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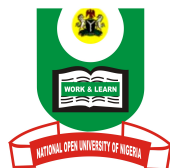**COURSE CODE :AEM 251**

COURSE TITLE:
INTRODUCTION TO AGRICULTURAL ECONOMICS

COURSE GUIDE

AEM 251
INTRODUCTION TO AGRICULTURAL ECONOMICS

Course Writer	Dr. S. O. Ojo Dept of Agricultural Economics and Extension Federal University of Technology Akure
Programme Leader	Prof A. Adebanjo School of Science and Technology National Open University of Nigeria Lagos.
Course Coordinator	Dr N. E. Mundi School of Science and Technology National Open University of Nigeria Lagos

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Introduction

Introduction to agricultural economics is a two unit degree course available to all students offering agriculture and agriculture related courses at the Nation Open University of Nigeria. Many non-agricultural economics students think that economics has no place in the study of agriculture and agricultural science. They believe that since agriculture is mainly concerned with provision of food the emphasis should therefore stop at the level of increased production.

Agricultural economics is the application of economic principles to the operations of the agricultural industry. Like the pure economics, it is concerned with resource allocation in the agricultural industry.
The study of agricultural economics has enabled us to know what to do, not only to ensure increased agricultural production, but, also how to produce profitably, productively and efficiently. It also teaches how to ensure the agricultural products get to the final consumers in the place and form they want it at affordable prices.

What You will Learn in this Course

This course consists of six modules which are sub-divided into units. This course guide tells you what the course is all about. What course materials you will be using and also suggests some general guidelines for the amount of time you are likely to spend on each unit of the course in order to complete it on schedule.

It also gives you guidance in respect of your tutor marked assignment (TMA) which will be made available in the assignment file. Please attend those tutorial sessions. The course will introduce you to the rudiments of agricultural economics.

Course Aims

The course aims to provide an introductory insight into the field of agricultural economics with a view to prepare the student for a future career in agricultural economics.

Course Objectives

To achieve the aims set out, the course has a set of objectives which are set out as specific objectives under each unit. You should read these objectives before you study the unit. After going through this course you should be able to:

(1) Understand the basic concepts of economics and agricultural economics
(2) Know how and when a problem is an economic problem
(3) How the discipline of agricultural economics started and the relationship between agricultural economics and the other disciplines of agriculture
(4) Meaning, types and laws of demand and supply
(5) Factors influencing the supply and demand for a commodity
(6) Meaning and types of elasticity and how they are measured
(7) Use of demand and supply analysis in agriculture
(8) Meaning of price and the various ways it can be determined
(9) The meaning of production, production functions and important resources involved in agricultural production.
(10) Basic characteristics of the three stages of the production function and the Necessary and sufficient conditions for optimal inputs and products combination
(11) Meaning, structure and various forms of cost and cost functions
(12) Meaning and Importance of markets and criteria for Categorizing Markets
(13) Marketing and conditions for efficient marketing
(14) Meaning and types of marketing functions
(15) Major problems of agricultural marketing
(16) Be able to evaluate the performance of the agricultural sector in the nation's economy.
(17) Various classes of problems facing the Nigerian agriculture

(18) Efforts at Solving the Problems of Agricultural Development in Nigeria.
(19) Some of the programmes to develop the agricultural sector:

Working through the Course

This course involves that you devote a lot of time to read and study the contents. Each unit contains self assessment exercises for this course and at certain points in the course you would be required to submit assignments for assessment purposes.

At the end of this course, there is a final examination. I would therefore advice that you attend the tutorial sessions where you would have the opportunity of comparing knowledge with your colleagues.

Course Materials

You will be provided with the following materials

- Course guide
- Study units
- References
- Assignments
- Presentation schedule

Study Units

Module 1   Scope and Nature of Economics

Unit 1   Scope and Nature of Economics
Unit 2   Meaning of Agricultural Economics

Module 2   Demand, Supply and Price Theory

Unit 1   Theory of Demand
Unit 2   Theory of Supply
Unit 3   Concepts of Elasticities of Demand and Supply
Unit 4   Price Theory

Module 3   Theory of Production

Unit 1   Meaning of Production
Unit 2   Production Function
Unit 3   Production Relationships – Factor – Product Relationship
Unit 4   Production Relationships – Factor– Factor Relationship
Unit 5   Production Relationships – Product–Product Relationship

Module 4   Theory of Cost

Unit 1   Meaning and Structure of Costs
Unit 2   Measurement of Costs
Unit 3   Agricultural Cost Functions

Module 5   Agricultural Marketing

Unit 1   Meaning of Markets
Unit 2   Types of Markets
Unit 3   Agricultural Marketing

Module 6   Agriculture in Nigeria's Economy

Unit 1   Agriculture in Nigeria's Economic Development
Unit 2   Problems of Nigerian Agriculture

Text Books and References

Adegeye A.J and Dittoh J.S (1985): *Essentials of Agricultural Economics*. CARD Anderson, D. J. (1981) *Economics of West Africa.* Macmillan Publishers.

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Assessment

There are two components of assessment for this course:

   a) The tutor marked assignment (TMA)
   b) The end of course examination.

Tutor-Marked Assignment

The TMA is the continuous assessment component of your course. It accounts for 30% of the total score. You will be given four TMA's by your facilitator to answer before you can sit for the final examination.

Final Examination and Grading

This examination concludes the assessment for the course. The examination will account for 70% of total score. You will be informed of the time for the examination.

Summary

This course intends to provide you with underlying knowledge of economic principles for the study of agricultural economics.

**COURSE
GUIDE**

**AEM 251
INTRODUCTION TO AGRICULTURAL ECONOMICS**

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MODULE 1   SCOPE AND NATURE OF ECONOMICS

Unit 1   Scope and Nature of Economics
Unit 2   Meaning of Agricultural Economics

UNIT 1   SCOPE AND NATURE OF ECONOMICS

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2.0   Objectives
3.0   Main Content
        3.1   Definitions of Economics
        3.2   Concepts of Economics
        3.3   Economic Problems
4.0   Conclusion
5.0   Summary
6.0   Tutor-Marked Assignment
7.0   References/Further Readings

1.0   INTRODUCTION

The most difficult task any beginner faces in studying any course is defining the course and understanding the nature and scope of the course. Once a student is able to overcome this hurdle everything about the course falls into place. Therefore, this unit and the next one have been devoted to the definitions of the subject matter of this course which is economics and agricultural economics.

2.0   OBJECTIVES

At the end of this unit, the student is expected to be able to:

- understand the meaning of economics
- define economics
- understand the basic concepts of economics
- know how and when a problem is an economic problem.

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3.0   MAIN CONTENT

3.1   Definitions of Economics

- Economics is the study of how resources are used to satisfy the needs and desires of people.
- It is a science of choice making.
- It deals with allocation of scarce resources among competing alternatives.
- It is a science of production: resources are used to produce goods and resources for the satisfaction of human wants.
- It is the study of the use of the scarce resources for the achievement of alternative ends.
- It is a social science which covers the actions of individuals and groups of individuals in the processes of producing, exchanging, and consuming of goods and services.

3.2   Concepts of Economics

The followings are the basic concepts of economics;

1)   **Wants:** human wants are many and insatiable. Everybody wants every good thing of life regardless of whether he or she could afford it. In other words, wants are wishes which people only dream to have without any serious efforts to actualize the dream. Wants are better framed in this wise saying; ' If wishes were horses beggars would ride'

2)   **Scarce resources:** It is not possible to satisfy all wants because the means of satisfying them are limited or scarce. In other words, the available resources have alternative uses. They can not satisfy all the alternative uses, they can only satisfy a limited number of uses hence they are regarded as scarce or limited.

3)   **Scale of preference:** Since man's wants are many and the means of satisfying them are limited he has to draw a scale of preference by arranging his wants in order of priority and importance. In doing this, the most important ones are listed on the top of the table of preference while the least important ones are found on the lower rung of the table.

4)   **Choice making:** Since man's wants are many and the means of satisfying them are limited, he makes a choice of the topmost item in his scale of preference to satisfy his very important want

as listed in his table of scale of preference while the other wants are left until resources are available to satisfy them.

5) **Opportunity cost:** This is the real cost of the item chosen on the man's scale of preference. In other words, the real cost of the item chosen on the scale of preference is the alternative want forgone, that is the next important item on the scale of preference that was not chosen due to scarcity of resources.

3.3   Economic Problems

Scarcity and alternatives are important ingredients for a problem to be an economic problem. For instance;

i.   If there is scarcity but no alternative, choice making is impossible and the problem is not economic in nature.
ii.   If there are alternatives but no scarcity, that is, goods are free, economics is not required.
iii.   Because resources are limited in supply, resource allocation is important regardless of the economic and political system of a country.
iv.   Products must be produced and resources must be allocated regardless of the political system – Capitalist, socialist and welfarist states.
v.   The type of governments only take decisions on; what, how and when to produce and the allocation of resources for the production of the goods and services.

4.0   CONCLUSION

In this unit you have been introduced to the basic definitions and concepts of economics and also how to know that a problem is an economic problem.

5.0   SUMMARY

In this unit we have learnt that;

• Economics is the study of how scarce resources are allocated for optimal production of goods and services to satisfy man's wants.
• Scarcity and alternatives are the major constituents of economic problems.

6.0   TUTOR-MARKED ASSIGNMENT

1)   Why do we study economics?
2)   When is a problem an economic and not an economic problem?
      Give examples in each case.

7.0   REFERENCES/FURTHER READINGS

Adegeye, A..J. and Dittoh, J.S (1985): *Essentials of Agricultural Economics*.   CARD University of Ibadan.

Anderson, D. J. (1981). *Economics of West Africa.* Macmillan Publishers Hanson J.L (1966): *A textbook of Economics*. Macdonald& Evans Ltd.

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UNIT 2   MEANING OF AGRICULTURAL ECONOMICS

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2.0   Objectives
3.0   Main Content
        3.1   Definition of Agricultural Economics
        3.2   Subject Matter of Agricultural Economics
        3.3   Field of Agricultural Economics
4.0   Conclusion
5.0   Summary
6.0   Tutor-Marked Assignment
7.0   References/Further Readings

1.0   INTRODUCTION

Many non-agricultural economics students think that economics has no place in the study of agriculture and agricultural science. They believe that since agriculture is mainly concerned with provision of food the emphasis should therefore stop at the level of increased production. The study of agricultural economics has enabled us to know what to do, not only to ensure increased agricultural production, but, also how to produce profitably, productively and efficiently.

2.0   OBJECTIVES

In this unit the student is expected to be able to know:

• the meaning of agricultural economics
• how the discipline of agricultural economics started
• relationship between agricultural economics and the other disciplines of agriculture
• the various sub-disciplines of agricultural economics.

3.0   MAIN CONTENT

3.1   Definition of Agricultural Economics

Agricultural economics is the application of economic principles to the operations of the agricultural industry. Like the pure economics, it is concerned with resource allocation in the agricultural industry.

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3.2   Subject Matter of Agricultural Economics

The discipline of agricultural economics grew out of farm management farm. Farm management involves the application of scientific and technical principles to the solution of the day to day problems facing the farmers on the farms. The early farm management experts were mainly interested in the overall operation of the farm business and they did not specially relate the discipline to economics until a few agriculturists with training in economics transferred economic theory such as profitability, productivity and efficiency analyses into the discipline of farm management. For instance, the various disciplines of agriculture, such as, Animal science, Agronomy soil science, Agricultural Engineering, Agricultural Biology, Animal Health, Agricultural Biochemistry| Nutrition, all work towards producing more food and fibre for the population. There is always a tendency for experts in the different disciplines to carry out their assignments in artificial environment, that is, without minding the economic implications of their various actions and thus producing in an uneconomic stage of production, thereby leading to economic losses of scarce resources. Therefore, the various disciplines in Agriculture have to learn to bring in economic analysis of the real farm situation where plants and animals have to be produced for a market with a number of socio-economic determinants influencing the resulting prices, costs and income. In agricultural economics, we study among other things, the following:

- Organization of farms.
- Availability of inputs and their prices.
- Marketing system for the various agric products.
- Organization of both production marketing cooperatives.
- Demands for and supply of agric products and those of allied industries.
- Finances of agriculture, role of banks, and other financial institutions in agric development.
- Peasant farms to identify their problems as well as the problems of government owned farms.

3.3   Field of Agricultural Economics

Agricultural economics is divided into the following sub-disciplines or subject areas.

- Farm management
- Agricultural finance
- Agricultural marketing
- Agricultural resource economics

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- Agricultural production economics
- Agricultural extension education
- Agricultural project planning and appraisal
- Agricultural policy development
- Agricultural cooperation
- Agric business management.

4.0   CONCLUSION

Agricultural economics is the application of economic principles to solve problems of the agricultural industry. It is concerned with the allocation of scarce resources for optimal production and productivity in the agricultural industry.

5.0   SUMMARY

In this unit you have learnt that:

- Agricultural economics is the application of economic principles to the operations of the agricultural industry.
- The discipline of agricultural economics grew out of farm management when some agriculturists with training in economics transferred economic theory into the discipline of farm management.
- Agricultural economics is divided in many subject areas or sub-disciplines.

6.0   TUTOR-MARKED ASSIGNMENT

1)   Why is Agricultural Economics an important discipline in the Agricultural Science study?
2)   What is the difference between agricultural economics and other disciplines in agriculture?

7.0   REFERENCES/FURTHER READINGS

Adegeye, A..J. and Dittoh J.S. (1985). Essentials of Agricultural Economics. CARD University of Ibadan.

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MODULE 2   DEMAND, SUPPLY AND PRICE THEORY

INTRODUCTION

The student is expected to learn the mechanisms of demand, supply and price determination. He will also learn that one of the main tasks of economic theory is to explain why goods are demanded, supplied and have prices.

The module is divided into four units, namely:

Unit 1   Theory of Demand
Unit 2   Theory of Supply
Unit 3   Concepts of Elasticities of Demand and Supply
Unit 4   Price Theory

UNIT 1   THEORY OF DEMAND

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1.0   Introduction
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3.0   Main Content
        3.1   Meaning of Demand
        3.2   Individual Demand
        3.3   Market Demand
        3.4   Law of Demand
        3.5   Demand curve
        3.6   Slope of the Demand Curve
        3.7   Factors Influencing the Demand for a Commodity
        3.8   Shifts in Demand
4.0   Conclusion
5.0   Summary
6.0   Tutor-Marked Assignment
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1.0   INTRODUCTION

The issue of demand is central to the behaviour of every consumer. The consumer is very important in any production scheme if the goods and services being produced must bring the desired benefits to the producer, hence there is need to understand the term 'demand' and its various characteristics in other to understand motive behind the behaviour of the consumer with respect to a particular good and service.

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2.0   OBJECTIVES

At the end of this unit the student would be expected to have learnt about the:

- meaning, types and laws of demand
- reasons for the negative slope of the demand curve
- factors influencing the demand for a commodity
- difference in the terms 'change and shift' in the demand curves.

3.0   MAIN CONTENT

3.1   Meaning of Demand

Demand for a good or service is the quantity the consumer is prepared to buy of the good or service at a particular price. Demand is a desire backed up with the ability to pay for the good or service in question, thus it is not a wish.

There are two types of demand; individual demand and market demand.

3.2   Individual Demand

This is the schedule of amounts of a commodity which a person would buy at various possible alternative prices over a particular interval of time. Therefore, demand is a function of time and price. For example, a housewife's demand schedule for beef in a month is presented in Table 1.

Table 1: Individual Demand Schedule.

Price per Kg of Beef	Kg of beef per month
250	5
300	4
350	3
400	2
450	1

3.3   Market Demand

A market demand is a schedule of total amounts that would be purchased by all buyers in a particular commodity market at various possible alternative prices within a particular interval of time. It is the summation of individual demand schedules.

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Examples of commodity market include; egg market, vegetable market, yam market, fish market and so on. The market demand of beef buyers is presented in Table 2.

A single individual demand can not affect the market prices for a particular commodity because there are many buyers in the market, but changes in the market demand will affect the market, thus, it is the market demand that is important in economic analysis.

Table 2: Individual and Market Demand Schedules.

Prices	A	B	C	D	E	F	G	H	I	J	Market Demand
250	5	8	3	12	4	4	2	1	6	5	50.3
300	4	6	3	10	3	3	2	1	4	4	40
350	3	5	2	8	2.5	2.5	1	1	3	2	30.5
400	2	4.5	1	5	2	1.5	0	0	2	2	20.0
450	1	4	1	3	2	1	0	0	2	1	15.5

3.4   Law of Demand

The quantity demanded of a commodity increases as the price decreases. In other words, the quantity demanded of a commodity decreases as the price of the commodity increases. Therefore, from the definition of demand, it follows that the prices and quantities demanded of a commodity are inversely related.

Mathematically, it is expressed as:

Qd = f(1\p).
Where: Qd = Quantity demanded of the commodity, p = unit price of the commodity (Qd) is an inverse function of price.

The above expression indicates that quantity demanded of a commodity (Qd) is an inverse function of the price of the commodity (p).
The law of demand is violated if:

(a)   The commodity is a Giffen (inferior) good: Basic foodstuffs like garri, yam, and rice fall into this category. Most people do not vary their purchases as the prices of basic food stuffs increase (decrease) because the expenditure on them forms a small percentage of one's total outlay on food.

(b)   There is fear of a future increase in price: The fear that the present increase in price is just the beginning of such increases in the future may not prevent people from buying more of it now

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even though its price is increasing. For example, increasing prices of ram during Salah celebration may be seen as a sign that ram would become scarce as the festival draws nearer, so people may rush to buy more with the increasing prices.

(c)   The article is that of ostentation: Articles of ostentation, such as jewelries, expensive cars and clothes fall into this category. Rich women rush at expensive jewelries and clothes in place of the cheap ones while rich guys are crazy for state of the art expensive cars, with the assumption that the more expensive these goods are the more superior quality-wise.

3.5   Demand Curve

The demand curve shows the plotting of the prices on the vertical axis against the quantity demanded on the horizontal axis.

Figure 1 shows the demand curve for beef of the market demand schedules of Table 2 where quantity demanded is in kg and price is in naira. The demand curve slopes from left to right.

Price

D

0   Q
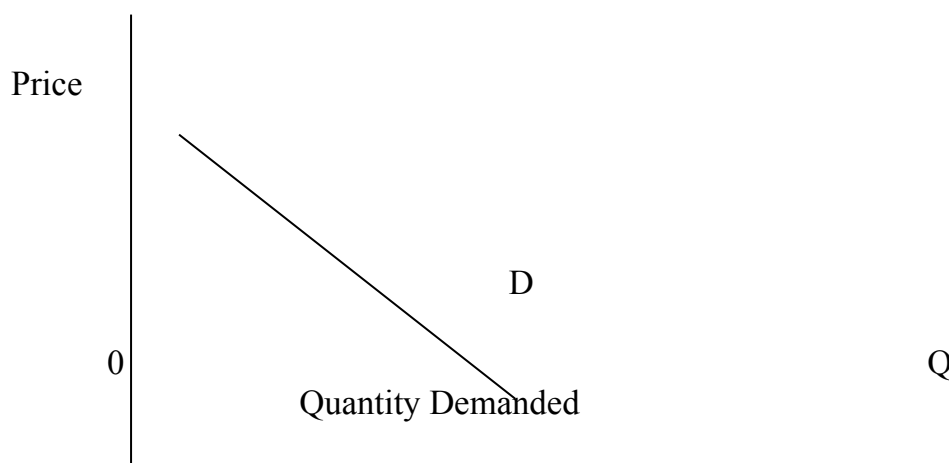
Quantity Demanded

Figure 1: Demand curve for Beef.

3.6   Slope of the Demand Curve

The slope of the demand curve is got mathematically from figure 2 thus:

$$\text{Slope} = \frac{0Q_1 - 0Q_2}{0P_1 - 0P_2}$$

The slope of the demand curve is negative because:

- Price is inversely related to quantity demanded.
- A fall in the price of a normal good makes it less expensive and more is purchased of such good (commodity). While a rise in the

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price of a normal good makes it more expensive and less of it is purchased.

- A fall in price raises the purchasing power or real income of consumers while a rise in price reduces the purchasing power of the consumer.

3.7   Factors Influencing the Demand for a Commodity

The following factors affect the demand for a commodity, either in the form of a movement along the demand curve or real shift in the demand curve.

c) **Price of the commodity:** Demand for a commodity increases with decrease in the price of the commodity *ceteris paribus*. This is a negative relationship, that is, the quantity demanded of a commodity is inversely related to its prices *ceteris paribus.*

d) **Price of Substitutes:** An increase in the prices of substitutes results in an increase in the demand for the commodity while a decrease in the prices of substitutes leads to a decrease in the demand for the commodity. For example, a fall in the price of beef may lead to switching from fish to beef. This is a positive relationship, that is, the quantity demanded of a commodity is directly related to the prices of its substitutes.

e) **Taste and fashion:** The demand for a particular commodity depends on taste and fashion. Fashion is apt to change more arbitrarily without reason. It is more fashionable for undergraduates and academicians to have laptop computers than desktop computers nowadays, hence the rush by this category of people for laptop computers.

f) **New commodities replace old ones (obsolete goods):** New inventions are constantly being made and the demand for these takes the place of the demand for the things they replace. For example, demand for desktop computers has replaced the demand for main-frame computers which was in vogue in the 1970s.

g) **A change in real incomes:** A change in real income means a change in the quantity of goods and services the money income will buy. An increase in people's real income may have little effect on the demand for giffen goods (basic food stuffs) but it may have considerable effect on the demand for luxury goods. A university graduate after the traditional NYSC programme that has just been employed by one of these new consolidated banks on a fat salary would be eyeing one

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of the posh cars in town or getting married the society-way than spending his income to increase his purchase of rice and meat.

h) **Population and its composition:** The more people we have to cater for, the more the demand for food items. The more children in the population the more the demand for toys, baby dresses and educational facilities. Other variables under population that affect demand are wealth, credit availability, stock and habit.

i) **A change in the quantity of money:** An increase in income will lead to increase in quantity demanded of a normal and luxury goods.

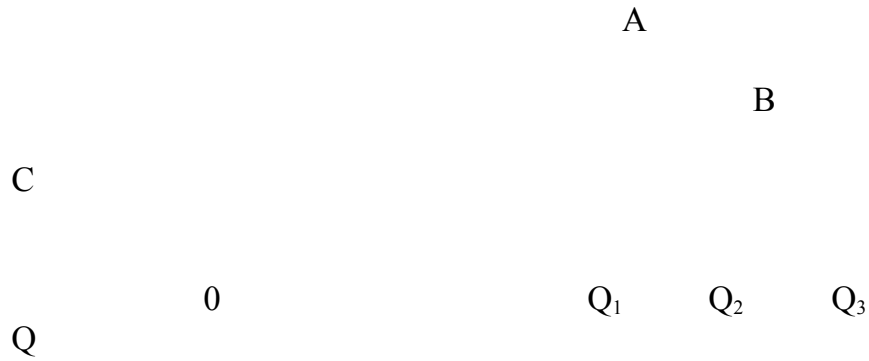## 3.8   Shifts in Demand

All the factors mentioned in 3.6 would affect the demand curve, either as mere movement along the demand curve or outright shift of demand curve upward or downward.

- Changes in the price of the commodity determine the slope of the demand curve, that is, they explain the movement along the demand curve.
- Changes in the other factors determine the position of the demand curve. An increase in the factors would shift the demand curve away from the origin while a decrease in the factors would shift the demand curve towards the origin.
- Factors which shift the demand curve inward or outward are called demand shifters.

In figure 2, movement from points A to B is still on the same demand curve. The movement was caused by changes in the price of the commodity. When the price of the commodity was P_1 Quantity demanded was Q_1 and the consumer was in point A. but when the price decreased to P_2, quantity demanded was increased from Q_1 to Q_2 and the consumer was in point B.

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A

B

C

            0   Q_1 Q_2 Q_3

Q
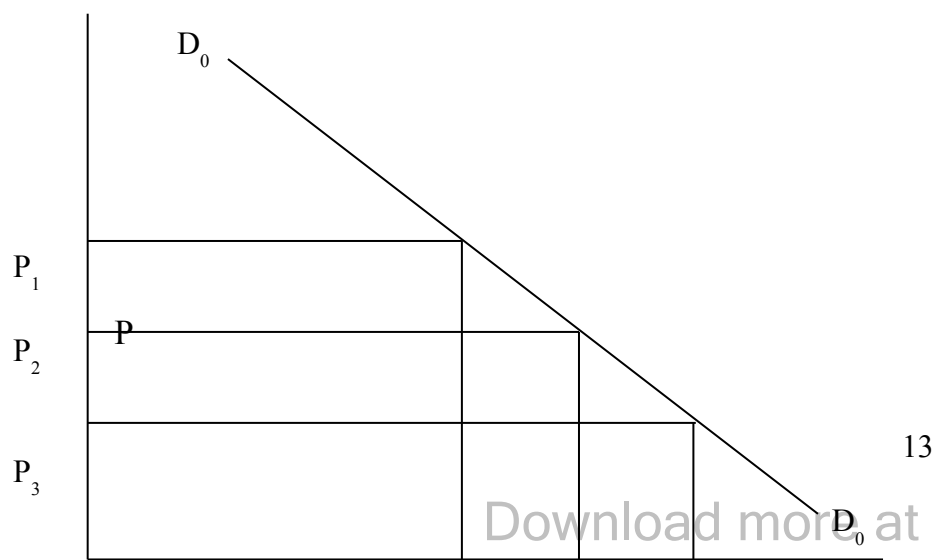
Figure 2: Movement along the Demand Curve

In figure 3, the three demand curves depict shifts in the demand.
The initial demand curve D_oD_o shifted to D_1D_1 with decrease in factors such as income, price of substitute, population or fashion/taste, but with increase in the factors, the demand curve moves from D_oD_o to D_2D_2.

D_1

D_0

D_2

rise

fall

P_1

Q_1 Q_2D_0 $Q_3{}^1$ D^1

D_2
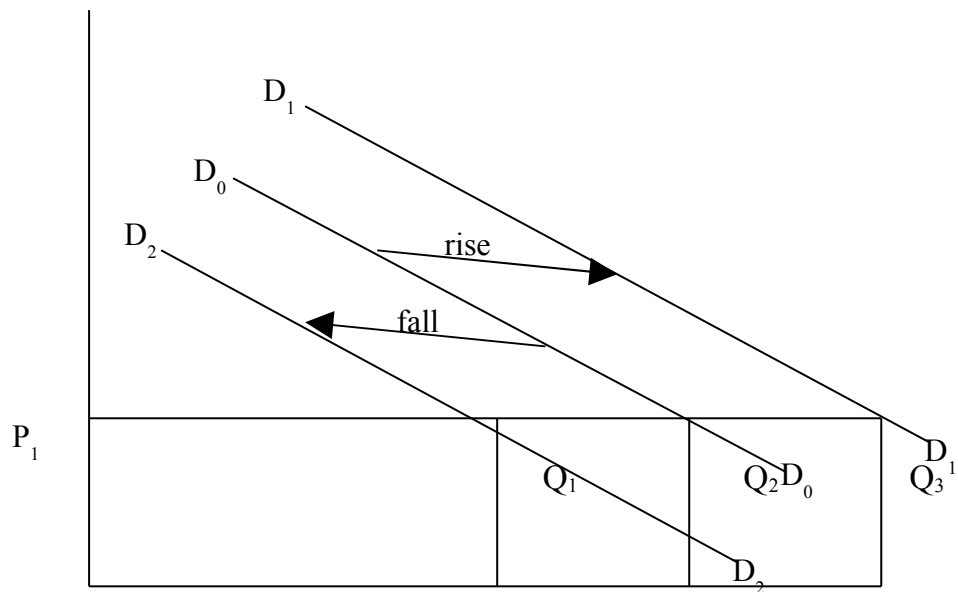
Figure 3: Shifts in Demand

4.0   CONCLUSION

Goods have prices because they are demanded. Quantity demanded is inversely related to price and thus the demand curve is negatively sloped.

5.0   SUMMARY

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In this unit we have learnt that:

- Demand is a desire backed up with ability to pay for good and services at alternative prices over an interval of time.
- The quantity demanded of a commodity is inversely related to its price and the slope of the demand curve is negative.
- The law of demand is violated for inferior (Giffen) goods, article of ostentation and for fear of future rise in price.
- Apart from the price of the commodity, all other factors affecting demand are shifter variables

6.0   TUTOR-MARKED ASSIGNMENT

1)   Why is the slope of the demand curve negatively sloped?
2)   Explain and give examples of demand shifters

7.0   REFERENCES/FURTHER READINGS

Adegeye A.J and Dittoh J.S (1985): *Essentials of Agricultural Economics*. CARD University of Ibadan.

Anderson D J (1981) *Economics of West Africa.* Macmillan Publishers

Hanson J.L (1966): *A textbook of Economics*. Macdonald& Evans Ltd.

Olayide S.O and Heady E.O (1982): *Introduction to Agricultural Production Economics.* University Press, Ibadan.

Ferquson C.E & Gould J.P (1975): Micro Economic Theory. Richard D. Irwin Inc Homewood Illinoisro430.

Koutsoyiannis A (1980). Modern Microeconomics. Macmillan Press Ltd London.

UNIT 2   THEORY OF SUPPLY

CONTENTS

1.0   INTRODUCTION

Just as demand is very important in the analysis of the consumer behaviour, supply is also equally important. In the demand analysis, we have seen that the demand is the amount of a commodity that would be bought at a price. We have not yet seen what the actual price will be. To do so we must first look at the supply of the commodity.

2.0   OBJECTIVES

At the end of this unit, the student is expected to have known the following about supply:

- Meaning, types and laws of supply
- Factors influencing the supply for a commodity
- Difference in the terms 'change and shift' in the supply curves

3.0   MAIN CONTENT

3.1   Meaning of Supply

This is the quantity of a commodity that is called forth into the market over a particular period of time by a certain price.

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Supply is not the entire stock (production) of any commodity in existence but only that amount drawn into the market by the price ruling at the time.

Supply depends on ruling price and scarcity. The supply of any commodity is limited because factors for its production have alternative uses.

There are individual and market supply.

3.2   Individual Supply

This is the schedule of the amounts of any commodity which a seller would bring to the market at various possible alternative prices within a particular interval of time. The seller of the beef used in the demand example may have the following supply schedule.

Table 3: Individual Supply Schedule.

Price/Kg of beef	Kg of beef supplied/month
250	1.0
300	2.0
350	3.0
400	4.0
450	5.0

3.3   Market Supply

A market or aggregate supply is a schedule of total amounts that would be brought to the market by all sellers of the commodity at various possible alternative prices within a particular interval of time. It is the summation of individual supply schedules as depicted in Table 4.
A single individual supply schedule can not affect the market nor the market price except in combination with other sellers. It is the market supply that is important in economic analysis.

Table 4: Individual and Market Supply Schedules.

Price	A	B	C	D	E	F	G	H	Market supply
250	1	3	2.5	2	1	4	2	1.5	17
300	2	4.5	3.5	3	1.5	4	4	2.5	25
350	3	5	4	3	2	5	4	4	30
400	4	6	5	4	2	7	6	6	40
450	5	7	8	5	4	8	8	10	55

3.4   Law of Supply

The law states that the quantity supplied of a commodity increases as the price increases. It also implies that the quantity supplied decreases as the price decreases. In other words the prices and quantities supplied are directly related.

Mathematically expressed:
Qs = f(p).
Where,
Qs = Quantity of the commodity supplied to the market
P = Unit price of the commodity

The law of supply could be violated under theses situations.

a) Fixed Supply: The supply of goods whose quantity is fixed and which cannot be increased as a result of economic decisions. The seller may decide not to even sell the commodity rather he may buy it himself. Examples: leisure & working overtime and supply of land.
b) Infinitely inelastic supply: Supply will not increase at all however much price rises. This happens when elasticity of supply is zero.
c) In the case of labour supply: Workers may wish to work shorter hours if wages (price of labour) are high.

3.5   Supply Curve

This is the plotting of the prices on the vertical axis against the quantities supplied on the horizontal axis.
 Figure 4 shows the supply curve of the market supply schedule of Table 1. 4.

 The supply curve slopes upward from origin to the right. The slope of the supply curve is positive.
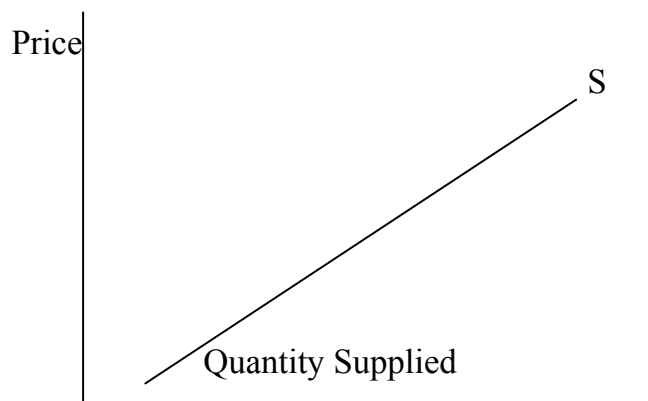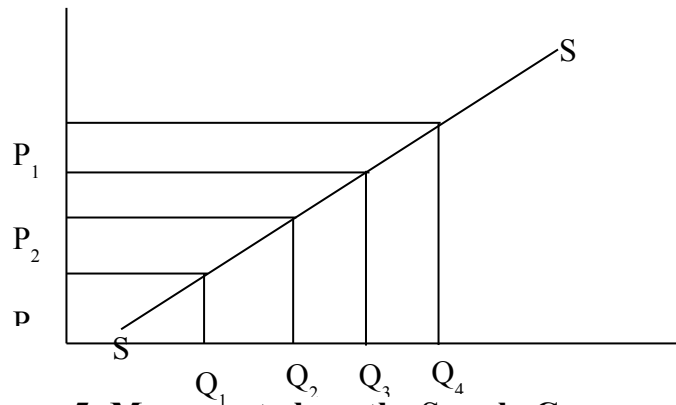

Figure 4: Supply curve.

3.6   Factors Influencing the Supply of a Commodity

The under listed factors affect the supply of a commodity either as movement along the supply curve or outright shift.

- Price of the commodity: Supply increases with increase in price of the commodity *ceteris paribus*.

- Cost of production of the commodity: Quantity supplied of a commodity is inversely related to the cost of production *ceteris paribus*. For example, if the cost of producing poultry increases due to high cost of feeds, vaccination and management, many poultry farmers would cut down on number of birds produced.

- Availability of productive capacity: This is the capacity of a firm to produce more. This may not be feasible for a firm that is already producing at maximum capacity. Therefore quantity supplied is directly related to productive capacity.

- Technological change: Improvement in technological change would lead to increase in supply. For example, the development by the Nigerian Institute for Oil-palm Research (NIFOR) of a high yielding elite tenera hybrid oil palm seedlings that can yield up to 22 metric tones of fresh fruit bunches (FFB) per hectare of mature oil-palm trees has led to increase in the production of palm oil and decrease in the cost of production of palm oil by Oil-palm companies and Oil-palm farmers in Nigeria.

- Favourable climatic factors: Agricultural production depends directly on favourable climatic factors, such as; adequate and well distributed rainfall, enough sunshine and good relative humidity. A good weather condition would lead to higher agricultural production.
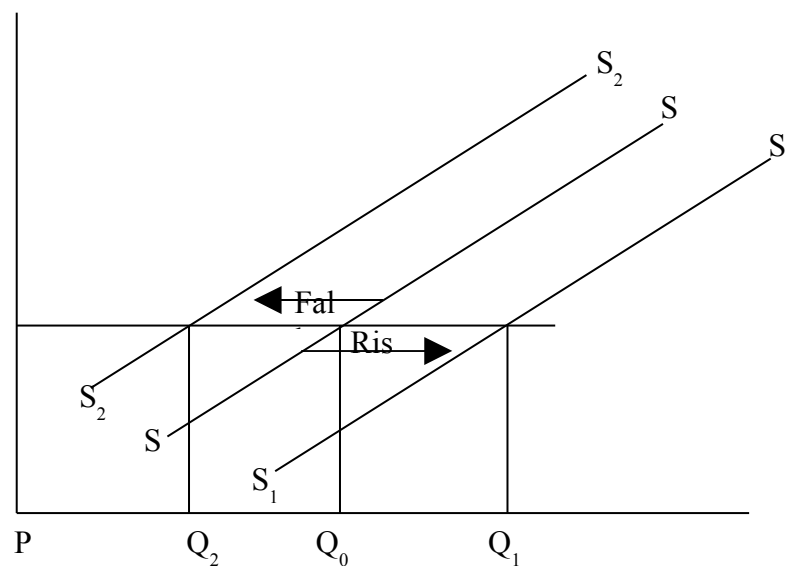
3.7   Shifts in supply

- The price of the commodity determines the shape of the supply curve. As prices change, the supplier changes the quantity supplied along the same supply curve. This is movement along the same supply curve. This is demonstrated in Figure 5.

Figure 5: Movement along the Supply Curve

- Changes in the other factors enumerated in 3.6 determine the position of the supply curve. Any variable that reduces the cost of production of a commodity would result in increased supply of the commodity and the supply curve would shift to the right, that is, from SS to S_1S_1 as given in Figure 6.

- Any variable that increases the cost of production of a commodity would result in decreased supply of the commodity and the supply curve would shift to the left that is from SS to S_2S_2.

Figure 6: Shifts in supply.

4.0   CONCLUSION

Goods are supplied because they have prices. Supply is positively related to the price of the commodity.

5.0   SUMMARY

In this unit we have learnt that:

* Supply is what comes into the market over a period of time at a particular price
* The law of supply is violated when there is fixed supply, infinitely inelastic supply and increasing the labour wages.

6.0   TUTOR-MARKED ASSIGNMENT

Explain the difference between movement along the supply curve and shift in the supply curve. Give examples of factors in each case.

7.0   REFERENCES/FURTHER READINGS

Adegeye A.J and Dittoh J.S (1985): *Essentials of Agricultural Economics*.   CARD University of Ibadan.

Anderson D J (1981) *Economics of West Africa.* Macmillan Publishers

Hanson J.L (1966): *A Textbook of Economics*. Macdonald& Evans Ltd.

Olayide S.O and Heady E.O (1982): *Introduction to Agricultural Production   Economics.* University Press, Ibadan.

Ferquson C.E & Gould J.P (1975): Micro Economic Theory. Richard D. Irwin Inc Homewood Illinoisro 430.

Koutsoyiannis A (1980) Modern Microeconomics. Macmillan Press Ltd London.
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UNIT 3   CONCEPTS OF ELASTICITIES OF DEMAND AND SUPPLY

CONTENTS

1.0   INTRODUCTION

The concept of elasticity is to show the type of relationship existing between quantities of commodity and the factors that affect the demand and supply as both quantity and any of these factors change.

2.0   OBJECTIVES

At the end of this unit, the student is expected to have learnt the;

- meaning of elasticity and how it is measured
- meaning, types and uses of elasticity of demand
- meaning and types of elasticity of supply
- use of demand and supply analysis in agriculture.

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3.0   MAIN CONTENT

3.1   Meaning of Elasticity

Elasticity measures the responsiveness of quantity (demand or supply) to changes in the factors that affect the demand or supply. These factors have been discussed in the earlier units under this module.

3.2   Measurement of Elasticity

Elasticity could be measured as point or arc elasticity.

(a) Point elasticity is the elasticity measurement if the changes in the variables of interest are very small, that is, at a point in both quantity and factors of interest. It is the first derivative of the demand or supply function.

(b)   Arc elasticity is the elasticity measurement if the changes in both quantity and the factors of interest are large. For example, for a demand curve in figure 1, the arc price elasticity of demand is given as

$$Ep = \frac{0Q_2 - 0Q_1}{0P_2 - 0P_1} \times \frac{0P_2}{0Q_2}$$

$$= \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$$

Where ΔQ = change in quantity demanded, ΔP = change in price of the commodity, Q = Initial quantity demanded, P = Initial price of the commodity.

3.3   Elasticity of Demand

Elasticity of demand is the responsiveness of quantity demanded of a commodity to changes in the factors that cause the change in the demand.

The important elasticities of demand are:

- Price elasticity of demand
- Income elasticity of demand
- Cross elasticity of demand

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3.3.1 Price Elasticity of demand

This is the measure of the responsiveness of demand to changes in the commodity's own price. The point price elasticity of demand is the first derivative of the demand function. It is differentiating the demand function with respect to price thus:

$$Ep = \frac{dQ}{dP} \times \frac{P}{Q}$$

Where Ep = price elasticity of demand.

      dQ = small change in quantity demanded.
      dP = small change in price of the commodity.
      Q = Quantity demanded
      P = price of commodity.

Price elasticity of demand is negative because the demand function (curve) has a negative slope.

3.3.2 Basic Determinants of Price Elasticity of Demand

- Availability of substitutes: The demand for a commodity is more elastic if there are close substitutes for it.
- Time period: Demand is more elastic in the long run.
- Number of uses to which a commodity can be put. The more the possible uses of a commodity the greater its price elasticity will be.
- The nature of the need that the commodity satisfies. Luxury goods are price elastic while necessities are price inelastic.
- The proportion of income spent on the particular commodity.

3.3.3 Types of Price Elasticity of Demand

There are five types of price elasticity of demand.

(20)Perfectly Elastic Demand

A small decrease in price gives rise to an indefinitely large increase in amount demanded. The demand curve for a perfectly elastic demand is given in Figure 7. The demand curve is a horizontal line and the numerical elasticity of demand is infinite, that is, Ep $= \infty$

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P

Pric ──────────────────────────────── D

0   Quantity Demanded   Q

Figure 7: Perfectly elastic demand curve.

(ii)   Perfectly Inelastic Demand

In a perfectly inelastic demand, whatever the original price is, a reduction in that price will lead to no increase at all in the amounts demanded. A perfectly inelastic demand curve is given in Figure 8.The demand curve is a vertical line and the numerical elasticity of demand is zero.

P

D

Price

0   Quantity Demanded   Q
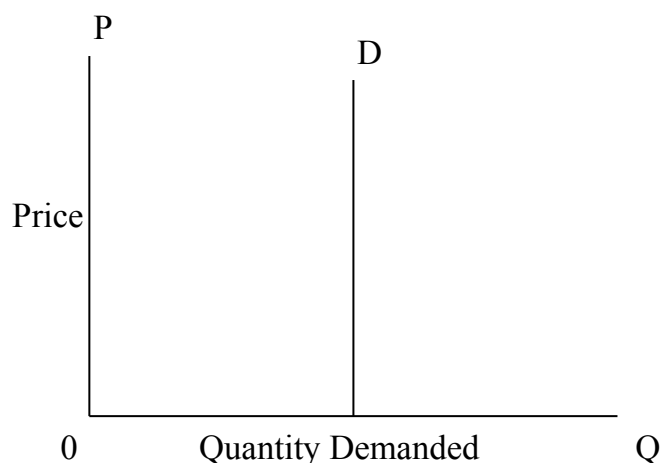
Figure 8: Perfectly inelastic demand curve.

(iii)   Unitary Elasticity Of Demand

A proportionate change in the price of a commodity results in the same proportionate change in quantity demanded. The curve of the unitary elasticity of demand is given in Figure 9. The curve slopes from left to right. The numerical elasticity of demand under the unitary elasticity is equal to one throughout the length of the demand curve.

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P

Price

Figure 9: Unitary elastic demand curve.

D

0   Quantity Demanded   Q
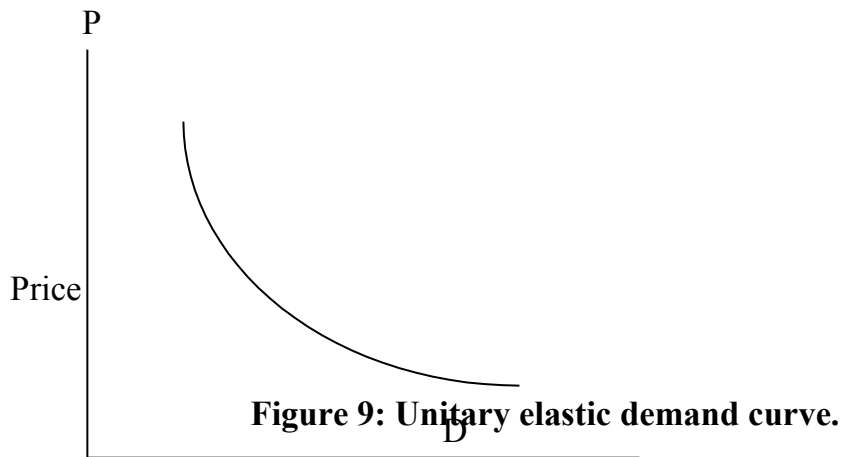
(iv)   **Elastic Demand**: A proportionate change in the price of a commodity results in more than proportionate change in quantity demanded. The numerical elasticity of demand is between one and infinity, that is,
$1 < Ep < \infty$

(v)   **Inelastic Demand**: a proportionate change in the price of a commodity results in a less than proportionate change in quantity demanded. The numerical elasticity of demand is between zero and unity, that is,
$0 < Ep < 1$

3.3.4 Uses of Price Elasticity of Demand

It is used as a planning tool.

(i)   To classify goods as superior and inferior goods.

•   Luxuries have high elasticity of demand. Examples of luxuries are jewelries, expensive cars and so on.
•   Necessities (normal goods) have small elasticity of demand examples are basic food stuffs. Yam meat, rice etc. they have elastic demand sand the numerical elasticity is between unity and infinity.
•   Giffen goods have inelastic demand and the numerical elasticity is between zero and unity.
•   Salt has perfectly inelastic demand and the numerical elasticity is zero.

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3.3.5 Income Elasticity of Demand

It is the proportionate change in the quantity demanded of a commodity resulting from a proportionate change in the income of the consumer.

It is expressed mathematically as;

$$Ey = \frac{\Delta Q}{\Delta Y} \cdot \frac{Y}{Q}$$

Or

$$Ey = \frac{dQ}{dY} \times \frac{Y}{Q}$$

Where Q = Quantity demanded, Y = initial income.
        dQ or ΔQ = change in quantity demanded.
        dY or ΔY = change in income.

Income elasticity can be positive or negative.

3.3.6 Basic Determinants of Income Elasticity of Demand

- The nature of the need that the commodity covers. The percentage of income spent on food declines as income increases (this is Engel's law).
- The initial level of income of a country. A personal computer is a luxury in the developing country, whereas it is a necessity in the developed country with high per capita income.
- The time period, because consumption patterns adjust with a time lag to changes in income.

3.3.7 Uses of Income Elasticity on Demand

Income elasticity of demand is used to classify goods into luxuries, necessities and inferior goods.

- Luxuries have income elasticity that is greater than unity, that is, Ey > 1
- Necessities have income elasticity that is between zero and unity, that is, 0 < Ey < 1.   .
- Inferior goods have income elasticity that is less than zero, that is, Ey < 0.
- A good may not be superior or inferior every time, it depends on the income level of the consumers (Engel's law).

3.3.8 Cross Elasticity of Demand

It is the proportionate change in the quantity demanded of a commodity (X) resulting from a proportionate change in the price of another commodity (Y).

$$Exy = \frac{dQx}{dPy} \cdot \frac{Py}{Qx}$$

Where Exy = cross elasticity of demand.

Qx = Quantity demanded of commodity X
Py = Price of commodity Y
dQx = change in quantity of commodity X
dPy = change in price of commodity Y.

The cross elasticity can be positive or negative.

The basic determinant of cross elasticity is the nature of the commodities relative to their uses. If two commodities can satisfy equally well the same needs, the cross elasticity is high, if not the cross elasticity is low.

3.3.9 Uses of Cross Elasticity

It is used to classify goods as complementary and substitutes goods.

- Complementary goods X and Y have negative cross elasticity
- Substitutes have positive cross elasticity
- The higher the value of the cross elasticity, the stronger is the degree of substitutability or complementarity of commodities X and Y.

3.4   Elasticity of Supply

It is the measure of the responsiveness of supply to changes in the commodity's own price.

$$Es = \frac{\Delta S}{\Delta P} \cdot \frac{P}{S}$$

Or

$$Es = \frac{dS}{dP} \times \frac{P}{S}$$

Where Es = price elasticity of supply, ΔS or dS = change in quantity supplied,

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Δ P or dP = change in price of the commodity, S = Initial quantity supplied,

P = Initial price of the commodity.
The price elasticity of supply is positive.

3.4.1 Types of Elasticity of Supply

- Unitary elasticity of supply.
- Zero elasticity of supply.
- Infinite elasticity of supply.

3.5   Demand and Supply Analysis in Agriculture

- Agricultural products are inelastic in demand because they are generally necessary for human existence.
- Agricultural products are inelastic in supply because of the seasonality in their production and thus, their production can not easily be varied no matter the demand.
- The inter-action of demand and supply determines the market prices of agricultural products.
- In the events of decreased demand during the peak season and to encourage increase production government can give price support or guaranteed minimum prices.
- To decrease the cost of producing a commodity, government can subsidize the price of the resources used in the production of the commodity. Such resources or inputs include fertilizer, seeds, agro chemicals, machinery and equipment.
- Price controls of agricultural products during the period of shortages to protect consumers from paying exorbitant prices.

4.0   CONCLUSION

Important elasticity measures are mostly used to classify goods as luxury, normal, inferior, substitutes and complementary goods. Most agricultural products are inelastic in demand and supply.

5.0   SUMMARY

In this unit we have learnt that:

- Elasticity measures the responsiveness of demand (supply) to changes in the factors that affect them.
- Important elasticities of demand are price, income and cross elasticities.
- Elasticity of demand measurements are used to classify goods as luxury, normal, inferior goods, substitutes and complements.
- Agricultural products are inelastic in demand and supply

6.0   TUTOR-MARKED ASSIGNMENT

1. "The demand for salt is perfectly inelastic" Explain what you understand by this statement, and give reasons why it is probably true.
2. When is the elasticity of demand greater than unity?

7.0   REFERENCES/FURTHER READINGS

Adegeye A.J and Dittoh J.S (1985): *Essentials of Agricultural Economics*. CARD University of Ibadan.

Anderson D J (1981) *Economics of West Africa.* Macmillan Publishers

Hanson J.L (1966): *A textbook of Economics*. Macdonald& Evans Ltd.

Olayide S.O and Heady E.O (1982): *Introduction to Agricultural Production   Economics.* University Press, Ibadan.

Ferquson C.E & Gould J.P (1975): Micro Economic Theory. Richard D. Irwin Inc Homewood Illinoisro430.

Koutsoyiannis A (1980) Modern Microeconomics. Macmillan Press Ltd London.

UNIT 4   PRICE THEORY

CONTENTS

1.0   Introduction
2.0   Objectives
3.0   Main Content
        3.1   Meaning of Price
        3.2   Price Determination
        3.3   Market Price and Normal Price
        3.4   Stable Equilibrium Analysis
4.0   Conclusion
5.0   Summary
6.0   Tutor-Marked Assignment
7.0   References/Further Readings

1.0   INTRODUCTION

We have analysed the forces of demand and supply in the two previous units. We have seen that according to the laws of demand and supply, more is supplied at a high price while less is demanded, but at a low price the opposite is the case; less is supplied but more is demanded. From these two laws, we should see that there will be a price. Goods have prices because they are useful and scarce. Free goods do not have prices because they are not scarce.

2.0   OBJECTIVES

At the end of this unit, the student is expected to know the:

- meaning of price and the various ways it can be determined
- difference between market and normal prices
- conditions necessary for stable equilibrium.

3.0   MAIN CONTENT

3.1   Meaning of Price

The price of a commodity is the rate at which the commodity can be exchanged for anything else.

a)   Price is a signal to producers to expand or contract their rate of production.
b)   It reflects the marginal social value of a commodity.
c)   It is used to ration goods among prospective buyers in the market.
        ➢ One central function of price is to equate demand with supply.

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3.2   Price determination

Prices are determined by the following processes.

(a) Haggling. This is the process of bargaining on the price of the commodity between a few sellers and a few buyers. The seller says a price probably higher than the price he expects the good to be sold. The buyer then presents a lower price and after a period of bargaining a final price is reached. This is how price is mostly determined in Nigerian local markets.

(b) Sales by Auction: This involves one seller and a number of prospective buyers. The good is offered for sale, the buyer bid for it and the good is sold to the highest bidder, that is, the one prepared to pay the highest price. In sales by auction, the cost of production or acquisition cost does not enter into the determination of the price. The price of the good depends on the relation between the keenness of buyers to buy and the keenness of sellers to sell.

(c) Offers at fixed prices: In the advanced countries and even supermarkets in Nigeria, prices of; foodstuffs, clothing, and household goods and so on are pre-determined at definite prices. The prices are marked and pasted on the goods. The seller fixes his prices after due considerations for his acquisition and marketing costs.

(d) Equilibrium price: The market price is determined by the interplay of the forces of demand and supply. The equilibrium price is the price that clears the market, that is, the price that clears the amount of commodity supplied and demanded or the price when quantity supplied equals quantity demanded. The quantity is also called equilibrium quantity.
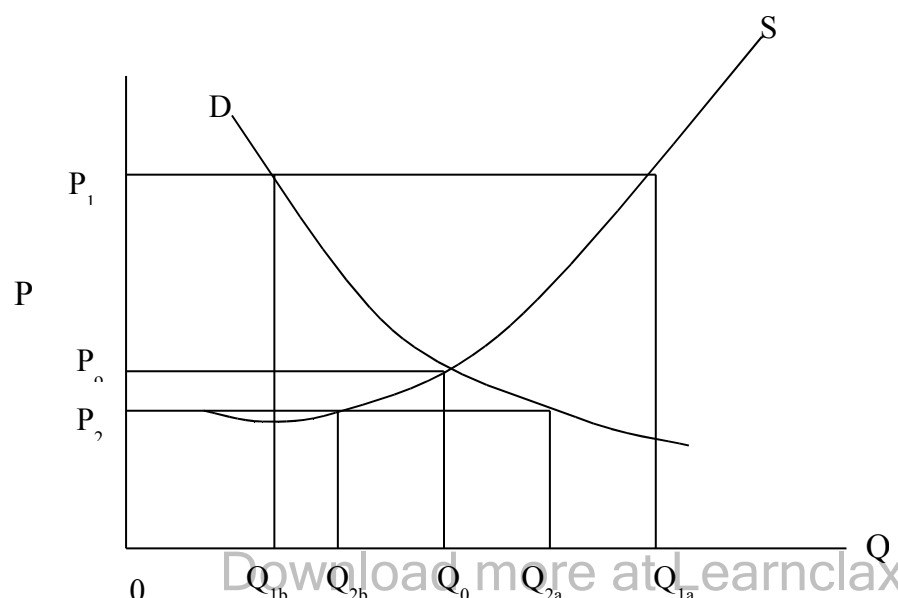
Figure 10:   Equilibrium price and quantity determination.

Figure 10 shows a downward sloping demand curve and an upward sloping supply curve. The market is in equilibrium when the amount 0Qe of the good is sold at the price of 0Pe.

If price rises to P_1, supply is $0Q_{1a}$ and demand is $0Q_{1b}$, supply is greater than demand. There is excess supply and no equilibrium condition is reached. Sellers supply more than they can sell; they have to reduce their prices to Pe to clear the market. Also, if the price falls to P_2, supply is $0Q_{2b}$ and demand is $0Q_{2a}$, supply is less than demand, there is excess demand. Buyers would be willing to pay more to get the goods. The competition between buyers for the goods will force the price up until the equilibrium price, 0Pe is reached. At price 0Pe the seller brings to the market exactly what the buyer is ready and willing to buy. The quantity 0Qe is therefore the equilibrium quantity.

3.3   Market and Normal Prices

(a) Market price. This is the price charged in the market in the short run period, that is, the short term equilibrium price when supply and demand may be subject to temporary influences.

(b) Normal price: This is the price charged in the market in the long run period when the conditions of supply and demand have stabilized and the rate of consumption of a good is equal to the rate at which it is produced. Normal price is the long run equilibrium price.

3.4   Stable Equilibrium Analysis

Stable equilibrium: The equilibrium is stable if demand and supply conditions are such that a displacement of the equilibrium situation automatically causes a return to it as explained for Figure 10.

- Equilibrium will be stable when slightly to the left of the equilibrium position, the demand price exceeds the supply price and slightly to the right of it the supply price exceeds the demand price.

- Equilibrium is also stable if at a price slightly above the equilibrium level, the amount demanded falls short of the amount supplied.

- The stability condition will always be fulfilled if the demand curves slopes downward and the supply curve slopes upward.

4.0   CONCLUSION

Goods are demanded because they are useful and have prices because they are scarce, useful and demanded while they are supplied because they have prices. Therefore economic theory explains why goods are demanded, supplied and have prices.

5.0   SUMMARY

In this unit we have learnt that;

- The price of a commodity is determined by: Haggling, Sales by auction, Offers at fixed price, Interplay of the forces of demand and supply.
- Equilibrium price clears the market of all quantity supplied
- Stable equilibrium is when it is possible to come to the equilibrium position after a slight displacement in the short run equilibrium.

6.0   TUTOR-MARKED ASSIGNMENT

For these demand and supply equations:

$$Qd = (6.5 - P)\ 20,000$$
$$Qs = (P - 0.5)\ 20,000.$$

Determine the equilibrium price and equilibrium quantity.

7.0   REFERENCES/FURTHER READINGS

Adegeye A.J and Dittoh J.S (1985): *Essentials of Agricultural Economics*.   CARD University of Ibadan.

Anderson D J (1981) *Economics of West Africa.* Macmillan Publishers

Hanson J.L (1966): *A Textbook of Economics*. Macdonald& Evans Ltd.

Olayide S.O and Heady E.O (1982): *Introduction to Agricultural Production   Economics.* University Press, Ibadan.

Ferquson C.E & Gould J.P (1975): Micro Economic Theory. Richard D. Irwin Inc   Homewood Illinoisro430.

Koutsoyiannis A (1980) Modern Microeconomics. Macmillan Press Ltd London.

MODULE 3   THEORY OF PRODUCTION

Unit 1   Meaning of Production
Unit 2   Production Function

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UNIT 1   MEANING OF PRODUCTION

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1.0   INTRODUCTION

Production is synonymous with creating something. Economist does not restrict production to the manufacture of commodities; he also takes the expression to include the provision of services such as those of lawyer, accountant, actor, musician, or market women. The central aim of all production is to satisfy people's wants and increase the economic welfare of a people, to raise their standard of living by enabling to satisfy more fully a greater number of their wants.

2.0   OBJECTIVES

At the end of this unit, the student is expected to know:

•   the meaning of production
•   the important resources involved in agricultural production.

3.0   MAIN CONTENT

3.1   Definition of Production

Production is the process by which inputs are transformed into output in output producing units. The output producing units include farms and factories.

Production therefore means changing either the form of something or its situation in space or time, or the provision of a service of some kind. Agricultural production involves many controllable and uncontrollable inputs. The controllable inputs include land, labour, capital, irrigated water and management and their various disaggregated forms to give as more specific set of factors. The controllable inputs include rainfall, other weather variables and many variables such as animal and plant nutrition or photosynthesis which are not completely understood. Because of the uncontrollable inputs in agricultural production, last years production response may be estimate of this year's production response.

3.2   Agricultural Resources (Inputs)

The major resources used in agriculture are free and economic resources.

- The free resources are termed free because they are relatively abundant in supply and hence have no cost elements attached to them but they are highly essential in agricultural production. They are the air, heat, water (rain) and so on.
- The economic resources are scarce in supply and limiting in production. They possess high economic value. They are land, labour, capital and management The economic resources come into agricultural production in different disaggregated forms to give a more specific set of resources for example, land of different types, different categories of capital expenditure and labour of different categories such as hired labour, family labour, skilled or casual or unskilled labour.

3.3   Economic Agricultural Resources

Land: Land is the most important resource in agricultural production. Its supply is relatively fixed except it can be expanded slightly by drainage of swamps, reclamation from sea bodies and water, and chemical or biological improvement of non-cultivable lands. Land (farm size) is measured in hectares but the local farmers sometimes, refer to the size of their farms in number of heaps.

Labour: Labour is the effort of human being that is used in making things happen in the production process. It is the second most important resource next to land in agricultural production. Labour availability is a function of the economically active proportion of the population released for agricultural activities. Farm labour on peasant farms could be from both family or hired sources depending on the size of the farm and type of operation to be performed, but in large commercial farms, farm labour is purely hired and categorized as casual, unskilled, semiskilled and skilled labour. The quality of labour in use is a function of the level of education and training in relevant agricultural production, that is, the higher the level of training in the cultivation and management of any crop the higher the productivity and efficiency.

Labour is measured in terms of the adult male equivalents, where one man day is the work done by one adult male in eight hours, and one woman is equivalence of 2/3 of a man-day while a juvenile is 1/2 of a man-day.

Capital: Capital resources come into farm production in three forms, namely,

- Farm machinery, such as, tractors and various farm tools
- Biological capital such as fertilizers, pesticides, herbicides, improved seeds and breeding stock
- Feed for Livestock.

Also, capital can be categorized on the basis of their cost structure, that is,

- Depreciation cost on building which are for farm improvement.
- Maintenance and running costs on machinery and equipment, livestock & feed expenses, feed and fertilizer purchases.
- Depreciation cost on machinery.

Management: Management or entrepreneur or co-ordination is the most important factor of production. In this input resides the decision making power in farm business. It is concerned with efficient mixing of resources in the production process. An efficient resources planning and utilization ensures attainment of the objective of the production function. Management is therefore concerned with planning, implementation and control of the farm business.

4.0   CONCLUSION

Production is creation of output from resources fed into the production process. Economic agricultural resources are land, labour, capital, water and entrepreneur.

5.0   SUMMARY

In this unit we have learnt that:

- Production involves transforming inputs into outputs.
- Agricultural resources are of two types; free and economic.
- Economic agricultural resources include land, labour, capital, water, and entrepreneur.

6.0   TUTOR-MARKED ASSIGNMENT

Why is labour and entrepreneur the most important resources in production?

7.0   REFERENCES/FURTHER READINGS

Adegeye A.J and Dittoh J.S (1985): *Essentials of Agricultural Economics*. CARD   University of Ibadan.

Anderson, D. J. (1981) *Economics of West Africa.* Macmillan Publishers

Dillon J L and Hardaker J B (1993) Farm Management Research for Small Farmer Development FAO Rome.

Doll, J P and Orazen, P (1978) Production Economics Theory with Application. John Wiley and Sons Incorporated.

Hanson J.L (1966): *A Textbook of Economics*. Macdonald& Evans Ltd.

Olayide, S.O and Heady E.O (1982): *Introduction to Agricultural Production Economics.* University Press, Ibadan.

UNIT 2   THEORY OF PRODUCTION FUNCTION

CONTENTS

1.0   INTRODUCTION

In this unit the theory of production will be discussed in an applied sense by concentrating on the concept of the production function, how the production function can be estimated and the important economic parameters that can be used for further economic analysis.

2.0   OBJECTIVES

At the end of this unit the student is expected to know the:

- meaning and uses of the concept of production function
- various forms of equations that could be employed in estimating the parameters of the production function
- derivation of the essential parameters of the production function that could be used for further economic analysis.

3.0   MAIN CONTENT

3.1   Definition of Production Function

Production function is a physical or technical relationship between inputs and output in any given production processes. It describes the rate at which inputs are transformed into outputs. It defines the production

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possibilities open to the farmers. In an implicit form, the production function is defined as:

$Y = f(x)$.
It states that output Y is a function of input X.
Where Y = output of product, X = input used, f() = functional form.

3.2 Types of Production Function

Production functions are classified into two based on time period. They are short run and long run production functions.

(a) Short run production function:

In the short run production function, at least one of the inputs used can be varied with the others fixed.
The implicit functional form is defined as:
$Y = f(X_1, X_2/ X_3, X_4… X_n)$.
Or
$Y = f(X_1, X_2)$.
It implies that output (Y) is a function of variable inputs X_1 and X_2 given fixed values of inputs X_3 to X_n.

(b) Long run production function:

In the long run production function, all the inputs can be varied.
It is implicitly expressed as;
$Y= f(X_1, X_2, X_3… X_n)$.

3.3 Agricultural Production Function

There are two forms of agricultural production functions: biological and farm functions.

(a) **Biological functions:** They are derived from experiments in crops and livestock. The experiments may be conducted in plants, group of animals, or using area of land as basis for experimentation. Biological functions guide farmers in their decisions, such as, optimal plant size, quantity of fertilizers to use per hectare. The data used in biological functions are of importance for purposes of policy and as an instrument for planning economic development.

(b) **Farm functions:** They are used on farm survey of existing farms. Data are collected from secondary and primary sources. Because we do not keep good records, the better option is to draw up

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questionnaires on information on average input and output quantities, inputs and output prices, all within a given season or time period. From this information, we fix the production function and estimate using appropriate procedures and methods of analysis.

3.4 Uses of Agricultural Production Function

- They serve diagnostics purposes to diagnose input and output relationship within sampled farms.
- They tell us the level of optimum use of inputs.
- Determination of the scale of production.
- They are useful in determination of enterprise combination.
- They guide farmers in decision making.

3.5 Algebraic Forms of the Production Function

The algebraic forms of the production function are the explicit representations of the production function. The type of algebraic forms used depends on three considerations namely;

(i) The functional form used must adequately represent the production process it is meant to represent, that is, the estimated function fits the data on which it is based. How well it fits our *apriori* expectation about the physical and economic logic of the production process under study.

(ii) The algebraic form should be easily estimated by econometric and statistical procedures.

(iii) It should be easily manipulated in terms of economic analysis..

3.6 Types of Functional Forms

The common algebraic forms of production function are the linear, quadratic, semi log, exponential, power or Cobb Douglas and transcendental functions.

(a) Linear function

For the one variable production function the linear function is expressed thus:

$Y = a + bX$.
Where Y = output, X = variable input, a = constant term, b = slope of the line or coefficient of production parameter

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For two variables case:

$Y = a + b_1X_1 = b_2X_2.$

The linear function is very simple, easy to work with and mainly taught for academic exercise since most agricultural production functions are not adequately represented in the linear functional form.

(b)   Quadratic function

The function is defined for a single variable case as;
$Y = a + b_1X_1 + b_2X_1^2$
Where Y, X_1, a, b_1 and b_2 are as previously defined.
For two variable inputs, the function is;
$Y = a + b_1X_1 + b_2X_2 + b_3X_1^2 + b_4X_2^2 + b_5X_1X_2.$
The quadratic function becomes cumbersome and messy to use when there are more than three variable inputs.

(c)   Semi log function

The semi log function for a single variable input is defined thus:
$Y = a + b_1\log X_1$
For two variable inputs case;
$Y = a + b_1\log X_1 = b_2\log X_2.$

(d)   Exponential function

For a single variable input it is defined as;
$Y = ae^{b1x1}.$
When linearised in the log form it becomes;
$\text{Log } Y = \log a + b_1X_1$
For two variable inputs case:
$Y = ae^{b1X1 + b2X2}.$
And when linearised in the log form it becomes;
$\text{Log } Y = \log a + b_1X_1 + b_2X_2.$

(e)   Power function (Cobb Douglas)

The power function for a single variable input is defined as:
$Y = aX_1^{b1}.$
For two variable inputs case, it is;
$Y = a X_1^{b1} X_2^{b2}.$

When the input and output quantities are transformed into logarithms, the resultant function is linear in the log and the function becomes a double log function.

Log Y = log a + $b_1$logX$_1$ + $b_2$logX$_2$.

3.6.1 Properties of the Power Function

- The power function is multiplicative: $Y = aX_1^{b_1}X_2^{b_2}$.
- None of the X$_1$ and the estimated coefficients can be Zero since this implies zero output.
- It does not have a maximum, it increases indefinitely.
- When linearised in the log, the function is easy to fit.
- The coefficients of the double log function are direct elasticities of production for the variable inputs.

3.7   Production Function Parameters of Interest

The following productivity measurements are derivable from the analysis of the production function. They include:

(a)   Average Product

The average product (AP) measures the average rate at which an input is transformed into a product. It is a measure of technical efficiency of the variable inputs used in the production process. The AP is the total product (TP) divided by the input quantity (X).
If Y = f(X).
AP = Y / X = f(X) / X

(b)   Marginal Product

The marginal product (MP) measures the amount that total output increases as input increases. It is the change in output resulting from a unit change in the variable input. The MP is the slope of the production function curve. The MP could be average MP if tabulated data are used or exact MP when it is derived from the production function as the first derivatives of the production function. Mathematically it is derived thus:
If Y = f(X)
MP = dY / dX = f(X).

(c)   Elasticity of Production

Elasticity of production (Ep) is the proportionate change in output caused by a proportionate change in the variable input.

Ep = percent change in output / percent change in variable input.
     = Ep = $\underline{\Delta Y}$. $\underline{X}$ …………………. arc elasticity of production.
               ΔX Y
Or

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Ep = $\underline{dY}$. $\underline{X}$ ………… point elasticity.
         dX   Y

 Ep = marginal product / average product.
Where dY / dX = MP and X / Y = inverse of AP.

(d)   Values of Elasticity of Production

- The values of the Ep are between minus infinity and infinity, that is, $-\infty < Ep < \infty$
- When MP > AP , Ep > 1
- When MP < AP, Ep < 1
- When MP = AP, Ep = 1
- When MP = 0, AP > 0, Ep = 0
- When MP < 0, Ep < 0.

(e)   Returns to Scale

The return to scale (RTS) is the summation of the elasticities of production of variable inputs involved in the production function, that is, RTS = $\sum Ep_i$

It is used to determine the stage the overall production process is in the production surface. There are three stages in the production function, namely;

(i)   When RTS > 1, it implies production is in stage 1, the stage of increasing returns to scale. Production at this stage should be intensified by increased use of variable resources with positive Ep.

(ii)   When 0 < RTS < 1, it implies production is in stage 11. The stage of economic efficiency or positive decreasing returns to scale. This is the stage where every producer thrives to be to maximize profit, output and minimize cost.

(iii)   When RTS < 0, it implies production is in stage 111. This is the stage of negative decreasing returns to scale or stage of economic inefficiency. This is the stage where there should be no production because with each additional use of variable input, over all total production decreases.

3.8   Types of Marginal Returns

Marginal return is the rate at which output is increased by each additional increase in input possibilities. There are three types of possibilities between input and output in the production function curve, they are: constant, increasing and decreasing marginal returns.

(a)   Constant Marginal Returns (CRM)

The constant marginal returns states that each additional unit in input results in a constant rate of increase in output. The change in output is constant throughout. The slope of the curve is equal throughout the length of the straight line curve.

Figure 11 shows the output of fresh fruit bunches (FFB) of oil palm produced from farm sizes in hectares. The table and figure show that for each additional increase in farm size, the FFB produced increased by metric tonnes.

Table 5   Constant Marginal Returns

Farm size	Output of oil palm	Change in farm size	Change in FFB (mt)
1	6.5	1	6.5
2	13	1	6.5
3	19.5	1	6.5
4	26	1	6.5
5	32.5	1	6.5.

Output (tonnes)

        0   Farm size(ha)
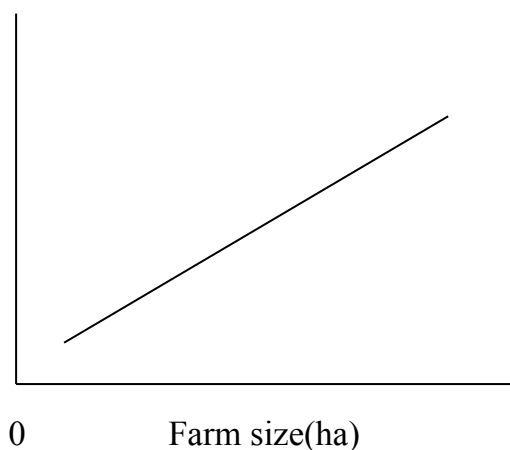
Figure 11: Constant Marginal Returns.

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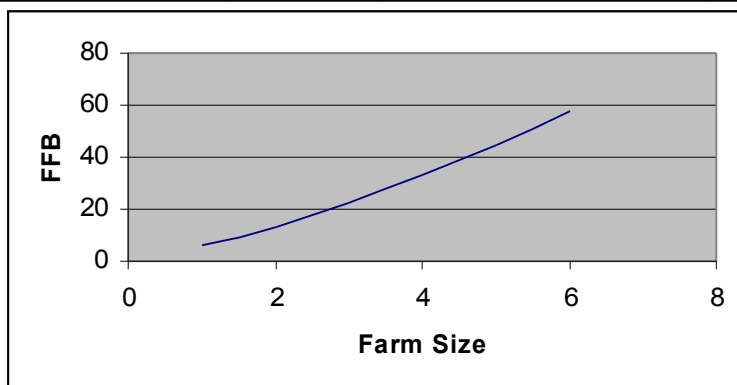**(b)   Increasing Marginal Returns (IMR).**

In the increasing marginal returns, each additional increase in the inputs leads to more than increase in output than the preceding increase in output. The change in output increases at an increasing rate. The slope of the curve becomes steeper as more inputs are added.

Table 6 and Figure 12 show the output of FFB of oil palm produced from the farm size in hectares from an oil palm plantation. The change in output of FFB with each additional increase in farm size is greater than the preceding change in output of FFB.

Table 6: Increasing Marginal Returns

Farm size (ha)	FFB mt	Change in farm size	Change in FFB.
1	6.5	1	
2	13	1	6.5
3	22	1	9
4	33	1	11
5	45	1	12
6	58	1	13

Figure 12: Increasing Marginal Returns

(c)   Decreasing (Diminishing) Marginal Returns

In the decreasing marginal returns, each additional increase in the inputs leads to smaller increase in output than the preceding increase in output. The slope of the curve becomes smaller as more inputs are added. The change in output increases at a decreasing rate until it becomes zero and even negative. Decreasing marginal returns is common in most agricultural production. Table 7 shows that the change in output of FFB due to unit change in farm size becomes smaller than the preceding change in output of FFB.

Table 7: Decreasing Marginal Returns

Farm size	Output of FFB	Change in farm size	Change in FFB
5	45	1	
6	58	1	13
7	63	1	5
8	68	1	5
9	72	1	4
10	70	1	-2
11	65	1	-5
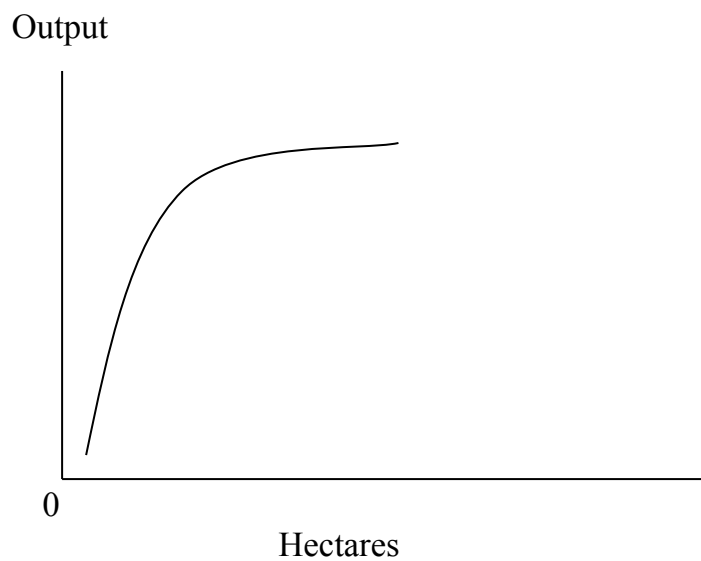
Output

Hectares
Figure 13: Decreasing Marginal Returns

4.0   CONCLUSION

The production function is a technical relationship between inputs and output. It is expressed mathematically with a number of algebraic equations that are estimated using econometric principles and the parameter estimates got are used for further economic analysis.

5.0   SUMMARY

In this unit the student has learnt that:

- The production function is a technical relationship between inputs and output
- Production functions are classified into two based on time period, namely; short run and long run production functions.

- The common algebraic forms of production function are the linear, quadratic, semi log, exponential, power or Cobb Douglas and transcendental functions.
- Production function parameters of interest are, average product, marginal product, elasticity of production, returns to scale and marginal returns.

6.0   TUTOR MARKED ASSIGNMENT

1)   What is the difference between production and production function?
2)   Why is the power function preferred over other functional forms of the algebraic representation of the production function?

7.0   REFERENCES/FURTHER READINGS

Adegeye A.J and Dittoh J.S (1985): *Essentials of Agricultural Economics*.   CARD University of Ibadan.

Anderson, D. J. (1981) *Economics of West Africa.* Macmillan Publishers

Dillon J L and Hardaker J B (1993) Farm Management Research for Small Farmer   Development FAO Rome.

Doll, J P and Orazen, P (1978) Production Economics Theory with Application. John Wiley and Sons Incorporated.

Hanson J.L (1966): *A Textbook of Economics*. Macdonald& Evans Ltd.

Olayide, S.O and Heady E.O (1982): *Introduction to Agricultural Production   Economics.* University Press, Ibadan.

UNIT 3   PRODUCTION RELATIONSHIPS: FACTOR – PRODUCT RELATIONSHIP

CONTENTS

1.0   Introduction
2.0   Objectives
3.0   Main Content
   3.1   Meaning of Production Relationship
   3.2   Factor Product Relationship
   3.3   Stages of the production function curve
   3.4   Mathematical Interpretation of the Three Stages of Production
   3.5   Optimal Input Combination
4.0   Conclusion
5.0   Summary
6.0   Tutor-Marked Assignment
7.0   References/Further Readings

1.0   INTRODUCTION

This unit explains the simplest basic theoretical framework under the title of production relationships. It is basically used for teaching purposes as there is no agricultural product that is produced with only one input.

2.0   OBJECTIVES

At the end of this unit the student is expected to have learnt the:

*   meaning of factor-product relationship
*   basic characteristics of the three stages of the production function
*   necessary and sufficient conditions for optimal input combination.

3.0   MAIN CONTENT

3.1   Meaning of Production Relationship

Production relationship describes the form of association between inputs involved in production and the product produced. The relationship specifies a production unit which makes use of input mix in obtaining a given output.

There are three major types of production relationships between inputs and output, namely;

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- Factor-product relationship
- Factor-factor relationship
- Product-product relationship

3.2   Factor Product Relationship

It describes the transformation of a given input into a product. There is only one product such as cassava. We are interested in the effect of variation of only one input such as labour or fertilizer while other inputs are fixed. Many farm decisions are mostly analysed using this production relationship, especially when the problem is to determine the intensity with which the given variable input shall be combined with fixed quantities of other essential inputs to achieve the stated objectives. The factor product relationship is not true to life because production always involves more than one variable input in the short run an all inputs are variable in the long run. It is only used for diagnostic purpose where one basic input is the limiting input e.g. labour or capital in developing economy.

The production function under the factor product relationship is of the implicit form; $Y = f(X_1 / X_2 \ldots X_n)$, or $Y = f(X_1)$
Where Y = output in specified unit, X_1 = variable input, $X_2 - X_n$ are fixed quantities of other inputs.

The total product (TP) = Y.
$Y = f(X_1)$.
The average product (AP)
$AP = Y/X_1$
  $= f(X_1)/X_1$
The marginal product (MP).
$MP = dY/dX_1$
  $= f^1(X_1)$.

3.3   The Generalized Production Functions under Factor-Product Relationship

The total product (TP), average product (AP) and marginal product (MP) are presented in Table 8 and figure 14.

The analysis of the production function curve with the knowledge of the important production function parameters are used as a frame of reference to undertake a quantitative interpretation of the three stages of the production surface.

Stage 1   Stage 11   Stage 111

TP

AP

MP

Increasing returns Decreasing (+)
Decreasing (-) returns
returns

X₁

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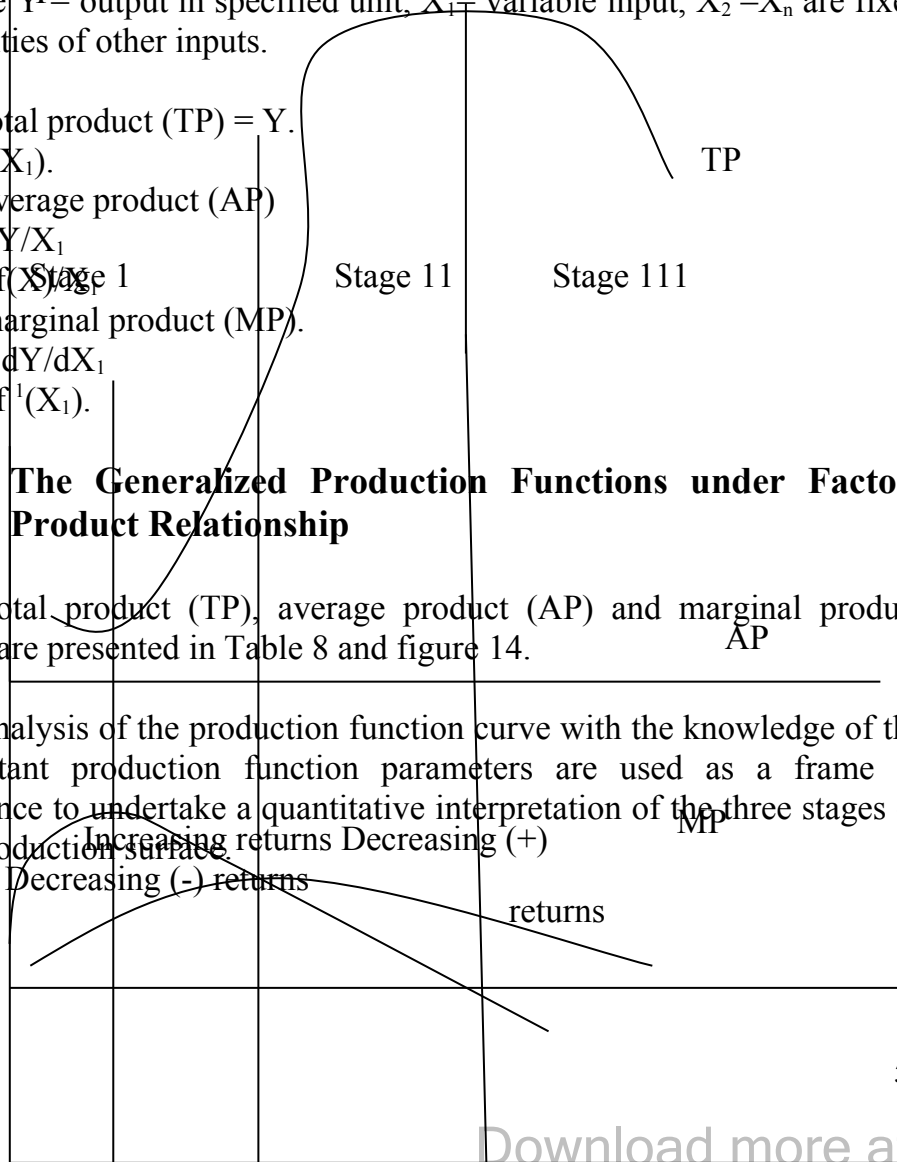
Figure 14: Total, Average and Marginal Products curves.

3.4   Stages of the Production Function Curve

There are three stages of the production function.

(a)   Stage I

- It is a stage where the marginal product, MP, is greater than the average product, AP.
- Both MP and AP are increasing.
- MP is maximum at point of inflexion where the first derivative of the production function, dY/dX_1, is zero and the second level derivation, d^2Y/dX^2_1 is also zero.
- MP equals AP at the boundary of stages 1 and 11 where the elasticity of production equals unity.
- Elasticity of production is greater than or equal to unity.
- It is a stage of increasing marginal returns.
- It is an irrational zone of production

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- The economic decision is that if the product being produced has any valve at all. Input use and output production input use once started should be continued until stage 11 is reached.

(b)   Stage II

i.   It is a stage where the MP is less than AP.
ii.   AP is still increasing.
iii.   MP is decreasing but positive.
iv.   MP is zero at the boundary of stages 2 or 3.
v.   It is a stage of economic relevance in production where total product increasing at a decreasing rate.
vi.   it is a stage of decreasing positive marginal returns and decreasing returns to scale.
vii.   the elasticity of production is between zero and the unity.
viii.   it is a stage of rational production where output and profit are maximized and input use is optimized.

(c)   Stage III

In this stage;

i.   AP is greater than MP.
ii.   AP is positive and greater than zero.
iii.   MP is less than zero and negative.
iv.   Both MP and AP are falling.
v.   Production is not advisable in this stage because increase in input use leads to reduction in total product.
vi.   Elasticity of production is less than zero that is, it is negative.

3.5   Mathematical Interpretation of the Three Stages of Production

(a)   At maximum Total product (TP)

The slope of TP is zero.
If $Y = f(X)$.
$MP = dY/dX = f^1(X)$
TP is maximum when MP = 0. We can then solve for the value of X when MP = 0 by equating MPP to zero.
The value of X when MP = 0 is the boundary of stages 2 and 3.
(b)   At maximum Average Product, (AP).

The slope of AP = 0
$Y = f(X)$
$AP = Y/X$

Also at maximum AP, MP equals AP, that is when AP is maximum.
MP = AP.
That is, $dY/dX = Y/X$.

3.6   Optimal Input Combination

Economic efficiency in factor product relationship is attained when the necessary and sufficient conditions are met. This implies integrating the physical concept (necessary condition) with the economic principles (sufficient condition).

The necessary condition for optimum production is when the marginal product is equal to zero. That is, Total Product is maximum when MP = 0.

For the sufficient condition the profit maximizing combination of inputs is given by equating the marginal product of each input with the price ratios of the variable input and product, that is, MP = Px / Py.

Where,

MP = marginal product of variable input X
Px = unit price of X
Py = unit price of product Y

A further analysis of the above condition gives more conditions for reaching optimum or maximum profit, that is, profit is maximized when,
MP = Px / Py
Or
Py(MP) = Px.

That is when the value of marginal product MVP, (PyMP) equals the unit price of the input.

4.0   CONCLUSION

The factor-product relationship analysis is basically used to quantitatively interprete and analyse the three stages of the production function.

5.0   SUMMARY

In this unit we have learnt that:

- Only one input is varied under the factor-product relationship
- Stage 11 of the production function is the only economically relevant stage of the production function
- Stages 1 and 11 of the production function are uneconomical to produce
- Optimal input combination takes place under the factor-product relationship when the marginal product equals the ratio of the input price and output price

6.0   TUTOR-MARKED ASSIGNMENT

Consider the production function of the form:

$$Y = 10 + 5X - 0.2X^2$$

Where, Y = Output(kg) / ha and X = Input(kg) / ha

a) Derive the MP and AP functions
b) Determine the value of X at which

- Y is maximum
- AP = MP
- MP is maximum

7.0   REFERENCES/FURTHER READINGS

Adegeye A.J and Dittoh J.S (1985): *Essentials of Agricultural Economics*.   CARD University of Ibadan.

Anderson, D. J. (1981) *Economics of West Africa.* Macmillan Publishers

Dillon J L and Hardaker J B (1993) Farm Management Research for Small Farmer Development FAO Rome.

Doll, J P and Orazen, P (1978) Production Economics Theory with Application. John Wiley and Sons Incorporated.

Hanson J.L (1966): *A Textbook of Economics*. Macdonald& Evans Ltd.

Olayide, S.O and Heady E.O (1982): *Introduction to Agricultural Production   Economics.* University Press, Ibadan.

UNIT 4   PRODUCTION RELATIONSHIPS: FACTOR-FACTOR RELATIONSHIP

CONTENTS

1.0   INTRODUCTION

This unit explains the theory of the factor-factor relationship under the title of production relationships.

2.0   OBJECTIVES

At the end of this unit the student is expected to have learnt the

- meaning of factor-factor relationship
- basic parameters of importance of the factor-factor relationship
- important parameters for the analysis of the three stages of the production function under the relationship
- necessary and sufficient conditions for optimal inputs combination and profit maximization.

3.0   MAIN CONTENT

3.1   Meaning of Factor-Factor Relationship

This is a situation whereby two variable inputs are used in the production of one product. Each combination of the inputs produces a unique amount of output. In this relationship, changes in the product (Y) are due to possibilities of substituting one input for the other input, that is, substituting X_1 for X_2 or X_2 for X_1 as Y is held constant at a particular level.

Implicitly, a factor – factor production function is defined as:
$$Y = f(X_1, X_2 / X_3 \ldots X_n),$$
Or
$$Y = f(X_1, X_2)$$
Where Y is the output, X_1 and X_2 are the variable inputs with inputs X_3 to X_n fixed.

In factor – factor relationship, a given level of output can be produced with different combinations of inputs. Table 9 presents the outputs resulting from various combinations of X_1 and X_2 given a quadratic production function of the form;

$$Y = 7X_1 - X_1^2 + 9X_2 - X_2^2 \text{ and } X_1 = 0, 1 \ldots 6, \text{ while } X_2 = 0, 1, \ldots 6.$$

Table 9 Outputs Resulting From Various Combinations of X_1 and X_2

$X_1 \setminus X_2$	0	1	2	3	4	5	6
0	0	8	14	18	20	20	18
1	6	14	20	24	26	26	24
2	10	18	24	28	30	30	28
3	12	20	26	30	32	32	30
4	12	20	26	30	32	32	30
5	10	18	24	28	32	30	28
6	6	14	20	24	26	26	24

In factor – factor relationship, a given level of output can be produced with different combinations of inputs. For example,

(a)   Given Y = 20 units

The various combinations of X_1 and X_2 that will produce some specified units of Y are as presented in tables 10 to 11.

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Table 10: Combinations of X_1 and X_2 for Y = 20 units.

X_1	3	4	6	0	0
X_2	1	1	2	4	5

Table 11 Combinations of X_1 and X_2 for Y = 32 units.

X_1	3	4	2	2	5	3	4
X_2	3	3	4	5	5	6	6

## 3.2   Important Economic Parameters of Factor-Factor Relationship

3.2.1 Isoquant

This is the curve of all combinations of X_1 and X_2 which yield specified output levels. It is also called iso-product or equal product curves. A movement on each isoquant implies the same output level but with different combinations of X_1 and X_2.

In Table 11 the inputs combination for point B on the isoquant is (X_1, X_2) = (3, 3) but for point C the inputs combination is (X_1, X_2) = (2, 4). But in each case the output level is Y = 32 units.

Properties of Isoquants:

i.   Two isoquants will never cross because each combination of inputs can only produce one and only one amount of output, (see figure 15)
ii.   Isoquants are either convex to the origin or slopes from left to right.
iii.   A convex isoquant implies diminishing marginal production and production is in stage 11 or stage of rational production or efficient stage of production.
iv.   Isoquant has negative slope.

Figure 15   Two Isoquants

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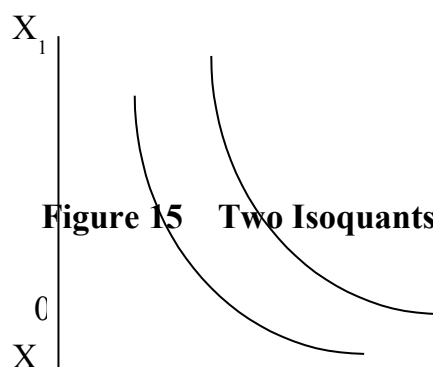
3.2.2 Marginal Rate of Input Substitution (MRIS)

MRIS is the rate at which inputs substitute for each other to maintain a constant output. It is obtained from a total differentiation of the production function:

$Y = f(X_1, X_2)$

$dY = f_1 dX_1 + f_2 dX_2 = 0$.

$f_1 dX_1 = - f_2 dX_2$

$f_1/ f_2 = - dX_2/dX_1 = MRIS(x_1 \text{ for } x_2)$.

Where, f_1 and f_2 are the partial derivatives of Y with respect to X_1 and X_2 respectively. The f_1 and f_2 are also the marginal products with respect to X_1 and X_2 respectively.

(i)   MRIS is the negative of the ratio of two marginal products. That is, $MRIS = - f_1/f_2$.
(ii)   It is the slope of the isoquant.
(iii)   It is negative because the isoquant slopes downward from left to right.

3.2.3 Types of Marginal Rate of Input Substitution

(a)   Constant MRIS

 In constant marginal rate of input substitution, one unit of one input of X_1 substitutes for one unit of the other input X_2 at each output level.
The isoquant is a straight line and the interior angle with the input axes is 45.

Inputs that substitute at constant rates are called perfect substitutes or competitive since one can be used to replace the other. This is true to a point in agriculture after which they become complementary to each other, for example, labour and capital, seeds and fertilizer.
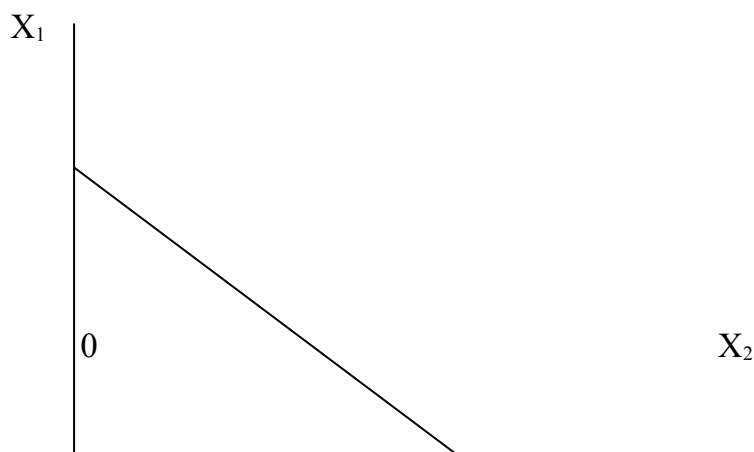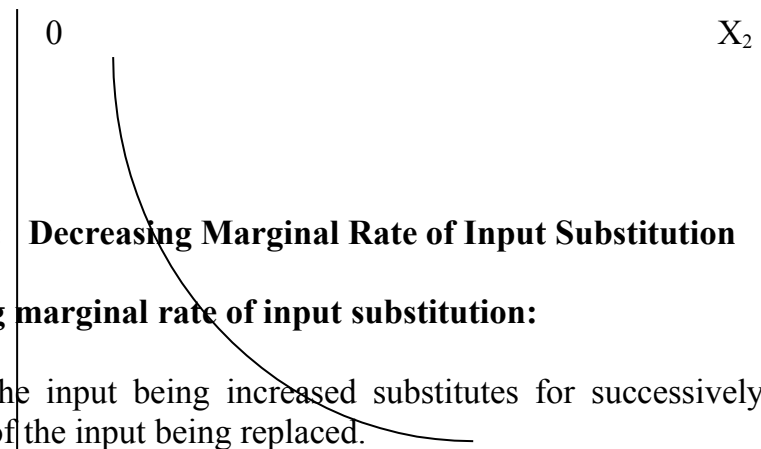

Figure 16: Constant Marginal Rate of Input Substitution Curve

(b)　Decreasing marginal rate of input substitution:

It occurs when the input being increased substitutes for successively smaller quantities of the input being replaced. That is,

$MRIS_{(X_1 - X_2)}$ decreases as X_1 is increased along an isoquant.

DMRIS is caused by the law of diminishing returns.

When diminishing returns are present, marginal product (MP_{x_1}) with respect to input X_1 decreases as input X_1 increases. That is, $MP_{X_1} \downarrow$ as X_1 $\uparrow$ and $MP_{X_2} \uparrow$ as $X_2 \downarrow$.

Thus the ratio decreases numerically, that is, MP_{X_1}/MP_{X_2} decreases.

Cases of decreasing MRS are common with farm inputs.

X_1

0　　　　　　　　　　　　　　　　　　　　　　　　　　　　X_2

Figure 17:　Decreasing Marginal Rate of Input Substitution

(c)　Increasing marginal rate of input substitution:

It occurs when the input being increased substitutes for successively larger quantities of the input being replaced.

The $MRIS_{X_1 \rightarrow X_2}$ increases as X_1 is increased along the isoquant.

Cases of IMRS are common with farm inputs.

X_1

0　　　　　　　　　　X_2
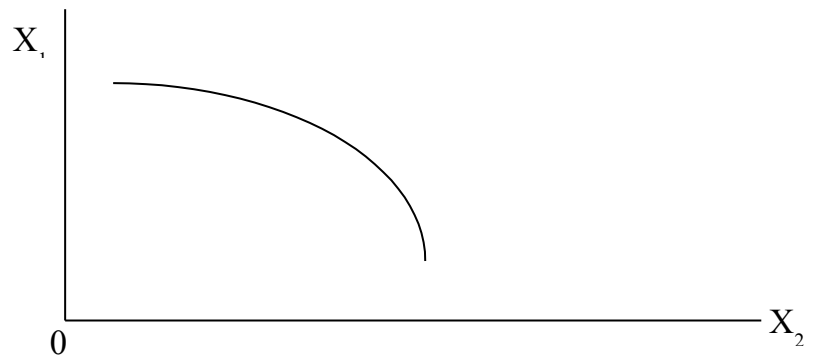
Figure 18:　Increasing Marginal Rate of Input Substitution

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Types of Inputs

Based on the knowledge of marginal rate of input substitution, inputs are classified as substitutes and complementary inputs.

(i)   Substitutes: Inputs are technical substitutes when an increase in one input causes a decrease in the other input at a constant output level. Technical substitutes also inputs compete with each other.

(ii)   Complementary inputs: These are inputs that increase output when they are combined in fixed proportions or otherwise no output production. Complementary inputs are common in agriculture, e.g., tractors and drivers, tractors and tyres and so on.

X_1

0

X_2
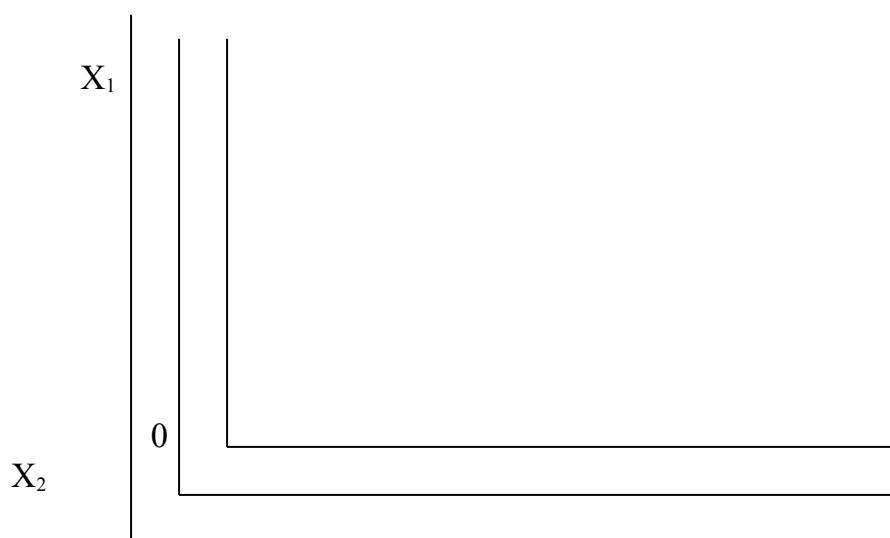
Figure 19:   Complementary Inputs Curve

3.3   Three Stages of Production Function under Factor-Factor Relationship

The three stages of the production function under the factor – factor relationship are determined with a good knowledge of the following three basic terms; isocline, ridgeline and expansion path.

Isocline

It is a line which connects points of equal slope on a production surface. That is, it passes through points of equal MRIS on an isoquant map. On the isocline for each input MRIS = k.

Ridgeline

This is a line which connects points of zero slopes on successively higher isoquants. They connect points which mark the limit of the efficiency of input use. They are boundaries for the stages of the production function in the factor-factor production relationship. On the ridgeline for each input, MP = 0 and MRIS = 0.

Expansion path

This is the line joining points of least cost combination of inputs on the production surface. These are points where isocost lines are tangent to the isoquants. On the expansion path for each input, the marginal rate of input substitution of input X_1 for X_2 equals the ratio of the input prices, that is, $MRIS_{X1 \to X2} = P_{x1} / P_{x2}$.

Where, Px_1 and Px_2 are unit prices of inputs X_1 and X_2 respectively.

3.4   Optimal Inputs Combination and Profit Maximization under Factor – Factor Relationship

Economic efficiency in factor – factor relationship is attained when the physical concept (necessary condition) is integrated with the economic principles (sufficient condition).
The necessary condition is met when the marginal rate of input substitution is zero, that is, MRIS = 0.
The sufficient condition is met by employing the least cost criterion.

3.4.1 Least cost criterion

The least cost criterion is met by equating the MRIS with the negative of the price ratio of inputs, that is, the least cost combination is when;
$MRIS = - Px_1 / Px_2$

That is, using the concept of the MRIS and the isocost line or
$MRIS_{X1 \to X2} = -\Delta X_2 / \Delta X_1 = - dX_2 / dX_1 = - Px_1 / Px_2$

Graphically, the least cost combination of inputs occurs at the point where the isocost line is tangent to the isoquant given that the isoquant is convex to the origin.
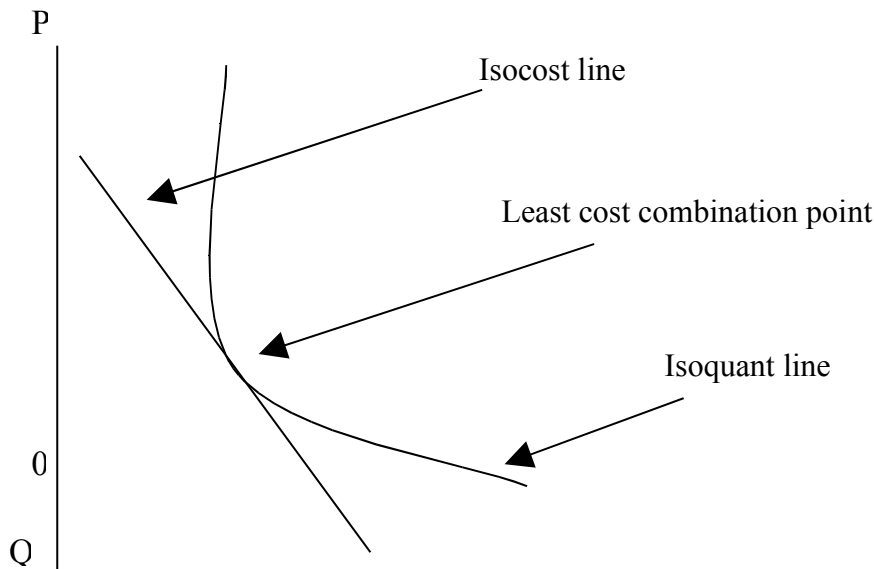
Figure 20: Least-cost combination Point

Isocost Line

The isocost line is the curve of all combinations of two inputs that cost the same amount, that is,

$TVC = f(X_1, X_2)$
$\qquad = P_{x1}X_1 + P_{x2}X_2$
$P_{x2}X_2 = TVC - P_{x1}X_1$
$X_2 = TVC/P_{x2} - P_{x1}/P_{x2} X_1$
$dX_2/dX_1 = - P_{x1}/P_{x2}$.
Where TVC = total variable cost of inputs X_1 and X_2
P_{x1} = unit price of input X_1
P_{x2} = unit price of input X_2
X_1 = quantity of input X_1
X_2 = quantity of inputs X_2

3.5   Profit maximization -A Mathematical Example

Assume a Cobb – Douglas production function of the form;
$Y = 1/2 \ X_1^{1/2}X_2^{2/5}$ and prices $P_{x1} = ₦5$, $P_{x2} = ₦ 4$ and $P_y = ₦ 40$.

(a) Find the least cost combination of inputs at which profit is maximized.
(b) Compute the output level at optimal inputs combination.

Solution:
$Y = 1/2X_1^{1/2}X_2^{2/5}$
(i) Necessary condition: find MP and MRIS.
The marginal products are:

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$MP_1 = \partial Y / \partial X_1 = (1/4X_1^{1/2}X_2^{2/5}) / X_1$
$MP_2 = \partial Y / \partial X_2 = (1/5X_1^{1/2}X_2^{2/5}) / X_2$
$MRIS_{x2 \to x1} = -dX_1 / dX_2 = - MP_2 / MP_1$
$MRIS_{X2 \to X1} = -\{(1/5X_1^{1/2}X_2^{2/5}) / X_2\} / \{(1/4X_2^{1/2}X_2^{2/5}) / X_1\}$
$\qquad\qquad = - [1/5Y/X_2 / 1/4 \ Y/X_1] = - 4X_1/5X_2$

(ii)   Sufficient condition: equate the MRIS with expansion path, that is, equate MRIS with price ratio of inputs, that is,

$MRIS = - Px_2/Px_1$
$- 4X_1/5X_2 = - 4/5$
 $20X_2 = 20X_1$
 $X_2 = X_1$.

 Substitute the value of $X_2 = X_1$ into the production function.
$Y = 1/2X_1^{1/2}X_2^{2/5}$
$Y = 1/2X_1^{1/2}X_1^{2/5}$
$Y = 1/2X_1^{9/10}$

(i)   The values of X_1 and X_2 given a specified valve of Y can be got by solving the above equation and then substitute for X_2.
(ii)   To determine the level of output at which profit is maximized, the first step is to examine the profit function ($\prod$) of the form;

$\pi = TR – (TVC+TFC)$
 Where π = profit.
 TR = total value of output.
 TVC = total variable cost (cost of variable inputs).
 TFC = total fixed cost (cost of fixed inputs).

It follows that;

$\pi = TR – (TVC + TFC) = P_yY – (P_{x1}X_1 + P_{x2}X_1 +b)$
$\quad = P_yY – P_{x1}X_1 – P_{x2}X_2 – b$
$\quad\quad =40Y – 5X_1 – 4X_2 – b$
$\quad\quad = 40(1/2X_1^{9/10}) – 9X_1 – b)$
Note that, $X_1 = X_2$).

At maximum profit, change in profit, $d\pi = 0$.

$\pi = 20X_1^{9/10} – 9X_1 – b$
$d\pi / dX_1 = [\{20(9/10)X_1^{9/10}\} / X_1] – 9 = 0$.
$=18X_1^{-1/10} – 9 = 0$.
$X_1^{-1/10} = 9/18$.
$X_1^{-1/10} = 9/18$.

(a) $X_1 = (1/2)^{-10}$
        $= 1024$ units.
        $X_2 = 1024$ units.

(b)   Y at optimum X_1 and X_2.
        $Y = 1/2 X_1^{9/10}$
        $= 1/2 (1024)^{9/10}$
         256 units.

4.0   CONCLUSION

In factor-factor production function relationship, the focus is on substitution of inputs to achieve a constant level of output. Also there is optimum combination of inputs when the marginal rate of input substitution equals the ratio of inputs prices

5.0   SUMMARY

In this unit the student has learnt that:

- Factor-factor relationship involves the use of two inputs to produce one output
- Factor-factor production function relationship involves the substitution of one input for another to achieve a constant level of output
- There is optimum combination of inputs when the marginal rate of input substitution equals the ratio of inputs prices

6.0   TUTOR-MARKED ASSIGNMENT

Write brief notes on

1)   Least cost combination of inputs in factor-factor production relationship
2)   Marginal rate of inputs substitution
3)   Substitutes and complementary inputs

7.0   REFERENCES/FURTHER READINGS

Adegeye A.J and Dittoh J.S (1985): *Essentials of Agricultural Economics*.   CARD University of Ibadan.

Anderson, D. J. (1981) *Economics of West Africa.* Macmillan Publishers
Dillon J L and Hardaker J B (1993) Farm Management Research for Small Farmer Development FAO Rome.

Doll, J P and Orazen, P (1978) Production Economics Theory with Application.   John Wiley and Sons Incorporated.

Hanson J.L (1966): *A Textbook of Economics*. Macdonald& Evans Ltd.

Olayide, S.O and Heady E.O (1982): *Introduction to Agricultural Production   Economics.* University Press, Ibadan.

UNIT 5   PRODUCTION RELATIONSHIPS: PRODUCT-PRODUCT RELATIONSHIP

CONTENTS

1.0   INTRODUCTION

This unit will explain the third in the series of production relationships, especially, the one dealing with the production of two different products with a given level of input. Here the emphasis is different quantities of the products to produce by substituting one for another while the input level is kept constant.

2.0   OBJECTIVES

At the end of this unit the student is expected to have learnt the:

- meaning of product-product production relationship and production possibility curve
- meaning and uses of the term marginal rate of product substitution
- various types of relationships among products
- necessary and sufficient conditions for optimal products combination and profit maximization.

3.0   MAIN CONTENT

3.1   Meaning of Product-Product Relationship

This is a production relationship involving the production of two different enterprises such as oil palm and rubber with only one variable input such as land or labour. It involves substitution between the two enterprises given the variable input. In other words, to produce more hectares of oil palm with a given hectares of land will imply the production of less hectares of rubber and vice versa. Product – product relationship determines the combination of enterprises that best meets management objectives given the resource limitation.

Implicitly, the production function is of the form;
$X = (Y_1, Y_2)$
Where X = variable input.
Y_1 = enterprise 1 (oil palm).
Y_2 = enterprises 2 (rubber).

3.2   Production Possibility Curve (PPC)

This is the curve of the combination of two enterprises that can be produced with a given set of input. It is to determine the most profitable combination of enterprises for a limited amount of input. The PPC is also called Iso-resource curve because each point on the curve represents combinations of outputs from equal amounts of input.

Table 12 presents two production function for Y_1 and Y_2 using the same limited input X.

Table 12: Production Possibility Schedule for Products Y_1 and Y_2.

X	Y_1	Y_2	ΔY_1	ΔY_2
0	0	0		
1	7	11	7	11
2	12	20	5	9
3	16	28	4	8
4	19	34	3	6
5	22	38	3	4
6	24	40	2	2
7	26	41	2	1
8	25	39	-1	-2
9	23	35	-2	-4
10	19	30	-4	-5

Assuming, that 6 units of X are available for the production of Y_1 and Y_2, Table 13 and figure 21 present the production possibilities schedules and curves for X = 6 units fort the production of Y_1 and Y_2.

Table 13: Production Possibilities Schedule for X 6 units.

X	Y_1	X	Y_2
0	0	6	40
1	7	5	38
2	12	4	34
3	16	3	28
4	19	2	20
5	22	1	11
6	24	0	0
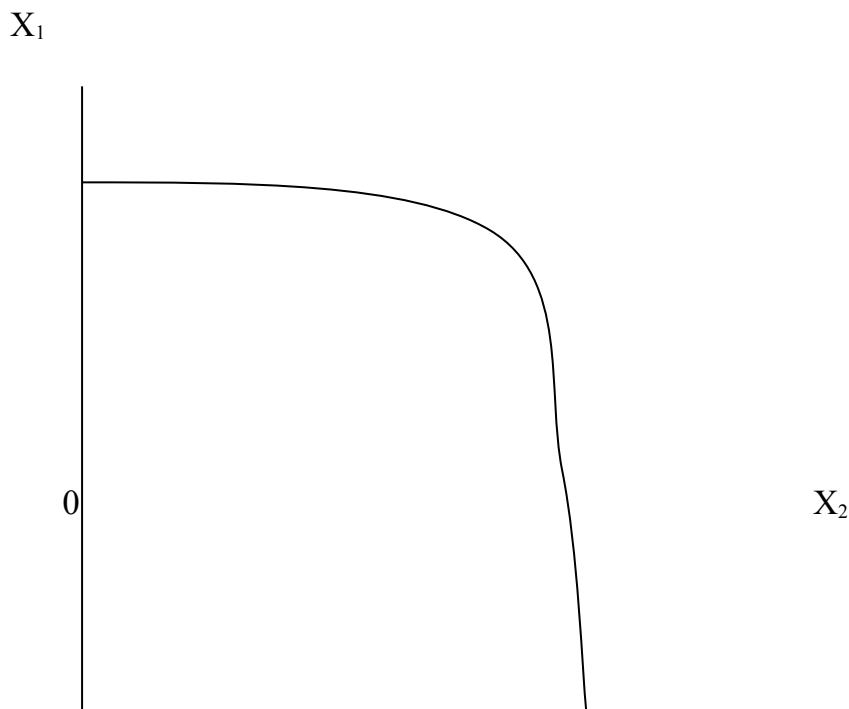
Figure 21: production possibilities curve for X = 6 units.

3.3   Marginal Rate of Product Substitution (MRPS)

This is the rate at which one product is substituted for the production of the other product, given a limited level of variable input use. It is obtained from a total differentiation of the product possibility function.
$X = h(Y_1, Y_2)$ which states that the cost of production in terms of X is a function of the two products Y_1 and Y_2.

The total differentiation of X with respect to Y_1 and Y_2 is
$dX = h_1 \, dY_1 + h_2 Y_2$.

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Since movement along any given transformation curve is zero that is dX = 0

we have;
$h_1 dY_1 + h_2 dY_2 = 0$
$h_1 dY_1 = - h_2 dY_2$
$h_1 / h_2 = -dY_2 / dY_1 = MRPS.$

Where, h_1 and h_2 are the marginal cost of Y_1 and Y_2 in terms of X. Therefore, MPRS equals the ratio of marginal cost of Y_1, (h_1) in terms of inputs X and marginal cost of Y_2, (h_2) in terms of input X or negative of ratio of change in Y_2, (dY_2 or ΔY_2) and change in Y_1, (dY_1 or ΔY_1) that is, MPRS = $-dY_2/dY_1$ or $\Delta Y_2/\Delta Y_1$.

- The MRPS is the slope of the product possibility curve.
- The MRPS is negative because the product possibility curve slopes downward from left to right.

3.4   Relationship among Products: Types of Products

An examination of the marginal rate of product substitution allows us to classify products into competitive, complementary, supplementary and joint products.

Competitive Products

For competitive products the MPRS is less than zero. This implies that output of one product can only be increased by reducing the output of the other product. Competitive products require the same set of inputs and one product can be expanded by diverting inputs to its production and thus reduce the quantity of inputs to other. Examples of competitive products are oil palm and rubber, oil palm and cocoa, cassava and yam, yam and cocoyam, maize and rice and so on.

Complementary Products

For the complementary products, the MPRS is greater than zero. This implies that increasing the production of one by diverting the use of more inputs to its production leads to increase in the production of the other product. This is very common in agriculture.

Examples of complementary products are;

Legumes and grass crops in crop rotation.
Beef cows and hog (pigs) produced together. The pigs feed on the wastes of the beef cows.

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Supplementary Products

In supplementary products the MPRS is zero. Two enterprises bear complementary relationship to each other when the output of one product can be increased without reduction or increase in the output of the other product. Supplementary products are common in agriculture. Examples; using family labour for gardening and poultry enterprise, production of up-land and swamp rice with labour and machinery. Swamp rice does not need machinery for production; therefore, using machinery for upland rice does not affect the production of swamp rice.

Joint Products

Joint products are always produced together in the same production period. Examples are palm oil and palm kernel. Beef and hides and so on.

3.5   Optimal Product Combination and Profit Maximization under Product-Product Relationship

Economic efficiency in product- product relationship is attained when the following necessary and sufficient conditions are met.

(a)   Necessary condition:
MPRS = 0.

(b)   Sufficient condition:
When the MPRS is equated with the negative ratio of the prices of products Y_1 and Y_2, that is,
$MPRS_{Y1 \rightarrow Y2} = -P_{y1} / P_{y2}$
where P_{y1} and P_{y2} are unit prices of products Y_1 and Y_2 respectively.

3.6   Profit Maximization - A Mathematical Example

Assuming the production of Y_1 and Y_2 with 6 units of inputs X to realize the following production possibilities (see Table 14).

Table 14: Production possibility of Y_1 and Y_2 with 6 units of inputs X

X	Y_1	X	Y_2
0	0	6	40
1	7	5	38
2	12	4	34
3	16	3	28
4	19	2	20
5	22	1	11
6	24	0	0

If the unit prices of Y_1 and Y_2 are Py_1 = ₦9 and Py_2 = ₦ 3 respectively, calculate;

(a)   The optimum combination of Y_1 and Y_2 that maximizes revenue.
(b)   The maximum revenue.

Solution:
For the type of problem, we first compute the changes in Y_1 and Y_2 to get the exact ratio of $\Delta Y_1/\Delta Y_2$.

Y_1	Y_2	ΔY_1	ΔY_2	$\Delta Y_1/\Delta Y_2$	$\Delta Y_2/\Delta Y_1$
0	40	-	-	-	-
7	38	7	-2	-7/2	-2/7
12	34	5	-4	-5/4	=4/5
16	28	4	-6	-4/6	-6/4
19	20	3	-8	-3/8	-8/3
22	11	3	-9	-3/9	-3
24	0	2	-11	-2/11	-11/2

(i)   Necessary condition:
         MRPS = 0

(ii)   Sufficient condition:
         $MPRS_{Y1 \rightarrow Y2}$ = - Py_1 / Py_2
         $\Delta Y_2/\Delta Y_1$ = - Py_1/Py_2
         $\Delta Y_2/\Delta Y_1$ = -9/3
           = -3.

(a)   Optimum combination of Y_1 and Y_2 that maximizes revenue is at
         where,
         $\Delta Y_2/\Delta Y_1$ = -3
         that is when, Y_1 = 22, Y_2= 11 units and X = units.
(b)   Maximum revenue.
         TR = Py_1Y_1 + Py_2Y_2
         = 9(22) + 3(11) = (198 + 33) = ₦231.

4.0   CONCLUSION

In product-product production function relationship, the focus is on substitution of one product for another product given a constant level of input. There is optimum combination of products when the marginal rate of product substitution equals the ratio of products prices

5.0   SUMMARY

In this unit the student has learnt that:

- Product-product production relationship involves the use of one input to produce two products.
- Product-product production function relationship involves the substitution of one product for another at a given level of input.
- There is optimum combination of products when the marginal rate of input substitution equals the ratio of products prices

6.0   TUTOR-MARKED ASSIGNMENT

Write brief notes on:

1)   Competitive products and Complementary products
2)   Supplementary products and Joint products
3)   Marginal rate of product substitution
4)   Product possibility curve

7.0   REFERENCES/FURTHER READINGS

Adegeye A.J and Dittoh J.S (1985): *Essentials of Agricultural Economics*. CARD University of Ibadan.

Anderson, D. J. (1981). *Economics of West Africa.* Macmillan Publishers

Dillon J L and Hardaker J B (1993) Farm Management Research for Small Farmer Development FAO Rome.

Doll, J P and Orazen, P (1978) Production Economics Theory with Application. John Wiley and Sons Incorporated.

Hanson J.L (1966): *A Textbook of Economics*. Macdonald& Evans Ltd.

Olayide, S.O and Heady E.O (1982): *Introduction to Agricultural Production Economics.* University Press, Ibadan.

MODULE 4   THEORY OF COST

Unit 1   Meaning and Structure of Costs
Unit 2   Measurement of Costs
Unit 3   Agricultural Cost Functions

UNIT 1   MEANING AND STRUCTURE OF COSTS

CONTENTS

1.0   Introduction
2.0   Objectives
3.0   Main Content
          3.1   Meaning of Cost
          3.2   Forms of Costs
          3.3   Structure of Farm Costs
4.0   Conclusion
5.0   Summary
6.0   Tutor-Marked Assignment
7.0   References/Further Readings

1.0   INTRODUCTION

This unit will discuss the concept of cost and its importance in farm business analysis.

2.0   OBJECTIVES

In this unit the student is expected to know the

- meaning and various forms of cost
- basic structure of farm costs.

3.0   MAIN CONTENT

3.1   Meaning of Cost

Costs from the perspective of the farm are the:

i.   Expenses incurred by the farmer on the operations of his farm business.
ii.   Values in monetary terms of the inputs used in production of the product of the farm.
iii.   Outlay of funds on goods and services used in organizing and carrying out the production process.

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3.2 Forms of Costs

There are three forms of costs. Accounting costs, opportunity costs, and private costs.

(a) Accounting Costs

These are the expenses incurred on inputs used in the production of specified units of a product. It could be the expenses on procuring labour, fertilizer, depreciation, land and so on to produce a specified unit of a product. The accounting costs are the explicit costs or direct costs of production.

Assuming inputs X_1, X_2, X_3 and fixed inputs X_4 to X_n are used to produce product Y and that the prices of the variable inputs are Px_1, Px_2, Px_3 and the cost of the fixed inputs is b. Therefore, the total cost, TC, of producing Y is given as;

$$TC = Px_1X_1 + Px_2X_2 + Px_3X_3 + b$$
Where TC is total cost of production, X_1, X_2, X_3 are variable inputs.
Px_1, Px_2, Px_3 are unit prices of X_1, X_2, X_3 respectively, and b is cost of fixed inputs.

(b) Opportunity Cost

Opportunity cost is the economic cost or real cost of producing a specified quantity of a product. If a farmer has ability to produce yam and cassava but the resources (inputs) available could only produce one of the products – say yam, it follows that the real cost or social cost or economic cost of the yam produced is the return from the alternative foregone (cassava). Therefore the opportunity cost of producing one unit of a commodity Y_1 is the amount of another alternative commodity Y_2 that must be sacrificed in order to use resources to produce Y_1 rather than Y_2.

(c) Private Costs of Production

Private costs of production are the implicit costs of producing a product. They are different from accounting costs which are used to compute the accounting profit (difference between receipts from sales with the cost of inputs). These costs of inputs could be the time and money invested to produce the product in question. But if the producer had not undertaken this line of business, he could have invested his time and money elsewhere, say, purchasing shares with his money and using his time to work for another employer. The implicit costs incurred by a producer in producing a specific commodity consist of the amounts he

could earn in the best alternative use of his time and money. He earns a pure economic profit from producing Y_1 if and only if, his total receipts exceed the sum of his explicit and implicit costs.

3.3   Structure of Farm Costs

The structure of farm costs depends on how farm inputs are defined. Farm inputs are either purchased or producer-owned from previous year's produce in case of seeds/planting materials or sourced within the farm household in case of family labour and land for small scale farming.

The cost of producing one unit will depend on the prices of the inputs used, the size and scale of the producing enterprise and the rate of plant operation.

The farm cost structure is therefore the summation of the market prices of all purchased inputs and the imputed costs of the producer -owned inputs. The imputed costs are calculated at what the inputs could have earned in alternative uses.

Note that in small scale farming operations or peasant farms, imputed labour (family labour) and owner-supplied farm capital (such as seeds/planting materials) are very important while imputed capital cost is important in large corporate farms.

4.0   CONCLUSION

Costs are expenses incurred by the farmer on the operations of his farm business and there are three forms of costs, namely; accounting costs, opportunity costs, and private costs.

5.0   SUMMARY

In this unit the student has learnt that:

* Costs are the values of inputs used in the production process
* Or, costs are expenses incurred by the farmer on the operations of his farm business
* There are three forms of costs, namely; accounting costs, opportunity costs, and private costs.
* The farm cost structure is the summation of the market prices of all purchased inputs and the imputed costs of the producer -owned inputs.

6.0   TUTOR-MARKED ASSIGNMENT

Differentiate among these forms of costs: Accounting cost, Opportunity cost and Private cost.

7.0   REFERENCES/FURTHER READINGS

Adegeye A.J and Dittoh J.S (1985): *Essentials of Agricultural Economics*.   CARD   University of Ibadan.

Anderson, D. J. (1981). *Economics of West Africa.* Macmillan Publishers

Olayide, S.O and Heady E.O (1982): *Introduction to Agricultural Production   Economics.* University Press, Ibadan.

UNIT 2   MEASUREMENT OF COST

CONTENTS

1.0   Introduction
2.0   Objectives
3.0   Main Content
      3.1   Measures of Cost
      3.2   Classical Measurement of Cost
4.0   Conclusion
5.0   Summary
6.0   Tutor-Marked Assignment
7.0   References/Further Readings

1.0   INTRODUCTION

To know the meaning of cost is one important concept but knowing how cost is measured is a more important concept because costs are different from the perspectives of people employing them. For example the concept of cost to the farmer is not the same thing to the accountant.

2.0   OBJECTIVES

In this unit the student is expected to know the:

- various measures of cost
- components of the classical measure of cost
- differences among total, variable and fixed costs.

3.0   MAIN CONTENT

3.1   Measures of cost

There are three measures of cost, they are;

i.   Capital value measure.
ii.   Alternative expressions of costs.
iii.   Classical measures.

For the purpose of this course, the classical measures of cost would be treated.

3.2   Classical Measurement of Cost

Under the classical measures of cost, there are three major components of cost. They are namely: total cost, variable cost, fixed cost.

(a)   Fixed Costs

These are the costs of fixed inputs of production. They do not vary with the level of output. They may be incurred even when production is not undertaken as is the case with building a factory or farm house or procuring a tractor for farm business. For example, once a firm has provided itself with a factory and installed the necessary machinery, the costs on these items remain the same whether the firm is working at full or only half capacity. Examples of fixed costs include: salaries of administrative staff, expenses for land maintenance and rent, allowances for depreciation (wear and tear) of machinery, expenses for building depreciation, interest on loans, charges for management and so on.

(b)   Variable Costs

Variable costs are the cost of variable inputs used in the production process. Variable costs vary with the level of output and are thus a function of output. This is a category of cost that varies in the short run period while in the medium run and long run, all costs become variable. For example administrative costs become variable in the medium period. Machinery wears out and buildings (factories) can be converted to other uses. Examples of variable costs are wages of labour, cost of raw materials (feeds, seeds, fertilizer, Agro chemicals etc), electricity bills, and cost of powering the generators and other repairs and maintenance to plant and machinery and factories.

Mathematically the variable cost is a linear function of this form:
$TVC = Px_1X_1 + Px_2X_2$.

Where TVC = total variable cost.
$\quad\quad$ Px_1 = unit price of variable input X_1.
$\quad\quad$ Px_2 = unit price of variable input X_2
$\quad\quad\quad$ X_1 = variable input X_1
$\quad\quad$ X_2 = variable input X_2.

(c)   Total Cost

Total cost is the sum of the variable costs and fixed costs.
It is expressed as:

TC = TVC + TFC
Where TC = total cost, TVC = total variable costs and
TFC = total fixed costs.

4.0   CONCLUSION

The classical measure of cost states that there are three types of cost, namely; fixed, variable and total costs. The total cost is made up of the variable and fixed costs.

5.0   SUMMARY

In this unit the student has learnt that:

- Under the classical measure of cost, there are three major components of cost under the classical measure of cost namely; total cost, variable cost, fixed cost.
- Fixed costs are the costs of fixed inputs of production
- Variable costs are the cost of variable inputs used in the production process and they vary with the level of output.
- Total cost is the sum of the variable costs and fixed costs.

6.0   TUTOR-MARKED ASSIGNMENT

Distinguish between total, variable and fixed costs in farm business.

7.0   REFERENCES/FURTHER READINGS

Adegeye A.J and Dittoh J.S (1985): *Essentials of Agricultural Economics*.   CARD   University of Ibadan.

Anderson, D. J. (1981) *Economics of West Africa.* Macmillan Publishers

Olayide, S.O and Heady E.O (1982): *Introduction to Agricultural Production   Economics.* University Press, Ibadan.

UNIT 3 AGRICULTURAL COST FUNCTIONS

CONTENTS

1.0 INTRODUCTION

A thorough knowledge of the cost function is required before the student can do any meaningful economic analysis of the cost function. In this unit the student will be exposed to an in-depth analysis of the cost functions.

2.0 OBJECTIVES

At the end of this unit the student is expected to have known the

- meaning of cost function
- shape of the various cost functions
- derivation of cost functions from a production function
- derivation of the average and marginal cost functions.

3.0 MAIN CONTENT

3.1 Cost Functions

A cost function is a mathematical relationship between the total cost of production and the output produced. It is derived from the production function. For a factor – product production function of the form.

$Y = f(X)$.
Where Y = output
Y is a function variable of the input X. it can also be written as;

Y = f (P$_x$, X), that is, output Y is a function of cost of variable of cost of variable input X where P$_x$ is the unit price of variable input X and P$_x$X is the cost outlay on variable input X at various levels of X (assuming the unit price of X does not vary with the quantity of input purchased). The cost function is therefore written as Y = f (P$_x$X).

3.2   Shape of the Cost Functions

(a)   Total Cost Function

Since the cost function is derived from the production function, the shape of the total cost curve is similar to that of the underlying production function.

A generalized total cost function is the one for a production function that has distinctly the three stages of production- constant, increasing and decreasing returns to scale as explained under the analysis of the production function generalized cost function looks like an inverted letter S as shown in figure -.
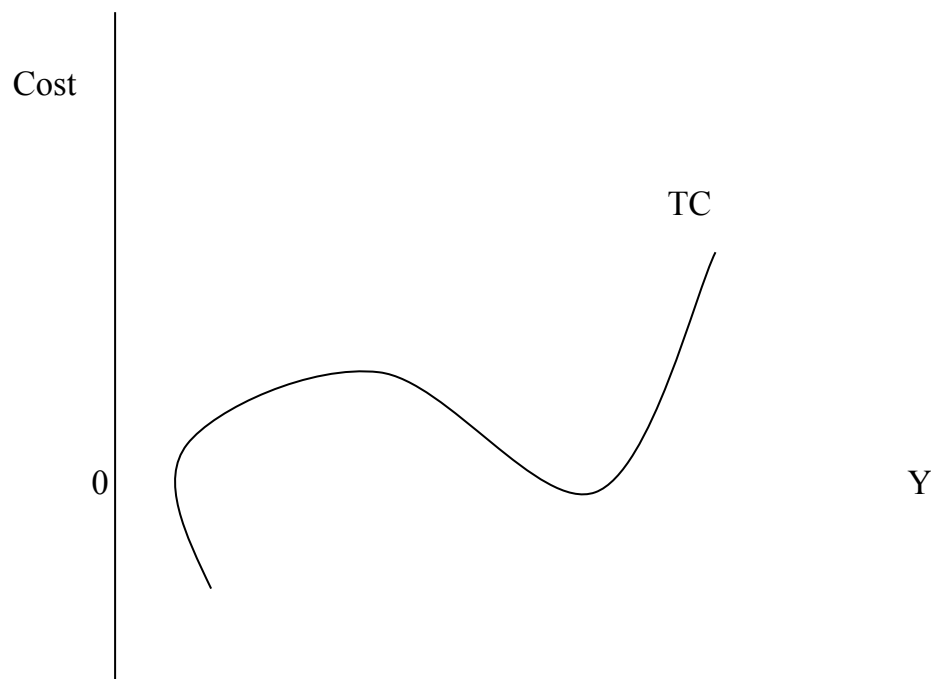
Figure 22: A Generalized Total Cost Function.

(b)   Total Fixed Cost Function

The shape of the fixed cost function is straight line that is parallel to the output axis as shown in figure because it does not vary with output level and thus does not change during the short run period of production.

Cost

TFC

0   Y
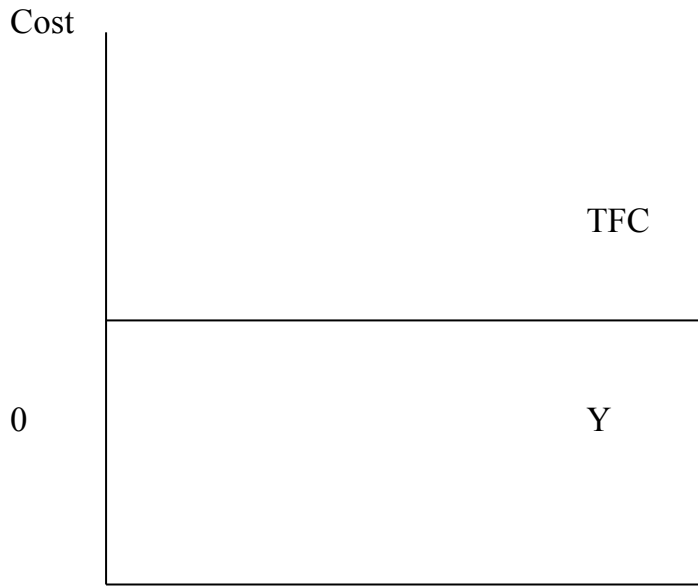
Figure 23: Total fixed cost function.

(c)   Total Variable Cost

The total variable cost function looks like the total cost function.
It is different from the total cost function:

- It is below the total cost curve
- It starts from the origin while the total cost has an intercept equal
  to the size of the total fixed cost.

Cost
TC

TV

TFC

Y
0

Figure 24: Curves of TC, TVC, and TFC functions.

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3.3   Analysis of Cost Functions

The cost functions when subjected to further analysis would result in the derivation of the average cost functions and the marginal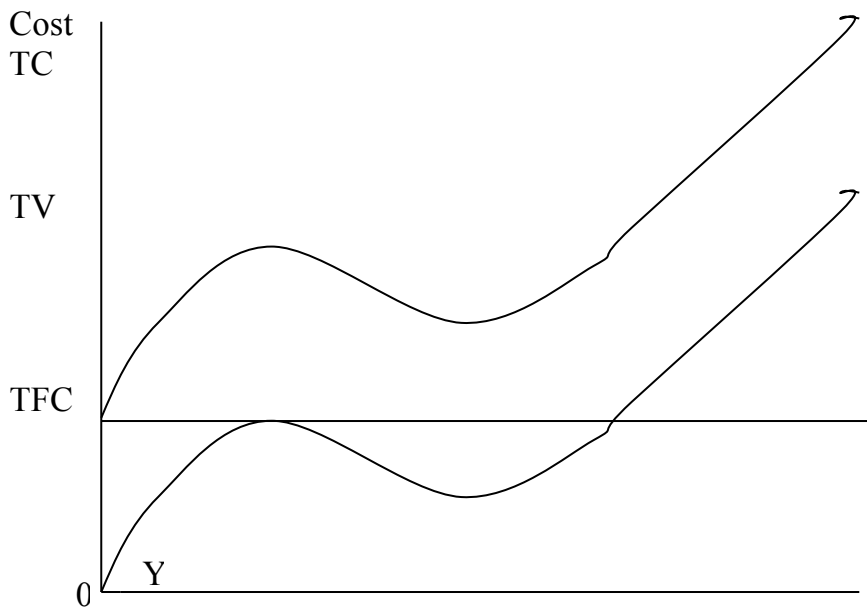 cost functions. These two cost metrics, that is, the average cost (AC) and marginal costs (MC) are used in further economic analysis of the cost and profit functions of the farm business.

3.4   Average Cost

The average cost is the average cost of producing each unit of output. Three categories of average costs are: Average total cost (ATC), Average fixed cost (AFC) and Average variable cost (AVC).

(a)   Average Total Cost (ATC)

This is got by dividing the total cost (TC) by the total product, (Y).
It is mathematically defined as;
ATC = TC / Y.
Where TC = Total cost and Y = Total Product.
The curve of the ATC is U shaped. It declines initially, it reaches a minimum at the level of optimal plant size and rises again (see figure 25)

(b)   Average Variable Cost (AVC)

It is the total variable cost divided by the total product.

It is mathematically defined as;
AVC = TVC/Y.
Like the ATC:
The curve of the AVC is U-shaped.
 It declines initially
It reaches a minimum and rises again (see figure -).
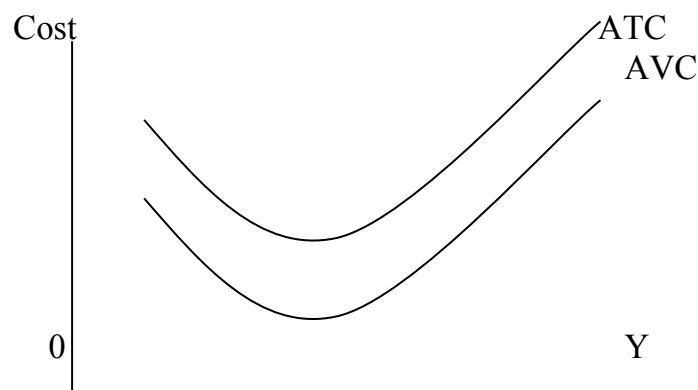
Figure 25: ATC and AVC curves.

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(c)   Relationship between Average Total Cost and Average Variable Cost

The AVC is a component of ATC because;
ATC = AVC + AFC.
AVC and ATC are U-shaped.
The minimum point of ATC is to the right of the minimum point of AVC because ATC includes both AVC and AFC.
AVC approaches the ATC asymptotically as Y increases.

3.4   Marginal Cost

The marginal cost (MC) is the change in total cost (TC) due to unit change in output (Y). It is the cost of producing an additional unit of output. It is got by dividing the change in total cost by the change in total product, that is,

$\Delta TC / \Delta Y$.
Since the fixed cost does not change, therefore, the only change in total cost, ΔTC is the change in total variable cost (ΔTVC).
The marginal cost is also defined as $MC = \Delta TVC / \Delta Y$.
The exact marginal cost is the first derivative of the Total cost function, that is, $MC = dTC / dY$.

Graphically,

- the MC is the slope of the TC curve
- it is also the slope of the TVC curve.
- The MC is also U shaped for TC and TVC curves that are inverted S –shaped. See figure 26)

Figure 26: MC curve.

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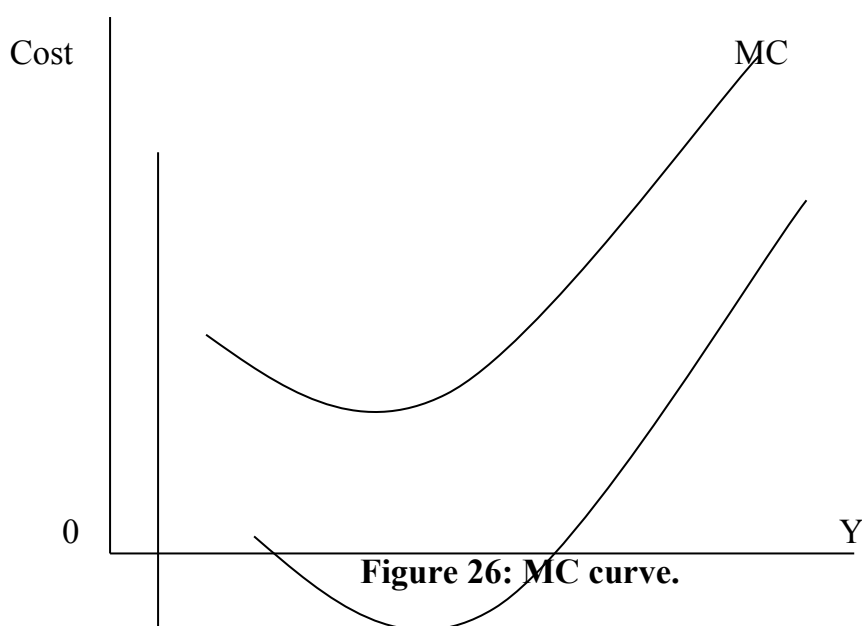
(a) Relationship among MC, ATC, AVC and AFC

- MC equals ATC and AVC at their minimum point.
- MC equals ATC at an output greater than the output at which AVC is at minimum because of the presence of some fixed cost in the total cost.
- AFC slopes downward from left to right and asymptotically approach the output axis as output increases.
- When MC < 0, MC < ATC.
- When MC > 0, MC > ATC.
- When MC = 0, MC = ATC.
- The slope of ATC becomes zero at the minimum point of ATC and MC equals ATC at the minimum point of ATC.
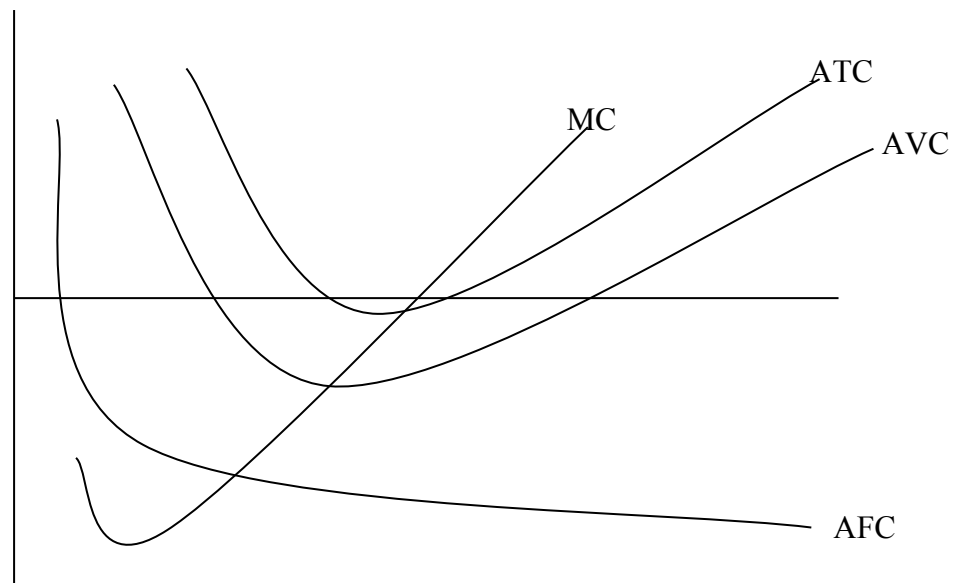
Figure 27 -: AFC, AVC, ATC, MC curves.

3.6 Derivation of Cost Functions from a Production Function: A Mathematically Example

Given a production function of the form:

$Y = 3X + X^2 – 0.1X^3$

Where, X ranges from 0 to 10, P_x = ₦200, TFC = ₦ 1000.

For various levels of X, compute Y, TVC, TC, AFC, AVC, ATC, and MC (average).

Solution:

If $Y = 3X + X^2 – 0.1X^3$

TC = TVC + TFC.

$= P_x X + 1000$.

AFC = TFC / Y.

AVC = TVC / Y
ATC = TC / Y
MC = dTC / dY
$\quad$ = ΔTC / ΔY
$\quad$ = ΔTVC / ΔY
$\quad$ = $P_x \Delta X / \Delta Y$
$\quad$ = $P_x \Delta X / \Delta Y = P_x / MP$.
Where MP = marginal product.

X	Y	TFC	TVC	TC	AFC	AVC	ATC	MC average
0	0	1000	0	1000	0	0	0	
1	3.9	1000	200	1200	256.41	51.28	256.41	51.28
2	9.2	1000	400	1400	108.70	43.48	152.17	24.10
3	15.3	1000	600	1600	63.63	39.22	104.58	32.79
4	21.6	1000	800	1800	46.30	37.04	83.33	31.75
5	27.5	1000	1000	2000	36.36	36.36	72.73	33.90
6	32.4	1000	1200	2200	30.86	37.04	67.90	40.82
7	35.7	1000	1400	2400	28.01	39.22	67.23	60.61
8	36.8	1000	1600	2600	27.17	43.48	70.65	181.82.
9	35.1	1000	1800	2800	28.49	51.28	79.77	
10	30	1000	2000	3000	33.33	66.67	100.00	
11	20.9	1000	2200	3200	47.85	105.26	153.11	
12	7.2	1000	2400	3400	138.89	333.33	472.22	
13	11.7	1000	2600	3600	85.47	222.22	307.69	

4.0 CONCLUSION

The shape of the total and variable cost functions looks like an inverted S and that cost functions are derived from the production function

5.0 SUMMARY

In this unit the student has learnt that the:

- Total, and variable cost functions look like inverted S
- variable cost is always under the total cost
- cost functions are derived from production functions
- average cost is got by dividing the total cost by output level
- marginal cost is the first derivative of the total cost function

6.0   TUTOR-MARKED ASSIGNMENT

1)   Distinguish between average and marginal costs in farm business.
2)   Why is the variable cost curve always below the total cost curve?

7.0   REFERENCES/FURTHER READINGS

Adegeye A.J and Dittoh J.S (1985): *Essentials of Agricultural Economics*. CARD University of Ibadan.

Dillon J L and Hardaker J B (1993) Farm Management Research for Small Farmer Development FAO Rome.

Doll, J P and Orazen, P (1978) Production Economics Theory with Application. John Wiley and Sons Incorporated.

Olayide, S.O and Heady E.O (1982): *Introduction to Agricultural Production Economics*. University Press, Ibadan.

MODULE 5   AGRICULTURAL MARKETING

Unit 1   Meaning of Markets
Unit 2   Types of Markets
Unit 3   Agricultural Marketing

UNIT 1   MEANING OF MARKETS

CONTENTS

1.0   Introduction
2.0   Objectives
3.0   Main Content
        3.1   Definition of Market
        3.2   Conditions for a Market to Exist
        3.3   Importance of Markets
4.0   Conclusion
5.0   Summary
6.0   Tutor-Marked Assignment
7.0   References/Further Readings

1.0   INTRODUCTION

The analysis of demand and supply has made us to know what happens to the goods and services produced for the needs of the consumer. The environment in which the forces of supply and demand operate is the market. This unit therefore looks at the concept of market.

2.0   OBJECTIVES

At the end of this unit the student is expected to know the:

- Various definitions of a market
- Conditions for a market to exist
- Importance of markets

3.0   MAIN CONTENT

3.1   Definition of Market

i.   Market refers to any group of transactions or business dealings between buyers and sellers.

ii.   As opposed to simple selling, a market implies trade that is transacted with some regularity and regulation and in which a certain amount of competition is involved. This competition arises whenever groups of buyers and sellers come together and allows the operation of supply and demand.

iii.   And market can denote potential or estimated consumer demand.

iv.   The earliest markets in history conducted bartering. After the introduction of money, commercial codes were developed that ultimately led to modern national and international enterprises. As production expanded, communications and middlemen came to play an ever growing role in markets.

v.   The term market is also used to denote: A place where people meet to buy and sell goods or commodities on daily, every five days and even on weekly basis. This type of market is found in the rural and urban areas with a basic feature of buyers and sellers meeting to exchange the title-ownership of the commodities brought to the market.

vi.   A market is any organization whereby the buyers and sellers of a commodity are kept in close touch with each other for the exchange of title-ownership of the commodity in the market. This particular definition of market takes care of marketing activities using the Internet facilities, Mobile Phones, and postal Services. The buyers and sellers do not have to come to a particular place as is the case with the rural and urban markets for their marketing activities. They could contact themselves using the phones, internet facilities and the postal services to transact marketing activities. The development of communications such as means of transport, postal, telephone, internet facilities, telegraph services, banking and scientific grading of commodities have all helped to widen markets.

vii.   Another way of defining market is to indicate the type of commodity and the extent of the sale of the commodity. This type of market is called commodity market. Examples are cocoa market, yam market, egg market and so on.

3.2   Conditions for a Market to Exist

The existence of any forms of a market depends on the following basic factors, namely;

- The commodities to sell must exist
- There must be sellers who are ready to sell the commodities
- There must be buyers who want to buy the commodities put up for sale
- The buyers must be able to strike bargains with the sellers on the prices of the commodities
- The process of striking a bargain is done through the process of haggling in most rural and urban markets. In most commodity markets, price determination is not by haggling but through a process of attaching specific prices to different quality grades of the commodity.

3.3   Importance of Markets

- The constitution of markets and market prices are central problems of economics.
- The economic importance of a market is that it is a place where prices of commodities are determined and title-ownership is exchanged.

4.0   CONCLUSION

Market is a place where the forces of supply and demand operate to determine price and exchange title-ownership of goods and services.

5.0   SUMMARY

In this unit the student has learnt that:

- Market is a place where prices of commodities are determined and title-ownership is exchanged
- availability of commodities to sell, presence of sellers and buyers are basic conditions for a market to exist
- The constitution of markets and market prices are central problems of economics.

6.0   TUTOR-MARKED ASSIGNMENT

Why is market important in economic study?

7.0   REFERENCES/FURTHER READINGS

Adegeye A.J and Dittoh J.S (1985): *Essentials of Agricultural Economics*.   CARD University of Ibadan.

Kohls R L (1970) Marketing of Agricultural Products. Macmillan Publishers, New York.

UNIT 2   TYPES OF MARKETS

CONTENTS

1.0   INTRODUCTION

In this unit attempts will be made to categorize markets and discuss the various forms and the characteristics of market under each category.

2.0   OBJECTIVES

At the end of this unit the student is expected to know the:

- criteria for categorizing markets
- essential features of a perfect market
- essential features of imperfect
- characteristics of retail and wholesale markets
- markets under the commodity traded form.

3.0   MAIN CONTENT

3.1   Criteria for Categorizing Markets

There are three criteria for categorizing markets. They include;

i.   Degree of Competition
ii.   Volume of trade
iii.   Commodity traded

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3.2   Degree of Competition

Competitions in economics are conditions that are present in markets where buyers and sellers interact to establish prices and exchange goods and services. Economic competition is the means whereby the self-interest of buyers and sellers acts to serve the needs of society as well as those of individual market participants.
Society is served when the maximum number of goods is produced at the least possible prices.

Under the degree of competition, there are two main types of markets;

- Perfect markets
- Imperfect markets

3.2.1 Perfect Markets

The essential features of a perfect market are;

(a)   Homogeneous Commodity

Any one unit of the commodity brought to the market is exactly like any other. There is no trade name or trade mark to distinguish the supply of one seller from that of another. It is of no consequence then from which seller a buyer makes his purchases.

For example, if garri is offered for sale, all the sellers will be selling garri. If it is white yam, all the sellers would be selling white yam.

(b)   Many Buyers and Sellers

A large number of buyers and sellers would make it impossible for a few buyers and sellers to significantly influence the market demand, supply and prices either by curtailing purchases and supply respectively. Apart from being many, the many buyers and sellers must be on the average small firms. The significance of a large number of small firms and many buyers is that the power to influence the behaviour of the participants in the market is thoroughly dispersed. In other words, no single person or business has the power to dictate the terms on which the exchange of goods and services takes place (unlike the situation in a monopoly or oligopoly). Market results then are truly impersonal.

(c)   Buyers and Sellers must be in Close Touch

Buyers and sellers should have complete knowledge of transactions within the market. This is necessary so that they could be immediately

aware of what is happening in any part of the market. This is possible through the following means;

- Buyers and sellers to be present together in the same place.
- Modern methods of communication, such as telephones, postal services, and internet facilities can easily bring buyers and sellers into easy contact with one another in spite of the distance between them.

(d)   Preferential Treatment

In a perfect market, there must not be any preferential treatment of favoured customers or buyers and sellers.

(e)   Free Entry and Exit into the Market

Buyers and sellers should be free to enter and leave the market. There should be no unionism of any kind that will hinder or limit the extent of entry and exit.

(f)   Portability of Commodity

Commodity in a perfect market should be capable of being easily transported from one part of the market to another.

3.2.2 Imperfect Markets

Any deviation from those conditions that make a perfect market makes the market an imperfect one. Therefore, under imperfect markets the following features are discernable;

(i)   Non-homogeneous Commodity

The same type of a commodity may be branded under different names or may be differentiated on the basis of further processing. For example, in the garri market, yellow garri is different from white garri while USA brand of rice is not the same as Golden brand of rice to an average house wife and Elephant cement is different from Dangote cement to a bricklayer.

(ii)   Entry and Exit

Entry into imperfect market is not free. A prospective seller must join an existing association before he or she can be allowed to entry the market while buyers may be compelled to buy from particular sellers. For example, farmers' wives who bring the produce from their

husbands' farms to the market can not sell directly to the final consumers in most markets. They have to sell first to some designated middlemen who will eventually distribute to the retailers and the wholesalers before the final consumers can get the commodity to buy.

(iii)   Preferential Treatment

Sellers in imperfect markets treat buyers differently since market information is hoarded. Sellers charge differential prices depending on who they are selling to.

3.2.3 Cases of Imperfect Markets

(a)   Monopoly:

In a monopolistic market, two conditions must be fulfilled:

- There is only one seller selling the commodity or the few sellers combine together to fix supply and price of the commodity.
- There is no substitute for the commodity.

(b)   Oligopoly

In an oligopoly market;

- There are a few sellers and many buyers.
- It is called duopoly when there are just two sellers.
- Duopoly is thus a special case of oligopoly.

3.3   Volume of Trade

Markets can be classified on the basis of volume of trade and resource base of the operators. There are retail and wholesale markets.

3.3.1 Retail Market

- The sellers in this market are small traders.
- The sellers have small resource base hence they could only handle small volume of the commodity they sell.
- The retailers sell directly to the final consumers.

3.3.2 Wholesale Market

- The wholesalers are big traders.
- They have huge resource base.
- They handle large volume of the commodity market and perform the following functions

3.3.2.1 Functions of Wholesaler

(a)   Breaking of Bulk

Producers prefer to sell directly to wholesalers who buy in bulk in order to avoid sundry marketing problems. The wholesalers then distribute the commodity to the retailers who buy in small quantities.

(b)   Warehousing

The wholesalers relieve the manufacturers of the trouble and expense of holding large stocks by taking stock of what is produced so that the manufacturer can have their factory space cleared for further production. The holding of stocks by the wholesalers is a valuable service, as it acts as a lubricant to the economic system, enabling distribution to work smoothly and preventing the development of bottlenecks.

(c)   Expert Buying and Selling

Expert knowledge is required of the commodity bought and sold in the organized produce markets. Only wholesalers could employ specialists to examine, test and assess the commodities before purchase and sale.

(d)   Marketing the Product

Wholesalers assist manufacturers in marketing their products by passing on to them information regarding consumers' demand which they obtained from the retailers with whom they (wholesalers) are in touch. This assists manufacturers to know the anticipated demand.

(e)   Financing production and Distribution

In addition to financing the holding of stocks, the wholesalers often help to finance both the manufacturer and retailers directly. By prompt payment to the manufacturer or even giving soft loans and by allowing credit to the retailers the wholesalers help to finance the activities of the manufacturers and retailers.

(f)   Preparing the Product for Sale

The wholesalers often process or prepare for sale the goods they receive from the manufacturer before passing them on to the retailers. The processing or preparation may take the form of packing, grading or branding.

3.4   Commodity Traded

It is assumed that markets exist for the buying and selling of commodities.

(a)   Forms of Commodities

Commodities can assume many meanings such as;

- Consumer goods or final products such as, yam, rice, beef, eggs and so on.
- Producer goods or intermediate products such as, raw materials such as cocoa, cotton, rubber and so on.
- Production resources such as labour, capital, land and so on.

(b)   Forms of Market

Using the various meanings of commodities we can therefore talk of the following markets:

- Markets for final products: yam market, rice market and so on.
- Markets for Intermediate products: cocoa market, groundnut market, leather market and so on.
- Markets for Production resources: labour market, land market.
- Financial market such as; capital market for new securities, money market for short term loans, stock exchange for transfer of securities and foreign exchange market for foreign exchange.

4.0   CONCLUSION

Markets are classified based on three criteria, namely; degree of competition, volume of trade and commodity traded.

5.0   SUMMARY

In this unit the student has learnt that:

- Based on degree of competition there are perfect and imperfect markets
- Based on volume of trade there are wholesale and retail markets
- Based on commodity traded there consumer goods markets, producer goods markets, and production resources markets.

6.0   TUTOR-MARKED ASSIGNMENT

Identify the three criteria for classifying markets and write on their characteristics giving examples in each case.

7.0   REFERENCES/FURTHER READINGS

Adegeye A.J and Dittoh J.S (1985): *Essentials of Agricultural Economics*.   CARD University of Ibadan.

Kohls R L (1970) Marketing of Agricultural Products. Macmillan Publishers, New York.

UNIT 3   AGRICULTURAL MARKETING

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1.0   Introduction
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       3.2   Importance of Efficient Marketing
       3.3   Marketing of Agricultural Products
       3.4   Marketing Functions
       3.5   Problems of Agricultural Marketing
4.0   Conclusion
5.0   Summary
6.0   Tutor-Marked Assignment
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1.0   INTRODUCTION

In this unit the student will be made to know the differences between market and marketing. Efforts will be made to discuss the various meanings of marketing and the peculiar characteristics of agricultural marketing.

2.0   OBJECTIVES

In this unit the student is expected to know the:

- meaning of marketing
- conditions for efficient marketing
- essential features of agricultural product
- meaning and types of marketing functions
- major problems of agricultural marketing.

3.0   MAIN CONTENT

3.1   Definition of Marketing

i.   Agricultural marketing is the performance of all activities involved in the flow of goods and services from the point of initial production until they are in the hands of the ultimate consumers.

ii.   It is the process of satisfying human needs by bringing precuts to people in the proper form, at the proper time and place they need the products.

iii.   Marketing however has several other meanings from the perspective of product, business firms and the society as a whole. While the consumers are interested in getting what they want at the lowest possible cost, the produces are interested in obtaining the highest possible returns from the sale of their products. The various firms engaged in doing the various marketing tasks are interested in the profitability of their particular business operation. The overall ruler of marketing activities in a society organized in a private enterprise framework is the consumer. The consumer is king.

iv.   Marketing is the process through which producers and consumers are brought into contact formally or informally for the exchange of goods and services involving the performance of marketing activities. It is a management function that organized and directs all business activities involved in assessing and converting consumer purchasing power into effective demand for a specific product or service and in moving it to the final consumer or user so as to achieve the profit target or other objectives set by the producer.

3.2   Importance of Efficient Marketing

Any efficient marketing system should address the following:

i.   Supply of food crops and livestock in the form, place, and time the consumers want them.
ii.   Location of where there are surpluses of produce and bringing them to where there are shortages.
iii.   Marketing is important for countries whose products are export oriented since earnings from such exports are used to finance other development programmes.
iv.   Marketing is an indicator of consumer preferences through the prices they are prepared to pay and this also affects the production decisions of farmers as they are likely to produce commodities that have high demand.
v.   Efficient marketing system leads to increase in employment, rise in the standard of living of the people and wealth of the community.
vi.   It also leads to increased incentives for government to provide infrastructures such as roads, water, electricity, storage facilities.

vii.   It leads to stimulation of research into techniques of food preservation, preparation and processing to meet the needs and tastes of the people.

viii. It ensures that supplies of goods that are seasonal become available throughout the year with little variation in prices.

3.3   Marketing of Agricultural Products

The marketing of agricultural products is very unique because of the special characteristics of most of the agricultural products. These characteristics include;

(a) Seasonality

Agricultural products are seasonal, whereas demand for them is fairly stable throughout the year. It is the function of marketing to ensure that the seasonal agricultural products are available throughout the year.

(b)   Bulkiness

Agricultural products are very bulky due to their high waters content. For them to attract high values they have to be processed to reduce the water content (changing the form utility) before they are marketed. Examples of bulky agricultural products are cassava, yam, sugar cane and plantain.

(c)   Perishability

Agricultural products are highly perishable. Vegetables cannot stay for more than two days after being harvested before consumption except they are frozen or dried. This characteristic increases the marketing cost because they must get to the final consumer as quickly as possible. The problem is compounded by the inefficient storage facilities in the country due to incessant power failure to operate the available cold rooms and refrigeration.

(d)   Production in the Hands of Peasant Farmers

Over 70 percent of agricultural productions in Nigeria are handled by small scale farmers. This group of farmers operates small holding that are scattered over appreciable long distances. The surpluses from these farms can not easily be assembled because of the deplorable state of the feeder roads and networks in the rural areas of the country. Also, the transportation system is very expensive in the rural areas due to high cost of vehicle maintenance and state of the rural road networks.

(e)   Processing Cost

Most agricultural products are not consumed in the state they are produced. The processes of processing them into the form expected by the consumers increase the marketing cost.

3.4   Marketing Functions

(a)   Definition of Marketing Functions

- These are the activities performed by a marketing system in presenting goods to consumers in the form, place and time they want the goods so that both producers and consumers gain.
- Marketing functions describe what happens or what can happen to the product between the time of production and time of purchase by the final consumers.
- They are the major specialized activity performed in accomplishing the marketing process.

(b)   The Major Marketing Functions

The three major marketing functions include:

- Exchange functions
- Physical functions
- Facilitating functions

(i)   Exchange Functions

These are activities involved in the transfer of title to good. It is at this stage that price determination enters the study of marketing. The activities involved include;

- Seeking out the sources of supply.
- Buying the products and activities associated with purchase
- Assembling of products.
- Selling; activities associated with merchandizing such as physical display of goods, advertising to create demand.

(ii)   Physical Functions

Activities that involve handling, movement and physical change of the goods to solve the problem of when, what and where utilities in marketing, the functions are:

- Storage
- Transportation
- Processing.

(iii)   Facilitating Functions

They are activities that make possible the smooth performance of the exchange and physical functions. They include;

- Standardization
- Financing
- Risk bearing
- Marketing intelligence.

3.5   Problems of Agricultural Marketing

Agricultural marketing is bedeviled by a lot of problems. Some of the problems arise because of the basic characteristics and problems of Nigeria's agriculture.

Some of the problems of agricultural marketing include;

- Supply of agricultural produce from scattered farms
- Lack of transport facilities
- Inefficient handling, packaging, and processing facilities
- Inadequate storage and warehousing facilities
- Lack of uniform weights and measures
- Adulteration of produce
- Instability in prices
- Lack of market information
- Inadequate research on marketing

4.0   CONCLUSION

Agricultural marketing is the performance of all activities involved in the flow of goods and services from the point of initial production until they are in the hands of the ultimate consumers.

5.0   SUMMARY

In this unit the student has learnt that:

* Efficient marketing ensures adequate supply of food and export commodities as well as guarantees employment and research
* Marketing of agricultural products is unique due to some peculiar characteristics of agricultural products
* Marketing functions are the activities performed by a marketing system in presenting goods to consumers in the form, place and time they want the goods so that both producers and consumers gain

6.0   TUTOR-MARKED ASSIGNMENT

1) Why is the marketing of agricultural products unique?
2) Write brief notes on the physical and exchange functions of the marketing functions

7.0   REFERENCES/FURTHER READINGS

Adegeye A.J and Dittoh J.S (1985): *Essentials of Agricultural Economics*.   CARD University of Ibadan.

Kohls R L (1970). Marketing of Agricultural Products. Macmillan Publishers, New York.

MODULE 6   AGRICULTURE IN NIGERIA'S ECONOMY

Unit 1   Agriculture in Nigeria's Economic Development
Unit 2   Problems of Nigerian Agriculture

UNIT 1   AGRICULTURE IN NIGERIA'S ECONOMIC DEVELOPMENT

CONTENTS

1.0   Introduction
2.0   Objectives
3.0   Main Content
    3.1   Introduction
    3.2   Characteristics of Nigerian Agricultural Sector
    3.3   Evaluation of Agriculture Sector Performance
4.0   Conclusion
5.0   Summary
6.0   Tutor-Marked Assignment
7.0   References/Further Readings

1.0   INTRODUCTION

Nigeria is an agrarian nation going by the singular contributions of this sector to the country's socio-economic development. It is therefore necessary to discuss the importance of agriculture in the country's economic development as well as the problems facing this all important sector of the economy.

2.0   OBJECTIVES

In this unit the student is expected to:

•   know the contributions of agriculture to the nation's economy
•   be able to evaluate the performance of the agricultural sector.

3.0   MAIN CONTENT

3.1   Introduction

Nigeria economy was agrarian prior to the commercial exploration and exploitation of petroleum in the 1970s.The major contributions of productive agriculture to a nation's economic growth could be summarized thus:

i.   food production
ii.   capital accumulation for industrial development
iii. provision of employment for rural population, scientists and middlemen-the distributive section of the economy
iv.   foreign exchange earning for effective balance of trade at the international scene

Before the decade of the 1960s the domination role of agriculture in Nigeria's economy was taken for granted.
Nigerian agriculture was able to grow at a sufficient rate without government's efforts and support to:

- provide adequate food for an increasing population
- raw materials for a building industrial sector
- increasing public revenue and foreign exchange for government
- employment opportunities for an expanding labour force.

The little support provided by government for agricultural development was concentrated on export crops like cocoa, groundnut, rubber and cotton as self sufficiency in food production seemed not to pose any problem worthy of public attention.

Even though, emphasis has shifted from agriculture to petroleum exploitation and manufacturing sector, agriculture still remains;

- The main stay of the Nigerian economy.

- Farming still remains the major source of employment of the bulk of the adult male population since a large proportion of Nigerians live in rural areas as full time farmers where they cultivate both food and cash crop for home consumption and for cash. About 70% of the labour force is still employed in agriculture.

- Nigerian Agriculture still provides enough food for the population with little importation. Thus the fear of famine may

not materialize in Nigeria if the current tempo in the agricultural food production is maintained.

• Agriculture was and is still the leading contributor to the Gross Domestic Product (GDP) of Nigeria. Even though the trend declined significantly between 1960 to the 1980s, agriculture is still the single major contributor to the GDP with about 40% of the GDP coming from the sector alone.

3.2   Characteristics of Nigerian Agricultural Sector

The basic features of Nigerian Agriculture include the following:

(i)   Agriculture is the major employer of the population's active labour force with   about 70% of the active labour force engaged in agriculture and agricultural related activities; where as, only about 3 to 5% of the population of the developed economy is engaged in agriculture.

(ii)   The farmers operate small and fragmented land holdings due to low resource base and land tenure systems. These small farms have been mainly responsible, for self sufficiency of food and cultivation of export crops. The small-scale farmers are significant in world development because 50% of world's population is dependent on subsistence agriculture cultivating 40% of cultivated land and producing 40% of all agricultural output.

(iii)   The farmers operate with very low level of capital input in terms of seeds or planting materials. Tools used are mainly cutlasses and hoes. The bulk of the factors of production used on the farm is sourced within the household and is limited in scope since only labour and land are the mostly used resources.

(iii)   Fertilizer input and other chemicals are poorly used. Credit input is not easily available. The informal sources are small, lack continuity and attract high interest rates while the formal sources are not easily available.

(iv)   Production is essentially for the farm family with surplus disposed of through the marketing channels to raise money for non-farms needs such as settlement of medical and school bills.

(v)   Productivity and production are low with resultant increasing shortages and rising food prices.

3.3   Evaluation of Agricultural Sector Performance

The evaluation of the performance of the Nigerian agriculture sector is based on the extent to which it has satisfactorily performed the roles ascribed to it and its contribution to the gross domestic product (GDP).

(a)   Agriculture Share of the GDP

The agriculture share of the estimated GDP of ₦3834.6 million in 1960 was 94%. This trend continued until the advent of commercial exploration of petroleum and the development of other sub-sectors of the economy. The agriculture share declined to about 56% in 1960-1969 period, it declined considerably to an average of about 24% in 1970-1979 period, 22% in 1980 and fluctuated further to between 16% and 24% between 1981 and 1985. But lately, there has been some improvement in the agriculture share of the GDP, especially since 1993. The share has increased to an average of about 39% between 1993 and 2005.

The sustained growth in agricultural production observed since 1993 has been due mainly to favourable weather conditions,

- Timely and well distributed rain fall throughout the country thus encouraging intense farming activity.
- This development coupled with intensified effort by the National Agricultural and Development Authority (NALDA) to bring more land and small holder hectares under cultivation.

Other factors which contributed to the improvement included;

- The intensification of on farm adaptive research by more relevant agencies such as Agricultural Development Projects (ADPs)
- the supply of high quality seeds/seedlings
- better usage of improved storage facilities

(b)   Employment Generation

Prior to 1960 the agricultural sector's share of the total labour force stood at over 70%. It declined to about 55% in 1979 and about 52% in 1985. Agriculture which used to be the major employer of labour has been releasing labour at a higher rate than the non-agricultural sector can absorb thereby contributing significantly to the country's unemployment problem.

(c)   Source of Foreign Exchange Earnings

Agriculture share of foreign exchange earnings has been declining over time. The value of agricultural exports declined from an average of ₦432.7 million between 1978/80 to an average of ₦271.3million from 1980/82 due to declining supply of agricultural products for export.

(d)   Food for an Increasing Population

The rate of growth of Nigeria's food production has been very low. Nigeria's food production has been growing at about 2.5% per annum in recent years while   food demand has been growing at a rate of more than 3.5% per annum due to the high rate of population growth of 2.83%.

This has led to:

•   A widening gap between domestic food supply and the total food requirement.
•   An increasing resort to food importation.
•   High rates of increase in food prices.

(e)   Raw Materials for Industries

Nigerian agriculture has not performed well in providing raw materials for our industries as most of Nigerian Industries are increasingly dependent on import sources for their agricultural raw materials.

(f)   Markets for the Products of the Industrial Sector:

The slow rate of growth and modernization in the agricultural sector has been an impediment to the growth of the agricultural sector market for the products of the industrial sector in Nigeria.

4.0   CONCLUSION

The Nigerian economy is still at the mercy of improved agricultural development for its provision of food and employment generation for the ever growing population. Unfortunately, the Nigerian agriculture has not performed to expectation.

5.0   SUMMARY

In this unit the student has learnt that

- Agriculture is very central in the socio-economic development of Nigeria
- Agriculture has not performed to expectation in Nigerian economy

6.0   TUTOR-MARKED ASSIGNMENT

Discuss the performance of agriculture in Nigeria's economic development

7.0   REFERENCES/ FURTHER READINGS

Central Bank of Nigeria (1997) Annual Report and Statement of Accounts. CBN Publication. Lagos.

Federal Ministry of Agriculture Water Resources and Rural Development (1988): Agricultural Policy for Nigeria. FMAWRD Publication.

Ojo S O (2000) A Comparative Economic analysis of Oil-Palm Farms in Ondo State, Nigeria. Unpublished Ph.D Thesis in the Dept of Agric Economics and Extension, Federal University of Technology, Akure.

Oludimu, O L and Imoudu, P B (1998). Institutional Reforms for Agricultural Development (Essays in Honour of Late Professor Segun Famoriyo)   Published by Triumph Books Publishers, Ijebu Ode.

UNIT 2 PROBLEMS AND PAST EFFORTS AT SOLVING THE PROBLEMS OF THE NIGERIAN AGRICULTURAL SECTOR

CONTENTS

1.0   INTRODUCTION

Nigeria is an agrarian nation going by the singular contributions of this sector to the country's socio-economic development. It is therefore necessary to discuss the importance of agriculture in the country's economic development as well as the problems facing this all important sector of the economy and past efforts at solving these problems.

2.0   OBJECTIVES

In this unit the student is expected to know the:

- various classes of problems facing the Nigerian agriculture
- efforts at solving the problems of agricultural development in Nigeria
- some of the programmes to develop the agricultural sector.

3.0   MAIN CONTENT

3.1   Introduction

The Nigerian agricultural sector has not performed to expectation due to some problems and constraints which could be grouped into four broad categories, namely; technical, socio-economic, organizational and institutional problems.

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3.2   Problems of the Nigerian Agricultural Sector

(i)   Technical Problems

- Inadequate quantity and quality of farm inputs.
- Low level of agricultural technology.
- Inadequate infrastructural facilities for agricultural production such as roads, electricity and so on.
- Marketing and distribution problems.
- Disruptive effects of some natural phenomena on agricultural activities such as drought, pest and disease, erosion and flood.

(ii)   Socio-economic Problems

- High and increasing cost of agric production.
- Low rates of return from most agric investments.
- High labour wage rate in agriculture.
- Low labour productivity.
- Corruption, mismanagement, ineffective utilization.

(iii)   Organizational Problems

- Agricultural business needs to be organized properly for efficient management but under the predominantly traditional system of farm organization in Nigeria, modern management techniques are difficult to practice.
- Organizational aspects of government programmes need improvement. There should be proper coordination among government programmes, ministries, agencies and states to avoid duplication of services, activities, resource wastes, conflict in goals and poor quality of service due to bureaucratic bottlenecks.

(iv)   Institutional Problems

A large number of institutions have been created in Nigeria to execute a wide range of agricultural programmes and projects. These include institutions designed to;

- produce and supply material inputs
- provide farm credit
- provide marketing support for agric products
- administer input price subsidy.

These institutions are bedeviled by operational inefficiency due to;

- poor coordination of activities
- overlap in services provided
- high administrative over head cost
- unduly high cost of providing services
- corruption.

3.3   Efforts at Solving the Problems of Agricultural Development in Nigeria

In an effort to tackle the problem of agricultural development in Nigeria, the various governments initiated several policies, programmes and projects largely within the frame work of four development plans and rolling plans since independence in 1960.

The four national development plans are;

- 1st plan 1962-1968
- 2nd plan 1970-1974
- 3rd plan 1975-1980
- 4th plan 1981-1985.

In each plan document, except the 1st plan, the agricultural sector objectives were specified in addition to the overall national economic development goals.

The agricultural policy objectives include:

- Ensuring food supplies in adequate quantity and quality to keep pace with rising population and urbanization, having regards to changing tastes and the need for fair and stable prices.
- Expanding the production of export crop with a view to increasing and further diversifying the country's foreign exchange earnings.
- Significantly increasing the production of agricultural raw materials to support domestic manufacturing activities especially in the field of agro-based industries in addition to export.
- Creating rural employment opportunities to enhance the deployment of human resources.
- Evolving appropriate institutional and administrative apparatus to facilitate a smooth integrated development of the agricultural potential of the country as a whole.

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3.4   Programmes and Projects to Develop the Agricultural Sector

Even before independence in 1960 and thereafter, specific agricultural programmes were initiated to develop the agricultural sector. They include:

(a) **The Farm Settlement Scheme, Whose Major objectives were to:**

- overcome the land tenure problems
- encourage the adoption of techniques and cooperative form of organization by private farmers
- absorb some of the primary and secondary school leavers thereby reducing their influx into urban centres
- provide infrastructures such as roads, electricity, water supplies and schools for the rural areas thus reducing rural–urban migration,

(b)   River Basin Development Authority (RBDA)

They were initiated in 1970 and became operational in 1974 with the creation of Sokoto-Rima and Chad basin RBDAS.
The initial objectives of the RBDAs include:

- Provision of large scale mechanized clearing of farmlands for farmers.
- Construction of dams and bore holes.
- Supply of electricity.
- Setting up of agro-chemical centre equipped with workshops and tractor hire services.
- Multiplication of improved seeds.
- Promotion of rural development projects through manpower training

(c)   Agricultural Development Projects (ADPS)

They started as enclave projects in Funtua (Katsina, Gusau, Zamfara) and Gombe (Bauchi) in 1972. Their main objectives were to accelerate in crop production, productivity and income of small scale farmers.
The ADPS system contributed significantly to agricultural production in Nigeria. The yield and income realized by farmers have increased, while the extension services of the ADPS have also shown the power of effective education and information dissemination in agricultural production.

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(d)   Operation Feed the Nation

This Programme was launched in May 1976 to popularize agriculture and food production among schools, colleges and various other institutions.

(e)   Green Revolution

It was launched in 1979 to make Nigeria self sufficient in the staples within five years and encourage export crops with seven years.
The scheme involved farm mechanization, national rice production, large scale production of root and grain crops.

(f)   National Accelerated Food Production Programmes (NAFPP)

This is the most enduring of the agricultural development programmes.
Its objectives include:

- Development of a comprehensive package of technology that farmers could adopt to achieve higher productivity.
- Development of an input delivery system, through an integrated research extension programme.
- Improve storage, marketing, credit supply and prices in such a way that both farmers and consumers are better off.

(g)   Other Programmes include:

- National Directorate of Employment (NDE)
- Better Life Programme
- Directorate of Food, Roads and Rural Infrastructure (DFRRI)
- Family Economic Advancement Programme (FEAP)
- Structural Adjustment Programme (SAP)
- Poverty Eradication Programme (PEP)
- Youth Empowerment Scheme (YES)

4.0   CONCLUSION

The problems of Nigerian agriculture are classified as technical, socio-economic, organizational and institutional. Nigerian various governments have been making efforts to solve these myriad of problems through many programmes and projects.

5.0   SUMMARY

In this unit the student has learnt that:

*   The Nigerian agricultural sector has not performed to expectation due to some problems and constraints which are grouped into technical, socio-economic, organizational and institutional problems.
*   Efforts at Solving the Problems of Agricultural Development in Nigeria include the introduction of four development plans between 1962 and 1985 and some agricultural programmes and projects.

6.0   TUTOR-MARKED ASSIGNMENT

1)   (Briefly enumerate the problems facing agricultural development in Nigeria.
2)   Why has past efforts at revamping Nigerian agriculture failed?

7.0   REFERENCES/FURTHER READINGS

Central Bank of Nigeria (1997) Annual Report and Statement of Accounts. CBN Publication. Lagos.

Federal Ministry of Agriculture Water Resources and Rural Development (1988): Agricultural Policy for Nigeria. FMAWRD Publication.

Ojo S O (2000) A Comparative Economic analysis of Oil-Palm Farms in Ondo State, Nigeria. Unpublished Ph.D Thesis in the Dept of Agric Economics and Extension, Federal University of Technology, Akure.

Oludimu, O L and Imoudu, P B (1998) Institutional Reforms for Agricultural Development (Essays in Honour of Late Professor Segun Famoriyo) Published by Triumph Books Publishers, Ijebu Ode Dept. of Agric Economics and Extension, Federal University of Technology, Akure.

Oludimu, O L and Imoudu, P B (1998) Institutional Reforms for Agricultural Development (Essays in Honour of Late Professor Segun Famoriyo) Published by Triumph Books Publishers, Ijebu Ode.