. very expensive in terms of feeds, labour and capital
2. contagious disease will create a problem
3. there is competition between man and animals for food.

3.3 Care of a Pregnant Cow

In order to ensure production of a healthy off-spring, the pregnant cow should be well taken care of. The following should be provided:

a. adequate pasture
b. supplementary feeding, particularly during the dry season
c. good shelter
d. access to open space to have exercise fresh air and sunshine.

When the cow is nearing parturition it should be given extra attention. At this time, it is essential to prepare for calving. A clear open pasture,

away from other livestock, should be provided. If it is not possible or if the weather does not permit this, a spacious, well built and properly ventilated pen should be provided instead. The pen should be carefully cleaned, disinfected and bedded.

Calving

At calving time, it is advisable for the attendant to be around, but he should not let himself be seen by the cow. His presence is needed for assistance should the need arise. Herd can do the following:

a. wipe the mucus from the nostrils of the calf to permit breathing if this is not done by the cow
b. apply artificial respiration when the need arises
c. treat the navel cord with a 10% solution of iodine to prevent infection
d. assist the calf to suckle the mother by holding it up to the cow's udder
e. this is necessary particularly for the weak calf
f. remove the after birth should the cow fail to expel it herself. Call a veterinarian if inexperienced to carry this out
g. burn or bury the after – birth when expelled.

3.4 Care of the Young

It is good practice to allow the calf to stay with the cow for the first few days. If the calf is weak or small, it may stay longer with the mother. The time of weaning varies. In early weaning, the calf is separated from the cow a few days after birth. However in late weaning the calf can stay with the mother for about four months.

Early weaning demands high efficiency in management. In early weaning the calf is separated and kept in a calf shed. The shed should be well – ventilated, easily cleared and well bedded. The calf should be provided with adequate feed, salt minerals, concentrates, clean water and good quality forage. Initially, the amount of milk given to the calf is regulated. It is bucket – fed. It should be noted that the rumen does not start functioning in the calf from birth. Milk must be supplied for several months as well as concentrates and good quality forage. Milk feeding stops when the calf reaches a body weight of 68 kg. The milk may be supplied twice daily. It is important to start feeding the calf carefully. A small quantity of feed should be supplied during the initial stage. Calves with mothers that milk well may not be started on feed easily. Calves should have access to concentrates and good quality forage at about 3 weeks of age.

Horned calves should be dehorned during the age of 7 days to 14 days. Castration of male calves, if desired, should also be done then.

The heifers, bulls and steers are reared either indoors or outdoors depending on the circumstances. Under good weather, they can be reared comfortably outdoors. In the northern parts of Nigeria which are free of tsetse-flies, this system is often practiced. The system is also adopted by the local herdsmen for rearing their cattle, both the young and matured ones.

Depending on the purpose of keeping these cattle, they are fed and catered for to get the maximum output from them. If they are kept for slaughter, they are reared specifically for the meat. They may be kept as replacement stock and are prepared for this. It is seen that their feeding varies according to the output desired.

4.0 CONCLUSION

In this unit, you have learnt about the systems of cattle management. The advantages and disadvantages of each system were highlighted. The importance of cattle industry to the economy of Nigeria was also discussed. Based on these important roles of cattle production to the economy of Nigeria, intensive system of cattle management will be more productive than the other systems.

5.0 SUMMARY

The summary of our major discussions include the following:

- cattle production provides – food in form of meat and milk to meet our daily protein needs
- other importance of cattle include provision of income, foreign exchange, hides and skins, employment generation, boost leather industries etc
- cattle can be managed using extensive, semi-intensive and intensive methods
- each method has advantages and disadvantages attached to it
- both pregnant cow and calves require special cares to survive.

6.0 TUTOR-MARKED ASSIGNMENT

i. Write an essay on the importance of cattle production to the economy of Nigeria.

ii. a. List the three systems of cattle management.
b. Which one do you recommend for dairy farmer and why?

7.0 REFERENCES/FURTHER READING

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UNIT 3 FARM ANIMALS PRODUCTION: PIG PRODUCTION

CONTENTS

1.0 INTRODUCTION

In the last unit, you learnt about the systems of cattle management. You also learnt that there are three main methods of livestock management.

The three methods are the extensive system, Semi-intensive system and intensive system. Each system has its own advantages and disadvantages. The economic importance of cattle was highlighted. In this unit, we shall discuss pig production. Some areas of pig production to be discussed include – the economic importance of pig, characteristics of pigs, selection of pigs for breeding, management of pigs and some diseases affecting pigs.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- list the characteristics of pigs
- state the economic importance of pigs
- state 5 reasons pig farming is an attractive business
- identify 5 features to consider in selecting pigs for breeding
- list some disease conditions of pigs.

3.0 MAIN CONTENT

3.1 Pig Production

Pig farming is a highly specialised business but it is not very popular in Nigeria because of some social, economic and religious reasons. In Moslem- dominated parts of Nigeria the pig is a forbidden animal because of religious reason. Some other Nigerians believe that the pig is a dirty animal because of its dirty habits and therefore would have nothing to do with it. However, pigs are kept for their lard, bacon or meat. The cost outlay for pig production is moderate which recommends pig farming as an enterprise for peasant farmers or other farmers of small means as individuals or more conveniently as farmers' co-operative groups.

More reasons pig farming is an attractive business are as follows:

- pigs are efficient converters of feed
- they have fast returns on investment
- can be adapted to both extensive and intensive farming
- they produce the most valuable fat
- used in marketing grains if grains prices are poor
- they utilise the bye-products of manufacturers e.g. ground nut and palm kernel meal
- they require little labour because pigs are adapted to self feeding
- pigs are highly prolific-up to seventeen piglets can be farrowed
- pigs have the highest dressing percentage
- they produce high quality meat that is easy to cut, cure and store.

3.2 Economic Importance of Pig

1. Pig for meat production-fresh
   a. Process or cured – Bacon, sausages, smoked or salted
   b. Lard (cooking fat) = contain little essential fatty acid and developed Atherosclerosis (blockage of arteries near heart)
2. Industrial uses – Leather
   a. Pocket), hand bag, briefcase, Tobacco pouches and box
   b. pig bristles = upholstery purposes and protein supplement
3. Manure production – soil fertility
4. Provision of market for Feeds and labour

Where food is in abundance – grains or unsuited for consumption – Rice bran, Bone meal, blood meal, G/nut cake, yam peel cassava peel, Rice husk, kernel cake, leaves.

3.3 Characteristics of Pigs

- Makes them efficient producer of meat compare to others
- The meat (pork) differ from others – texture, colour and nutritive component
- Because of their growth rate & nature of diet they are sensitive to careless management & change of environment, they are also efficient utiliser of concentrate and converter of feed into edible human diet
- Consume up to 50% of animal corn produce yearly
- No single measure can be used to compare utility of feed by livestock before they differ in amount of nutrient regard and nature of the nutrient e.g. sheep and cattle – roughages while poultry require concentrate.

Where pigs excel:

a. Produce large with gain from a given feed
b. Recover larger proportion of total calorie from edible portion of their products, out of the ration consumed than any other livestock
c. Maynard report in 1964 –
    i. pig leads other in produce of thiamine per unit of ration consume
    ii. Second in production of Niacin
    iii. 3rd in production of riboflavin and Iron
    iv. Store little calcium and Vitamins A & D in the edible portion of carcass.

- Fat storage capacity = 1st
    i. Pigs weighing 230Ib before slaughter can dress out 180Ib out of which about 25Ib of lard can be recovered: pig should not be fatten beyond 225Ib
- Prolificacy
    i. Judged by number of pigs per litter, farmers can raise 2 - 2½ liters per year.
- Poor utiliser of roughages
    i. They have small and simple stomach – monoqastries
    ii. Ruminants have large and complex stomach – sheep, cattle
    iii. Unable to obtain from roughages enough nutrient
    iv. Limit its distribution
- Susceptibility to disease
- Regard for hog tight fences
- Damage to land
    i. Due to poor management.

3.4 Terminologies and Information in Pig Production

Pig	-	Swine
Boar	-	Uncastrated male of any age
Stud boar		Mature male
Barrow		A male castrate (before sexual maturity)
Gilt		Immature female pig
Baby pig		Piglet
Furrowing		The process of giving birth to young ones
Litter size		Number of young ones borne at a single birth
Dam		Mother
Sire	`	Father
Litter mate		Sibs

Estrus cycle	21 days
Heat Duration	2 – 3 days
Gestation period	114 days
Weaning	3, 5 or 8 weeks
Act of parturition	Furrowing
Number of teats	Not less than twelve

Heat Signs
1. Swollen and Red vulva
2. The animal becomes restless
3. Starts riding other sows
4. Responds to riding test.

3.5 Selection of Pigs for Breeding

During selection the following characteristics should be looked for in each case.

Boar:
1. Must be strong and masculine
2. Must be of quiet disposition
3. Vigorous and healthy ones should be selected
4. They should have strong legs, short straight pasterns and can mount the sow without falling.
5. The reproductive organs should be well developed at 4-5 months. Use young boars not more than once a day and only when they are up to 8 months old and physically mature.

Gilt
1. Must be large thrifty and vigorous
2. Deep long body well proportioned
3. Straight long feet and pasterns

4. Well developed udder, teats well developed and uninverted
5. Hair fine and smooth
6. Selected from litter of 8 – 12.
7. Don't breed the gilt before 8 – 10 months of age.

3.6 Management of the Pig

1. During the first day of life, the piglet should be assisted to get free from the foetal membranes which may either hinder its movement or block the face and nostrils and thus prevent free breathing.
2. Navel cord should be cut and sanitised from pathogens.
3. It is the practice to clip off the needle teeth which the young piglet is born with. This will prevent damage to the udder by the sharp needle teeth especially during suckling. Also, clipping of the needle teeth prevents wounds being inflicted on other piglets when fighting.
4. Heat must be provided in a corner of the pen. As a matter of fact, just as it is important that heat lamps be provided in pig pens during the first few days of life, so it is also important to provide facilities which prevent the young piglets from being crushed by the heavy mothers through overlaying. The latter is easily achieved if proper furrowing crates are used for the animals during furrowing.
5. It is very important too that the piglets have unlimited access to the mother's udder from where they derive colostrums during the first three days of life. Colostrums, which is the first drawn milk from the udder after furrowing or parturition is very rich in antibodies and special proteins. Since the piglets or any other young animals are so unprotected against diseases in their first few days of life, allowing them to feed on colostrums during the first two to three days confers some immunity to them against diseases until they are able to manufacture their own antibodies that will give them the 'active' or permanent immunity. Failure to feed colostrums to young animal leads to disastrous results.
6. Iron must also be provided by intramuscularly injecting iron preparation in order to prevent piglet anemia which is common to piglets because of the poor placental transfer of iron during pregnancy.
7. During the first 10 to 14 days, the piglet should survive only on the mother's milk and should not be allowed to feed on rations. After 14 days, she can then be fed in small quantities, with the creep feed which is very high in protein and energy, low in fibre and easily digested. The creep feed is fed in special containers not accessible to their mothers. They will eat these in addition to con tined suckling of the dams and this continues till the piglets

are 56 days. Initially, the quantity consumed is small but increases as the pigs get used to it. Creep feed supplements the declining milk yield of the mothers and improves the live-weight gain.

8. The piglets should be weaned (separated from their mothers) after 56 days (Normal weaning) although circumstances may force weaning after 3 weeks (early weaning). After weaning, the piglets are separately kept in pens of convenient sizes, making sure there is no over-crowding that encourages vices.
9. Castration of piglets not intended for use as a breeding boar may be done before the piglets are weaned, which is preferable, or shortly after weaning but before those piglets grow too big. Castration prevents uncontrolled breeding.
10. Castrated piglets can be housed in the same pens with the female piglets, while the uncastrated male piglets destined to become future breeders should be separately housed too. Keeping uncastrated male and female piglets together after weaning is a bad management practice because the males tend to trouble the females.
11. After weaning, the weaner diet should be freely fed to the pigs, this is also high in protein but slightly lower than the creep feed, and is high in energy too. Weaner pigs should no longer suckle their mothers.
12. Weaner stage lies between weight range of 10 to 12 kg and 32 to 35 kg.
13. After the weaner stage comes the growing stage, and the pigs are weighing over 35 kg live weight. From this stage onwards management will depend on the destiny, i.e. whether the animal is meant to be fattened for the market or whether it is to go into the breeding herd.
14. If it is to be fattened for slaughter, it will be fed grower's ration followed by the fattener's diet after 60 kg live weight. There is no special housing requirement except that the pig is kept inside concrete-floored, well ventilated, disinfected and covered pen (intensive system). Exercise for her is extremely limited, and the crude protein content of the diet is lower (about 15 to 18%) than that for weaners. The fibre level is higher to prevent excessive fat deposition.
15. If she is destined for the breeding herd, she should be semi-intensively managed in pens which have backyard pastures where the pigs can exercise and graze for some part of the day, usually in the morning. She is also given breeder's ration which contains about 15 to 18% crude protein, high in fibre to prevent excessive fattening. The pasture should be fresh and clean and it supplies important nutrients such as vitamins and minerals. Such pigs are

outdoors in the mornings and late in the evenings, but are indoors in the afternoons and the night.

16. The pig is sexually mature at the age of about six months at which time she should weigh between 75 and 80kg. But she should not be mated (served) until she is about 8 to 9 months when she will be shedding enough eggs.

3.7 Site for Pig Production

In choosing a site for a piggery the following factors should be taken into consideration:

- The site should be elevated
- Should be well drained
- Should have a sunny exposure
- Should be drought free
- Should be removed from dwelling houses.

Housing for Pigs
In determining the type of house to build for pigs, the following factors should be taken into consideration:

- type of farming
- climate,
- place of piggery in farm set up
- amount of capital
- production capacity.
- The following provisions should be made no matter the type of house being built:
- as pigs are sensitive to extremes of temperature, the house should be such that temperature can be controlled
- the house should be well ventilated
- the house should be such that both manure disposal and general cleaning up are easy.

Types of House
The two types of houses involved in pig management are the stationary type and the movable type. The stationary use is for the indoor management while the movable type is for the outdoor management.

Stationary House
The stationary house should be solidly built with concrete walls. It should be either double or single row. The roof should be the lean-to

conventional type. Asbestos sheets are preferred to corrugated iron sheets as asbestos is a poorer conductor of heat. The house should be divided into pens or apartments and each apartment should have (1) a feeding trough (2) wallowing trough (3) drinking trough (4) furrowing pens. Stores, office and garages should also be provided where necessary.

Movable House
The movable house should be easily moved, cleared and used for a variety of purposes e.g. shade, unexpected furrowing and distribution of manure.

Feeding
Dry and wet feeding systems are available. The dry stuff is given to all pigs except lactating sows, sows about to furrow and those that have loss of appetite. These are placed on wet while the rest should go on dry mash. Feeding could also be adlib or restricted.

Between the ages of 1 week to 12 weeks piglets should be fed adlib. From this period onwards piglets are given restricted feeding according to their weight. In restricted feeding, start with 1 kg to one piglet a day split into ½ kg in the morning and ½ kg in the evening. Step up according to weight to a maximum of 4kg per pig per day. Another system of feeding is floor feeding and trough feeding. In this case pigs are either fed in troughs or on the floor.

Types of Feed

1. Creep feed: fed to piglets of 1to12 weeks old. Its crude protein content is approximately 23%.
2. Grower's mash: A piglet 12 weeks and above, crude protein percentage is about 15%.
3. Breeders, in pig and nursing sow diet. Crude protein percentage is 16%.

3.8 Diseases of Pigs

1. **Africa Swine Fever**
   This is a highly contagious and fatal disease of pigs.
   Symptoms: Usually there is rise in temperature up to 105^{o}C or more. The animal is dull and suffers loss of appetite. It lies alone with rapid and jerky breathing. The hind quarters are weak and appear paralyses. There are nervous manifestations (muscular tremor) and the animal is unable to rise. Later it has constipation followed by diarrhea with bloody coating. There may be vomiting. In very acute cases pigs are found dead

without showing any symptoms otherwise the sickness lasts for days before death. The disease is caused by a virus.

2. **Swine Influenza**
   This is a very contagious disease of pigs very similar to human influenza.
   Symptoms: There is high temperature, prostration, coughing and stiffness of the joints and muscles. Pigs may be ill for two or four days.
   Causal Organism: Swine influenza is caused by a virus in association with a bacillus. It is spread by inhalation of infested nasal discharge. Mortality rate is about 1-2% but may be up to 10%
3. **Swine Erysipelas**
   This is disease of pigs under one year old that causes septicemia. Acute cases are characterised by diamond shaped purple patches on the skin. The acute septicemia case occurs in serious out breaks. There is raised temperature, thirst, dullness, and prostration. The skin shows red patches over the ear, abdomen and inside of the forelegs and thighs. The tip of the ear may become necrotic and drop off. Cases may recover or become chronic. It is caused by a bacterium which can live in the soil or dirt around pig sites. Contaminated foods, water or occasionally wounds are sources of infection. A recovered animal becomes immune for life.

Signs of ill-health in Pigs

1. Absence of urine and faeces in the pen.
2. Faeces coloration
3. Huddling or crouching at a corner
4. Reddening of the head region
5. Lesions on the body

General Signs of ill-health in farm animals

1. Loss of appetite
2. Abnormal pulse or temperature
3. Scouring, faeces may be discolored and evil smelling
4. Running eyes and nose
5. Dull -looking
6. Starry coat and wild looking
7. Dropping ears
8. Standing apart from other animals.
9. Loss of condition
10. Difficult breathing, coughing, swelling of the body and limping.

In order to maintain animals and keep them healthy we have to keep the so called “the 10 commandments of animal health”.

1. Be alert for signs of diseases and conditions which might produce stress and string.
2. Get an accurate diagnosis immediately by calling the veterinary personnel.
3. Buy disease-free stock from clean herds and flocks where you can check on the health and performance background.
4. Be careful with visitors and strangers which might track in diseases.
5. Follow a rigid vaccination programme with the advice of the veterinary personnel.
6. Provide good ventilation and plenty of sunlight in the building.
7. Always keep confined animals in a clean and disinfected place that are dry and free of draught.
8. Make sure all animals get well balanced food to meet their individual nutritional needs for healthy growth.
9. Get rid of all dead animals immediately and send them to the vet for post mortem, burn or bury immediately in quick lime.
10. Thoroughly clean and disinfect all quarters where disease existed before bringing in new and healthy animals.

4.0 CONCLUSION

In this unit, you have learnt about pig production. The important areas discussed were the importance of pig production to the economy of Nigeria, characteristics of pigs, factors to be considered when selecting pigs for breeding, general management of pigs, the site for pig production and diseases affecting pigs. It can be concluded that despite religious prohibition of pork eating, pig production is striving well in Christian- dominated areas of the country.

5.0 SUMMARY

You have learnt in this unit that:

- pig production is becoming an attractive business among Christians in Nigeria
- pigs provide meat, raw materials for industry manure, income, job opportunities etc.
- pigs are efficient converter of feeds, with rapid growth.
- both boar and gilt are selected based on good quality trait.
- pig houses are constructed using different designs
- some of the diseases affecting pigs include:
- African swine fever, swine influenza, swine erysipelas etc.

6.0 TUTOR-MARKED ASSIGNMENT

i. Discuss the economic importance of pig production.
ii. Discuss in detail the general management of pig.

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UNIT 4 POULTRY PRODUCTION AND MANAGEMENT

CONTENTS

1.0 INTRODUCTION

In the last unit, you learnt about the production and management of pigs. The important items discussed include – economic importance of pig, characteristics of pigs, selection of pigs for breeding, management of the pig, site for pig production and diseases of pigs. In this unit, we shall start our discussion on poultry production and analysing the systems of poultry management.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain the meaning of poultry
- discuss the importance of poultry to the economy of Nigeria
- mention some examples of domestic fowls
- list the advantages and disadvantages of the following systems of poultry management:
  a. open or free range system
  b. folding or restricted range system
  c. litter system, and
  d. battery cage system

- identify the factors to be considered when selecting site for poultry farm.

3.0 MAIN CONTENT

3.1 Introduction to Poultry- keeping

Livestock consist of cattle, pigs, sheep, goats, poultry and fish farming. Traditionally, most families in Nigeria are engaged in one form of livestock production or the other.

Poultry is a collection of domesticated birds which include: chickens (domestic fowls), turkeys, ducks, geese, pigeons, guinea fowls etc.

Domestic fowls consist of local and exotic breeds which constitute about 85% of poultry population in Nigeria. As a result of this, the term poultry is sometimes considered to mean fowls.

Ducks are kept in more or less confined areas of the backyard with provision for artificial ponds. At times they are allowed to go on free-range like the local fowls.

Guinea fowls are by nature wild and so, they are naturally bred and produced in the bushes of Northern Nigeria where about 95% of them are found. They are reared mostly on semi-free range environment. Pigeons and geese are kept more as pets than for any other reason. Less than one million Turkeys are reared in Nigeria under free-range conditions.

Poultry industry in Nigeria can be grouped into the following categories:

1. Egg production
2. Table – meat production
3. Poultry feeds
4. Manufacturing of poultry equipment, and
5. Processing or marketing of poultry products.

3.1.1 The Importance of Poultry Industry

Poultry production is just as important as the practice of agriculture itself. Poultry supplies meat and eggs for human consumption. It is perhaps the major source and probably the fastest economic route of increasing the output of animal protein required for balanced diet and healthy growth.

The poultry sector contributes substantially to the income of individual farmers and to the Gross Domestic Product (GDP) of the country. Poultry farmers realise a substantial amount from the sale of broilers, eggs and spent layers.

Traditionally, most households in Nigeria engaged in one form of poultry or the other. Commercial poultry farmer employ full time labourers to work on the farm. Other branches of poultry industry for example, processing and marketing of poultry products involve some full time workers.

Poultry products especially the eggs and meat, serve as raw materials for other products, for example, bakeries, paints etc.

Poultry droppings provide organic manure for the soil. This could be in the form of compost or direct application to the plant roots as farm yard manure.

The initial costs of poultry production are low and can be met by small operators. As a result of the low cost per bird, they are used in the laboratory for the purpose of research findings.

3.1.2 Breed of Domestic Fowls

The breed of domestic fowls in Nigeria can be grouped into two distinct categories, namely: the local dwarf chickens and the exotic breed.

1. **Local Dwarf Fowls**
   The local dwarf chickens are indigenous to Nigeria. They are kept all over the country by almost every rural household for both egg and meat production. Unlike the exotic breeds, local fowls grow very slowly and take longer time before attaining slaughter weight.
2. **The Exotic Breed**
   Exotic fowls are kept by relatively few Nigerians in both large commercial farms and small scale farms.
   The choice of breeds and strains of chicken will depend on the purpose of the production.

For egg production, the best breeds available in Nigeria are as follows:

a. Harco
b. Babcock
c. Leghorn
d. Rangers

e. Thormbers and
f. Hylimes

For meat production (broilers) we have the following:

a. Cobb
b. Super-o-broilers
c. Red Sussex
d. Cornish
e. Mid-Atlantic
f. Dorking breed

For dual purpose breeds i.e. the breed that combines large body size with egg production ability, the following breeds are available:

a. Plymouth Rock
b. Rhode Island Rod and
c. Light Sussex.

3.1.3 Common Poultry Terms

	Chickens	**Turkey**	**Duck**
Adult Male	Cock	Tom	Drake
Adult Female	Hen	Turkey Hen	Duck
Young Male	Cockerel	Tom	Drake
Young Female	Pullet	Poult	Duckling
Group of Adults	Flock	Flock	Flight
Group of Young ones	Chicks	Poult	Ducklings
Castrated male	Capon	-	-
Sterilised females	Pollard	-	-
Flesh	Chicken	Turkey	Duck
Mating	Treading	Treading	Treading
Pregnancy	In-lay	In-lay	In-lay
Parturition	Laying and Hatching	Laying and Hatching	Laying and Hatching

3.2 Systems of Poultry Management

Generally, there are three methods of poultry management:

- Extensive system
- Semi – intensive system, and
- Intensive system.

3.2.1 The Extensive System

This system is mainly restricted to the management of local breeds. It involves the exposure of the birds to free pasture and sunshine. The most popular method under this system is the open range, sometimes called free range system.

Open or Free Range System
In this system, the birds are left on their own during the day light while accommodation may be provided for them during the night. These fowls are occasionally supplied with sorghum or maize especially in the morning before they are left on their own.

Advantages

1. It is very cheap in terms of labour and capital
2. The birds are exposed to all varieties of food.
3. Outbreak of diseases among the flock is highly minimised.
4. Their droppings increase the fertility of the soil.

Disadvantages

1. The birds are exposed to the danger of pests and diseases.
2. There is also danger of thieves and wild animals.
3. Egg production is very low and sometimes difficult to locate.
4. The system is only possible where the ratio of land to poultry population is low.

3.2.2 The Semi–Intensive System

The semi – intensive system of poultry management allows the birds some movement outside their house and at the same time, adequate care is also given to them.

Two methods can be identified under this system:

1. The folding system
2. Restricted range system.

The Folding System
This system is particularly useful for chick rearing. Birds of about 40 are kept in movable houses where food, fresh grasses and water are supplied to them. The houses are moved from one place to another daily.

Restricted Range System
This system is similar to the folding system; the only difference is that the poultry house in this case is not movable. A permanent house is built for the birds with a fence round the house to provide space for exercise.

Advantages of Semi – Intensive System

1. The risk of parasite infection is reduced.
2. Close observation of the birds is possible.
3. The danger of exposure to thieves and predators is considerably reduced.
4. Eggs laid can easily be located.
5. Movements of the birds in the folding system ensure even distribution of the droppings to the land.

Disadvantages

1. The cost of housing the birds and providing other management services is high.
2. They may be under fed since their movement is restricted to a particular area.
3. Outbreak of diseases is possible within each housing unit.

3.2.3 Intensive System

This method is normally used for commercial poultry production. The birds are kept permanently in one place while feeds, water and other necessary materials will be brought to them in the house. There are two popular methods of intensive system of poultry management:

1. Deep litter system
2. Battery cage system.

A. Litter System

This is a system whereby permanent structures are constructed for the birds. The birds are free to roam about within this confined but well ventilated house.

The floor is mostly cemented and covered with litter materials such as saw dust, wood shavings, straw, chaff or combinations of these. Wood shaving is preferred to any other material, because it is good absorbent of the droppings and it is easy to get. The litter materials could be built up to about 25 cm.

Occasionally some parts of the floor area (about half) are covered with slat, which will be about 60cm, above the ground. It is also

possible for the whole area to be covered with slat, but this is not very common in Nigeria.

Deep litter system is good for rearing both layers and broilers. The litter materials must be removed immediately the birds leave the house. Before new birds are brought in, the place must be properly disinfected and new litter materials must be provided.

Advantages

1. The system is less expensive than the battery cage system.
2. The litter contains micro-organisms which break down the organic matter in the litter thereby supplying parts of vitamin B complex to the birds.
3. The micro – organisms in the litter also produce ammonia which has been found to prevent the spread of coccididiosis disease among the flock.
4. When compared with the extensive system, the birds are less exposed to the danger of thieves and wild animals.
5. The system can be used to produce fertilised eggs when both hens and cocks are kept together.
6. Unlike battery cage system, the droppings can be easily mixed with litter materials thereby reducing the cost of constant cleaning of the poultry house.

Disadvantages

1. When compared with the extensive system, the cost of housing and feeding the birds is high.
2. There is high risk of disease outbreak among the flock if the litter material is wet.
3. The culling of unproductive layers is difficult under this system. This is because the eggs laid cannot be attributed to any particular bird.
4. There is generally lack of exercise among the flock, this factor is mostly responsible for the weakness of most exotic breeds of poultry.
5. There is frequent report of cannibalism, pecking and egg eating in this system of poultry management.

B. Battery Cage System

This system like the deep litter system involves the building of permanent structures for the birds. Unlike the deep litter system, the birds are not free to move within their compartments.

Battery cages differ in many respects such as:

- the number of birds per tier
- arrangement of the tiers
- the mode of operations etc: according to the number of birds per tier, there are three popular types of battery cages.

(i) **Single bird cage**
This type allows only one bird in each compartment. The space allowance is about 20 cm x 45 cm x 35cm per bird.

(ii) **Multiple bird cages**
Multiple bird cages allow two to five (2 – 5) birds in each compartment. The space allowance for three birds is about 45 x 45 x 35cm.

(iii) **Colony bird cages**
These types allow more than five birds in one compartment. The spacing depends on the number of birds to be kept in the compartment, for example, a cage of twelve birds will have a space of about 75 x 85 x 35cm.

Three types of tier arrangements are possible in the design of the battery cage system:

i. the step – stair or California (wire way) cage. In this case the tiers are arranged in steps.
ii. flat-deck (swift grow) battery cage. This is one tier battery cage system.
iii. reverse way battery cage. This type of cage with multiple tiers is vertically arranged with the rows in each tier facing opposite directions.

Battery cages also differ in their mode of operation. Some simple battery cages are operated manually. In some, feeds, water and the removal of the droppings are done by machines. The extent to which these operations are performed differs from one battery cage to another. However, whatever the nature of the cage, there must be enough ventilation for the birds. This is essential because of the high population of birds in a room.

Advantages of using battery cage

1. This system is used mainly for layers. It enables the farmer to record the individual performance of the birds especially in terms of egg laying.
2. It allows high density of birds, there of, it is most useful where there is shortage of land.
3. Unlike the extensive system the birds are safe from predators.
4. Since the birds are prevented from having direct contact with their droppings, the spread of diseases is minimised.
5. The problem of pecking and cannibalism is highly reduced because they are confined in their individual compartments.
6. The birds are easier to manage than in the deep litter system. The distribution of feeds and water to the birds and the removal of

droppings can be done by machines with little assistance of the poultry attendant.

Disadvantages

1. The cost of providing battery cages may be more than the cost of housing the birds on deep litter system.
2. The system can only be used for adult layers. It cannot be used for rearing cockerels and broilers.
3. The system cannot be used to produce fertilised eggs since mating is not possible inside the tiers.
4. There is complete lack of exercise among the birds.

3.2.4 Poultry House

The provision of poultry house is very essential especially under the intensive system. Most of the advantages of housing poultry have been discussed under the intensive system of poultry management. It is pertinent to note here, however, that:

- when the birds are properly housed, they will be free from thieves and other predators
- poultry house provides optimum temperature conditions for the birds, i.e. the temperature conditions of the house should neither be too hot nor too cold
- the birds are also protected from rainfall, excessive sunlight and strong wind.
- if the birds are housed, it will be easy to control disease and parasite infestation among the flock
- provisions of house will enable the poultry farmer to make use of small area. This is very useful where land is scarce
- it will increase the general management efficiency of the farm. For example, it will make it easy for the farmer to collect the eggs and even the droppings for use as fertiliser.

3.2.5 Siting of Poultry Farm

The selection of site in commercial poultry is very important as this could contribute to the failure or success of the farm.

The site selected should be able to satisfy most of the conditions listed below:

1. Accessibility

The site of the farm should be easily reached by both the farmer himself and his customers. This means that the route should be

motorable and it must not also be too far from the town. The young chicks need to be watched almost 24 hours daily and for this to be done, demands that the farmer must be close to the poultry house.

2. **Topography of the area**
   The poultry site should be well drained and should not be too exposed as this will increase the winds speed. Forest areas should also be avoided as this may cause water logging.
   The topography of the site must therefore be such that provides the best weather conditions to the birds.
3. **Availability of water**
   The supply of water is very essential in poultry management. There should be steady source of water supply in the site. It is safer and cheaper to use pipe borne water, but in the absence of this, well water can be used.
4. **Nearness to existing poultry farm**
   It is advisable that the new farm should be at least 100 metres away from any existing poultry farm. This is to avoid rapid spread of diseases from the existing poultry farm to the new one.
5. **Provision of shade**
   Poultry house should be sited where there are few trees to provide shade for the house. The trees will help to keep down the temperature of the house especially during the hot weather. They will also serve as wind break.
   Potential poultry farmers should therefore look for a site that will satisfy most of these conditions.

SELF-ASSESSMENT EXERCISE

Draw a typical chicken and label the parts.

4.0 CONCLUSION

In this unit we discussed the meaning and economic importance of poultry: We equally discussed the different breeds of poultry and some common terns used in poultry management: The advantages and disadvantages of each system of poultry management were highlighted. In conclusion, you would have discovered that poultry production is the most popular form of animal farming as it is widely kept throughout the country irrespective of tribal or religious background.

5.0 SUMMARY

In this unit, you have learnt the following:

- poultry is a collection of domestic birds
- poultry supply meat and eggs, provide income, employment, raw materials for industry. They are also used for laboratory experiment and their droppings used as manure for crops production
- poultry can be grouped into two: Local dwarf fowls and the exotic breed
- there are three methods of poultry management – Extensive, semi-intensive and intensive systems
- the extensive system is called open range or free range system
- there are two methods of managing poultry under the semi-intensive system – folding and restricted range systems
- there are two popular methods of intensive system of poultry management – deep litter system and battery cage system
- some important factors to be considered when siting a poultry farm include the following: accessibility, topography, water, shade and distance from the existing poultry farm.

6.0 TUTOR-MARKED ASSIGNMENT

i. Why is poultry industry important in Nigeria?
ii. Discuss the factors you would consider when selecting a site for poultry farm.
iii. Explain the two popular intensive methods of poultry management.
iv. Discuss the advantages and disadvantages of one of them.

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UNIT 5 MANAGEMENT OF CHICKS, BROILERS, COCKERIES AND LAYERS

CONTENTS

1.0 INTRODUCTION

In the last unit, you learnt about the meaning and economic importance of poultry production. You also learnt about the breeds of poultry and some common terms used in poultry management. The advantages and disadvantages of extensive, semi–intensive and intensive methods of poultry management were also highlighted. In this unit we shall continue our discussion on poultry production. Your attention in this unit will be focused on the management of chicks, broilers, cockerels and layers.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain how to take care of baby chicks
- describe the management of broilers, and cockerel
- explain how to take proper care of layers
- identify the essential equipment used in the management of poultry
- describe how to use and maintain equipment found in poultry house.

3.0 MAIN CONTENT

3.1 Rearing of Baby Chicks

The brooding of baby chicks, whether broilers or pullets, is the most important activity in poultry management. The success of the business can be determined at this stage because it is the stage where the highest mortality rate occurs. The efficiency achieved at this stage will also determine the future performance of the birds. In broilers this crucial stage may end at four weeks, while it may extend beyond that in pullets.

The success or otherwise of the business will depend on the following factors:

1. quality of the chicks
2. constant supply of clean water
3. quantity and quality of feed supply
4. medical treatment and
5. the suitability of the poultry house.

A. Preparing to receive the chicks

For a poultry man to be successful during the brooding period, he has to provide a suitable rearing environment for at least two weeks before the arrival of the chicks.

The following steps should be taken before receiving your day old chicks:

1. For the new entrants, make sure the brooder house is ready at least two weeks before the arrival of the chicks.
2. The poultry man should make the necessary repairs to any damaged parts of the house e.g. roof, wall, floor, windows, doors etc.
3. This should be followed closely by the cleaning and washing of the house. The floor should also be disinfected by using any good disinfectant, e.g. Dettol, Izal, Morgan etc.
4. The next step will be introduction of new litter materials. Wood shaving or sawdust can be spread on the floor of the house.
5. All the equipment should then be properly cleaned and disinfected. The damaged ones should be repaired before they are brought back to the brooder house. At this stage make sure that all the equipment are in good condition.
6. Close all the doors and windows to fumigate the house. Fumigants like solution of potassium permanganate and

Formalin can be used. The fumigation should be done at least a week before the arrival of the chicks.

7. Twenty – four (24) hours before the arrival of the chicks, set the heaters in operation to reach the required brooding temperature of about 91^{o}F (33^{o}C). The doors and windows should remain closed. Open places should be covered with sacks, papers or any other suitable materials to prevent draft. This may not be necessary during the hot weather.
8. Twelve hours before the arrival of the chicks, spread, clean paper to cover the brooding areas. The paper will help them to differentiate between the feeds and the litter materials. Brooder guard should also be placed around the brooding areas to prevent the chicks from running astray.
9. Just before the arrival of the birds, fill the baby chick drinkers with water in readiness to receive them. The plastic drown proof chick water fountain is the best for young chicks.
10. Get the history of the birds from the supplier. Always insist on good quality birds. Examples of such qualities are as follows:
    a. low mortality rate
    b. ability to convert feeds into body weight or egg production
    c. high egg laying performance
    d. vaccination against Newcastle and Marex diseases before leaving the hatchery etc.

B. **Receiving day old chicks**

As soon as the chicks arrive on the farm, count and examine them individually. After the inspection, they should be thrown on the paper. Weak ones should be culled immediately. Healthy ones have bright eyes, fine feathers and they will also be able to stand on their feet when placed on their backs. Allow the chicks to drink enough water before introducing feed on the clean paper. Allow a minimum period of four hours before spreading the appropriate feed on the paper. For broilers, use broiler starter mash and for pullets, use chick mash. To avoid constant removal of paper and feed wastage, feeding trays can be used instead of spreading the feed on paper.

Check the brooder temperature, and make sure that it is optimum for the chicks. Use chick guard to confine the chicks within the brooder area. The guard should be adjusted according to the heat requirements of the chicks. The guard should be closed to the source of heat when the chicks feel cold and it should be far away when they feel hot.

C. Brooder management

Brooder is equipment that is used for providing heat to the baby chicks from a day old until they are able to provide their own heat requirement.

There are two methods of brooding chicks: Natural and artificial methods. In natural brooding, the broody hen provides heat for her chicks until such a time they are capable of independent life. In this system the mother hen cannot cater for more than 15 chicks at a time.

In modern commercial poultry management where a large number of chicks are reared together, equipment are used to provide such conditions similar to the mother hen e.g. heat requirements, feed, water and general protection. This method is referred to as artificial brooding.

1. The chicks should be inspected as often as possible. Make sure they are in good condition. Watch the thermometer to be sure that the temperature is optimum for them. In the absence of a thermometer, you can easily tell whether the heat is optimum for the chicks by watching their behaviour towards the source of the heat, if the chicks huddle around the source of the heat, it means they are feeling cold. If this happens, you can increase the intensity of the heat supply. You will also reduce the intensity of the heat supply if the chick runs away from the source of heat. The brooder temperature is optimum if the chicks are evenly distributed within the brooder. Kerosene lantern or electric bulbs are used to supply heat for the brooder house.
2. Feeding troughs should be introduced as from the third day. Feed troughs should completely replace serving of feeds on news paper or trays after one week of age.
3. Remove all the news papers from the brooder house as from the seventh day. Also remove the chicks guard from the tenth day of brooding. This is done in order to encourage the chicks to move freely within the house. At this stage, feeder and drinkers should be evenly distributed within the house not minding the source of heat.
4. If the weather is not too cold you can remove all the curtains and other covers from the brooder house after the second week. At this stage you still need to maintain the brooder temperature up to the fourth week. This is however subject to the chicks demand for extra heat. The removal of the curtains will allow for proper ventilation.

If the weather is too cold the curtains should be left until the weather condition improves.

5. Always clean the drinkers and feeders everyday but do not wash with detergents.

   Provide clean and fresh water every morning. Also feed the chicks twice a day, once in the morning and the second time in the evening. As a rule the feeding trough should not be empty for more than four hours.

   Avoid overcrowding of the chicks, always maintain the recommended spacing of the chicks and also that of the feeding and drinking troughs. 100 chicks up to the age of six weeks require about three of 1m x 10cm wide c 7cm deep feeding troughs and five of one litre capacity plastic water fountains.

6. Watch the chicks against any unusual behaviour e.g. drop in feed consumption, cold e.t.c. It may be a sign of sickness. Follow the routine vaccination programmes. Apply antibiotics e.g. Terramycin, Furaprol e.t.c. once in two weeks to their drinking water. Maintain proper sanitation and also consult the nearest veterinary office for any outbreak of diseases.

D. Caring for chicks

The rearing programmes may start from the fifth week after the brooding programme. At this age you can remove the heater but there should be light for the chicks to be able to move freely in the night. The chicks are now ready to be transferred to the growing houses. All the routine activities should continue at this stage.

1. Continue to provide clean water daily. Clean the drinkers first thing in the morning. One hundred chicks should now be provided with 4 to 5 litres of water daily.
2. As from five weeks old gradually change the broiler starter mash to finisher mash. This feed will be given until the broilers reach market weight. For the pullets also change the chick mash to grower mash as from eight weeks up to 18 weeks old.

   At this stage, you can increase the number of feeding troughs from 3 to 5 per 100 chicks. The alternative way is to maintain the number of feeding troughs (3), but increase the capacity from 1m long by 10cm wide and 10cm deep to 1m long by 15cm wide and 10cm deep.

   You can introduce green vegetables to the birds. Always insist on good quality feeds. Avoid anything that will reduce the quality of the feeds e.g. exposure of feeds to rain, water or sunlight, storing of feeds for more than one month, contamination of feeds etc.

3. Stir the litters frequently to avoid outbreak of diseases. Continue the medical treatment. Change from the use of Tetracycline chick formula to Tetracycline soluble powder as you gradually change the feed. Seek the help of veterinary officer on all matters related to the health of the birds. Also continue the removal of non-productive ones, (Culling). This should be done to minimise the outbreak of diseases.
4. Debunking should be carried out at the age of six weeks. This is necessary in order to reduce cannibalism, feather pecking and feed wastage. This bad habit is caused by overcrowding, lack or poor quality feed, poor ventilation, heat stress etc.
5. Try to minimise the stress on the birds especially when transferring the chicks from the brooder house to the growing house. First remove all the equipment in the house. Use catching panels to keep the chicks in one corner. They should then be carefully placed in the crate and handle the crate with extra care.

3.2 Management of Broilers

Broilers are fast growing breeds of fowls and because of their fast growing nature they are reared for meat rather than for any other purpose. Female broilers can lay eggs after attaining the age of 20 weeks, but they are poor layers, laying on the average three eggs in a week.

If broilers are properly managed, they can reach the slaughter weight of about 1.5kg in 6 weeks. Due to their fastness on growth rate people are more interested in keeping broilers than layers. This is in attempt to make quick money. Unfortunately many inexperienced poultry farmers have failed to achieve this objective. This is because broilers are very delicate to handle, lack of proper management can lead to 90% mortality rate among the broiler chicks.

All the management practices recommended under the rearing of chicks' should continue for broilers until they reach slaughter weight.

A. **Planning for broiler house**

Commercial broilers are normally reared under the deep litter system. They perform poorly when reared under the range systems. This is because they are normally underfed when left on their own.

The various modes of constructing broiler house have been discussed in chapter 3. Whatever method use, there should be

proper ventilation. The size of the house will depend on the number of birds to be kept. To minimise outbreak of diseases each house should not contain more than 500 broilers at a time.

To maintain monthly sales of broilers, there should be three housing units and each unit can be programmed in a way that will allow for monthly sales of the broilers.
Assuming there will be regular supply of day old chicks and there will be regular market for the sales of the birds, the following suggestions can be followed by commercial broiler producers:

B. Broiler house equipment

Most of the essential equipment in a commercial poultry house have been discussed under 'Poultry Equipment and Appliances'.

A good commercial broiler house should have the following equipment:

a. Brooder
This is necessary to provide adequate heat. For the chicks until they are able to provide their own warmth. The chicks may be brooded in a brooder box or on the floor with artificial source of light e.g. electric bulb, kerosene lantern etc.

b. Brooder Guard
This should be about 25cm high. It is used for guarding the chicks from going too far from the source of heat.

c. Waterer
The watering troughs are used to supply water for the chicks. There are different types of waterer but the best is the plastic water fountain or Baby chick drinker. In the absence of this, other low cost waterers can be used.

d. Feeder
This is used for serving the feeds. There are many types of feeding troughs, but the best is the hanging feeder. Other types can be used but it should as much as possible avoid feed wastage.

e. Catching Panel
Catching panel is used for catching broilers when they are ready to be sold or if they are to be transferred to another place.

f. Debeaker
If the farmer wishes, the birds can be debeaked with either the debeaking machine or scissors. This is done in broilers to avoid feather packing and food wastage which is likely to occur from the age of six weeks.

C. Feeding the birds

It is advisable for a broiler keeper to purchase commercial feeds than to mix the feeds at home. To achieve maximum efficiency, mixing of the feeds should be left in the hands of experts.

There are two systems of feeding broilers. The first system is to start with broiler starter mash up to the age of five weeks. Broiler finisher mash will replace starter mash from the age of five weeks until the birds reach slaughter weight.

The second option is to use straight or all purpose broiler mash. This type of feed is used for broilers of all ages. Whatever the system adopted, the birds should be fed twice a day. The feeders should also be cleaned daily.

Space Requirements for Feeder per Birds

Age of birds (Wks)	Feeder (cm2)
1 – 2	2.5
2 – 6	4.5
6 – 8	6.5
Above 8	7.5

D. **Supply of water**

Broilers drink twice as much water as what they eat and their stomach can hold water only in small amounts. It is therefore very essential for them to drink water freely and often. One hundred chicks of about two weeks old consume approximately four litters of water daily.

The water should be changed daily and the drinker should also be cleaned with ordinary water before serving new water.

Space requirements for drinker per bird

Age of birds (wks)	Drinker(cm^2)
1 – 2	0.5
2 – 6	1.0
6 – 8	1.5
Above 8	2.0

E. **Medical treatment**

Routine inspection of the birds is essential in the management of broilers. Always avoid creating undue stress on the birds as this can retard their growth rate.

The birds should be given antibiotics e.g. Terramycin, Amprolium, Furaprol, Furazolidon etc. to prevent outbreak of disease, visit the nearest veterinary office in your area. Also follow the routine vaccination programmes.

Some broiler keepers used to think that it was not necessary to apply any drug on broilers. This is quite unsafe for the birds as diseases can attack them at any point inn time.

By combining good management with the use of antibiotics as preventive measures, the birds will be freed from diseases. Chapter six will guide you on the type of medical treatments that should be given and also the management practices that will avoid the outbreak of diseases.

F. Labour requirements

One labourer can efficiently manage 3,000 broilers; he may also need occasional helping hands.

The major duties of the attendant are as follows:

- daily supply of feeds and water
- cleaning of poultry equipment and the house
- other miscellaneous works e.g. lighting, stirring up of the litters etc

3.3 Management of Cockerels

Cockerels and local fowls are similar in their growth rate. They have very slow growth rate when compared with broilers. For instance, a broiler may reach slaughter weight at the age of 10 weeks while it may take cockerel of the same age at least 20 weeks to reach the same weight.

The productions of cockerels are still largely left in the hands of the backyard poultry keepers and the villagers. If cockerels are properly managed and times towards festive occasions, they can be made more profitable.

Due to their slow growth rate compared with the feed consumption, it is advisable to rear cockerels on semi – intensive basis.

A. Provision of house

Cockerels should be reared under restricted range system, since it will be unprofitable to keep them under the intensive system.

The houses should be provided with necessary equipment similar to that of broiler house. For instance, there should be brooder, brooder guard, feeding troughs, watering troughs, perches, catching panel etc.

B. Feed and water supply

Cockerels can be kept under intensive system up to the ages of 8 weeks. Thereafter it will be less profitable to continue keeping them under that system.

Cockerels should be given broiler starter mash or chick mash from day old up to 8 weeks. After 8 weeks they can be kept under semi – intensive system. In this case they should be given grower's mash or broiler finisher mash in the morning and be allowed to go on range within the fenced area until evening. They can be brought back to their house at around 4.00p.m. and the second feeding can be provided. Water should always be available in the poultry house.

Apart from giving them the commercial feeds, their feeds can also be made at home. This type of feed is not as efficient as the commercial feeds. The home made feeds should contain the following feed ingredients:

a. coarsely grinded cereal grains e.g. maize, sorghum, millet etc
b. *dusa*, e.g. rice bran, wheat offal, maize bran or brewers grain
c. groundnut cake and soya bean meal
d. bone meal and limestone or oyster shell
e. common salt
f. greens and other vegetables to be given as required by the birds.

The feeding and watering troughs should be cleaned daily in the morning before serving new ones.

C. Medical treatment

Cockerels are less susceptible to diseases than broilers and layers. Despite this fact they should be given all the necessary medical attention.

The routine vaccination programmes should be followed. Preventive drugs especially antibiotics should also be added regularly to their drinking water. Any outbreak of disease should be reported to the nearest veterinary office for necessary actions. All the medical treatments recommended for broilers will also go for cockerels.

D. Marketing of cockerels

The demand for cockerels is still very high in Nigeria. Most Nigerians prefer cockerels and local fowls to broilers. This according to them, this is due to the fact that the meat of the

cockerels and local fowls are tougher and sweeter than those of broilers.

It is uneconomical, however, to keep cockerels on permanent intensive system. For maximum efficiency, it is advisable to keep them on semi – intensive system. Under this system if the productions are timed towards festive periods like Christmas, Easter, Id – el fitr and id – el Kabir, they could be made profitable.

Commercial poultry farmers are therefore encouraged to go into occasional production of cockerels.

3.4 Production of Layers

Layers refer to the exotic breeds of hens, kept purposely for egg production. This branch of poultry is very important and therefore needs special attention.

There are two branches of egg production: the production of fertilised eggs for hatching (breeding layers) and that of unfertilised eggs for daily consumption (Table eggs). The later is more common in commercial poultry production.

The only difference in their management system is that males (cocks) are introduced to the hen for the production of fertilised eggs. The hens are never kept in battery cages. In the production of unfertilised eggs the layers could be kept in either battery cages or deep litter. One cock can effectively mate about 15 hens.

Egg production is the most profitable among the branches of poultry business, apart from the regular income from the sale of eggs; the birds will also be sold off at the end of the laying period.

Incidentally, most poultry farmers prefer broiler production to egg production. This is probably due to short term involved in the production of broilers. Most farmers cannot afford to wait for the periods involved in egg production. Likewise layers production involves higher risk than broiler production. In the long run layers production may be more profitable than broiler production but the combination of both enterprises is the most ideal.

For the laying houses, open sided poultry house is highly recommended for commercial purposes.The spacing will depend on the size of the flock and the equipment to be installed.

To maintain all year round egg production, there should be a separate rearing house and two laying houses.

A. Equipment for laying houses

The following equipment is essential for the production of good quality layers.

a. **Waterer**

It is used for constant supply of clean drinking water. The plastic chick waterer is highly recommended but in the absence of this, other suitable types of drinkers can be used.

b. **Feeder**

Feeding troughs are used to serve feeds for the layers. The troughs should be large enough to store feed for at least six hours. It should also be constructed in a way that will avoid feed wastage.

c. **Brooder**

This is used to provide artificial heat for the chicks before their feathers will be able to provide this for them. Brooder be it boxes, deep litter floor or battery, is often accompanied with artificial sources of heat e.g. electric bulbs, kerosene lanterns etc.

d. **Chick guard**

This may be made from planks, cardboard, ceiling board or even wire. It is used to guard the chicks around the source of heat. They are normally used for chicks between the ages of one week to four weeks.

e. **Nest**

The provision of nest is very important in a deep litter system. The provision of nest in a large commercial poultry will make collection of eggs easier and it will also help to check the habit of egg eating among the layers. Nest makes the birds comfortable and undisturbed when laying. In battery cage system, the birds are already in the separate apartments and do not require nest.

A good nest should have enough space and proper ventilation. The nest should be introduced into the laying house at the end of the 18^{th} week, so that the birds will be accustomed to it. Nests should be placed at the dark corners of the house.

f. **Crates**

Crates are used for transferring layers, especially from pullet rearing unit to the laying unit.

g. **Egg Tray**
When collecting eggs from the laying house, egg trays should be used. This will make counting easier and decrease the risk of being broken.

h. **Catching Panel**
It is used for catching the birds. This is necessary in order to avoid creating stress on the birds.

i. **Debeaker**
It is necessary to debeak layers in order to avoid feather pecking, cannibalism and feed wastage among the flock. Debeaking is normally done with electric debeaker or scissors. Debeaking is not necessary in a battery cage system.

j. **Perches**
This may be necessary under the deep litter system. It provides the birds with the opportunity to exercise their body.

k. **Feed cart**
In a large commercial poultry, feed cart may be necessary in laying house. The cart is used for transporting feeds and other ingredients round the house.

B. Supply of water

Provide clean and fresh water to the layers at all times. Dirty water predisposes the birds to diseases. The temperature of the drinking water should be kept below $32^{o}C$. Hot water can reduce feed consumption which can cause death or slow down production. Lack of water in the poultry house can cause the layers to shed their feathers and can also reduce egg production to as low as 20% within a day.

The plastic water fountain drinker can be used to provide water for layers. Other water troughs can also be used.

Always avoid wet litters. Stir up the wet litters at least once in a week. The wet litters around the drinkers can be replaced with new ones.

The amount of water consumed by layers will depend on weather conditions in the area and the breed of the layer. On the average, one hundred layers will require about 25 litres of water daily. A large commercial poultry house should have large water reservoir or a well around the poultry house to ensure constant supply of water.

C. Feeding the layers

From day old to 8 weeks, the chicks should be fed on chick mash, from 8 weeks to 18 weeks they are fed on growers mash and from 18 weeks upwards they are fed on layers mash. Check the labels on the bags in order to buy the right type of feed. Feed should

always be available for the layers, the more they eat, the more eggs they produce.

Supplement their feeds with green forage e.g. Centrocema, stylosanthes, Amaranthus, pawpaw leaves etc.

The source of the feed supplies is also very important. Always insist on high quality feeds.

Try to avoid as much as possible the purchasing of feeds from different sources. Different mixers used different formulae and this may adversely affect eggs production.

Unless with expert idea, it is always dangerous to prepare layers mash on your own. Seek for expert advice on matters related to feed preparation.

D. Medical treatment

Daily inspection of the layers is very important. Make sure that the birds are always in good condition.

As from the age of 20 weeks start serving Terramycin egg formula in their drinking water. Separate the sick ones from the healthy ones. Clean all the equipment to avoid contamination.

Follow the routine vaccination programmes. Two vaccination programmes should be carried out on layers after the age of 18 weeks – Grumboro and egg drop syndrome vaccines.

Seek the assistance of the veterinary officer in your area for all matters related to the health of the birds. See chapter four for the detailed discussion on health management.

E. Culling of unproductive layers

Birds could be culled based on their performance records or through physical appearance. The undesirable layers should be culled as soon as they are detected. Culling is a continuous process, which should start from the day the birds are brought in and end on the day they leave the house.

Sick ones and poor layers should be removed from the house. In battery cages, poor layers are easy to detect through the records of their egg production.

In deep litter system, poor layers are detected through their physical appearance e.g. the areas around the vent are dry, the vent looks tight, the comb appears dull and dry etc. they lay very few or undersized eggs and consume more than what they

produce. Such layers are uneconomical to keep and should be removed immediately.

A good layer is one that lays at least once in every other day. A good layer should be able to lay about 280 eggs in a year.

F. Collection and grading of eggs

Collection of eggs should be a routine duty. In battery cages eggs could be collected twice a day, the first collection could be around 9a.m., while the second collection could be around 4.00p.m. In the deep liter system eggs should be collected as often as possible to prevent egg eating among the layers.

After collection, the eggs are graded according to their weights. In a large commercial poultry farms, eggs are grouped into three, the small size with average weight of about 55 grams, next group are the medium size eggs with average weight of about 65 grams. Those with average weight of about 65 grams are the large size eggs. The extra large ones called jumbo and the under sized ones are not graded.

Grading is done in order to determine the prices of the eggs. When automatic grading machine is used, it will also help to detect the damaged ones.

G. Marketing of eggs and meat

Apart from the availability of capital, the total production of birds should also depend on the marketability of the products.

The farmer should survey the market to know the available capacity so as to avoid overproduction. The sources of supply are the general public, petty traders, departmental stores and institutions.

The farmer should note that, there may be stiff competition between the local fowls and the exotic breeds. Secondly he may not be the only poultry farmer in the area. Therefore he needs to sell at lowest possible price.

SELF-ASSESSMENT EXERCISE

i. Name five common diseases that normally affect chicken.
ii. How can you control them?

4.0 CONCLUSION

In this unit you learnt about the management of chicks, broilers, cockerels and layers. This is because the survival of these fowls depends on the proper knowledge of their management practices. Any negligence on the part of poultry farmer can result in 100% mortality rate.

5.0 SUMMARY

In this unit, you have learnt that:

- success in poultry business depend on – quality of chicks, water supply, feed supply medical care and the poultry house
- there are essential steps that must be taken before receiving a day old chicks
- management of brooder box is very important because it perform the function of providing warm in the absence of the chicks mother
- house, correct feeds and water supply are very essential in the proper management of poultry
- proper medical treatment must also be provided for all categories of fowls to ensure maximum performance.

6.0 TUTOR-MARKED ASSIGNMENT

Describe the management practices involved in the production of any of the following categories of fowl:

i. Cockerel
ii. Broilers
iii. Layers.

7.0 REFERENCES/FURTHER READING

Ibitoye, S.J. (2002). *Introduction to Poultry Keeping.* Ankpa: Bencaz Printers.

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MODULE 4

UNIT 1 AGRICULTURAL EXTENSION SERVICES

CONTENTS

1.0 INTRODUCTION

In the last unit, we concluded our discussions on poultry production. We discussed management of baby chicks, broilers, cockerels and layers. You discovered that proper handling of these categories of fowls will ensure maximum production and reduce mortality rate. In this unit, you are entering into a new field of agriculture called agricultural extension. Here, your major concern will be on the meaning, principles and development of agricultural extension.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- define agricultural extension
- list at least three objectives of agricultural extension
- state five principles of agricultural extension
- state five qualities of a good agricultural extension worker
- list five problems facing agricultural extension in Nigeria.

3.0 MAIN CONTENT

3.1 Introduction to Agricultural Extension

3.1.1 Meaning of Agricultural Extension

Extension education generally, is not easy to define in a short phrase because of its broad objectives. It covers such areas, like Agriculture, Home economics and Community development. These three areas interact with each other and are therefore difficult to separate. As a result of this, the term agricultural extension may simply be referred to as extension education.

In his attempt to state the purpose of all extension work, Savile (1965) explains that the aim of extension work is to teach rural people how to raise their standard of living by their own efforts, using their own resources of manpower and material, with the minimum assistance from government.

Mosher (1958) defines extension education as a voluntary out of school educational programme designed to help rural people or farmers learn new skills, knowledge and acquire favourable attitude as a basis for making changes in their ways of living.

Williams (1978) in his own opinion sees extension as a service which assists the farmers through educational procedures in improving their farming methods and techniques, increasing their production efficiency and income and improving their levels of living.

Adams (1982) defines agricultural extension as assistance to farmers to help them to identify and analyse their production problems and to become aware of the opportunities for improvement. From the above understanding of extension education, it is clear that agricultural extension is a voluntary, out of school education directed at the farmers to help them improve on their standard of living through the efficient utilisation of production resources available to them. Essentially the

term embraces all scientific activities aimed at helping the farmers solve their problems with their own resources not only on the farms but also in their families.

3.1.2 Objectives of Agricultural Extension

The main objective of agricultural extension in Nigeria is to assist the farmers increase their production capacity. This however, cannot be achieved in isolation; it has to be done in conjunction with other programme. The broad objectives of agricultural extension service therefore are as follows:

a. **Link between researchers and farmers**
One of the objectives of agricultural extension service is to serve as a link between researchers in the Universities or Research institute and the farming communities. In achieving these objectives, the extension workers bring to the notice of the farmers all the latest development in the field of agriculture from the Research institutes through the ministry of Agriculture. In the same way, the problems of the farmers are also taken to the researchers for solutions. In this way extension service tries to bridge the gap between the researcher and the farmers.

b. **Adoption of new innovation**
Apart from bringing research findings to the farmers, it is the responsibility of extension service to persuade the farmers to adopt new innovation. Local farmers are known for their reluctance to adopt new changes. This is probably due to their belief in the old tradition and also as a result of their poverty. They don't want to take any costly risk that will adversely affect their income. Through persuasion and education about the value of the improved method, it is possible for most of them to change.

c. **Identification of available resources**
Another important objective of extension service is to help the farmers identify the resources available to them. For the farmers to adopt the new innovation, they need certain essential facilities. It is the duty of extension service to educate the farmers on the availability of these resources. Apart from the identification of these resources, extension services also educate the farmers on how to make use of them on the farm.

d. **Living standard of the family**
Improving the living standard of the farmer and his family is another objective of agricultural extension service. This objective is achieved through the education of the farmers and their families on the management of their incomes, children and their own welfare, the general improvement of the home and the

formation of cooperative movement. This objective is very important as it can affect the decision of the farmers with regard to the adoption of new innovation.

e. **Development of local leaders**
It is the aim of agricultural extension service to develop local leaders among the rural community. Leadership development is very essential in all extension work. Extension service most often makes use of local leaders in executing their programmes. The leader will provide a link between the farmers and the extension agents all the request and problems of the farmers are formally channel through their leaders. Any information from the agent will first be passed to the leader before the farmers receive them.

f. **Development of rural youth**
Youth development is another area of concern to agricultural extension service. Extension service prepares the youths for adulthood through the formation of youth club, women's club and farm settlement scheme. This objective is aimed at making rural areas a better dwelling place for the youths. This is necessary to arrest the rural-urban drift. Rural youths are known to be more positive towards the adoption of new innovation than adults. There is therefore the need to retain some of them in their areas as innovators.

3.1.3 Agricultural Extension and Formal Education

Agricultural extension education differs from the formal system of education in many respects:

a. Agricultural extension education unlike the formal education is voluntary. The farmers can decide at any point in time to attend or not to attend. They cannot be forced by the extension agent to attend. In the formal school setting on the other hand, it is compulsory for the students to attend the classes.

b. Agricultural extension education could be carried out in any place. There is no specific place where the teaching takes place like the schools in the formal system. Teaching of farmers could take place on their farms, market place or in their respective houses. In the case of formal education, there is a specific place and time when students and their teachers meet for lessons.

c. There is no age limit or sex difference in agricultural extension education. The learning is open to everybody in the community whether old or young, male or female etc. There is often limit to the number of pupils admitted yearly in the formal system of education. The number is based on the age, sex and passing the qualifying examinations.

d. In the formal system of education, there are certain subjects that the pupils must study and there is also syllabus guiding the teaching of these subjects. This is not true of agricultural extension education. There is no specific subject for each day and there is no laid down regulation as to how the teaching should be carried out.
e. There is no award of certificate in agricultural extension education. The farmers are never tested on what they have been taught, while in the formal system, the pupils are evaluated on what they have done and certificates are also awarded based on their performances.
f. In Extension education, farmers' problems are taken to the researchers for solution, while new innovations from the researchers are also brought to the farmers for adoption. Such arrangement does not exist in the formal education.
g. Extension education is directed towards solving practical problems identified by the farmers themselves. The farmers must see the problems by themselves and must be eager to do something about it. In the formal system, the courses are designed for the pupils. It is the duty of the teacher to follow the course outline as it is laid down for them without any serious consideration for the pupils' interest.

3.1.4 Principles of Agricultural Extension

The principles of agricultural extension are the essential elements that guide the effective teaching of agricultural extension. Failure to abide by these principles may lead to total failure of the extension programmes. Some of these principles are as follows:

a. That extension programmes should be based on the needs and interest of the farmers. Programmes should never be forced on the farmers. It is therefore essential for the extension agent to seek for the opinion of the farmers before introducing a new project for them.
b. Closely linked to the above principle is that all extension programmes should be concerned with the welfare of the community. If the programme is not related to their welfare it may not be readily accepted. Farmers will be interested in any programme that touches on their well-being.
c. Agricultural extension education is also based on the conditions that exist in the community. All extension programmes must respect the norms and values of the people in the community. Any extension activity that runs contrary to the critical belief of the people will not be accepted by the farmers. Agricultural extension service also believes in the economic achievement of

the farmers. This also determines the types of projects that can be introduced in a particular area.

d. One of the basic principles of agricultural extension is the use of local leaders in executing the extension programmes. It is essential that extension agents should seek the cooperation of the local leaders before introducing new ideas. If the leaders accept the idea, it's believed that more than half of the people in the community will also accept it. Using local leader has a multiplier effect on the success of extension programmes.

e. It is also the principle of agricultural extension to seek to involve the entire family in its programmes. A farmer may be taught on how to increase his productivity while his wife will be engaged in home management and the children will also be involved in youth development programmes. The extension agent should allow the family to participate in the activities rather than carrying them out on their behalf.

f. All agricultural extension service should be in line with government policies and objectives. Any extension programme that runs contrary to the wish of government may likely fail even if the community is interested in it.

g. Agricultural extension programme is concerned with the quality of the work done rather than quantity of the work. The programmes are continuously evaluated to assess the progress made. The pace of the work is largely determined by the economic level of the people. It is therefore important that extension agent should not be too much in a hurry to complete the project as this can have adverse effect on future projects.

h. It is very essential for agricultural extension service to make use of any existing club or societies in the community. Cooperative societies are good sources of approaching the local farmers. Rural societies are agents of change and agricultural extension service should take advantage of any existing one in the rural area. For example, clubs with political undertone extension work. Extension agents should try by all means to avoid such association.

3.1.5 Qualities of a Good Extension Worker

Certain criteria are very essential in the selection of the agricultural extension worker. Any person lacking in any of these qualities should not be chosen as an extension agent. The basic qualities that a good extension worker should possess are as follows:

a. **Educational qualification**

It is essential that agricultural extension worker must have a basic knowledge of the subject matter. The qualification required will depend on the level of entry into the profession. At the administrative level, the Agricultural Extension officer (AEO), normally must have at least B.Sc. degree in Agriculture. Close to him is the Agricultural Superintendent (AS) who is normally an HND holder in agriculture. At the community level are the agricultural assistants (AA), who are normally OND holders in agriculture. The last set of the people are the field officers (FO), who may be school certificate holders or an experienced primary school holder. The field officers should undergo some training before they are allowed into the profession.

b. **Ability to speak the local language**

This quality is very essential for extension worker at the community level. About 90 percent of the local farmers are illiterates. They cannot read, write or speak English language or the extension worker to communicate effectively with the practical farmers demands that he must be able to speak their dialects. However, this quality is not important for the administrative officer as they are not directly linked with the farmers.

c. **Experience of the extension worker**

Experience, they say, is the best teacher. The experience acquired in the job will largely depend on the age and years of service of the extension worker. Through experience, the extension worker will be able to find solution to some of the farmers' problems without necessarily referring the case to the highest authority. He will also be able to tackle most of the farmers' problems in the ways that will satisfy them.

d. **Interest in the job**

Agricultural extension worker must be highly interested in the job before he can perform efficiently. To Some extent, some agents take to the job probably because there is no other opportunity opened for them. This group of extension workers may not be committed to the job as expected of them.

e. **Attitude towards the job**

The extension worker must show positive attitude towards his job. He must be punctual and prepared to stay in rural area. It is common to find extension agent posted to rural area to live in urban centres in order to enjoy electricity and pipe-borne water. As a result of this, he may absent himself from duty for up to two or three days in a week.

f. **Attitude towards the farmers**

The extension agent must not place himself too high above the farmers. He should feel free to mix and eat with them. He

should not be ashamed to associate with the farmers and members of their families. He must be rural minded. He must also be ready to abide by the norms and values of the people. It is only when this is done that the farmers will be prepared to receive his message. The farmers will equally be happy to narrate their problems to him.

g. **Personal Character**
Generally, the agricultural extension worker must be somebody of good behaviour. He must be respectful and obedient. He must always have patience so as to be able to cope with the illiterate farmers. He must be hardworking, tolerant and be prepared to work for 24 hours every day.

3.1.6 The Role of Agricultural Extension Worker

a. **As an educator**: The agricultural extension agent plays a vital role in the education of the farmers and their families. The farmers rely on the extension agent for solution to all their educational problems. This is why it is essential for extension workers to have some basic educational qualification to be able to cope with the demand of the farmers. He teaches the farmers generally on how to raise their standard of living through their own efforts.

b. **As a link between researchers and the farmers**: Extension workers are largely responsible for the transmission of research findings to the farmers. All research findings especially in the field of agriculture are simplified by the extension workers for the farmers. In the same process all the problems of the farmers regarding production are taken to the researchers. Without the help of extension workers, there will be a communication gap between the researchers and the farmers.

c. **As a change agent**: Prior to the introduction of intensive extension service in Nigeria, farmers were known to be reluctant to change from their traditional system of farming. Nowadays, through the help of extension workers, most farmers realised that before they can progress in life it is inevitable for them to change to the modern techniques. For instance, at the beginning of planting season, farmers now rush for the purchase of fertilisers and pesticides. Some of them are now using tractors and applying herbicides on their farms. This success is largely attributed to the role played by extension workers. As a result of this, the farmers have been able to substantially improve on their standard of living through increased productivity.

d. **As a supervisor**: Extension agents do not merely pass information to the farmers, they also make sure that the information is carried out to the letter. This is possible through

direct supervision of the farmers. The farmers are guided by the extension workers at all stages of the project. The projects are never carried out directly by the extension worker, what they normally do is to guide the farmers on how it should be done especially through demonstration or pilot projects.

e. **As a programme planner**: This role is being performed mainly at the administrative level. It is the duty of the agricultural extension officer to plan all the projects to be carried out each year and how it should be done. The plan is based on the needs and aspirations of the people concerned.

3.2 Development of Agricultural Extension in Nigeria

Introduction

The practice of Agriculture is as old as the creation of man which started in Nigeria prior to the Colonial era. The development of agricultural extension in Nigeria is synonymous to the development of agriculture.

The development of agriculture in the Country also follows the same pattern with the historical development of the country. This development can be grouped into two:

a. Pre-independence development, and
b. Post-independence development.

Pre-Independence Development

Government involvement in a purposeful agricultural and extension development started with the colonisation of the country by the British. The main purpose then was to increase the agricultural production of the export crops. This was aimed at getting a ready source of raw materials for their industries in Britain. As a result of this all extension works at that time were directed towards the development of export crops.

The period between 1890 and 1905 can be described as a period of trial and error. Many projects were tried but all failed.

Notably among them were the establishment of a Department of Botanical Research in the Southern region in 1893, and a Cotton Farm by the British Cotton Growing Association in the Northern region in 1905.

In 1910 and 1912 Departments of Agriculture were created in the southern and the northern parts of the country respectively. At that time the two regions were being administered as separate political entities.

Seven years after the amalgamation of the South and North, a National Department of Agriculture was created in 1921 with the headquarters at Moor Plantation in Ibadan (Williams, 1978).

It was also during the same year that a school of Agriculture was established at the headquarters. One of the aims of establishing that school was to train some extension service workers who will advice the farmers on the modern techniques of farming.

During the period between 1931 and 1940, series of agricultural development activities occurred. The most significant perhaps of these activities is the establishment of school of agriculture at Samaru-Zaria in 1931. It has the same objectives with that one at Moor Plantation, Ibadan.

Four years after government's involvement in the cooperative societies, the cooperative society ordinance was passed in 1935. From then registered cooperative societies started to receive government recognition and financial assistance. (Forrest, 1979).

Other attempts were made between 1941 and 1950 to develop agriculture and extension throughout the country, .Such attempts according to Forrest, (1979) are the Mokwa Project, Shendam Scheme, Wawa bush project etc. However, Some of them failed, due to lack of fund and inadequate planning.

According to Atala, (1981), the period between 1951 and 1960 before the country got her independence was a period of major landmarks in the development of Agriculture and Extension in Nigeria. For instance in 1952, as a result of constitutional changes three regions were created – Northern, Western and Eastern regions. Separate regional Ministries of Agriculture were also created. This also led to the creation of separate extension units under the Ministries. Due to this major reorganisation, extension service was given a prominent role to play in the education of the farmers and the supply of essential farming materials.

Nigeria got her independence in October, 1960. Three years after the independence, Midwest region was created in 1963 and this brought the number of Ministries of Agriculture to four. As a result of the regional creation of the ministries of Agriculture, development of Agriculture became a regional concern. Each region made several attempts to make use of all the agricultural potentials in their areas. Such attempts included the establishment in their rural projects, farm settlements. Agricultural Financing agencies, marketing boards etc. Most of these projects could not succeed due to political and financial problems.

However, they were able to make significant impacts on Agricultural development especially in the area of extension.

Twelve states were created in 1968 to replace the four regions. This also led to the creation of twelve separate ministries of agriculture with one Federal Ministry of Agriculture; as the thirteenth.

More purposeful agricultural programmes were initiated during the 1970s, all aiming at increasing agricultural productivity. Notable among them were the National Accelerated Food Production Project (NAFPP), Agricultural Extension and Research Liaison Services (AERLS), River Basin and Rural Development Authorities, Operation Feed the Nation (OFN) etc.

In 1975, Seven additional States were created, bringing the number of State Ministries of Agriculture to Nineteen (19).

1980s witnessed further development of Agriculture and extension. During the change to civilian rule between 1979 and 1983, the Green Revolution Programme was launched. This programme could not succeed for political reasons.

In 1987, two more States were created thereby increasing the number of State Ministries of Agriculture to Twenty one (21). Presently we have 36 States in the Country.

Despite all the transformation, the country has witnessed in the agricultural sector, the Country continues to experience food shortage and the extension unit of the sector is still at the mercy of our policy makers.

3.2.1 Problems of Agricultural Extension in Nigeria

Nigeria has witnessed a series of transformation in the area of agricultural extension for almost a century ago. Despite all these changes, agricultural extension is yet to find its feet in terms of development. The reasons for this are many and vary from state to state. Some of the generalised problems facing agricultural extension in Nigeria are as follows:

a. **Lack of adequate training**
   It is essential that agricultural extension workers should be well equipped with modern agricultural knowledge in order to cope with the demand of the farmers. Most of our extension workers could not proceeds further in their training especially in their specialised work. This is due to the government refusal to grant

in service training to them. As a result of lack of in-service training, most of the extension workers find it difficult to cope with the field experience.

b. **Lack of proper coverage**

The ratio of extension agents to farming families in Nigeria is about 1: 2,000. This is by far above the recommended ratio of 1: 250. This problem is affecting the effective coverage of the farming families.

Other problems militating against effective coverage of extension work are lack of mobility for extension agents and deplorable conditions of our feeder roads. Despite the wide areas the extension agents are expected to cover, Vehicles loan are not provided for them. Some areas are not motorable especially during the rainy season. As a result of these problems, agricultural extension agents find it difficult to maintain close contact with their clientele.

c. **Lack of co-ordination with research institutes**

It has been alleged in many quarters that most of the researches conducted in Nigeria are not very useful to our farmers. They are either not adaptable or too complicated for the farmers to understand. In others the expected results are quite different from the actual results obtained in the field. One of the major reasons for this is lack of proper co-ordination between researchers and extension workers. Extension workers are supposed to play the role of middlemen between the researchers and the farmers by bringing to the notice of the farmers any new innovation from the researchers and the farmer's problems to the researchers. This role has not been effectively performed due to lack of proper coordination between extension workers and researchers.

d. **Political instability**

Nigeria has witnessed more than ten changes of leadership since 1960 when the century got her independence. These changes had effects on the agricultural extension programmes as each leader tended to condemn most of the work of their predecessors and bringing in their own ideas, which in most cases may quite differ from the former programmes.

This often leads to abandonment of some extension programmes and the introduction of new ones. This is reflected in the development of agricultural extension in Nigeria. Such projects are the Farm Settlement Scheme, OFN, River Basin Development Authorities, and Green Revolution etc. This has also made proper evaluation of agricultural extension programmes very difficult.

e. **Lack of commitment**

Most of the Agricultural extension workers serving in the rural areas are normally neglected at the headquarters. Most of the

amenities such as vehicle loan, in-serve training, payment of allowances etc are normally reserved for those staff at the headquarters.

Coupled with the fact that most of our areas lack essential amenities such as electricity and pipe borne water, it is not uncommon to find most of the extension workers posted to rural areas living in the nearby urban centres. Some of them only report for work once a week. Some engage themselves in other forms of business thereby neglecting the work assigned to them. This has contributed in no small measure to the poor performance of agricultural extension service in Nigeria.

f. **Lack of resources**

Lack of essential facilities has serious impact on the effective performance of agricultural extension duties. Some of these resources include: Sources of transport, Audio Visual aids, office accommodation, farm inputs and other equipment. Some of these facilities when provided are grossly inadequate. Farm inputs such as fertilisers, treated seeds, pesticides etc do not arrive at the appropriate time that the farmers are supposed to use them. Some treated seeds are brought into this country after they have expired.

All these have negative effect on the agricultural extension worker, as farmers tend to put all the blames on the extension agent in case of any failure. This can also affect future acceptance of agricultural programmes.

Certain posters are supposed to be used at a specific time of the year. For instance posters on planting of seeds are supposed to be distributed to the farmers before the planting is done. Audio visual aids are necessary to supplement the work of the extension agents.

g. **Lack of credit facilities**

With the removal of subsidy from most of the farm inputs such as fertilisers, insecticides, herbicides and farm tools, it is very difficult for peasant farmers to use these inputs. The prices of these inputs are by far beyond the reach of the peasant farmers. Commercial banks are not willing to give loan to farmers despite the Federal Government directives. This is because of the lack of collateral security normally demanded by the banks in addition to the credit guarantee scheme by the Central Bank of Nigeria.

h. **Channels of communication**

The organisational structure of agricultural extension in Nigeria follows the line type. The positions are arranged in a hierarch, each lower office being under the control and supervision of a higher one. In this regard the extension field officer who occupies the lowest position has to report farmers' problems to the agricultural assistant who will in-turn report to the

agricultural superintendent. This channel will be followed until when the information will get to the highest officer for necessary actions. This channel appears to be too long for matters demanding urgent attention, e.g. outbreak of disease, pest invasion and other natural disasters.

i. Illiteracy of the farmers

More than 80 per cent of our peasant farmers are illiterates. They can neither write nor read. Among the few that can read and write, some of them cannot communicate in English Language. Most of the extension guides are writing in English language. Most of the extension guides are writing in English. These leaflets are essential to supplement the efforts of extension workers especially in those areas where they cannot effectively cover.

The problem of illiteracy has great impact on the adoption process. Adoption of agricultural innovations among these illiterate farmers is often slow because of their attitudes towards new innovation. This problem also demands that for any extension agent to perform effectively, he must be able to speak the local, language in the area he is posted to.

j. **Lack of unified extension service**

One of the problems facing agricultural extension in Nigeria is lack of Unified extension service. At present each state is solely responsible for organising her own extension services. This problem renders the evaluation of extension service at the national level difficult. Comparison of extension service between states is almost impossible.

In some states extension service is limited to agricultural development only, while in others it may include community development, some states have no well defined extension service. In a case where extension agents will be under the control of two or more Ministries, it will be difficult for them to perform efficiently.

3.2.2 Reforming Agricultural Extension in Nigeria

Some of the strategies that could be adopted to improve the effectiveness of agricultural extension in Nigeria and to ameliorate the above problems include the followings:

a. As a way of encouraging the extension staff working in the rural areas, in-service training should be granted to them after two years of active service. This is essential for them to increase their knowledge and also to be able to compare class work with field experience.

There is also the serious need to train all agricultural extension staff in the operation and maintenance of modern farm tools. Farmers who may wish to adopt these modern tools may eventually call on the agricultural extension staff for help.

This demands that extension staff must be well informed about the operation and maintenance of this equipment before they can render any advice.

b. The present ratio of extension workers to farming families is too high for effective coverage; this is worsened by lack of mobility. It is therefore highly recommended that government should embark on urgent recruitment of extension staff to reduce this ratio.

In addition to employment of more staff, vehicle loan should be given to all extension staffs serving in the rural areas. Most of the roads linking to the rural areas should also be graded periodically to provide easy accessibility to these villages.

c. the activities of Agricultural Extension and Research Liaison Service Unit of Ahmadu Bello University (ABU) should be expanded to cover all the Research Institutes in the Yoruba, Hausa and Igbo Languages and distributed to all the farmers in the country. If this is done, it will minimise the gap between Researcher and the Farmers.

Research findings sent to farmers should be those that are profitable to the farmers, simple to adopt and must not be in conflict with the existing farming practices in the Country. These conditions can be met by carrying out field trials under different soil and climatic condition. The trial should be carried out under the supervision of the extension agents in those areas. It will also include the variation between the expected and the observed results.

d. The provision of essential facilities for extension staff, especially those serving in the rural areas is very important. Such facilities include prompt payment of salary, leave grant, promotion, in-service training and the like. These facilities when provided promptly and regularly will motivate the extension staff to stay in the field.

The supply of resources such as Audio Visual aids, improved seeds, fertilisers, pesticides, farm tools, etc, should also be timely. Farm inputs should be supplied at subsidised prices. It will be meaningless for extension agents to advocate the use of these inputs when the farmers cannot afford to buy them.

e. One of the identified problems militating against effective performance of extension service in Nigeria is the lack of capital and credit facilities. When this credit is granted to a few privileged farmers, they often misuse it by using it for the provision of social amenities and other things that are against the

purpose for which the loan is granted. One way of solving this problem is for the banks to engage on supervised credit. In addition to this, some of the money can be given to farmers in form of inputs.

The credit guarantee scheme should be the only condition for granting loan to farmers. The farmers on their own part should not see the loan as a way of sharing the national cake. The money should be judiciously used for agricultural production. Formation of cooperative movement will enable the farmers to reap economy of scale.

f. To improve the effectiveness of agricultural extension service in Nigeria and also to eliminate the unnecessary bureaucracy of the Civil Service, extension service should have autonomous board. If Agricultural Extension Board is created, it will enable the staff to operate more efficiently.

This may also enable the extension service to operate at national level since the board will have offices throughout the states Performance evaluation of the board will also be easier.

g. There is also the need to introduce adult education for the illiterate farmers. This will enable them to read and write at least in their major local language. Certificate should be awarded at the end of the course which should be the pre-requisite for receiving government assistance in farm operation.

If the level of illiteracy is reduced, adoption process will be faster. This is because most farmers will be able to read and understand any leaflet or poster given to them.

SELF-ASSESSMENT EXERCISE

Sketch the organisational structure of Agricultural Extension in your own State Ministry of Agriculture.

4.0 CONCLUSION

In this unit, you have learnt the meaning of agricultural extension, the objectives of agricultural extension and principles of agricultural extension. Other areas discussed include – qualities of a good agricultural extension officer and the role of agricultural extension worker. You also studied the problems facing agricultural extension in Nigeria and the suggestions made to proffer solutions to those problems.

5.0 SUMMARY

You have learnt in this unit, that:

- agricultural extension is a voluntary, out of school agricultural education for farmers
- agricultural extension serves many objectives like linking farmers and researchers, adoption of new innovation, identification of farm resources, improving standard of living etc.
- agricultural extension education is non-formal education and differs from formal education
- a good extension officer must posses the following qualities – educational qualification, ability to speak local language, experience, have interest in the job, develop positive attitudes toward farmers etc.
- Agricultural extension worker perform the following roles:
  - supervisor
  - change agent
- programme planner and link between researcher and farmers.
- the problems facing agricultural extension include – lack of proper coverage, training, commitment, resources, finance, education etc.
- suggestions made to solve some of these problems include – more recruitment of staff, provision of resources, granting of credit facilities, adult education programme etc.

6.0 TUTOR-MARKED ASSIGNMENT

i. Define agricultural extension.
ii. Explain five principles of agricultural extension.
iii. Discuss five problems facing agricultural extension in Nigeria and suggest solutions to them.

7.0 REFERENCE/FURTHER READING

Ibitoye, S.J. & Mundi, N.E. (2004). *Essentials of Agricultural Extension in Nigeria.* Ankpa: Rowis Printers.

UNIT 2 AGRICULTURAL EXTENSION AND RURAL DEVELOPMENT

CONTENTS

1.0 INTRODUCTION

In our last unit, you learnt about agricultural extension services. The main points discussed include – the meaning of agricultural extension, objectives of agricultural extension, principles of agricultural extension, qualities and roles of extension officers. Other areas discussed include – the history of extension in Nigeria, problems facing agricultural extension in Nigeria and suggestions to reduce the effects of these problems. In this unit, we shall continue our discussion on agricultural extension services. This unit shall focus on rural development, social system and social change, community development and organisation, Training and visit system, as well as administration of agricultural extension.

2.0 OBJECTIVES

At the end this unit, you should be able to:

- define rural development
- explain the meaning of rural poverty
- explain the meaning of social system and social change
- identify the element and processes of social system
- list at least three types of social change
- explain the meaning of community development
- explain the relationship and differences between community development and organisation
- mention the merits and features of training and visit system.
- explain the meaning of administration in agricultural extension
- identify the basic principles of administration.

3.0 MAIN CONTENT

3.1 Concept of Rural Development

Rural development is a strategy or an intervention programme that is designed to improve the economic and social life of a specific group of people. The target group is the "Rural poor", example includes rural poor farmers, traders, tenants etc. They are also known as the "silent majority." It involves tending the benefits of development to the poorest among those who seek livelihood in the rural areas (World Bank, 1995). The three main concerns of rural development are: the transfer of people out of low productivity of agriculture (subsistence farmers) and other activities into better pay jobs (to improve their standard of living). The silent majority (mass of people in the rural areas) face different degree of poverty.

There is need to mobilise the major factors of production (i.e. land, labour and capital).

Rural development has the following objectives:

1. to improve productivity of the people (rural poor)
2. to increase employment and higher income of the people
3. the provision of adequate food, shelter, education, health, among others.

Note that 1 and 2 are economic objectives while 3 is social objective.

Rural development is a complicated process that defies easy definition. Its complication is attested to by the multiplicity forms that the programme has taken in many different parts of the world.

Rural development is therefore a set of policies with two main objectives:

1. to encourage and promote the wellbeing of the rural majority
2. to ensure the production of a surplus that will enable the rural people to meet their rising expectation.

The ambit of rural development is therefore very wide. It includes economic problems, mobilisation of savings, credit and investment, changes in land tenure policy that will result inequitable distribution of land among the various sectors of different population. It involves preservation of law and order, administration of justice, provision of needs and other means of communication, health and medical facilities that will improve the quality of life of the rural people.

Due to the comprehensive nature of rural development, many approaches such as Community Development (C.D) and Adult Education (AE) have been tried with the view to improving the lot of rural people but with little success.

A new approach called Integrated Rural Development (IRD) is now in vogue and Nigeria has joined the bandwagon of this approach. This approach is based on the premise that the very nature and the process of IRD and the enormous size of the problem of promoting economic and social progress in many rural areas require that action be taken on several forms simultaneously and not independently of each other (health, education, rural electrification, water supply). Furthermore, it is felt that the very concept of rural development demands an application of knowledge and skills of all the relevant national services in an

integrated rather than in an isolatory/fragmentary ways. This implies that programmes of agriculture, education and training, health administration, rural electrification, water supply and road construction should not be planned and implemented each in-isolation without consideration of the implication that the development programme in one area will have on the other.

The Integrated Rural Development approach has as a primary objective of mobilising and harnessing a human and material resource to cope with the situation. It also involves active participation on the part of the population of whom the rural development programme is designed. To make integration viable, a core of rural institutions must be put in place to go along with this approach hence the development of Peoples Bank of Nigeria to mobilise savings in rural areas. The creations of health institution, rural electrification board are all developed to tackle the rural problems.

In pursuing integrated approach to rural development, type of training given to the staff is very crucial. The training should emphasise on the need for coordination and cooperation among the various institutions, rather than developing the attitude of jack of all trades and master of none as in the case of village multi-purpose worker. The training should also emphasise all the component parts in the integrated system of development which must be understood to be important and must be appreciated for the role they play individually and collectively.

Integrated rural development differs from harmonisation of place and cooperations of different governmental agencies, but emphasises the need for coordination, at various levels. The rural coordinating committee must comprise all the technical persons from different ministries.

3.1.1 The Concept of "Rural Poverty"

The rural areas have smaller share of economic and social infrastructural services viz domestic water, electricity, access roads, industries etc. than the urban areas.

A special intervention is therefore needed to raise rural production and incomes and to provide social and other services, such as health and education.

Poverty is reflected in poor nutrition, inadequate shelter and low health standards, this affects not only the quality of life but also the productivity of rural people. Note: they mutually reinforce impact of poverty and/deficient diet on production.

Measurement of Rural Poverty

A Absolute Poverty (AP) is defined as an income level of which even the minimum standards of nutrition, shelter and personal amenities can not be maintained.
By World Bank standards, this means the annual per capital income of the poor is less than 1.50 (dollars). Anybody who earns less than $2.00 daily is considered to be in absolute poverty according to the World Bank;

B Relative Poverty (RP) reflects extreme differences in level of living between the top and bottom. Strata in this case, the annual income is greater than or less than 150 (US dollars).
Note: relative poverty is often more of a problem in a better off developed or developing countries than in the poorest countries this is because the norm in such societies is that everybody is well-off, so any deviation/deviant would want to be on the same scale with his neighbours hence, relative poverty is often more of a problem in countries like USA and other developed countries.

3.1.2 The Theory of Community

Community forms two perspectives:

1. Psychological connotation
2. Geographical connotation

Psychological implies shared interest, characteristics or association. For example, the academic community or farming community.

Geographical denotes a specific area of people cluster.

Psychological definition of community combines the two learnings that is, “a people with a common locality having, shared interests and behaviuoural patterns.”

These shared interests and behavioural patterns manifest in the following areas:

- Production, distribution and consumption of goods and services.
- Socialisation – that is teaching members of a social system, in the norms and values of the system, so that they can behave in a relatively predictable manner.

- Social control – informal means of effecting societal norms and values.
- Social participation entails- involvement of people in community affairs.
- Mutual support team work i.e spirit de corp.

3.2 Social System and Social Change

3.2.1 Meaning of Social System

The social system is defined as a group of persons who interact and influence the behaviour of each other on a more or less permanent basis. A group of persons (buyers) meeting in a market square may not be regarded as a social system but the market women (sellers) who belong to an association is a social system. Similarly, a village and all formal and informal organisations within the village community are all social systems. The social system embraces the entire society.

3.2.2 Element and Processes of a Social System

A **Element**

1. There is the existence of a set of interdependent statuses (social positions) and roles responsibilities obligations or expected behaviour attached to any social position.
2. Existence of some power structure and patterns of sanction.
3. Every social system has some boundaries, physical location or territorial distribution in spaces which make it possible for the system to be located and identified. It also has a name which distinguished it from other village.
4. Social systems also have objectives, norms, values which are all actively defined.
5. All social systems have some facilities. That is, the equipment, objects or means by which the system attains its objectives e.g. the land is an economic facility for making a living in village communities.

B **Processes**

1. The community is a system of systems, a subdivision of which is rationally and deliberately related to one another. That is, the community is composed of other social systems such as a number of families, organisations and interest groups.

   However, memberships and interests cut across each other thereby ensuring the ultimate survival of the community and the attainment of its objectives.

2. The community is not structurally centralised in the same manner as a formal organisation for instance most of the needs and interests of community members are met through a variety of separate institution and groups none of which is entirely dominant.
3. The community as a social system, is more or less implicit in nature where else other social systems such as formal organisations are more explicit.

3.2.3 Social Change and Types

Social change refers to changes in social structures and social relationship (Rogers, 1979). A related concept, cultural change refers to change in the culture of society.

Change in culture brings about changes in society and social changes also bring about changes in society and social changes also bring about cultural change.

While theoretical distinction between social and cultural changes may be made, in practice, this is not always possible; most sociologists used the two terms interchangeably.

Types of Social Change

1. **Planned or unplanned change**: Planned changes or deliberate changes entail the direct human intervention in the shaping and direction of change towards some pre-defined goals. For instance, the state government introduces free education or agricultural revolution or land reforms, these changes are planned in advance to realise certain known goals.
   Unplanned change or accidental changes is that which happens suddenly – usually resulting from natural calamities such as earthquake, flood, locust infestation, drought, volcanic eruption etc which may bring with them drastic changes in the society.
2. **Total or segmented change**: Total change is that which covers a wide range of activities and may lead to complete transformation of a people's way of life or their social institutions e.g. as in the initiation of a new religion/religious factor.
   Segmented change covers only a portion and may not call for a total transformation of the system e.g. currently in Nigeria, Western Medical Practice or orthodox exists side by side with traditional or orthodox medicine and patients move from one sector to another, depending on how they feel.
3. Coercive or compulsory vs voluntary or democratic change: Coercive change is one that is forced on members of a society

e.g. military coup deal forces a military non-democratic government on people.

A community that decides to embark upon self help project plan for voluntary and democratic change; so as is a nation which after referendum decides to switch from a parliamentary or presidential form of government.

4. **Immanent change/contact change**: It refers to internally generated change that which occurs without any external influence. For example, an invention of a new type of hoe or other farming implement by the pattern of plugging within that community will be an immanent change.

Contact change is a change introduced into the system from sauces external to that system. Contact change can be of two types namely:

1. Selective contact change: when an outsider unintentionally communicates or introduces an innovation into a social system.
2. Direct contact change when an outsider deliberately introduces a new idea into the social system.

3.2.4 The Social Action Process

The social action process identified by Beal and Bohlen (1986) is a series of steps that proved U.A.M, village, LGA, State etc. of social system.

Steps in Social Action Process:

1. Understanding of the general social system and its power structure.
2. Identifying the initiating set (these group of 2 or 5 persons initially act as the advocate for the cause of social action).
3. The legitimiser (receives the identified problem) from the initiating set, they have the authority and prerogative to sanction i.e. endorse or oppose the proposed idea. If a legitimiser is bypassed, he feels threatened and may seek recognition by blocking the process.
4. The diffusion stage: The sets undertake the task of public enlightment to take the problem of proposal to public.
5. Commitment to action through the people's attendance at meetings and rallies and pledges of time and money volunteering service etc, all of these come under commitment to action.
6. Articulation of the goals and objectives of action as well as methods and attaining the goals.
7. Execution of the programme and evaluation.

3.3 Community Development and Organisation

3.3.1 Concept of Community Development

Community Development is a process by which the effort of the people themselves are united with those of government authority to improve the economic, social and cultural conditions of Communities to integrate these communities into the life of the nation and to enable them contribute fully to national progress "Community Development" (CD) is a complex process made up of two essential elements as follows:

1. The participation by the people themselves in efforts to improve their level of livings with as much reliance as possible on their own initiatives, and the provisions of technical and other services in ways which encourages initiative, self help and mutual help
2. Another concerted action in a locality taken by any agency and or the local people themselves with the primary aim of bringing some benefits to the locality.

The importance is to promote better living for the whole community with the active participation and if possible on the initiatives of the community itself (Ekong, 1988). Community development is an educational process involving changes in all fields of human endeavour. It involves all aspects of rural lives such as health, agriculture, education, woman programme, rural water supply, local self-help and maintenance of law and order. In order to make community development effective, make use of multi-purpose work at the village level by educating him to educate the rural people to, solve their problems.

The creation of multi-purpose worker has brought community development in direct conflict with other rural development strategies in rural area. Community development is established to increase the economic opportunity and equality of life of the community through its multi-purpose workers helping the people of the community with those problems that require group action.

The economic opportunity may include:

1. creation of new jobs for the people
2. provision of better services
3. construction of better houses, roads and marketing facilities for the storage and processing of their goods
4. provide opportunity for the elders and recreational facilities.

In a nutshell, community development objective is to make the community a better place to work and live. It is a complex education process with the following essential elements, if it is to be successfully implemented:

1. it should rely as much as possible on the community resources
2. technical assistance is required from outside the community to achieve its goal
3. it is designed to achieve a wide variety of community improvement on the society such as health, education, environmental sanitation, water supply, etc. that is, anything that will improve the quality of life of the community
4. active participation of the people in the implementation of the programme is essential with as much reliance as possible on their own initiative.

3.3.2 Community Organisation

Community organisation is a complex of techniques designed to involve people, specialists and technical services to mobilise and facilitate the effective use of resources for community development (ICSW, 1962) (i.e. International Conference of Social Work in Rio-de-Janeiro).

Community organisation is a social work term and it refers to the co-ordination, extension or initiation of existing agencies and institutions into a community (for example, welfare agencies, churches, service clubs, schools, etc), thereby eliminating overlapping services and planning to bring about greater efficiency among social welfare agencies (Clinard, 1986).

3.3.3 Relationship and Differences between Community Development and Community Organisation

According to Sanders (1988) community development derives its name from community organisation as the maternal parent. Thus community development can be regarded as a method or a process of tackling the problems of community organisation in order to bring about economic development.

Arthur (1988) holds that community development is more concerned with the economic aspects of rural community life, and lays more emphasis on integrated technical assistance from the government where as community organisation is concerned with social welfare.

ICSW (1962) referred to community development as conscious and deliberate efforts aimed at helping communities to recognise their needs

and to assume increasing responsibilities for solving their problems thereby increasing their capacities to participate fully in the life of the nation. Community organisation is often the responsibility of the boards of the more educated, wealthy and professionally-oriented citizens in the community under the guidance of professional social workers.

Community development on the other hand, is more functional and process oriented and covers a wide field of activities. It emphasises self-help by citizens and also initiatives a people oriented process that is based upon their own perception of their needs.

3.3.4 Approaches to Community Development

There are four major approaches to community development:

1. Process Approach: This focus on the sequence through which communities grow as they move from one level of development to another.
2. Method "Approach: Focuses on the methods through which development objectives can be achieved.
3. Programme Approach: This views community development as a development programme that has been carefully designed in terms of contents and procedures.
4. Movement Approach: Community development is seen as a special kind of programme which attracts the commitments of those who want to see poverty, illness and other forms of suffering alleviated among the great masses of under privileged humanity.

Other Approaches to community development in Nigeria include:

- Government level
- Local people's level.

Government Level
At this level, community development in Nigeria is handled through a multipurpose approach. It serves as an "umbrella" organisation within which a variety of local level organisations could be housed. The governmental level approach is subdivided into extension approach, project approach and service approach.

a **Extension Approach**: This involves teaching the local people the improved method and the techniques of farming, health care, nutrition, how to read and write and compute.
b **Project Approach**: This entails the establishment of economic approach e.g. small-scale rural industry.

c **Service Approach**: This involves the provision of social amenities such as postal agencies, dispensaries pipe borne water, schools, community halls, etc. community services are often initiated by the people themselves.

The Local Level

At this level, community development in Nigeria is tackled via the "inner resources or self help approach" through discussions, stimulation through demonstration and internal enlightened leadership, the local people identity their needs and mobilises their own resources to meet such needs.

3.3.5 Assumption upon which Community Development is Based

There are some assumptions on which community development is based and these are as follows:

Isolation 2. Poverty vs better life (conditions of living) 3. Self reliance 4. Local participation 5. Integrated Rural Development. –IRD i.e. multipurpose approach).

The concept of community development assumes that:

1. the local community has been over shadowed by the larger society as a result of long isolation
2. the local people are poor owing to an under development of both their available resources in their environment and their own individual potentialities
3. people everywhere want better conditions of living and a richer economy and can develop the capacity to improve these things by themselves
4. many problems besetting rural population can be solved at the community level and with local resources
5. participation of people in decision making on proper changes taking place in their communities is desirable and functional
6. local people do not see their problems in isolated packages but as a complex whole, hence community development must be multi-purposes in nature, touching upon all aspects of community development life.

3.3.6 Basic Steps in Community Development

The basic steps that are crucial to the success of community development are as follows:

- an informal survey, fact-finding and identification of community concerns. (concept of situational analysis)
- identification of small group of leaders and or interest groups who serve as the initiating sets
- identification of immediate community problems or needs
- sharing of problems identified with community leaders for legitimating i.e. people that give it stamp of approval
- diffusion of problems and definition of needs
- securing citizens commitment to act and identification of needed resources (e.g. financial commitment or moral commitments)
- appraisal of available internal resources and invitation of external aid where necessary
- formulation of a detailed plan of action including a time table of activities
- carrying out the action and evaluating the entire process and the results
- identification of derived problems or needs and planning for the continuation of the process. By "derived problems or needs" here means those unanticipated effects of the change implemented.

3.3.7 Concept of Initiative, Felt Needs, Self Help, Participation in Community Development (CD)

1. **Initiative**: this implies that the community which seeks development must take the first step in the process of development. It also assumes lack or an absence of initiative in the community as an original state.
   Apparent lack of initiative may be a reflection of the ignorance and poverty stricken conditions of the people. In other words, "apathy" (unconcerned attitude) and a general absence of initiative are all closely interwoven with poverty ignorance and low level of living.
2. **Felt Needs**: According to community development theorists there is a distinction between felt needs and real needs of every community. In most instances, however, the rural people do not know their real needs hence they tend to give more importance to their felt needs which are often irrelevant and unrealistic.
   According to Good Enough (1953) there are four ways of viewing a community needs namely:
   - the change agent's view with his own goals in mind

- the agents view with his clients goals in mind.

The clients view of what should be done to achieve their own goals.
The clients view of what is appropriate to the agent's goals e.g of (i) above. Change agent is to help farmers solve their problems. Above is to meet these needs but instead of meeting their real needs, they meet felt need first. E.g. a farmer focusing on their felt needs, training kids in schools.
A community's felt needs must be recognised and sympathised with before there can be any hope of success in tackling the real need identified by the agents.

3. **Self help**: This concept is closely connected with the concept of initiative. Self-help connotes a strategy aimed at supplementing governmental development effort with efforts of the people themselves. However, in Nigeria, state government does not generally give "matching grants" to communities embarking on projects until after the completion of such projects.
4. **Citizen participation**: Participation is defined as playing active, though not necessary direct role in community decisions, knowledge of local issues, attendance at public meetings, related attempts to influence proposed measures through individual or group actions, belonging to groups and communities and financial contributions towards community programmes (Beal & Raudabaugh, 1972).

Why participation is necessary:

1. It allows for tapping of unused or underused human resources and gets many people to understand and cooperate with measures called for in the planner's strategy for development.
2. It acts as an antidote to psychological alienation and root-less-ness among the masses, thereby making people develop a sense of belonging.
3. It provides a real hope for the poor neglected masses to obtain favourable responses to their immediate need, in form of larger income securing of livelihood and access to better resources.

3.4 Training and Visit System

3.4.1 Concept of Training and Visit (T & V)

The training and visit system is an attempt to reform and improve on the conventional extension system in many developing countries which has not made the necessary impact on agricultural productivity. It is a management procedure involving regular intensive training sessions for

VEWS followed by a scheduled of visit to farmers. The system emphasises simplicity in organisation, objectives and operations. It has a well-defined organisation, mode of operation and provides continues feedback from the farmers to the extension and research workers. It also allows for continues adjustments to the farmers needs. It is spreading rapidly in many developing countries because of its effectiveness as a means of increasing agricultural production and incomes of farmers. It also serves as a flexible management tool that is suited to the needs of many developing countries.

Its basic extension techniques is a systemic programme of training the Village Extension Workers (VEW) combined with frequent visits by him to the farmer's fields. Its central theme is efficiency in the use of resources available to the extension service and the farmers.

3.4.2 Merits of T&V System

The key advantages of T&V include:

1. it improves the organisation of the extension service by introducing a single line of command with clearly defined duties at each level
2. it establishes a well-defined geographical boundary of operation for each extension worker
3. it improves coverage by limiting the number of farmers the extension worker is expected to visit
4. it limits the number of extension supervisor to supervise ratio of not more than 1:8 which allows for adequate monitoring of performance and concentration of efforts to achieve maximum impact
5. it provides a systematic programme of short training courses at which instructions on the current technical messages to be extended to the farmers are explained to the VEWs, followed by a predetermined schedule of visits to selected contact farmers
6. it improves extension's ties with agricultural research through the provision of subject matter specialists who are expected to maintain regular contacts with the research institutes and to ensure continuing flow of technical information to the farmer' problems back to the research institutes
7. it removes all non agricultural extension functions from the responsibility of the extension workers
8. it provides adequate transport facilities or other logistics support that help improve the mobility of the extension worker.

Demerits/Criticisms of T & V System

The demerits include:

1. it assumes that all the essential infrastructural facilities and essential inputs are already available and are in good working condition, shape in all development countries. Many of these countries still have a long way to go to establish viable institutions to take care of these
2. it is too rigid, top oriented and does not allow for active participation of the farmers in its programme planning
3. many developing countries cannot afford to have the large number of subject matter specialists (SMSs) required to make the system effective
4. it is costly to operate because of high recurrent personal costs
5. it is too heavily focused on technology transfer at the expense of human resource development
6. Because of the hierarchical authority structure of many extension organisations and long channels of communication in the extension organisation in many countries, supervision is not often sufficiently positive or morale boosting.

3.4.4 Features of Training and Visit System

The system involves the systematic application of well-known management principles with a view to professionalising the extension service. These principles or the basic features of the T & V according to Benor (1984) are as follows:

- **Professionalism**: This is the capability of extension staff to identify production problems in the field, recommend appropriate messages to solve them and train farmers on how to use the messages on their farms.
- **Single line of command**: The extension service should technically and administratively be responsible to a single unit of authority.
- **Concentration of efforts**: This emphasises the educational role of extension service, that non-educational function should be severed from extension. And in training sessions focus should be on major or impact points.
- **Time bound work**: Farmers are taught in regular timely scheduled on that they make the best use of their information and other resources at their disposal.
- **Field and farmer orientation**: Emphasises that the village extension agents must spend most of their time visiting farmers and their farms.

- Regular and continuous training of their field staff through fortnightly training for village extension agents and block extension agents and through Monthly Technology Review Meetings (MTRM) for subject matter specialist and other staff should be ensured.
- **Linkage between Research and extension:** this system supports a close tow way linkage between research and extension based on joint responsibility for field activities such as identifying production constraints and formulating production recommendations and organising MTRM.

Other essential features and requirement of the T & V monitoring are built on supervision, continuous up-grading of staff monitoring and evaluation of all extension activities and provision of production recommendations that are economically feasible and relevant to the needs and resources conditions of the farmers.

The main idea behind the system is to have competent Visiting Extension Workers (VEWs) who will visit farmers frequently and regularly with useful technical messages and bring farmers problems to research (Benr and Baxter, 1984). They maintained that the methods to achieve this may vary from place to place to suit the prevailing conditions but the features must be closely followed. Otherwise the potential effectiveness of the system, which then may no longer qualify as training and visit extension will be drastically curtailed.

3.5 Administration in Agricultural Extension

3.5.1 The Concept of Administration

Administration, like most terms in social services has no one single all-inclusive definition. Several definitions have evolved and in most cases it is more of a description than a definition.

For any organisation to function, decision must be reached about what to be done, how by whom and at what levels of acceptable efficiency and effectiveness. Plans must be developed in terms of goals; fiscal and human resources must be allocated in accordance with approved objectives; people must be motivated to act positively; team work must be assured a determination must be made to the extent to which goals were achieved in relation to pre-determined plans and standards. This is in fact, administration.

One classical definition of administration is that which describes it (administration) as the guidance, leadership and achievement of organisational goals.

Administration is the guidance, leadership and control of human resources. It also involves the efforts of groups of individuals operating with a given set of materials resource in such a way as to achieve the maximum goals of the organisation and the objectives of individuals.

Effective administration should strive to achieve the organisational goals and individual objectives with minimum expenditure of resources and efforts without compromising either.

3.5.2 Function and Process of Administration

The function and processes of administration differ in kind and scope according to the kind of organisation in which the administrator has to work and the level of this responsibility. However, certain activities and function are common to all persons engaged in administrative duties, be it in a commercial organisation, an industrial enterprise, the church, the army or the public service of the state. In other words, the function of an administrator in terms of general principle can be identified. In this direction, we shall be concerned primarily with those administrative, managerial or executive processes, which apply in varying degrees to all levels of administrative responsibility. Gulich (undated) has identified the following as the functional elements of administration:

- **Planning**: this is concerned with working out in broad outline the things that have to be done and the methods to be employed for doing them in order to accomplish the purpose set for the organisation with greatest efficiency.
- **Organising**: is the setting out of the formal broad structure of authority and flow of work in such a way that the work in the various sub-divisions, sections and branches is carefully arranged, clearly defined, and effectively coordinated in order to accomplish the objective of the organisation or department.
- **Staffing**: has to do with the personnel function of bringing in and training staff and maintaining a conducive work environment for maximum performance.
- **Directing**: the continuous task of making decision, and embodying them in orders, and instructions, which serve as the basis of appropriate behaviour and compliance.
- **Coordinating**: ensuring that the various branches of the organisation are working smoothly and that the inter-related tasks being performed in the various subdivision and section of the organisation are harmoniously integrated.
- **Reporting**: keeping those to whom the administration is responsible informed of what is going on, while at the same time

the administrator or chief executive keeps himself and his subordinates informed through reporting, records, and inspection.

- **Budgeting**: has to do with financial planning, accounting and control.

The above list of basic functions of an administrator is commonly referred to by the acronym POSDCORB which is made up of their initials.

The listed functions attempt to outline the basic tasks and responsibilities of an administrator. The precise emphasis to be given to anyone set of administrative duties or another would vary from organisation to organisation, from department to department and also from time-to-time; but essentially the same list of managerial duties is performed by executives at all levels of administrative responsibility.

Thus, we may infer the specialist role of personnel administrators, financial administrators, etc. as different from the political role of generalist administrators as important determinants of what they emphasise in their functions training.

Application of Concept of Administration in Agricultural Extension

In agricultural extension, the government and its functionaries have to induce or motivate farmers to adopt new practices as well as supply right quantities of essential inputs at the right time, and place to achieve increased production. Here, the inputs include human and materials resources. The human resources include specialist researchers, extension staff as well as managers and administrators.

The materials and resources include finance, time, fertiliser, improved varieties of planting materials and breeds of livestock varieties, implements etc.

The ineffective coordination of the above two sets of resources has always been poor output as exemplified by poor performance. Effective administration com-rising management and techniques is therefore the answer. It is in this sense that administration in extension provides the basis for eliminating element of wrong time and place, resource mis-allocation, insufficient input as well as conflicting roles and objectives in programme development.

The primary aim of agricultural extension has to do with the improvement of teaching and learning which will enable practicing extension worker and farmer know of, adopt and use new agricultural technologies and practices developed through research. Consequently, all the activities of extension administrators must focus on this aim.

4.0 CONCLUSION

In this unit you learnt the concept of rural development including the rural poverty. The issues of social system and change were equally discussed. We also discussed community development and organisation. Other areas discussed include – the concept of training and visit system and administration of agricultural extension. The understanding of these concepts is essential in the administration of cooperative societies.

5.0 SUMMARY

During the course of your studying this unit, you would have learnt about the following areas:

- Rural development – as strategy for improving the standard of living of rural people.
- Rural poverty – which is reflected in nutrition, health, shelter etc.
- Measurement of rural poverty – Two categories: absolute and relative poverty.
- Social system – group of persons that interact to influence the behaviour of each other.
- Social change – changes in social structure and social relationship which include: – planned or unplanned change, total or segmented change and compulsory or voluntary change.
- Community development – combine the efforts of community with that of government authority to improve the standard of living of the people.
- Community organisation – techniques designed to involve people, specialists and technical services to mobilise and facilitate the effective use of resources.
- Training and visit system – designed to improve the organisation of extension service.
- Administration – have the following principles: division of work, authority and responsibility, discipline, unity of command, unity of direction, and subordination of infinitude interest to general interest, enumeration of personal, centralisation, the scalar initiative and Espirit de corp.

6.0 TUTOR-MARKED ASSIGNMENT

Explain the meaning of the following terms:

i. Rural development
ii. Rural poverty
iii. Social system
iv. Social change
v. Community development

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UNIT 3 FOREST PRODUCTION IN NIGERIA

CONTENTS

1.0 INTRODUCTION

In our last unit, we concluded our discussions on agricultural extension services. We discussed the following areas – rural development, rural poverty, measurement of rural poverty, social system, social change, community development, community organisation, Training and visit system and administration in agricultural extension service. In this unit we shall look into some key elements in forestry. Some of these elements include – the meaning of forestry, importance of forests to the economy of Nigeria, Agro-forestry practices, raising of seedlings for establishing tree plantation and processing, felling and transportation of logs.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- define forestry
- list at least five importance of forests
- list four advantages of agro-forestry
- determine the factors that will guide the selection of site for tree nursery preparation

- describe the steps involved in the preparation of land for tree plantation.

3.0 MAIN CONTENT

3.1 Definition of Forestry

Forestry is the systematic planting and tending of forest trees which will later be harvested to provide wood for timber and pulp for paper manufacture.

Forest reserves should be established in areas where there has not been great pressure for cultivation, or where the land is poor to be suitable for agriculture. Sometimes they may be sited in disputed areas between rival towns. Forest reserves have occupied a very large portion of the land of most countries in tropical Africa and the present expansion of plantation Agriculture is inevitably tending to reduce these areas.

3.2 Importance of Forests

- provision of full-wood for domestic use
- provision of timber for building and furniture construction
- provision of raw materials for manufacturing paper
- provision of food, fruit and leaves for human use
- provision of herbs for medical care
- checking soil erosion through plant canopy
- conservation of soil moisture by reducing run-off and increasing the rate of water infiltration into the soil
- provision of pleasant environment for citizens – tourist.
- provision of habitat for wild-life and game reserve
- improvement of micro-climate of the area
- provision of wind break
- prevention of desert encroachment
- provision of materials for rural crafts such as wood for carving, making hoes, mortars, etc.
- provision of raw materials for the manufacture of plywood, sewers as particle boards
- improvement of soil structure through the activities of soil organic matter.
- revenue – personal and foreign exchange
- employment
- provision of ropes, fibres and vegetables
- educational research.

3.3 Taungya Farming or Agroforestry

The separate development in agriculture and forestry has given rise to conflict between the two factors. It is argued that forest reserve has displaced highly developed agriculture in order to tract trees farm forests.

Farming practices like burning destroy forest both on unreserved and reserved forest. Both forest and agriculture however work for the benefit of rural people hence there must be cooperation in case of conflict.

This can be done through the system of Taungya farming i.e. raising of forest crops with agricultural crops. Such multiple use has duration not more than 2 – 3 years during the establishment.

The general picture is that there is very little cooperation between farmers and forests for rural development. Forest services always think in terms of large compact forest estate not because of economy of scale but in order to avoid inclusion of villages in forest reserves with consequent risk of shifting cultivation and other conflict in land use.

Taungya farming is a system of raising food crops in collaboration with cash crop. It is almost practised in all regions of the world. Taungya farming is practiced in Southern-Nigeria with Edo and Delta States having the most intensive programme. However managerial difficulties and illegal trading of Tawngya farmland have caused a drastic reduction over the last few years.

Operation of agroforestry: The area is first allocated to farmers for clearing during the dry season. The farmer begins the planting of food crops before the forest service's employed start forest planting to the early part of raining season. Farmers use the land for 2 – 3 years and give it up for forest production.

Common food crops in taungya farms are: plantain, yam, cassava and maize. Some countries exclude plantain and banana as food crops to avoid sucker plants which are difficult to eradicate. Yams are also excluded in some countries. In West Africa both are excluded. Sometimes cassava is allowed but may have some effects on the soil.

Advantages of practising agroforestry:

1. they contribute to the supply of fire wood better than monocropping

2. the system guides against total crop failure as the deep roots woody perennials are less affected by drought than the herbaceous plants
3. the system also contribute to increased stability in the food supply through diversification
4. the system also contribute to increase in soil fertility through the falling – off of plant leaves
5. the tree cover enhances the reduction of wind speed which protects the crops from strong wind
6. woody trees in agro-forestry system provide wood and other forest products
7. the system allows balanced utilisation of soil nutrients
8. the system creates micro-climate favorable to crop production itself.

SELF-ASSESSMENT EXERCISE (SAE)

Explain briefly the various activities of man that promote loss of the forest.

Perennial food crops are not allowed as they may suppress forest crops. Moreover perennial crops may encourage the farmers to stay on after the forest trees have grown and may be used to establish ownership of land. In the Western States of Nigeria, cocoa trees were planted. It is argued that cocoa tress have 30 years of useful life and the harvesting of timber trees will take about 50 years when the useful life of cocoa is already past. But cocoa trees do not like shade. Teak is the most popular tree in the Taungye farm.

The main condition for Taungye farming is that unused fertile land for agricultural land must not be available if taungye system must be used.

In addition to shortage of agricultural land, there must be middle labour capacity, under employment and limited possibility for skilled work.

From the point of view of peasant farmers the system represent on exploitation of the very poor segment of the rural population. It does not mean that the farmers have not benefited from the scheme and they have been freely attracted to the scheme.

It clearly gives them economic advantage compared to being landless labourers and can be looked upon as a temporary solution to rural unemployment problems.

However, it is not all that socially desirable to plant forest crops in a land that can be used for food crops which gives higher returns. Generally, flat or gently sloping land is recommended.

3.4 Raising of Seedling for Tree Plantation Establishment

3.4.1 Nursery Site Selection.

The most important factors influencing selection of a nursery are:

- soil and topography (depth inherent fertility, drainage)
- adequate water supply
- adequate supervision of labour
- proximity to planting areas
- accessibility all year round and
- freedom from biotic factors like weeds, insects, etc.

3.4.2 Materials and Tools Required for Nursery Operation

These include polypots, top soil, river sand, seeds, sieves, fermented cow dung, fertilisers, chemicals (insecticides, fungicide, Gamelin 20, Aldine Dust) Knapsack sprayer, fencing wire, fencing posts, bend wire, a sane nets (wheelbarrows, axes, diggers, machetes, filling funnels, hoes, shovels, spades, altering cans, rakes.

3.4.3 Site Perspiration

Involves site clearing and land preparation. Site clearing may involve total destruction of the existing vegetation as in tanngye farms. It may be a partial removal of the vegetation as in enrichment planting. The clearing itself can be done by hand machine, chemical, fire and a combination of two or three of them.

Hand- Clearing
Mostly practised in Nigeria using axes, diggers, machetes and is labour intensive. The practice is limited by hilly or rocky terrains where topographic and soil conditions preclude the use of tractors. Slash (cuttings debris) is gathered packed and burnt. The method is slow which results in high cost but normally gives a clean burn.

Machine -Clearing
- Suitable where there is security of unskilled labour
- Favoured if area to be cleared is expensive
- A Crowder tractor fixed with blades, tree pushers.
- Ancher chains, winches, root rakes often used in the process.

- Machine clearing saves time and costs but has limitations imposed by the slope, operator's skills, soil and site conditions and safety.

Chemical Clearing

- Since mechanical clearing is limited by terrain and hand method by high labour content and costs, a more effective alternative is use of chemicals for clearing purposes.
- Sodium arsenide or hormones such as 2.4D and 2.45E have been used extensively in Nigeria.

Fire Clearing

- In the Tropics, fire clearing is the most important land clearing agent.
- 90% of land is cleared by fire for forest plantation and farm land preparation, etc. good because it clears unwanted pests.
- Weeds, insects, pests etc are destroyed but it also destroys valuables like nutrients, wildlife.
- Efficiency of fire clearing is limited by weather conditions and amount of fuel available.

In land preparation, the following steps are usually taken:

- exploiting of existing vegetation
- brushing
- clear falling
- peg collection
- burning and packing
- liming unit and pegging
- planting
- beating up
- tending includes weeding and clearing, application of fertiliser and disease control.
- Steps (i), (iv) and (ix) above are common to both nursery and plantation preparation while steps (v) – Viii) are peculiar to land preparation only.

3.4.4 Seed Collection

1. Harvesting and Handling of Seeds

Seed collection is perhaps the, most intricate aspect of nursery work and many books have been written on it. Suffice it to say here that seeds are usually obtained from:

A) Professional seed collectors or dealers

- Native forests or plantations

- Seed orchards
- Gardens
- Imported or exotic seeds that are quarantined to ensure they are disease free.

B) Harvesting and handling of seeds

a Determining the location and the proper stage of maternity for harvesting the seed.

b Harvesting the seed.

c Storage of seed until required.

2. **Time for Collection**

Time for harvesting of nature seeds which have accumulation of sufficient reserve materials in them. Below are criteria to indicate optimum time to harvest most seeds are:

- moisture contents i.e. its dryness
- general appearance used for cones and Saculyptus
- Colour sometimes yellow or brown depending on species
- Specific gravity of freshly picked seed e.g in the case of pines

3. **Method of Collecting Seeds**

- felling the trees
- lopping off branches with seeds or fruits containing seeds
- climbing trees using ladder or tree bicycle
- bending down branches of trees
- collecting fallen seeds
- shooting down cones or branches

4. **Seed Extraction**

- Handling before Extraction
- sacking
- labeling
- transport to seed centre
- Storing.

5. **Extraction**

a) From flesh fruits

b) remove the pulpy covering
store in dry condition

c) From dry fruits or seeds
directly exposed to the sun before storing
cleaning the seeds.

6. **Important Factors of Seed Storage**

- Temperature reduced temperature prolongs the storage life of seed
- Moisture content – usually low moisture content of seeds is recommended and should dry.

- Cold – dry storage between 30o – 40o is recommended for those having access to refrigerator but generally storage in cool places is an advantage.
- Storage in sealed container is good to keep down the ascobic activities of the stored seeds.

7. **Pre-Sowing Treatment of Harvested Stored Seeds**
   The purpose is:
   - to break the seed dormancy
   - to reduce the time between soaking and emergence of plumule and radicle
   - to give the highest and most consistent germinations.
8. **Method**
   - Soaking in cold water overnight e.g task, pine, Gamalin, etc
   - Mechanical abraision for the hard – costed seeds using pinchers or harmer if need be.
   - Chemicals pretreatment in dilute commercial hydrochloric or sulphuric acid.

3.4.5 Soil Mixing Process

1. Procurement of river sand, top soil and crowding, fertilisers and aldrin dust
   - Supply of river sand, cowdung (manure) and top soil is often contract-out; Volume (in cubic metres) is measured in (lorry) tippers, tractor with trailer's load.
   - Fresh cowdung supply is often deposited in a dug trench in the nursery site where it is continually turned annually for almost three months to allow it to ferment i.e. slightly alkaline.
   - Fresh cow dung is acerbic and therefore toxic to germinating plants
   - Where top soil is not available in large quantities, fertiliser like NPK (complete) or superphosphate is bought to supplement nutrient deficiency of the river sand.
   - Carbons of Aldrin Dust may be bought and its function in soil mix to prevent ants exiting up the polypots.
2. Soil mix proper
   - River sand is sieved to remove stone content and other debris
   - Using headpans, mixture of sand, top soil and fermented cow dung in the ratio of 4:1:1 to which is added reasonable amount of fertiliser and small quantity of aldrin dust powder.
   - Alternatively, when top soil is available in reasonable quantity, soil mix of top soil and river seed in the ratio of

2:1 will be alright. Measure or fertiliser may not be necessary.

- Where top soil is found in large quantities, it can be used in pot without sand and fertiliser.
- The whole heep is thoroughly mixed using shovels in the process.

3. Potting and storing
   - The process of fuelling the polypots with the 'soil mix' using the filling funnels is POTTING.
   - On completion of potting process, the filled posts are then stacked i.e arranged in rows of hundred or thousand pots as desired.
   - Gaps of about 2 feet are left between rows of stacked pots for workers. Watering of filled polypots is carried out by using watering cans or where available, by using an irrigation set.
4. Sewing of treated Seeds:
   This can be used:
   - by direct sawing of the seeds in the filled polypots
   - by broading of the seed on germination beds
   - o and (b) are regularly watered early in the morning and in the evening daily to provide adequate moisture for germination of seeds
   - When seeds begin to germinate, on germination beds to some degree they are picked out and transplanted into unsown but filled polypots
   - Regular watering continues daily until the plants reach plantable size
   - Seeds in form of plant houses are often provided for some species of germinating plants because of their fragility.
   - These 'plant houses' are often temporarily made up of zim mate spread or top of yorked pegs. Heavy downpours of rain and sun scorch are thus prevented from damaging the fragile plants.
5. Budding and grafting
   - Budding process involves removal of beds from improved varieties plants to the root stalks of some species of plants
   - Grafting is taking the scion from some plants to the recipient (stock) plants of some species.
   - Both grafting and budding processes demand skilled work and some workers are trained for this type of work. The sole aim of budding and grafting is to improve varieties of seedlings.

6. Planting (e.g. teak, pine, gamalin).
    - Usually done by carrying seedlings in wheel barrow if planting site is close to the nursery or by Lorries or tractors with trailer if far.
    - Much fertility of seedlings occurs during this shifting process when workers are advised to handle seedling with great care to reduce them to tolerable level.
    - Plantation site is normally fenced to keep off grazing animals.
    - Planting is done by careful removal of the plypots' leather and lowering the seedling with their compact soil miggantly into the dug holes with the seedling shoots above ground level.

3.4.6 Post Planting Management

i Cleaning and weeding twice every year.
ii Fire tracing of plantation before dry season sets in to minimise damage because of forest and other plantation fires.
iii Judicious application of insecticides or fungicides when a plantation is attached by either insects or fungi.

Fungicides and insecticides come under several trade names but the common ones are as follows:

- Insecticides
- Dymercrun
- Ultruracide
- Nogos
- Fungicides
- Dithane – M – 45
- Polyramcomice
- Judicious application of common fertiliser like NPK (complete and super phosphate, ammonium nitrate
- Beating up – i.e. replacement of failures of planted stock
- Fencing is normally recommended for the first 3 years of planting to keep off growing animals.

Recommendations for fertiliser applications

- For Nitrogen Deficiency
- Use either: - Nitrate of sod: 27 – 54 kg/0.40 he suphate of Ammonia: 23 – 46kg/7.40ha.
- For Deficiency in Potash
- Use either (i) Nitrate of potash 27 – 56kg/1.41ha.

- Sulphate of putash 27 – 56kg ha.

It should be stressed however, that it is important to carry out some experiments to determine the nutrient status of the plantation soil and then the required seedlings to be raised with various concentrations or applied fertilisers. The combination that gives the best growth is then used in a target scale.

3.5 Felling Process Extraction and Transportation of Log

Tools usually used for felling operations are axes, sew, wedges, cutlasses, chains and chainsaws. Trees and the forests have potential value from a commercial point of view, only when removed and manufactured to become useful products. Falling in an un-even aged forest does more damage than in forest of even age.

Bad and careless felling resulting in smashed and split trees of results in many lost, hence falling gang should be made up of men who are known to be good tree fellers. They should be able to fell trees placing them on the ground with considerable accuracy.

After deciding on the direction of fall, the next operation is to make the under-cut which is the notch at the base of the tree that removes support for it at that point thereby increasing the tendency of the tree to fall in that direction. The depth of the undercut will depend on the size of the tree and the straight trees should be chapped horizontally for a distance of ¼ or 1/3 to its diameter and at an angle of 45o. The back-out is then made directly opposite the under-cut. The narrow bridge of under-cut wood that breaks off as the tree fells acts as a hanger that guides the tree in a direction of the under-cut.

The next thing to do after felling the tree is to remove the branches of a felled tree. Budding is the comparatively short distance movement in the forest of single unit of bunches of timber products from the points when the trees are felled and envided to the loading point called landing. The process involves using a cable skidder which is making up of a major cable and choker wires. On getting to the landing the skidded legs are then arranged in lines.

Cross-cutting can be carried out at the stem in case of large trees, but in difficult terrain, this can be done at the loading depot or at the mill. Trees or tag should be carefully examined and marched for cross-cutting before the actual work is carried out.

The loading depot is the point at which the logs are sketched, prepared for loading with the major transportation system. The depot (Landings

are usually is the centre of the working areas so that maximum volumes of logs can be handled before the site is changed. Hence, these loader operators will then come in with their machines and start loading the logging trucks.

This is the final stage in the forest. Logs can be transported in three main ways: (1) Road Transportation (2) Water Transportation; (3) Rail Transportation.

4.0 CONCLUSION

In this unit we discussed forest production with emphasis on Nigeria. Some important aspects of forestry discussed include – the meaning and importance, other aspects discussed include – agro forestry, raising of seedlings for tree plantation establishment and felling process, extraction and transportation of wood logs. From our various discussions we can conclude that forestry is as important as other crop production.

5.0 SUMMARY

In this unit, you have learnt about the following issues related to forestry:

- forestry is the systematic planting and tending of forest trees
- forests provides – fire wood, timber, raw materials, food, herbs, habitat for wildlife, revenue, employment, education, pleasant environment etc.
- the practicing of agriculture with forestry is called agroforestry or taungya farming.
- the site for nursery establishment must have good topography, fertile, near to the plantation site, free from biotic factors, accessible, labour supply, water supply etc.
- land clearing can be done by – hand, machine, chemical and fire
- potting is the process of filling the polypots with soil-mix
- stacking is the arrangement of polypots in rows of hundreds
- beating-up is the replacement of ungerminated seedlings.

6.0 TUTOR-MARKED ASSIGNMENT

i. What is the ecological importance of forests?
ii. State the various resources that can be obtained from the forests.
iii. What is agroforestry?
iv. State five advantages of agroforestry
v. Explain briefly the operations of agroforestry in Nigeria.

7.0 REFERENCE/FURTHER READING

Erebor, O. (1998). *Comprehensive Agricultural Science for Senior Secondary Schools.* Lagos: Johnson Publishers Ltd.

UNIT 4 WILDLIFE PRODUCTION IN NIGERIA

CONTENTS

1.0 INTRODUCTION

During our discussion in the last unit, we defined forestry, highlighted the importance of forests and explained the operations of agro forestry.

Other major aspects discussed are the methods of raising seedling for nursery establishment and felling process, extraction and transportation of logs. In this unit, we shall discuss the meaning of wildlife, development of wildlife in Nigeria, economic importance of wildlife, problems of wildlife management and factors that cause extinction of wildlife.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- define wildlife management
- describe the development of wildlife in Nigeria
- list five economic importance of wildlife
- mention four game reserves/wildlife parks in Nigeria
- enumerate four problems facing wildlife management in Nigeria
- explain four factors that are responsible for the extinction of wildlife.

3.0 MAIN CONTENT

3.1 Definition of Wildlife Management

Wildlife is defined as animals or plants that exist in a wild domesticated state, while wildlife management is the science and art of changing the characteristics and interactions of habitat wild animals and men in order to achieve specific human goals by means of the wildlife resources.

3.2 Wildlife Development

For hundreds of thousands of years man functioned has food gatherer, feeding omnivorously on what was most easily available, With time, effective hunting technics were developed, and these characterised the later part of the old stone age. During the food gathering and hunting phases of his existence, men have only regarded wildlife as something of supreme importance. It was important as energy, as a competitor, and as a principal source of food. When animals were first domesticated, they took on a new importance to man. The dog was the first species to be brought under human care. It followed the primitive human stock to the ends of the earth. But as man adopted a more settled way of life, the pig and domestic fowl were added to his collection of animal associates, still later, when the development of Agriculture allowed wildest beast, the cow, sheep, goat, horses, and ass were added.

3.2.1 Concept of Wildlife Conservation

With agriculture and domestic animals, man's relationship to the wild creatures changed, village gardens and crop lands had to the projected from the cain of hungry herbivores. Vulnerable domestic life stock had in guarded against the ravages of wolf and lions. Herds of sheep and cattle had to find grazing not already reflected by the feeding of herds. Thus wildlife assumed a different role. The old enemy predator, regained an enemy but deer and antelope, formerly valued as a source of food pined, the ranks of enemies through their threats to crop land and grazing. Hunting assumed a new place in the life of man.

With the rise of civilisation not all human beings lived the life of resent or herdsman. A leisure of the king or emperor and his noble court, free from the need to work for a living sought for ways to occupy their days. The old, primitive sport of hunting provided an exciting outlet for excess energy. To protect their hunting, reserves of various kinds were set aside to which the ressetry were denied access, and various kinds of beasts were assigned royal game, and not to be touched by common for it. Wildlife conservation thus had its bearing as an activity of king only in

recent years, with sovereign peoples assuming the full responsibility of government has it because the activity of the people.

3.2.2 History of Wildlife Development in Nigeria

It was not until the last four decades that pre-independence governments initiated programmes for the conservation, management and rational utilisation of wildlife. By 1932 the Fauna Preservation Society of London (FPS) minted resources on Nigeria to establish some reserves. In 1956, the first and presently the most developed game reserve (Yankari) in Nigeria was demarcated in the Sudan vegetation zone of the then Northern Region of Nigeria. In the same year, the Borgu Game Reserve was surveyed in the Northern Guinea Savannah Vegetation zone in Nigeria. By 1962, the Yankari Game Reserve had been opened to tourists but the Borgu Game Reserve was not opened until 1970.

In 1975, the Kainji Lake National Park was created by a Federal Military Government decree. The park is constituted by the same portion formerly called the Borgu Game Reserve to the West of Lake Kainji and the Zugurma Game Reserve on the eastern bank of the River Niger below the Kainji Dam site.

The number of game reserves in the country continued to grow as follows. In 1956, two in 1962, ten in 1961, in 1975 it had risen to thirty-six. The University of Ibadan introduced a degree programme in Wildlife Management and the Wildlife Management School in New Bussa which took off in 1980.

3.2.3 Local Park and Game Reserves of Nigeria

		State where situated
1.	Kainji Lake (Borgu)	Niger
2.	Kanuku	Kaduna
3.	Obundu	Cross-River
4.	Yankari	Bauchi
5.	Orle River	Delta
6.	Gilliugilli	Edo
7.	Kovale	Edo
8.	Kwatambana	Sokoto
9.	Klewa	Niger
10.	Bagidda	Niger
11.	Onyra	Oyo
12.	-------	Plateau.

Show concern for wild creatures: There are some people who can live without wild things and some who cannot. So the study of wildlife is for those who cannot, for no other reason is sufficient for entering the field of wildlife biology.

Attitude toward wildlife varies from active interest to an almost complete indifference. Indifference is to be found among some who live and work in spheres that rarely contact wild places or things such as his cities, while an active interest in wildlife is a positive since is to be found among those who consider wild life and wild nature important to their own welfare. Such attitudes can be acquired through exposure to wild country. But they can also be picked up from family tradition, education, and travel.

3.3 Economic Importance of Wildlife

a. **Meat production**: Presently wildlife constitutes a major source of animal protein for people living in the rural areas of Nigeria. In southern states in Nigeria, nearly 20% of all locally produced animal protein in 1979 came from wildlife. These figures show the importance of wildlife as a basis of food.

b. **Tourism and foreign exchange**: Wildlife reserves have proved to be one of the world's greatest attractions for tourists. Tourist revenue begins with funds paid for international and local air transport. This is followed by payment of hotel bills and hiring of vehicles for making local tours. In addition, tourists pay for such services as game guides and interpreter and they purchase locally made goods as souvenirs.

   At the present management levels, Yankari Game Reserve and Kainji Lake National Park are visited by over 10,000 and 3,000 fee-paying tourists one year, respectively excluding non-free paying nationals such as students, children societies and dignitaries.

c. **Aesthetic and ethical values**: The recreational value of wildlife takes many different forms, in the national parks, and wildlife reserves it is often the aesthetic appeal of wildlife that attracts people. Hunting is not permitted, but people by the millions come for the purpose of seeing or photographing wild animals in natural surroundings.

   Wildlife has no other value and were an economic detriment, it would still be with preserving for its sheer beauty and appeal to the human spirit.

e. **Sale of Live animals and wild animal products**: In Nigeria, the exportation of wild animals amounts to ₦2, million in the 1960s and for use in laboratories. Also wild animal products include the skins of reptiles such as snakes and lizards, mammals including leopards and antelope also Ivory a valuable export product is got from elephants.

f. **Scientific Values**: Apart from other consideration, the scientific value of wildlife justifies its place in the world of major significance. In this respect is the ecological value of wild animals, i.e. how it relates to the natural environment.

The balance of the natural communities have been modified and changed into managed aropands, fields and forests. Wildlife was a part of the biological community that kept soils productive and waters flooding on undisturbed lands. Today for us to have as standards against which to measure change and deterioration in the lands that we use for commercial production, wildlife or game reserves must be maintained.

Apart from ecology, wildlife has been used in most of the advances in biological and medical research. E.g. studies of reassures monkeys reveal new facts about human blood chemistry and the prevention of disease. Studies of animal behaviour reveal new insights into studies of the human mind.

The concept of ecosystem: Anatomical, physiological, genetic factors influencing animal adaptation.

The concept of the ecosystem: A group of interdependent organisms living in a particular place, such as a forest or a pond is called a community. A community consists of many different species of organisms, and the members of each species have what is called a population. In a forest, for example, there will be a population of each type of tree each type of termite, lizard snake, etc. The density of a population refers to the manners of individuals living in a particular place.

The complex relationships between the members of a community and between the community as a whole and its physical surroundings are described as an Ecosystem. An ecosystem is made up of all the producers and consumers in a community; the parasites and decomposer; the rocks, soil, water, and air of the physical environment; and the circulation between this environment and the (community) materials such as nitrogen, carbon, water and oxygen.

3.4 Energy Flow in an Ecosystem

Radiant energy, in form of sunlight, is the ultimate and only significant source of energy for an ecosystem. It is used in the photosynthetic processes. The organisms that perform vital function are the producers; and these include chlorophill-dearing prints, the abee of a pond, the press of a field, and the trees of a forest. These producers produce carbohydrate by converting radiant energy into a chemical form.

Since the energy incorporated in the producer, photosynthesis is subsequently synthesized into other molecules that serve the nutritional requirements of the producer's own growth of metabolism; some can speak of the producer as being autotrophic (self-feeding). In the same way, organisms whose nutritional needs are met by feeding on other organisms are referred to as heterotrophic feeding.

A primary consumer, or more commonly an herbivore, is a heterotrophy that deceives its nutrition directly from plants. A secondary consumer, a carnivore is a heterotrophy deriving its energy indirectly from the producers through the herbivore. Some ecosystems contain tertiary consumers – carnivores that feed on other carnivores. Omnivores are consumers that derive their energy from both producers and herbivores.

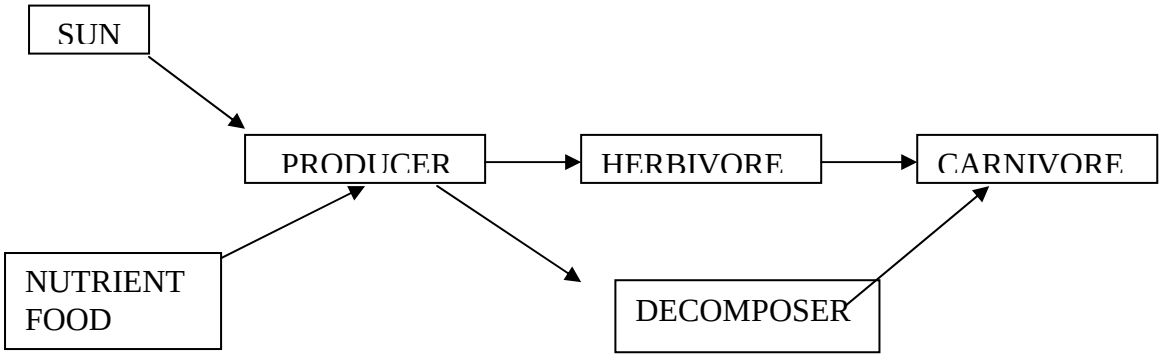
There is another major group of heterotrophs in ecosystems. The decomposers and consist chief of bacteria and fungi. The decomposers do not consume food in the digestive manner of a herbivore or carnivore; they do so by absorption. Enzymes produced within their bodies are released into dead plant and animal material, and some of the degraded and digested products are then absorbed.

In terrestrial ecosystem, bacteria tissues and fungi live on plant tissues, but in some aquatic ecosystems consumers play a more significant role than either bacteria to fungi in degrading and digesting organic products.

From the above, it is evident that two processes proceed concurrently in ecosystems, the movement of energy and old nutrient elements. The movement is noncyclical while that of nutrients is. In the process of converting radiant energy into chemical energy by photosynthesis, the green plants also incorporates into its protoplasm a variety of inorganic elements and compounds such as CO_2, H_2O, and also those that are critical to protoplasmic synthesis notably N_2 phosphorus, sulfurs, and magnesium etc. As the green plant is grazed upon, not only is chemicals in form of carbohydrates, fat, and proteins transferred to the herbivores but a host of nutrients also. Similarly there is a transfer of both energy and nutrients from herbivores to carnivores and from all the other levels to the decomposers.

In this feeding chain there is a progressive diminution of energy while the nutrient component is not dismissed, for when nutrient – containing protoplasm is eventually subjected to decomposer, activity the nutrients are released to the environment where they are available for reuse.

Energy & Mineral Movement in Ecosystems



3.5 Animal Adaptation

Definition: Many features in animal which seem to improve the chances of an organism surviving in its surroundings and leaving descendants to follow is called an adaptation. Normally a particular species of plants and animals are found to live in one particular environment and is unable to survive under other conditions. When these plants and animals are examined, it would be discovered that there are certain anatomical/structural and physiological features that help them to live successfully in their particular environment.

Organisms must be adapted in such a way that they can reproduce their kind, defend themselves from attack by other organisms, and compete successfully for food and other essential commodities. They must also be able to respond quickly and efficiently to changes in the environment. The particular set of conditions to which a given kind of animal is best adapted to be known as its habitat niche.

Factors influencing adaptation

1. **Genetic factors**: Conditions in an environment change from time to time. Sometimes these changes are sudden, as they are when there is a severe draught, a destructive storm, or a devastating fire. Other changes may occur much more slowly and over a long period of time. These include climatic changes, changes in soil, and the gradual erosion of hills and mountains. If an organism is not entirely suited to its environment, it can no longer satisfactorily compete with other living things. One of three things must happen: (1) It must migrate to more suitable

surroundings (2) adaptations must occur or the organism will perish as a species.

Variation is a characteristic that allows an organism to survive.

Changing conditions: this does not mean that no two offspring are exactly alike, nor are they exactly like their concepts. Some variations may be harmful and may even hasten death. Very occasionally however, a variation occurs in an organism that improves its chance for survival. If this beneficial variation is passed on to its offspring, it is impossible that eventually all organisms of that particular type will have that characteristic. When unfavorable environs, forces animals to migrate to new areas, these individuals interbreed with other populations of the same sops, new gene combinations are formed. Recourse of interbreeding, their offspring also receive different Degrees from the new IL. Thus the makeup of this entire II may be altered by the migrating organisms. The new characteristics that appear in offspring through mutations and recombination of peers may result in adoptions that are favorable to survival in the new environment.

2. Anatomical factors/physiological factors

   a) Sharply reduce their normal food and heat department during all living organisms must adjust to climatic conditions or become extinct. Liberation permits many animals to sharply reduce their normal food and heat requirement during the winter, when food supplies are low. Such animals also adapt to cold us then with extra layers of fat and thick fur.

   b) Also competitions among animals for food reveal many adaptations. Some animals have become adapted to special types of food, which reduces competition with other animals e.g. the cattle live wholly on plants, and their teeth and stomachs are adapted to a diet heavy in cellulose, which many other animals including humans cannot digest.

   c) Animals also show adoption against rapid movement. Many animals depend on their speed for catching food or escaping from enemies and show various adaptations which enable them to travel for one of such features is the posture of the foot when man swims, he places the whole of his feet on the ground, but when he swims he lifts the heal and move on his toes. The bear does not rise on its toes in this way but shuffles along on the felt of its feet. Animals who are more in this way are usually slow movers and are called plant grade. The effect or lifetime one weal in running is to increase the speed of movement by lengthening the limb. Some e.g. has tests with the sole

on the ground but raises it on the end jowls of the finger and toes these are supplentigraph. The seats and dogs both stand and walk on the end joints of finger and toes – digitigrades. The horse has only one digit and walks on the very tip of this digit – the proof represents the mail of the digit unguilgrade. The wild horse lives on grassy plains, and its hoofed limbs are particularly suited for fast movement on his surface. Its grant speed is largely due to its great length of leg which results from lengthening of the digits.

SELF-ASSESSMENT EXERCISE (SAE)

i. Draw the map of Nigeria and locate in it five game reserves or wildlife parks.
ii. What is the purpose of wildlife conservation?
iii. Preventing the extinction of some wild animals
iv. Keeping animals in forests
v. Preventing wild animals from destroying crops
vi. Ensuring that hunters always have some games
vii. Ensuring foreign exchange through export of meat.

3.6 Problems of Wildlife Management in Nigeria

a. Unregulated hunting and trapping of wild animals
b. Illegal grazing by Fulani herdsmen
c. Lack of skilled manpower i.e. Lack of trained personnel to man wildlife conservation
d. Inadequate funding of game reserves and wildlife parks
e. Risk of the lives of staff
f. Inadequate jeep tracks or access roads within the game reserves
g. The use of toxic chemicals to kill the animals by farmers or people living around the game reserves
h. Lack of empathy towards wildlife.

3.7 Factors which Cause Extinction of Wildlife

a. Encroachment on wildlife habitat by settlement
b. Breaking game laws especially by hunters
c. Chemical pollution especially water habitat
d. Natural disasters like droughts, floods, fires etc.
e. Over hunting and over trapping of wild animals by hunters
f. Predation by other animals e.g. lions and other carnivorous animals
g. Increased settlement as a result of increase in human population.

h. Deforestation as a result of human activities reduced the space for wild habitat
i. Improper management of game reserves as a result of political instability and maladministration.

4.0 CONCLUSION

In this unit, you learnt the meaning of wildlife, development, economic importance of wildlife, ecosystem and animal adaptation. We equally discussed the problems of wildlife management and factors that cause extinction of wildlife. From our various discussions we can conclude that because of enormous importance to wildlife management, this aspect of agriculture is as important as other aspects of animals' production.

5.0 SUMMARY

The issues discussed in this unit can be summarised as follows:

- Wildlife are animals adapted to live in a natural environment without the help of humans.
- The importance of wildlife includes: Source of protein, recreational value, educational value, aesthetic and heritage value, economic value, sports, useful products, laboratory experiment, improvement in genetic composition etc.
- Some of the problems of wildlife management include: unregulated hunting and trapping, illegal grazing, manpower, finance, risk to life, access roads, toxic chemicals, lack of empathy etc.
- The factors which cause extinction of wildlife include: floods, droughts, fires, predators, deforestation, over hunting and over trapping etc.

6.0 TUTOR-MARKED ASSIGNMENT

i. What do you understand by the concept 'wildlife'?
ii. Why do we need to conserve our wildlife resources?

7.0 REFERENCE/FURTHER READING

Erebor, O. (1998). *Comprehensive Agricultural Science for Senior Secondary Schools*. Lagos: Johnson Publishers Ltd.

UNIT 5 FISH PRODUCTION IN NIGERIA

CONTENTS

1.0 INTRODUCTION

In our last unit, we discussed wildlife management. Some of the important areas highlighted include – definition of wildlife management, development of wildlife in Nigeria, economic importance of wildlife, ecosystem and animal adaptation. We also look at problems facing wildlife management in Nigeria and factors that cause extinction of wildlife. In this last unit of this course, we shall discuss another important topic in the area of fish production. The major areas in this unit will include the meaning of fishes, fishery and fish farming, establishment and management of fish ponds.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- define fishes
- define fishery and fish farming
- differentiate between fishery and fish farming
- describe the establishment of fish ponds

- highlight the management of fish ponds.

3.0 MAIN CONTENT

3.1 Meaning of Fishes, Fishery and Fish Farming

3.1.1 Fishes

Fishes are those aquatic vertebrates that breathe by means of gills and move by means of fins. Apart from fishes, other aquatic animals are also included in fishery. They include – periwinkles, oysters, clams, shrimps, crayfish, cobsters, crabs, dolphins, whales, crocodiles etc.

3.1.2 Meaning of Fishery

Fishery is a branch of science that deals with water bodies, where fishing can be carried out. It also includes places where fish production activities like fishing gear technology, fish processing, fish culture and management are carried out.

3.1.3 Meaning of Fish Farming

Fish farming can be defined as rearing of fish in more than one culture system. There are different types of culture systems like ponds, raceways, pens, recirculation systems, tanks and cages. Any one of these culture systems can be used for fish farming, depending on what is available to the farmer; or sometimes the type of fish he wants to grow. Where the farmer can afford two or more types of the systems, then it becomes a matter of choice and economy.

Fish culture is the growing of fish in such culture systems as pond, cage, pen etc. The practice is usually carried out in one pond or cage as the case may be. As stated earlier, in fish farming, two or more of a particular culture system can be used at a time. This is often determined by the type of species and cultural methods the farmer is interested in.

3.2 Fish Pond Establishment

3.2.1 Advantages of Keeping Fishes

1. Meat production: Fish is an alternative supply of animal protein.
2. Fish multiplication: Young fishes and fingerlings are multiplied and raised in fish ponds to improve natural stock.
3. To introduce modern technology to reach traditional fish farmers.
4. To increase the income of farmers who embark on fish pond business.

5. Recreation and leisure. Some ponds are established and stocked with sport fish for entertainment and to attract tourists.
6. Education and research: Timely availability of fishes required for use for educational and scientific research is possible in fish ponds.
7. Utilisation of industrial wastes: Non-toxic industrial wastes are recycled and used in feeding fish in ponds.
8. Foreign exchange earnings: Large scale production of fish leads to export of fresh fish to other countries.
9. Maintenance of public health: Lakes, dams and reservoirs which are breeding grounds for mosquitoes are converted to fish ponds and fishes feed on the mosquitoes and mollusks which habour diseases.
10. Demonstration: Demonstration ponds are established for private fish farmers to copy.
11. Employment: Fish ponds are established to generate employment for thousands of people who are unemployed.

3.2.2 Factors Considered in Selecting Fish Pond

A. **Water supply**: Water supply is very important and should be in adequate quantity and quality. The sources can be through irrigation canal, river, creek, reservoir, lake, spring, rainfall, runoff and deep wells. The physical properties of water should be considered such as the colour, transparency and temperature.

Transparency: The phytoplankton's need light to develop in water. It is any transparent water that allows this light to reach the organisms which fish feed on for their lives. Water with suspended particles do not allow light to separate and the particulars also adhere to the gills and hinder breathing of fish.

Water Temperature: With good breed, water temperature suitable for fish varies from 15 – 30^{o}C in the tropics. Too low or too high temperatures hurt fish.

Colour: Certain colours are not good for fish pond e.g. red, yellow and any colours, but bluish, greenish, pale colours are tolerated by fish. Dark green is a mark of good fertilisation of fish pond.

B. **Biological quality of water**: Populations of plankton and parasites in water are very important hence they determine the available feed and problems respectively for the fish.

Chemical quality of water: The pH of water, dissolved oxygen, chemical oxygen demand, carbon dioxide, alkalinity, salinity, dissolved lides and ammonia are useful when in moderate quantity in water and toxic when in access. Also to be determined are the extent of water pollutants of agricultural and industrial origin

C. **Soil characteristics**: Good soil should be clayish and if it is up to the meter deep it is very good especially for earthen ponds. Organic, sandy and stony soils are not suitable because they cause seepage and if the soil must be used, it would entail transporting suitable soil from elsewhere to the pond, which will increase the cost.

D. **Climate**: Before a site is selected, data of rainfall, temperature, sunshine, evaporation, humidity over a long period of time must be collected. Monthly records of the climatic conditions collected over a very long period will be useful for sitting fish pond.

E. **Land (Topography):** Any land with slope not more than 2% is the best. Flat land is good for concrete, earthen and *fadama* ponds. Waste land can also be used. Places with excessive flooding should not be selected to avoid over flowing of dike and washing away of fish from the pond. Topography of the area determines the size, depth and the outline of the pond to be built i.e. whether barrage or contour. In that case, steep slope should be avoided. Gentle slope is preferable and more suitable for building several ponds to facilitate weather movement by the force of gravity e.g. barrage ponds.

F. **Economic and social factors**: The following are considered (i) Availability of construction materials (ii) Proximity to good roads and markets, (iii) Availability of electricity (iv) Availability of supplementary feeds, manures, fertilisers and drugs (v) Availability of skilled manpower etc.

3.2.3 Determination of Type of Fish Pond

When the suitable site is selected, the types of ponds to be built are determined.

a. **Barrage ponds**: These are established on the lower part of the valley by building wall across the stream. The water may be coming from several springs or from a stream and then collected in the pond or ponds. The water flow is from the force of gravity. There can be several barrage ponds constructed one behind another depending on the length of the slope.

b. **Contour ponds**: These are made along the side of a valley and fed by diverting water from spring. Only part of the water flow of the stream enters the ponds which are kept under control.

c. **Paddy pond**: This can be constructed on flat open valley, where fish production can be integrated with rice production in fadama areas. The two cultures can be alternated.

d. **Flood ponds**: These are small body of water contained in shallow depression or ditches in a flood plain. These depressions

are filled with river floods and become isolated when flood has ceased. Various wild fish that have gone there to breed are trapped. Two types of flood ponds are (i) Naturally occurring fish ponds commonly found in flood plains and (ii) Artificial flood ponds formed during road construction, mining or intentional modification of natural flood plain ponds.

e. **Earthen ponds:** This is an ordinary ditch made on a flat field with the help of bulldozer. The bottom is compressed firmly with the wheels of the bulldozer so that seepage will be reduced when water is introduced into the pond.

f. **Concrete pond**: The floor of earthen pond can be macadamised and the walls solidified with cement and iron rods to hold water permanently. Water is introduced using pumps.

3.2.4 Fish Pond

1. Rearing ponds: these are small concrete ponds of about 100 square metres where fry are reared from the age of 5 days to 4 weeks.
2. Nursery ponds: The fry reared in the ponds are transferred here for further growth. This pond is located very close to rearing ponds to facilitate the transfer of fry by allowing them to flow together with water into the nursery pond. Fingerlings from here are sold to farmers, individuals and institutions.
3. Production ponds: Fingerlings from nursery pond are moved into production pond where they develop into full grown fish.

3.2.5 Important Structures in Production Ponds

a. The monk: this is an important draining structure in production pond. It consists of a vertical tower which opens on top and another horizontal culvert or pipe going through the wall of the pond and opening into the cropping structure. Well constructed monk drains the pond completely without any remaining pool of water.

b. Harvesting structure: Fish gather here when the pond is emptied and they are then harvested. Types of pond harvesting, there can be complete or partial harvesting. In complete harvesting, water can be drained out completely through the monk and the fish are collected at the cropping and harvesting structures. Partial harvesting can be done by taking some fish using the following methods, partial draining, hooking, trapping, netting etc.

c. The spill way: this is a very important structure in every pond to let out any excess water from the pond. In barrage pond it is absolutely necessary to let the excess water out of the pond

through spill way or overflow. Spill way should be constructed in such a way that cultivated fish do not escape through it.

3.2.6 Fertilisation of Fish Pond

Efficiency of fish pond can be improved by improving its productivity by development of the plank tonic algae and zooplankton. Fertilisation of the pond can be achieved by the following:

a. Use of organic manure e.g. pig and poultry wastes, wastes of slaughter houses, blood, bones, soaking cassava, compost, brewery wastes, oil cakes and waste water of the cities. Use of inorganic manure is also tried e.g. Nitrogen and phosphate fertilisers.
b. Artificial feeding: These can be eaten directly by fish or help in development of planktons eaten by fish too e.g slaughter wastes, blood, oil cakes, brewery wastes, warms, termites, pawpaw, mango, commercially formulated feeds etc.

3.2.7 Determination of Type of Fish

Desirable types of fish to be used in intensive fish culture have the following: (i) It must be tasty (ii) It must be hardy and easy to handle (iii) It must be easy to breed (iv) It must be an efficient converter of feed. So it requires fish with short food chain capable of taking advantage of the food stuff put in the pond. So predatory fish may not be suitable but few of them still can be introduced to balance the population of over prolific fish and eliminate fish that are too small for market values.

3.2.8 Species of Fish for Culture

- Tilapia: *T. rendall and T. nilotica*
- Clarias: *C. anguillaris. C. submarginatus* & *C. lazera*
- Heterobranchus*: H. longifilis* & *H. bidorsalis*
- Labeo : *L. coubuie* & *L. Senegalensis*.

3.2.9 Fishing Regulations

No country allows indiscriminate fishing around her territorial waters and for that reason certain laws and regulations have to be put in place to check exploitation of fish by unscrupulous individuals. In Nigeria, important regulations against fishing in the national territorial waters are in place. These are contained in a paper sea fish decree (1971) a supplement to official gazette No. 60 Vol. 58 of 9th December 1971 the law prohibits the use of:

(a) explosive substances to kill fish
(b) noxious or poisonous substances
(c) unlicensed motor fishing boat within her territorial waters
(d) unrestricted taking of fish in any specific area within the territorial waters of Nigeria
(e) fishing boat or apparatus considered harmful to the sea fishing industry in Nigeria.

The regulation

(i) Prescribes the limits to the size of net mesh that may be employed in the taking of fish within the territorial waters
(ii) Provides for the inspection of buildings and premises used for the curing, preservation, storage and sale of fresh, cured or preserved fish
(iii) Provides for seizure and destruction of any fresh, cured or preserved fish that is unfit for human and animal consumption
(iv) Encourages other matters relating to the conservation and protection of the stock of sea fish
(v) Encourages experimental purposes in connection with the development of the sea fishing industry in Nigeria.

3.3 Management of Fish Pond

i. A homestead fish pond is usually built around a homestead fish culture. During construction, the pond should be located as close to a roof as possible, to enable the culturist collect water through a metal gutter, or any piping materials.
ii. In a functional fish pond, colour of water is of significant importance. In intensive fish culture, pond water can be cloudy due to food remnants and microscopic plant bloom. Movement of fish can worsen the situation. If the pond water is greenish in colour, it is favourable to the fish, and therefore of great advantage to the culturist. Unless the fish show signs of stress, there may be no need to change the water, until the end of the culture period.
iii. Tap water can be used for fish culture, provided necessary precautions are taken in the first place. Tap water can be used for keeping life fish for market or future domestic use; but for culture purposes, it should be allowed to dechlorinate before stocking. Depending on the concentration of chlorine, the water should be allowed to stay for a day or two before being used for culture purposes. Otherwise, the fish will be harmed after stocking.
iv. There are various sources of water for fish culture, which can be classified into major and minor sources. The major sources are

springs, rivers, streams and lakes. While the minor ones are rainfall, well and tap water.

v. An earthen fish pond can be made of acidic soil; and the acidity can be neutralised through pond water. In that case, suitable agricultural chemicals can be used. In the course of fish culture, there may be need to treat fish diseases with some chemicals through pond water. However, newly constructed fish ponds should be treated with natural or artificial manure, or both, depending on the nutrient requirements of the culture systems.

vi. Fertilisers are used to increase primary productivity in fish ponds. Therefore, fertilisation is inevitable in newly constructed ponds. In functional ones, fertiliser application may be necessary, depending on the level of nutrients in the pond.

vii. The ability of fish to survive in captivity differs from species to species. Any fish species that can survive for a reasonable length of time in captivity, accepting artificial food, and in some cases be able to reproduce can be cultured in pond. Some fish species adapt better than others to captivity, and are therefore very popular in fish culture. There are cat fishes, tilapias, carp etc.

viii. There are two basic methods of constructing earthen fish ponds, manual and mechanical. It is advisable to make use of machineries like bulldozer in constructing large ponds, whereas smaller one can be done manually. Sometimes, if a large pond is envisaged, employment of manual labour may become necessary. For example, in a water logged environment, it is unreasonable to employ the service of a bulldozer. More so, manually built fish ponds are usually stronger than those build with the aid of machines. This is because manual labours are better organised than mechanical effort.

ix. Fish ponds can be built in sweeps, provided the site is not located on a flood plain. Otherwise, a lot of money will be required to check flooding. This is to avoid losing the whole stock of fish after pond construction and stocking.

x. Before a large pond is constructed, the site on its surrounding must be blessed with a perennial source of water. Examples of perennial water are spring, stream and rivers. If the pond is well located, it can be filed by gravitational flow. It may be impossible to fill the pond by gravity due to shape of the land. In that case, a standby, water, pumping machine and do the job, sometimes at a longer time.

xi. Fish farming can be practised in a body of water, or on a piece of land near a suitable source of water. The determining factor is the type of environment available to a particular farmer. In a suitable water body cages and pens can be used, depending on the nature of the site and also, unavailable materials and cultural methods envisaged. On land, ponds and tanks are normally used.

Fish farming on land is common, and can be practiced on any clayey soil provided necessary precautions are taken. In clay soils, earthen ponds are usually built, while in porous soils concrete fish ponds or tanks can be used.

xii. Fish pond is a water retaining structure that has water control devices like inlet and outlet system. It is usually built for the purpose of fish culture, and sometimes natural fish food production. Whereas fish farm is a place where fish are cultured in ponds. It is therefore simple to understand that, fish ponds makes up a fish farm.

xiii. Fish culture as earlier stated deals with growing of fish alone; and can be practiced in various culture systems. Aquaculture is the cultivation of both plant and animal organisms in water. It can be practised in facilities found in aquatic environments, as well as those located on land, provided the culture medium is water. Therefore fish culture is a branch of aquaculture.

xiv. Fish ponds are usually built on land. There are special requirements a site should meet, before being chosen for pond construction. A fish pond site should be free of thick vegetation, otherwise, enough money must be provided for clearing. There should be a perennial source of water in or around the site. If earthen pond is envisaged, the site must be made of clay or clay loam soil. Otherwise concrete fish pond or tank can be built.

xv. There are two major types of fish ponds namely, earthen and concrete fish ponds. In earthen fish ponds, the walls are made of soil' while water control devices can be made of concrete, metal or wooden materials. Concrete fish ponds are usually built with cement, sand and gravel. This type of pond is usually referred to as tank or fish tank.

xvi. Earthen and concrete fish ponds can be built in a site recommended for the farmer, but earthen fish pond cannot be built in every site recommended for the later. In clay soils, earthen fish ponds can be built; and concrete ones can also be built. In a coarse soil, where water retention is not easy, concrete fish ponds are preferred. If a homestead fish pond is considered, concrete ponds are also recommended. This is because of their ability to adapt to different types of soils.

xvii. Unlike in poultry keeping, fish farming does not require drugs for prevention of disease outbreak. In fish culture, disease outbreak can be prevented by good cultural practices, such as good water management and proper feeding. If the pond attendant is careless, such dormant disease agents as bacteria can cause some havoc in fish pond. However, some locally available chemicals can be used in controlling the situation.

xviii. Fingerlings of some cultural species like Heterotis nilooticus, Gymmarchus nitoticus, ophiocephalus obscures etc. can be sourced from the wild. This is because of their inability to reproduce in captivity. For species that can multiply in ponds like tilapia, their fingerlings can be collected from any fish farm. Fingerlings of claries, heterobranchus and heteroclarieas (hybrid) are better collected from fish hatcheries. This is to avoid wrong selection of species.

xix. The ability of fish to thrive in captivity as earlier stated in the text, differ from species to species. Environmental conditions are generally known to influence growth rate in living organisms. Therefore, the ability of some fish species to adapt to pond environment will determine their growth rate. For example, some species that are available in stagnant waters and swamps can do well in ponds. It is only questions of understanding their biology, to enable one culture them economically.

xx. There are many cultivable fish species in the country, including the exotic carp. Some of them are hardy and grow bigger. It is important to note that, of all the cultural species, Clarias and Tilapia are hardier. Heterobranchus species are also hardy, and grow bigger than the rest. There is also a hybrid of Heterobranchus and Clarias species popularly called Heteroclarias. They are usually hardier than their herents, due to their inherent vigour.

xxi. There are various microscopic plants and animals in fertile fish ponds, which fish can feed on. Where nutritional requirements of a particular species are considered, various agricultural byproducts (of plant and animal origins) can also be used in feeding them. Generally, supplementary fish feed can be made of maize, millet, sorghum, rice bran, brewer's waste, soya bean, blood meal, groundnut cake, fish meal etc. The culturist should always use available feed stuff in feeding his fish.

xxii. Fish culture period depends to some extent on one's taste, and market demand. Although various fish species attain their maturity at various sizes, the fish culturist should always, look out for an acceptable "table size" fish. If the culturist can adhere to the fish management techniques, both partial and total harvesting of catfish will not exceed 6-9 months of the culture period. While that of Tilapia species will range from 4-6 months. If the fish culturist requires large-sized fish, he can culture for one year.

xxiii. No agricultural business is expensive rather the farmer's method of approach can be very expensive. Fish farming can be carried out in small, series of concrete or earthen ponds. It can also be carried out in foreign and local fisheries consultants, local ones are readily available and are as well knowledgeable in indigenous

species and their culture methods. In order to save cost, it is advisable to make use of indigenous materials and method.

xxiv. Fish culture is quite different from poultry keeping. With adequate advice, anybody can culture fish. Fish cultures do not require the type of care given to poultry in the first instance; like vaccination against disease outbreak. If good species of fish are stocked, kitchen wastes and agricultural byproducts can be used to effect growth. Fish in pond can live for some days without supplementary feed. In extreme starving condition, fish can survive by nibbling any edible organism in the pond for some weeks. However, it is neither ethical nor economical to starve cultured fish. But in event of an accident, effort should be made to resume feeding with feed rich in protein, mineral and vitamin, to compensate for stress and weight loss.

There is less mortality in fish culture than in poultry keeping. This is because, disease outbreak rarely occur in fish ponds. In large-scale fish farming, however, poultry can be kept alongside fish culture, provided necessary techniques are applied.

SELF-ASSESSMENT EXERCISE (SAE)

i. Draw a fish and label the parts.
ii. Describe the external features of a named fish.

4.0 CONCLUSION

In this last unit, we briefly discussed the meaning of fishes, fisheries and fish farming. You also learnt about how to establish and effectively manage fish pond. You can then conclude that fish production is gaining popularity everyday especially in Nigeria.

5.0 SUMMARY

A summary of what you learnt in this unit can be as follows:

- Fishes are aquatic vertebrate that breathe by means of gills.
- Fishery is a branch of science that deals with water bodies where fishing is carried out.
- Fish farming is the rearing of fish in more than one culture system.
- Fish keeping are important for the following reasons – meat production; fish multiplications improve modern technology, recreation and culture, education, utilisation of industrial wastes etc.

- The following factors are important in selecting fish pond – water, soil characteristics, climate, land, economic and social factors, and types of fish ponds.
- Fish ponds include – rearing pond, nursery pond, production pond.
- Fishes could be effectively managed like other farm animals.

6.0 TUTOR-MARKED ASSIGNMENT

i. Define the following terms:
   a. Fishes
   b. Fisheries
   c. Fish farming

ii. What are the factors that will guide you in siting a fish pond?

7.0 REFERENCES/FURTHER READING

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